

The Carcass and The Balloon: Reinterpreting the Hanford Landscape Through Mapping and Measure

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Abstract

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As a unique geography of irradiated space, the Hanford Reach in Washington State has been measured in every way conceived by modern science and bureaucracy. This former military site has been mapped in a variety of ways, in maps that tend to over specify and oversimplify at the same time, placing its entangled histories and futures of this landscape at odds with one another. The interpretation of the site currently relies on the articulation of the boundaries between things, contaminated and uncontaminated, natural and man-made, and future and past. This thesis argues for a more nuanced interpretation of the site employing mapping as a generative vehicle for designing and communicating within this context. The proposed design of architectural interventions, the Carcass and the Balloon, relies on the extraction of unseen spatial, material and formal measures of the site.

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Figure 1



Figure 2

CHAPTER 1.

Introduction

Around 13,000 years ago, the last major flood of the late Pleistocene Epoch receded revealing the landscape of the Columbian plateau stripped away of sediments. In strong contrast to the Cascade Mountains seen along the two and a half hour drive southeast from Seattle, the Hanford Site readily shows its geological history in the giant current ripples and flood bars left on its 586 square mile surface.¹ Native Americans including the Nez Perce, Umatilla, Wanapum Tribe, and Yakama Nation first inhabited this landscape as early as 12,000 years ago, migrating to the Columbia River to utilize the salmon runs in the spring and fall, and returning to the mountains to gather and hunt until winter snows pushed them back to the low lying Columbia river valley.² With the arrival of Lewis and Clark in 1805, land uses began to change dramatically as explorers, surveyors, and engineers set out to establish ownership of this vast, raw, untouched landscape.

1 S. P. Reidel, K. A. Lindsey, K. R. Fecht, Field Trip Guide to the Hanford Site (U.S. Department of Energy, 1992). P. 2

2 Hanford Comprehensive Land-Use Plan Environmental Impact Statements. (U.S. Department of Energy, 1999). P. 137



Figure 3

By the turn of the century, the landscape had been marked by the ubiquitous American grid that reveals itself from the sky as irrigated farmlands and grazing pastures. In contrast to the Native American architecture that existed temporarily throughout the seasons for thousands of years in a relationship with material and programmatic needs of a migratory lifestyle, western settlements left their marks on the land in more permanent ways. The town of Hanford was settled in 1907 on land bought from the local utility, growing quickly due to the Pacific Railroad Company link to Chicago, Milwaukee, and St. Paul to the east. Hanford's boom years as an agricultural town were cut short, along with those of the neighboring town of White Bluffs, in March of 1943 when the towns were condemned by the Federal Government to make way for the production of plutonium as part of the Manhattan Project (figure 1).³ In a matter of months over 50,000 workers occupied a construction camp near the former town of Hanford, hired to construct facilities for the nuclear project. The life of the site continued in secrecy in secrecy, with few people aware of the work they were involved in. On August 6, 1945, President Harry Truman specifically mentioned Hanford when he announced that an atomic bomb had been dropped on Hiroshima, with headlines the next day reading "It's Atomic Bombs!" (figure 2).⁴ Plutonium production ramped up during the Cold War until 1988 when the nuclear reactors were shut down.⁵

In 2000, by presidential decree, 195,000 acres at the periphery of the Hanford Site was endowed with the status of a national wildlife refuge.⁶ Today the Hanford Reach National Monument is a boundless expanse of shrub-steppe, towering white bluffs, and the last undammed stretch of the once mighty Columbia River (figure 3). The five decades of plutonium production at the Hanford Site have left an extensive waste legacy, with a variety of toxic waste discharged into the air, soil, and water. Today much of the remaining Hanford Site has been transferred to long-term stewardship for decades of continuing environmental remediation.

A unique geography of irradiated space, Hanford has been measured in every way conceived by modern science and bureaucracy - in maps that tends to over specify and oversimplify at the same time, placing entangled histories and futures of the site at odds with one another.⁷ The interpretation of the site relies on the articulation of the boundaries between things contaminated and uncontaminated, natural and man-made, and future and past. This thesis argues for a more nuanced interpretation of the site employing mapping as a generative vehicle for designing and communicating within its history. The proposed design of architectural interventions, the Carcass and the Balloon, relies on the extraction of unseen spatial, material and formal measures of the site.

3 John M. Findlay, Bruce W. Hevly, *Atomic Frontier Days: Hanford and the American West* (Seattle: Center for the Study of the Pacific Northwest in association with University of Washington Press, 2011). P. 102.

4 Jim Kershner, *Richland residents discover the truth about what they were producing at Hanford upon U.S. bombing of Hiroshima on August 6, 1945* (The State of Washington Department of Archeology and Historic Preservation, 2008) Web.

5 U.S. Department of Energy, *Hanford Site Cleanup Completion Framework* (U.S. Department of Energy, 2013). P. 11

6 U.S. President. Proclamation, "Establishment of the Hanford Reach National Monument." *Federal Register* 36, no. 23 (Office of the Federal Register, 2000). web.

7 James Corner, *Aerial Representation: Irony and Contradiction in an Age of Precision* (Yale University Press, 1996). P. 152

CHAPTER 2.

Theoretical Framework: Relational Measure

The meter was first devised in France in 1799 as a unit equal to 1/40,000,000 of the earth's meridian.⁸ Today, this unit of measure is defined as the length of the path traveled by light in a vacuum during the interval of 1/299,792,458 of a second.⁹ Unlike measures of the past, the meter provided a standard unit that was detached from external circumstances and therefore could be used to study things in isolation. This detachment enabled modern scientists to assume a separation from nature, even a dominance of it. James Corner argues that the belief in the idea of measure to control the natural world was linked to the building of utopia. In *Taking Measures Across the American Landscape*, Corner concludes that the great paradox of America is that modern measure has produced a "land in which practically everything has become available and anything is now possible... a 'hyperreality' of exhilarating and emancipating opportunity." At the same time these symptoms of control can reflect "symptoms of a 'dis-measure,' ...[in] a placeless space wherein all values are neutralized and all measures voided of meaning and hope."¹⁰

8 H.G. Jarrard, D.B. McNeill, *A Dictionary of Scientific Units*, Chapman and Hall, 1964, p. 85.

9 17th General Conference on Weights and Measures (1983), Resolution 1.

10 James Corner, *Aerial Representation: Irony and Contradiction in an Age of Precision* (Yale University Press, 1996). P. 128.

In contrast to the detached, rational logic of modern measure, Corner introduces the idea of “traditional measure” as possessing “the capacity to relate the everyday world to the infinite and invisible dimensions of the universe”, rooted in revealing the perfection of the natural world.¹¹ In this way, traditional measure was an understanding of harmony expressed by the movement of planets, harmonics, and heavenly deities. Expressing the relationships between the heavens and the horizon, celestial navigation allowed people to measure their place in the world and conjure a mythology that still exists today in the form of constellations. Corner also notes that traditional measure was a direct situational relationship between the human body and physical reality.¹² “A day’s work”, “arms length”, or “a fist full” are all specific measurements that are not necessarily applicable to other circumstances. Derived from the fluid relationship between labor, body and site, traditional measures were understood to fluctuate relative to shifts in time and place. The complex nature of traditional measure welcomes the entanglement of people, activity and place, while bringing together practical life with symbolic meaning.

Understanding traditional and modern measures as kinds of apparatus to understand the land allows for the imagining of a new type of relational measure. For Corner, this form of measurement brings together the abstract detachment of modern measure in its ability to specify exactness, and the situational and spatial relationships to life of traditional measure. Corner reflects that: “Such an understanding may be predicated upon the metaphor of measure - its capacity to tie precision and objective reason to subjectivity and the imagination, and its powerful ability to span and join across distance and time.”¹³ Relational measures implicate the human spectator in the world in the way they serve as personal and situational ratios rather than placing the viewer as an outsider. In a relational measure, entanglements are essential to the precision of the assessment. The goal is the uncovering of the hidden potentials of the site through a series of reinterpretations as the situation changes. Thus, the use of relational measure absolves the need for a comprehensive understanding and instead acknowledges the situational and personal nature of interpretation.

11 James Corner, *Aerial Representation: Irony and Contradiction in an Age of Precision* (Yale University Press, 1996). P. 141.

12 *Ibid.*, 141.

13 *Ibid.*, 157.

Methodology: Plotting the Map

Like modern and traditional measures, relational measures can be mapped in a process that uncovers realities previously unseen or unimagined. Relational measures take advantage of what James Corner refers to as the fourfold meaning of “plotting”, suggesting that this process is more than simply physically marking or graphically representing a measure. Plotting is also “the construing of a narrative or time series, as in an unfolding or sequential plot” and an act of devising, strategizing, or even subverting. “Hatching a plot”¹⁴ of relational measures gives agency to its representation.

14 James Corner, “Critical Thinking and Landscape Architecture.” *The Landscape Imagination: Collected Essays of James Corner 1990-2010*, (Princeton Architectural Press, 2014). P. 44.



Figure 5

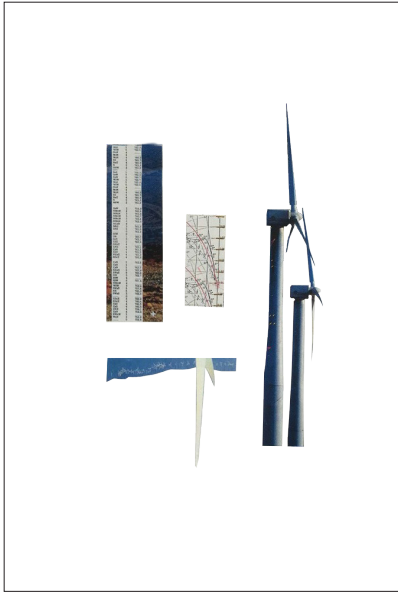


Figure 6

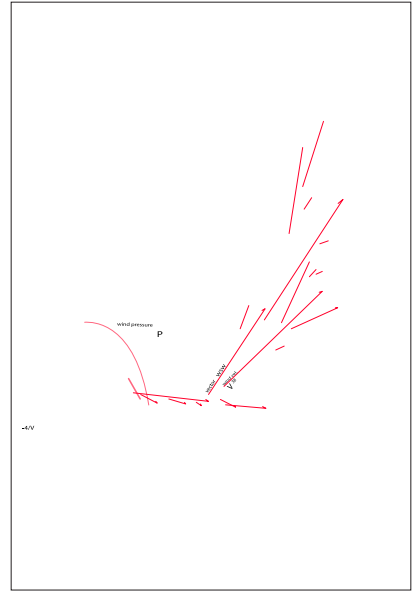


Figure 7

A map can be considered a representation of relational measure, in that as James Corner notes, this type of representation is comprised of fields, extracts, and plots.¹⁵ The field is the framed situation of a map: its scale, scope and method of projection. As the foundation, the field is crucial to the success of a map. A more neutral field that is designed to be non-hierarchical and breaks traditions, Corner notes, is more inclusive and more likely to precipitate new findings.¹⁶ In the case of his *Windmill Topography* (1994), the field is an egg shaped ellipse, comprised of a topographic map, and a section through windmill landscapes east of Los Angeles (figure 5).¹⁷ By abstracting the field of the map in both its form and context, plan and section, the map is able to carry a wide range of extracts and a variety of plots to describe the relational measure of windmills as a form and as a site that reflects the landscape and seasons.

Once a field has been chosen, extracts are selected as representational indications of the situation of the map. Extracts get their name because they are “deterritorialized” from their origin taking the form of other measures, stories, previous histories, or objects.¹⁸ For instance, the windmills, wind diagrams, ledgers of data, and photos of turbine blades and wind-farms in *Windmill Topography* are removed from their original contexts and therefore are free to exist in association with other extracts, constantly open to reinterpretation within the given field (figure 6).

Finally, plotting constructs a narrative or plot - reterritorializing extracts within a given field. A naturally inexact process, plotting results in an interpretation of the field and extracts that is based on a particular plotter’s agenda.¹⁹ The map, constructed through plotting, does not serve to explore or explain all aspects of its situation, but sets up a new territory of latent structures that bind field and extract together. It is not in search of a synoptic view as an aerial perspective might allude to, but a fluid, relational understanding of reality. Thus *Windmill Topography*, through the plotting of its extracts along the given field, is able to convey the idea of a specific situation, that of the topography of a particular section of east Los Angeles, within the larger context of windmill topographies, while creating a holistic discussion of technology in the landscape (Figure 4). In the entanglement of a map, relational measures express themselves through fields, extracts, and plotting to make ideas and processes visible and set the stage for future work. As James Corner points out: “Mapping is always already a project in the making.”²⁰

15 James Corner, “The Agency of Mapping: Speculation, Critique, and Invention.” *The Landscape Imagination: Collected Essays of James Corner 1990-2010*, (Princeton Architectural Press, 2014). P. 213.

16 *Ibid.*, 213.

17 *Ibid.*, 231.

18 James Corner, “The Agency of Mapping: Speculation, Critique, and Invention.” *The Landscape Imagination: Collected Essays of James Corner 1990-2010*, (Princeton Architectural Press, 2014). P. 213.

19 *Ibid.*, 214.

20 *Ibid.*, 234.



Figure 8

A map, as it is traditionally understood, has a direct relationship to the landscape it represents in that the field is easily understood at a representation of the earth. This is evident in the work of James Corner who often uses United States Geological Survey (USGS) maps in order to construct the based field or framed situation of the map. However, a field requires definitions of scale, scope, and a method of projection in order to make the document available to opportunities of use beyond the aerial view. At an architectural level, a field could take the form of a plan or a section, and/or could range in scale from a master plan to a detail, rendered as an orthographic projection or perspective.

Architect and artist Perry Kulper uses fields, extracts, and plotting in his mapping work that serves as a method to express the relational measures that underpin an architectural project. In the design of the Central California History Museum project, Kulper describes the drawings as “references for possible design relations and inspiration.”¹ In the *Proto-Formal Section*, Kuper cuts a section through the proposed history museum and uses it as the field to begin mapping ideas (figure 8). This section drawing breaks the traditional operation of a map in plan and introduces a new dimensional relationship between the field, extracts, and plots. Pencil smudges and construction lines show how the drawing is able to evolve over time and respond to the process of design. As Kulper states, the drawing “supports ideas and interests through notations and indexes that cannot yet be confirmed architecturally.”² As executed by Kuper, the maps represent a relational measure at an architectural scale, that grounds a particular situation in a “calculus of relationships.” The map is able to uncover the spatial, material, and formal possibilities of the architectural proposal.

In expanding the possibilities of the field of a map beyond the traditional site plan, relational measures can be applied to the context of any form of base representation. In doing so the act of mapping through plan, section, elevation, detail and other traditional modes of architectural representation become generative vehicles for both design and communication, providing a framework for extracting material, programmatic, and spatial possibilities both from the site and from the author’s imagination. These architectural mappings become measures that an architectural project can be built upon and that serve to tie the conceptual grounding of a project to the reality of built work. Mapping in this way is a method that is both the process and product.

1 Nat Chard and Perry Kulper. *Fathoming the Unfathomable : Archival Ghosts + Paradoxical Shadows*, (Princeton Architectural Press, 2013). P. 28.

2 *Ibid.*, 10.

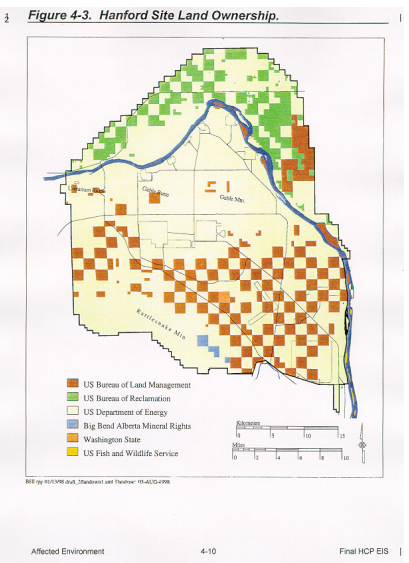
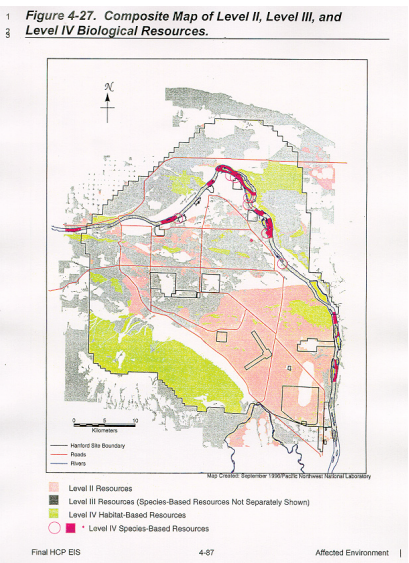
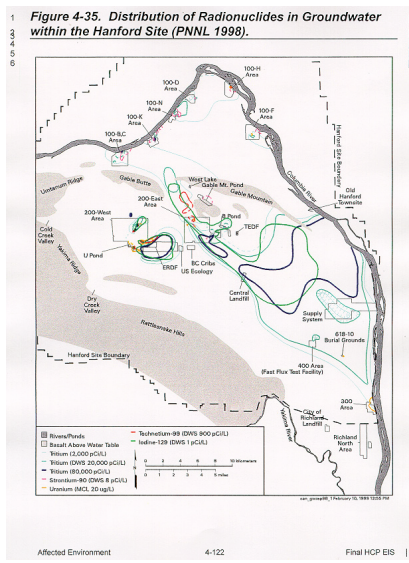


Figure 9

CHAPTER 4.

Process: The Hanford Measure

The Hanford landscape is a site that has been shaped and reshaped by the various measures taken and enacted upon it. Countless Environmental Impact Statements and just over seven decades of annual Environmental Reports illustrate a long history of modern measures taken from the landscape that attempt to establish a complete narrative of the Hanford Site's post production remediation efforts. The 1999 *Hanford Comprehensive Land-Use Plan Environmental Impact Statements* is a clear example of the application of modern measure towards the interpretation of the Hanford Site's future.²¹ The over 500 page report outlines various types of information of radiation plumes in the groundwater, to locations of vulnerable species living on the land, as well as existing land ownership in order to generate a series of alternative land use plans for the Hanford site (Figure 9). Modern measure serves its purpose in this document by quantifying the 586 square miles of the Hanford site in a way that is both comprehensive and exacting. However this specificity and simplification masks the underlying reality of the site as one that is, by its nature, complicated and situational. In separating radiation from natural resources on the site the modern measures of the report reinforce binaries of human and nature, contaminated and uncontaminated. However, these binaries are inherently an oversimplification of the irradiated landscape that is the Hanford Site in its present state today.

²¹ U.S. Department of Energy, *Hanford Comprehensive Land-Use Plan Environmental Impact Statements* (U.S. Department of Energy, 1999).

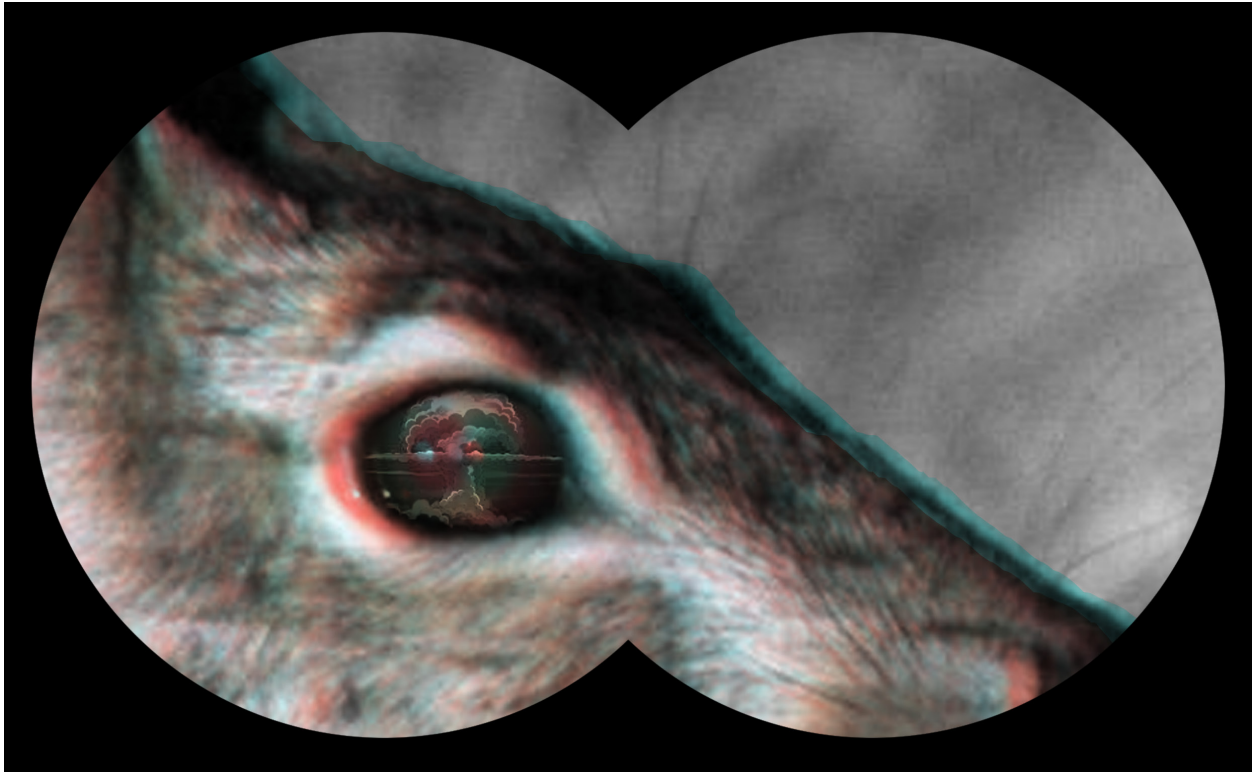


Figure 10

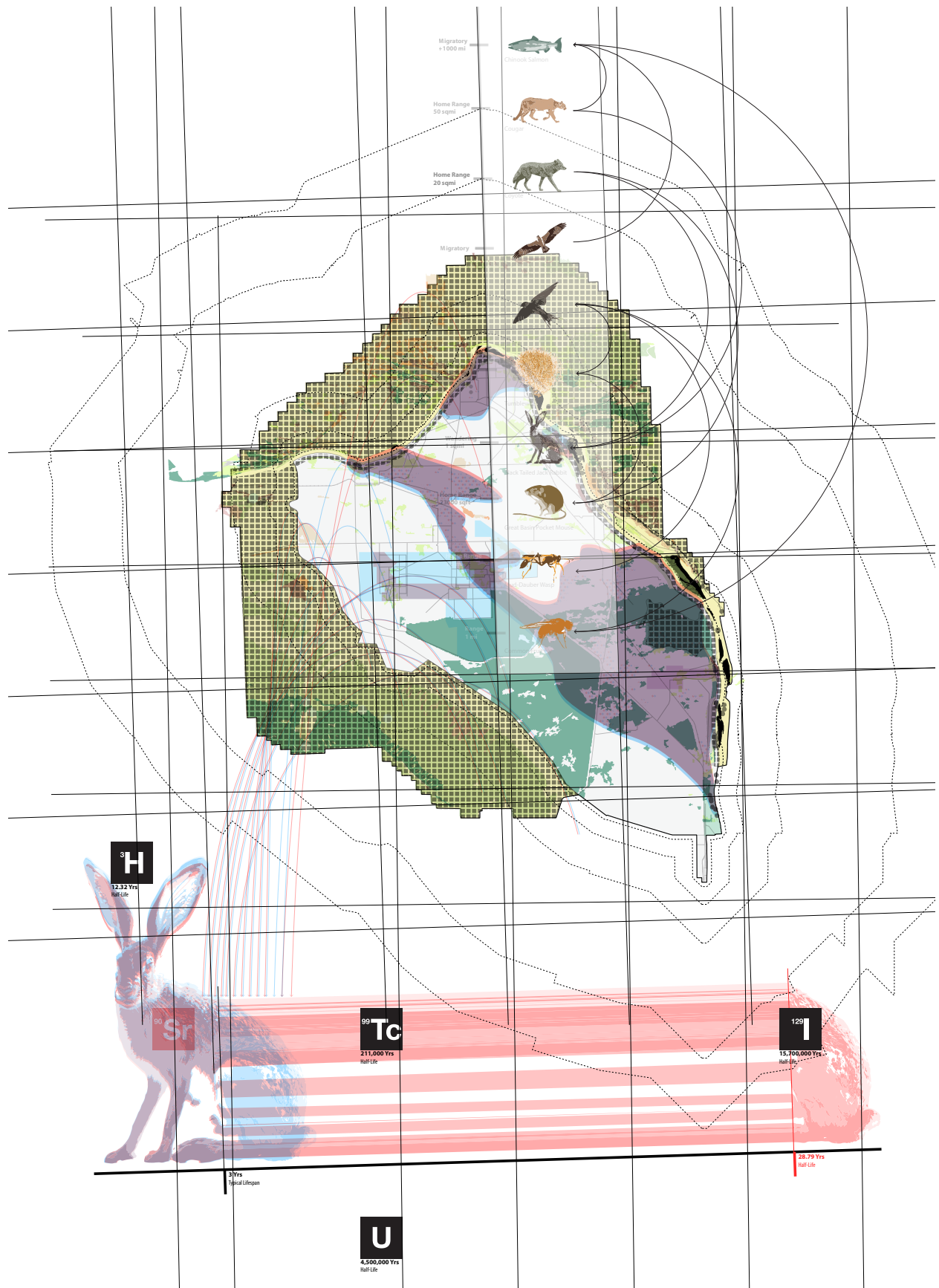
The plants and animals that occupy the site exist as evidence of its earlier natural state and its current irradiated one. These natural lifeforms have been contaminated with irradiated particles that can spread contamination throughout a landscape (figure 10). As carriers of these radioactive particles the creatures become biological vectors and subvert the binary narratives constructed through modern measures on the Hanford Site. They can be understood as relational measures that entangle Hanford's ecological and social past and present. Biological vectors have been studied at the Hanford Site since the mid-1940s through a process of "environmental surveillance" that was formalized in 1999 as Hanford's Integrated Biological Control (IBC). Since then, 81 biological vectors have been identified on site including 30 species of plants and 51 species of wildlife.²² This data is collected and quantified through annual reports, translated as irradiated livers, bones, and thyroids which are rendered into quantitative data.²³ However, these tidy spreadsheets fail to represent the elusive and intrusive yet inexplicably physical way these plants and animals make radiation real, contaminating the narrative of radioactive containment and control, making their way into neighboring towns and newspaper headlines.²⁴ A tumbleweed for example, can absorb radioactive materials through its roots and become a physical carrier of radiation.²⁵ In doing so, the tumbleweed or rabbit, deer or fly becomes a measure that entangles the waste legacy transforming the ecological history of the site into an exact yet imaginative data. Biological vectors at the Hanford Site are thus relational measures that blur the boundaries between contaminated and uncontaminated, nature and man-made, and the past and future.

22 Johnson et al., "An Integrated Biological Control System at Hanford"

23 Hanford Site Forty-Year Environmental Data Collection (MSS Hanford), Oregon State University Special Collections and Archives Research Center, Corvallis, Oregon.

24 Ashton, Linda. "At Ex-Plutonium Site, Tumbleweeds a Hazard." *The Washington Post*, 8 Apr. 2001, web.

25 Marshall, E. (1987). Hanford's Radioactive Tumbleweed. *Science* (New York, N.Y.), 236(4809), 1616-20.



The initial mapping (figure 11), takes on the traditional field of site plan, plots key animals of the Hanford Landscape in relation to the territorial outline of regulated space. From the common fruit fly to the mighty salmon each occupant of the site pushes and pulls the boundaries of containment with their ability to move radioactive material at micro and macro scales. For example a Jackrabbit's life in the landscape becomes mutated as its radioactive waste lives beyond its natural lifespan.



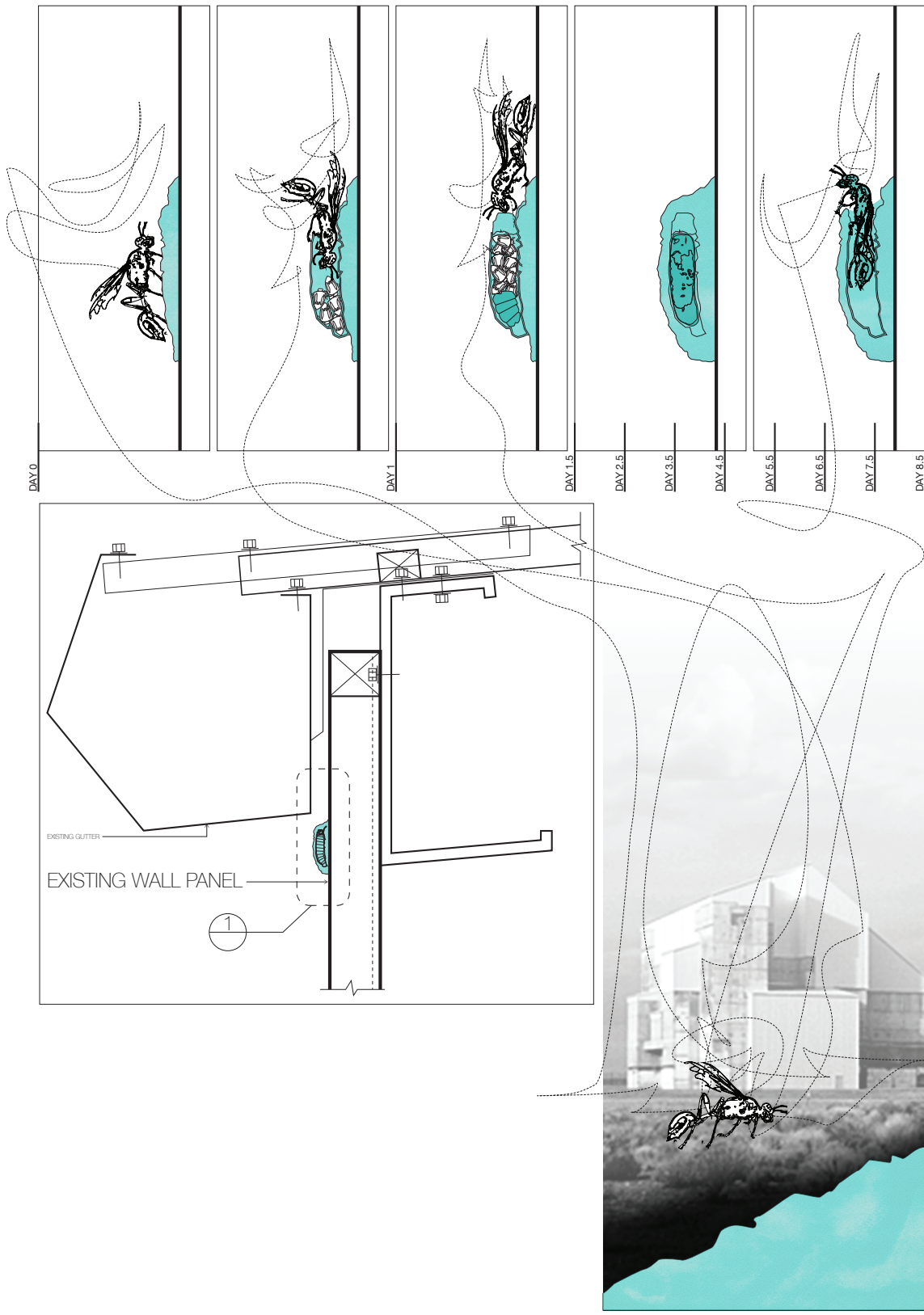
Figure 12

The vastness of the landscape makes it easy for visitors to miss these small transgressions as one passes through in a vehicle. Instead the walking, meandering path, becomes the more opportune method of engaging with these relational measures. In the proposed design intervention three trailheads become accessible to the general public from sunrise to sunset. These become moments where site and visitor collide as the Hanford Reach National Monument website warns “You’ll be experiencing the monument on its own terms.”²⁶ At one moment lost in the shifting sands of dunes, before revealed from a distant ridge, the trails lead the visitor on an unsure path, their start marked by only the texture of the ground before them.

26 “Hanford Reach National Monument,” accessed on April 22, 2018. <http://www.fws.gov/hanfordreach/>.



The instinct to mark the landscape in a way becomes the first architectural gesture in a proposed intervention as a way of making visible what is otherwise overlooked. The insertion of a vertical form becomes a point from which a human can gauge distance across the horizon and, in the landscape through repeated visits, experience the slowness of time in its decay as an extant form of life. the artifact stands as an exquisite corpse, a Carcass in the landscape.



The occupation of the site by other creatures reveals the traces of other measures that have been overlooked. For example the Mud-dauber wasp, a common and solitary wasp, gets its name from the daubed mud nests it builds for its offspring²⁷. Waste sites disturbed by remediation often use water to control the spread of radioactive dust, a by-product of which is mud laced with caesium and cobalt²⁸. Female wasps collect small pieces of radioactive mud and carry them to neighboring structures where they often build nests under eaves. Their young, born in radioactive wombs go on to repeat the process, hatching a nuclear family.

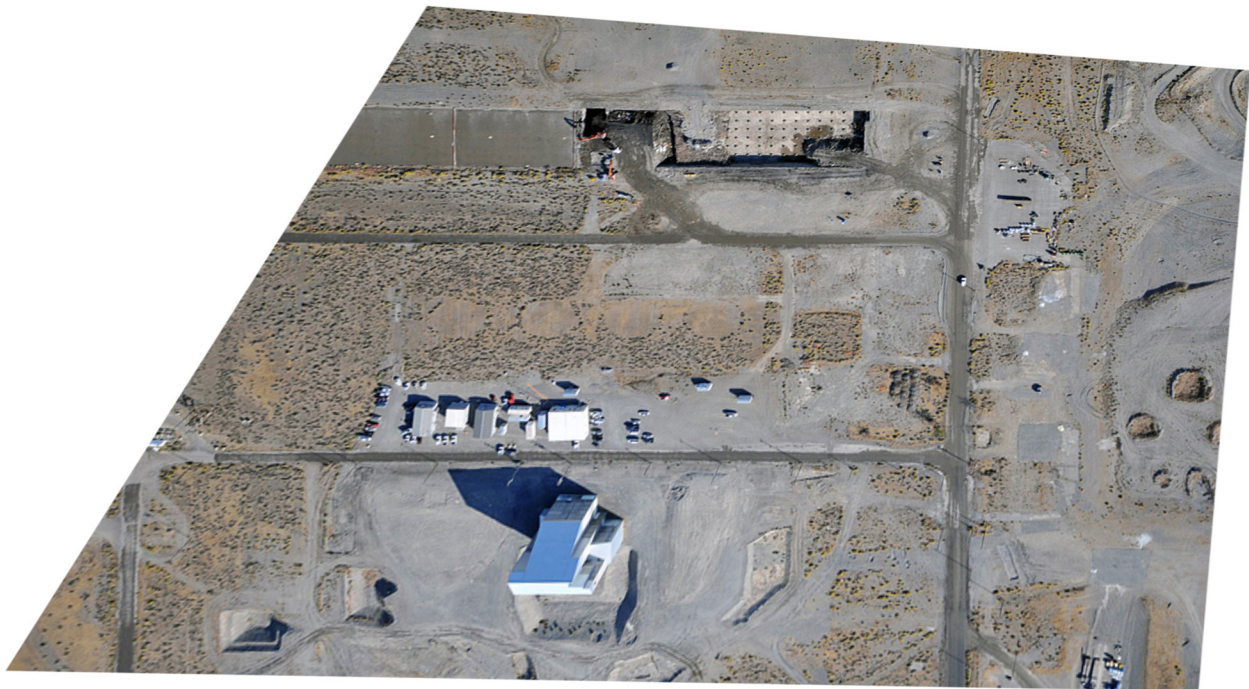
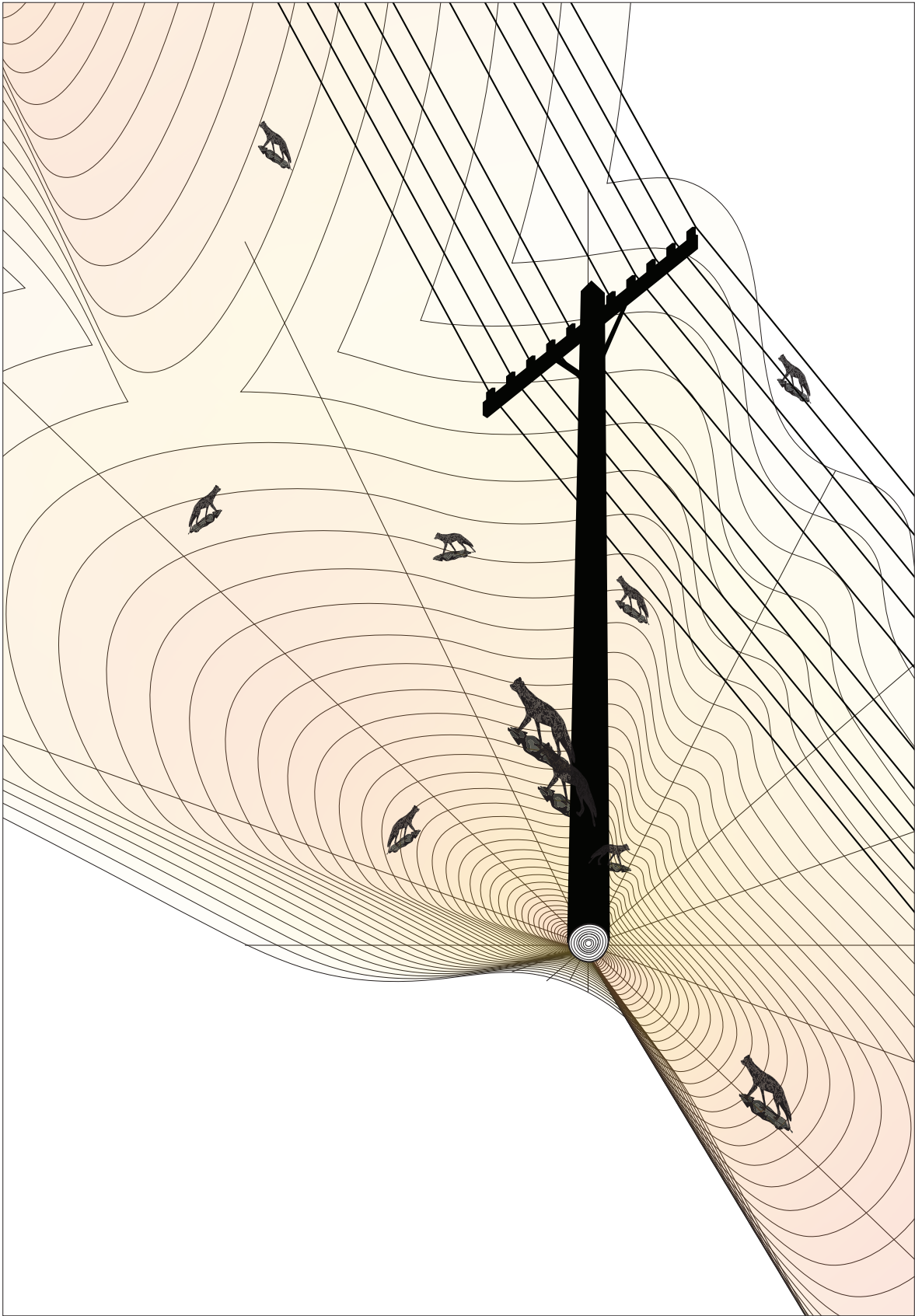


Figure 15

27 Powel, Erin, and Liz Taylor. "Black and Yellow Mud Dauber - *Sceliphron Caementarium*." University of Florida Entomology and Nematology Department, University of Florida, May 2016, web.

28 Muded, Charles. "The Landscape of Irony." *The Stranger*, April 22, 2010, web.



In a similar fashion, packs of coyotes occupy the Hanford landscape, Coyotes their territorial markings ebb and flow through the seasons. These site inhabitants remake the bounds of contaminated and uncontaminated through their ingestion of radioactive prey and dispersal of low level radiation in the form of scat and urine. Breezes redistribute the scent of these markings which form ever more transient revisions to the Coyotes territorial holdings. The Coyote may choose the place to land a marking but natural forces choose how their spread.

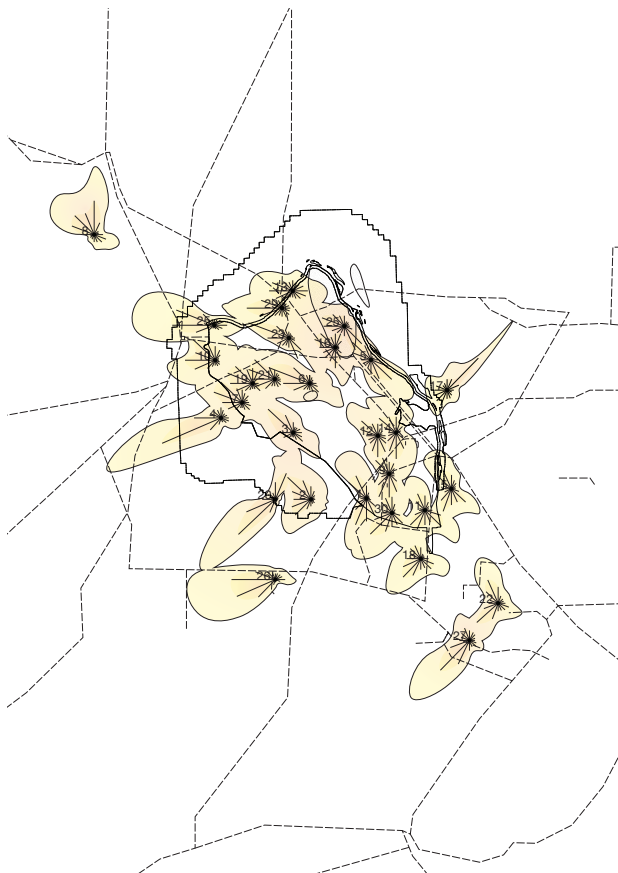


Figure 17

The Wasp and Coyote give impetus for the program of the site intervention where the desire to site, to ground, and to mark is subverted by a transient visitor on the site. Like a memory from childhood, the intervention of the Balloon flirts with the unknown of the interior of the Hanford site.



Figure 18

Relinquishing control to the winds, but for the decision to go on an adventure, this buoyant structure offers the opportunity for a situational relationship with the site. Some flights may send the Balloonist far into neighboring farms while others may strand riders deep in radioactive grounds.

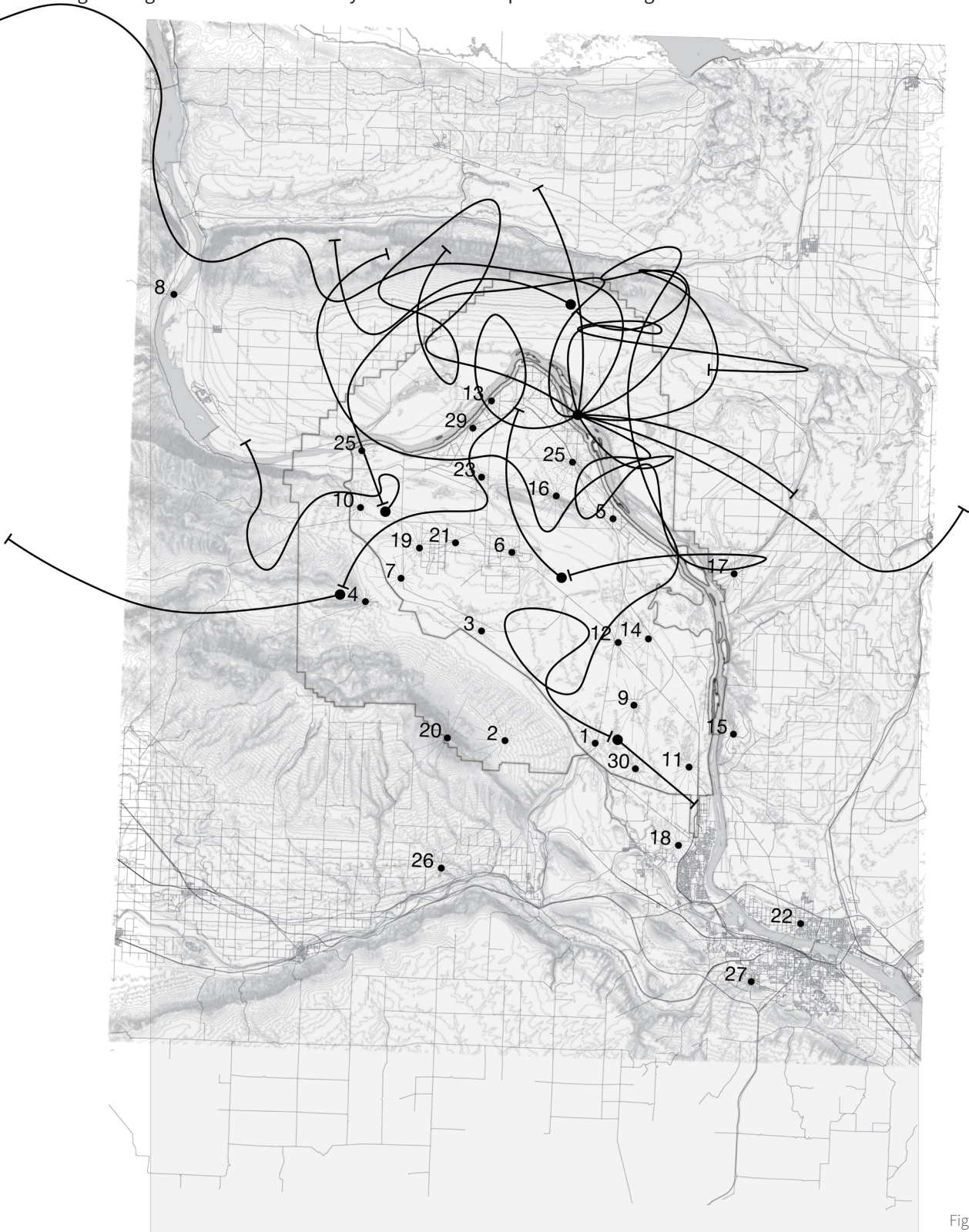


Figure 19

The Second installation on the site is the Carcass that derives its form from its placedness and is born into reality inscribing on the site many questions of the life it will lead.



Figure 20

How did this Carcass end up on the roadside and what could it mean? The aperture opens to the sky as one comes upon a Jackrabbit resting in the warm interior of its shell on a cold winter day, straw-wattle exterior glinting with the morning frost.



Figure 21

Alongside the banks of the Columbia River, the Carcass braves the rising waters after a storm. An entombed reactor in the distance stands indifferent to the concern of the Carcass's straining frame against the current.



Figure 22

A curious object, almost as if grazing upon the shrubs.



Figure 23

Creeping ever closer, the sand dunes nip at its footings. The trail that it heads becomes even harder to discern, is there a trail that this one marks or has it become its own attraction.



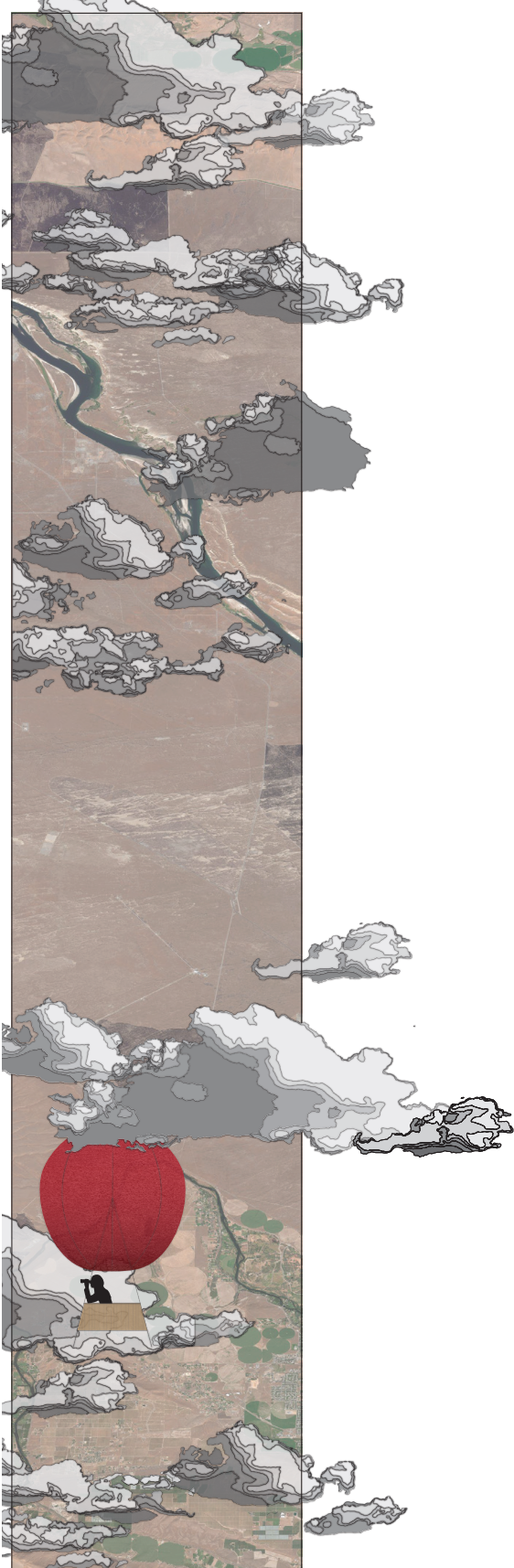
Figure 24

Through the years passed and its coat grew thin from the picking of birds and the eager mouths of passing mule deer, it persevered and the hikers returned to renew its frame.



Figure 25

Life on the land can be lonely, the Carcass always looked forward to little ones, who would marvel at its size and wonder what it meant as they peered at the many tracks that circled its legs.



The Balloon continues to float.



In shifting scales the Carcass becomes more concrete, decaying to reveal its welded rebar frame that supports a straw-wattle exterior. The netting of the wattle is lashed to the frame at the vertical supports. An onlooking deer examines it curiously before taking a bite.



Figure 28

Either crawling beneath or stepping through a gap in the wattle the Carcass's interior is a sanctuary from the heat and sun. Views slip in between the rings of straw, as an aperture captures nothing but sky.



Figure 29



Figure 30



Figure 31



Figure 32



Figure 33



Figure 34

As the Balloon rises and falls, its form becomes clearer. A tripod base provides stable footing on the uncertain ground. Ballooners grasp at a net sack that supports them during flight, serving as a hammock for overnight stays. An identifiable red envelope glints across the landscape falling victim to the sun as it fades.

The deflated balloon is a refuge in the night, framing a specific view of the ground.

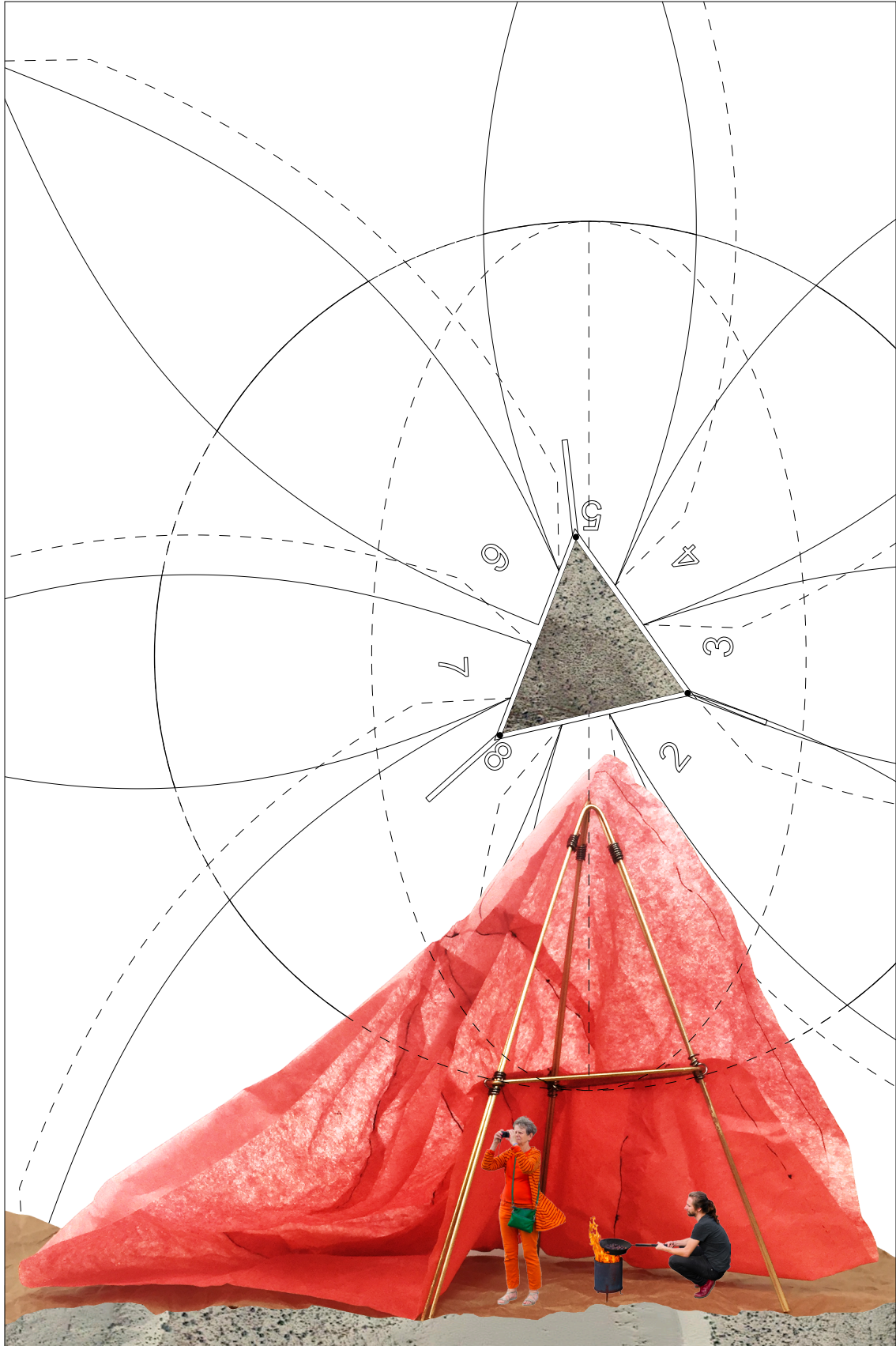


Figure 35 39



Figure 36
A Barn Swallow makes nest in the safety of a Carcass, a frame for experiencing decay that embraces life.
Night falls on the Hanford Landscape and the Coyotes stake their claim.



Figure 37 41



Figure 38

A New carcass takes form, its interior a quiet place to rest after a long days work.



Figure 39



Figure 40

CHAPTER 5.

Conclusions:

Nestled in the vastness of the Hanford landscape, the architectural interventions of the Carcass and the Balloon provide few answers to the questions they invite. Born from a process of mapping and remapping, each becomes an apparatus for interpreting the site that relies on intense inter-relationships rather than articulation of arbitrary and simplistic boundaries. This thesis argues for a turn away from simplification and reduction, instead arguing for entangling interventions into the complexity and contradictions inherent in the histories, realities, and fictions of a place (contaminated or not).

Robert Venturi's *Complexity and Contradiction in Architecture*:

“I am for richness of meaning rather than clarity of meaning; for the implicit function as well as the explicit function. I prefer ‘both-and’ to ‘either-or,’ black and white, and sometimes gray, to black and white. A valid architecture evokes many levels of meaning and combinations of focus: its space and its elements become readable and workable in several ways at once.

But an Architecture of complexity and contradiction has a special obligation towards the whole: its truth must be in its totality or its implications of totality. It must embody the difficult unity of inclusion rather than the easy unity of exclusion. More is not less.”²⁹

29 Venturi, Robert. *Complexity and Contradiction in Architecture*. Museum of Modern Art, 2014. P. 16

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Figures

1. The N Reactor at the Hanford Site along the Columbia River, 1960.
2. The Village headline from August 6, 1945. For most, this was the first time workers at Hanford knew what they were producing. Copyright The Atomic Heritage Foundation, 2018.
3. The Hanford Reach National Monument. Copyright The Nature Conservancy, 2017.
4. Windmill Topography, California by James Corner. Copyright The Royal Academy, 2018.
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