Architecture as Experience

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ARCH 560 Final Project

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Thesis: When does a building become a Dwelling?

Architecture is susceptible to many applications, interpretations, meanings, and values; it is **multivalent**.

Buildings are often described in terms of formal composition, or, only in reference to their **quantitative characteristics**.

Unfortunately, how the space **feels, qualitatively,** is rarely discussed or even acknowledged.

The **intersection** of these **varied quantitative values** and **multi-sensory qualitative experiences,** however, is where the richness of architecture occurs.

The central premise of this thesis is when both **quantitative** and **qualitative** elements are present then buildings become dwellings, something more.

This thesis defines **both sets of** elements in **dwellings,** Specifically residential.

Quantitative elements of a dwelling have been reduced to the minimum needed. Any exclusion precludes a dwelling.

Qualitative elements include what can be felt and experienced.



Sight:
Color, Light, Perception, connection



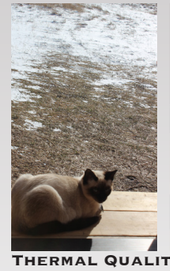
Sound:
Silence, Solitude, Rhythm, Loud

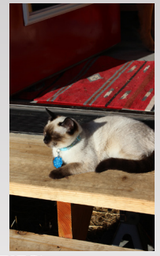


Touch:
Texture, Materials, temperature



Scent:
Sweet, Bitter, Sour, Salty, Dry, Rotting

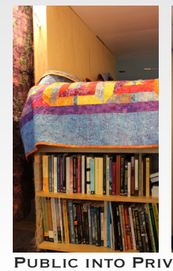


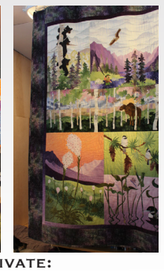


Thermal Qualities:
Convection, Radiation, Humidity, draft

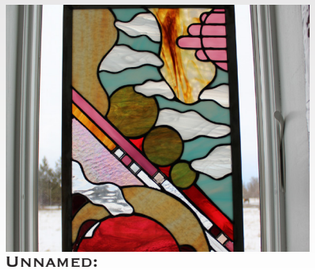


Space:
Proportion, Scale, Perception





Public into Private:
Flexibility of Spaces



Unnamed:
Mystery, Feeling

...do the houses themselves hold any guarantee that dwelling occurs in them?" Heidegger

Elements of a Dwelling: Qualitative

The quantitative elements of a building combine to create a space for habitation, **the qualities of those elements** combine to make it a dwelling.

A dwelling is a space to be exerienced; it has a feeling.

A dwelling brings meaning to building.

Heidegger describes **'The Fourfold,'** as consisting of the Earth, the Sky, the Divinities, and Mortals.

A dwelling connects the mortals to the earth and sky while allowing contemplation of the divine. All four of 'The Fourfold' are connected. **Earth** is both metaphorical and physical; dirt is earth. To be on Earth is to be connected to dirt, to be **mortal**. To be on earth is also to be connected to the **sky**. The sky is connected to **what is beyond**.

A dwelling protects and honors the earth, shelters mortals while **connecting** with the sky and fostering contemplation of the divine.



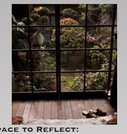
Space to feel secure:
Transition from Public



Space to express one's self:
Freedom of Choice



Space to connect:
Living Community Area



Space to Reflect:
Transitional Spaces Within



Space to recreate:
Transition Space, Storage



Space to rejuvenate:
Hygienic Area



Space to Restore:
Sleeping Area



Space to Replenish:
Cooking Area

Project opportunities: Qualitative

Even the simplest dwelling has **a threshold**; a line to cross to travel from without to within.

Once Within, there will be something, no matter how small that is **unique** to the person who resides within.

One may then be drawn to the center where A hearth is often thought of as the **heart of a home**. It generates heat; it is central and it provides nourishment and warmth.

gathering around the hearth, often in or near the kitchen usually happens **naturally**.

The spaces to connect with others and to replenish are often found next to each other.

Moving from one space to another within a dwelling is a natural **transition**.

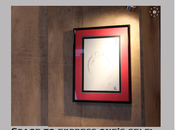
Windows allow **reflection** and a view out to something greater than oneself.

A place to cleanse oneself lets us to feel human, to have dignity.

A Pillow, a quiet space, to lay down, perhaps soft, and warm allows a **complete detachment** from this world. A place to restore and to dream.



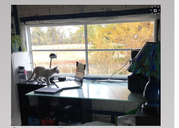
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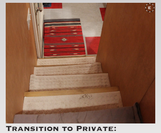
Space to express one's self:
Freedom of Choice



Space to connect:
Living Community Area



Space to Reflect:
Transitional Spaces Within



Transition to Private:
Human Scale Vertical Space



Space to Rejuvenate:
Hygienic Area



Space to Restore:
Sleeping Area



Space to Replenish:
Cooking Area

"The experience of home is essentially an experience of intimate warmth." Pallasmaa

Elements of a Dwelling: Quantitative

To dwell means to linger, pause or remain within.

A dwelling, therefore, is **a space within** which to linger, pause or otherwise reside.

A dwelling has certain **quantifiable** elements that identify it as a dwelling.

These elements, in combination, comprise the minimum needed for a space to be able to function as a dwelling.

If any element is missing, the space cannot function as a dwelling.



Transition from Public:
Human Scale Vertical Space (Standing)



Entry:
Door



Living/community area:
Chair, Couch, lamp, television, fireplace



Transitional spaces Within:
hallways, walls, stairs



Transition to Private:
Human Scale Vertical Space



Hygienic Area:
Toilet, Sink, Shower, Storage, Mirror



Sleeping Area:
human scale horizontal space (Lying); Mat, mattress, bedding



Cooking Area:
Countertop, Sink, Stove, Refrigerator, Storage

Project Opportunities: Quantitative

Exploration of:

+ High performance and natural materials

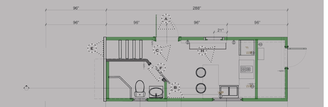
+ design constraints: 8.5' wide and 13.5' tall (from ground), to fit on a trailer allowing for transportability

+ Passive House (Air Tight yet breathable) design standards

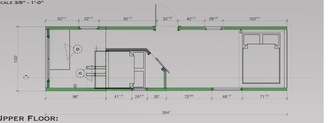
+ public and private spaces; prioritization based on life style

+ Systems: energy efficiency, passive systems, composting toilets, solar power, water harvesting, water saving habits, greywater

+ Construction Time Line: Liveable in 8 weeks



Main Floor:
Scale 3/8" - 1'-0"



Upper Floor:
Scale 3/8" - 1'-0"



Section 1: Scale 3/8" - 1'-0"

"A planned city, a monument, or even a simple dwelling can be a symbol of the cosmos. In the absence of books and formal instruction, architecture is the key to comprehending reality." Yi-Fu Tuan

Systems: Permeability

Roof:

ProClima Weldano

- One of the few roof membranes that specifically allow installation at pitches below 3:12
- Permeable and, at the same time, rain-proof against driving rain
- Homogeneously weldable
- Monolithic membrane



Roof:
ProClima Weldano

Heat Recovery Ventilation (HRV):

Lunos e2

- Units operate continuously (but can be turned off with a switch)
- Installed in pairs, working in a counter-flow manner: one exhausts (while recovering heat in the ceramic core), while the other supplies air (pre-heated)
- Flow directions and rates are synchronized for balanced ventilation, with 10-24 cfm flows reversing every 70 seconds
- System provides a complete exchange of heated, fresh air within 10 minutes (depending on size of space and placement of units)



Exterior Wrap:
Solitex Mento 1000

Exterior Wrap:

Solitex Mento 1000

- Actively vapor open, monolithic TEEE film membrane
- Very watertight, resists 33' ft of water column
- High vapor permeability (39 perms per ASTM E96) - Sd-value 0.05m (DIN 12572)
- Air permeance per ASTM E2178 0.00004cfm/ft2
- Class A material per ASTM E84 test (0 FS, 85 SDI)
- High thermo-stability



Interior wrap:
ProClima Intello Plus, Tescon Vana Tape

Interior Wrap:

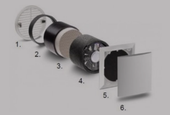
ProClima Intello Plus

- Allows vapor to pass through envelope rather than creating a dew point and condensation inside the envelope causing unseen damage
- Variable Permeability
- Tight diffusion rates in winter, Maximum diffusion in summer
- Pulls tight to wall surface after installation
- Seams sealed with permeable Tescon Vana tape

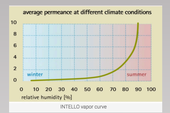
The Entire system above works together to allow vapor to diffuse through envelope while maintaining an air tight enclosure. Fresh air is mechanically introduced. Humidity is monitored.



Blower Door Test Result:
1.95 ach50



Air Exchange:
Lunos e2



INTELLO vapor curve

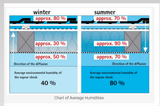


Chart of Average Humidities

Permeability Graphs

Blower door test:

- Tests the airtightness of the envelope by depressurizing the interior of the home
- Air comes into space from the outside high pressure to inside low pressure
- Leakages can be identified with smoke and then sealed
- Infrared temperature guns can also be used during these tests to indicate uneven or incomplete insulation areas by showing where heat is escaping the envelope
- Median air leakage is 3.9 ach50
- Passivhaus standard is 0.6 ach50
- **Test result was 1.95**, above average but not sufficient for Passive House

Systems: Passive Solar

The 2-acre site is south of Bozeman, outside of city limits, in a rural area where there are no street lights allowing exemplary views of the stars.

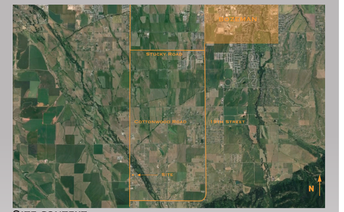
The **ideal location** on the site would have been the most southern portion to be hidden from neighbors to the west but new electric transformer needed to be located within 100 feet of old transformer at the northern portion of the site.

The dwelling is, therefore, **located** near the irrigation ditch, just west of **a stand of birch trees.** The sound of the water is soothing, provides easy access to water for pets and a future garden. The trees provide visual interest from the office window.

The dwelling is situated on the east-west axis to allow the greatest **solar gain** and to capitolize on the views to the mountains to the south.

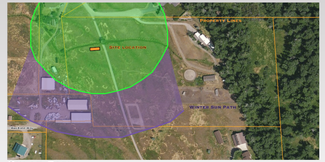
The solar gain causes, during **sunny** but cold days, the temperature inside the house rises approximately 10 degrees. The warmth along the south side of the house provides an ideal place to sit outside even in winter.

The windows, with the exception of one, are **operable.** This allows for natural ventilation from prevailing **southwest winds.** Sightings of **wildlife** are prevalent. An intimate experience of differing **weather** systems through sight and sound while still being protected is enjoyed.



Site context





Solar Path



"When we speak of man and space, it sounds as though man stood on one side, space on the other. Yet space is not something that faces man." Heidegger

Systems: Insulation

Envelope:

Structural Insulated Panels

NeoPor Structural Insulated Panels (SIPs) with Graphite EPS (Hence the Grey color) were used to allow for a time efficient build; the envelope was complete in 3 days. SIPs were also used to decrease thermal bridging and weight reduction. NeoPor increases the R-value over standard EPS SIPs by 1 R-value per inch. Thickness of the SIPs are 41/2 inches for floors and walls and 6 1/2 inches for roof.



Envelope:
NeoPor Structural Insulated Panels

Insulation:

Roxul ComfortBatt and Safe n' Sound

- Made from rock (mineral fiber) and 40% recycled material
- Fire resistant
- Sound dampening
- Water repellent
- R-14 from a 3 1/2" thick Batt

Havelock Wool Loose Fill

- Havelock Wool is sheep's wool, usually the part that is discarded
- High R-value, up to 4.30 per inch
- Entirely renewable and sustainable
- Fire Resistant
- Extensive useful life
- Devoid of harmful chemicals
- Minimized airborne sound
- Can be composted at the end of an extended useful life



Insulation, Fire and Sound Proofing: Roxul and Havelock Wool

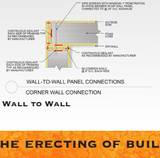
Heat:

Envi Electric

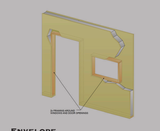
One (18"x22"x2") small electric heater (475 watts) keeps the interior of the house at 70 degrees easily when outside temperatures are at or above 20 degrees F. In summer, the interior of the home was 20 degrees below outside temperatures with only passive cooling measures (ventilation and night flush) even up to 90 degrees.



Envi Heater:
Thermal Delight



Wall to Wall



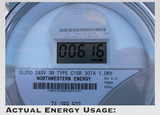
Envelope

Exterior Siding = 0.50
7/16th OSB = 0.51
3.5" NeoPor EPS= 4.5/inchx3.5=16.31
7/16th OSB = 0.51
Interior Maple wood Paneling = 0.2
Walls and Floor = R-18

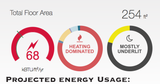
Ceiling = 4.5" EPS x 4.5= R-20.5

R-value increases as temperature decreases by 1 R-value per 10 degrees Fahrenheit drop for SIPs

R-Value



Actual Energy Usage:
616 kWh for 41 days (Oct. through Nov.)
8.29 kBTU/Y/2,041 day chunk



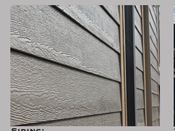
Projected Energy Usage:
68 kBTU/Y/2/Yr
7.639 kBTU/Y/2/41 day chunk

Design Details

Siding:

LP SmartSide DiamondKote

Exceptionally high wind resistance by using a special hidden fastener, called RigidStack, which also speeds installation. Siding pieces are quickly and accurately placed on top of each other without additional measurements.



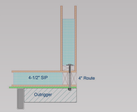
Siding:
LP SmartSide DiamondKote



Trailer

Trailer:

A trailer was used, rather than building on a foundation, to allow for flexibility in final location of home and allowed additional flexibility in design.



Trailer to SIPs



Trailer



Flooring:
Forbo Marmoleum Tiles

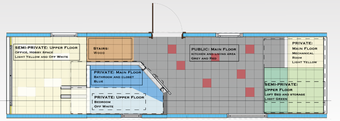


Flooring:
Transition from bathroom to kitchen

Flooring:

Forbo Marmoleum Tiles

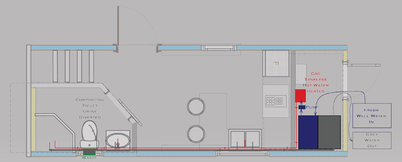
Marmoleum, Forbo's brand of linoleum, is made from 97% natural raw materials and contains 43% recycled content. It contains no phthalates, no plasticisers and no mineral oil. The key raw materials used in the Marmoleum production include linseed oil, wood flour and jute.



Floor Tile:
Differing colors used to separate spaces visually

"...The nature of the erecting of buildings cannot be understood adequately in terms either of architecture or of engineering construction, nor in terms of a mere combination of the two." Heidegger

Systems: Water



Water System: Scale 3/8" - 1'-0"

Plumbing System:
Indoor Gas Tankless Hot water, Pex, PVC, Custom Poly Welded Storage tanks (~100 gallon capacity for water and waste) and two Pumps
All plumbing was installed within the envelope to allow ease of transportation and prevent freezing of water systems.





Having no connection to water, needing to haul and pump water into the interior tanks makes one realize the necessity and appreciate the preciousness of fresh water. Hauling fresh water is treated not as a chore but celebrated. Every drop of water use has become very concious and is now, not taken for granted. Hauling waste out has had similar effect.

Weekly Water Usage:

Common Versus	Off-grid:
dishwasher	**hand wash dishes**
27 gallons per wash	5 gallons per wash
x 1 week	x 2 week
= 27 gallons	**= 10 gallons**
toilet (at home usage only)	**no water in toilet (Composting toilet)**
3 gallons per flush	
x 25 per week	
= 75 gallons	**= 0 gallons**
wash face, brush teeth	**Wash face, Brush Teeth**
5 gallons	1.25 cups**
x 14 per week	x 14 per week
= 70 gallons	**= 17.5 cups**
shower	**Shower**
20 gallons	10 Gallons
x 5 per week	x 1 per week
= 100 gallons	**= 10 gallons**
Weekly Total Water usage=	Weekly Total Water usage=
27+75+70+100	10+17.5 cups+10 gallons
= 272 gallons a week	**= 37.5 gallons a week**

*(does not include water consumption for cooking, drinking or usages such as cooking, watering lawns or washing cars.)
**1 8cups to a gallon

116% decrease from common



Mechanical Room

Conclusion

dwellings that are affordable are in short demand. Lot and building size are often prescriptive and prohibitive due to high land prices in many areas.

Natural resources are finite. **Sustainable, durable** and natural building materials are readily available. Yet, construction trades still build with toxic, less durable materials because of **cost**.

How a building becomes a dwelling is unique based on the characteristics for each mortal who resides within.

Buildings are just buildings until the occupants and characteristics of place are honored.

a building becomes a dwelling and a space becomes a place. Place affects mortals.

Dwelling is connected to mortals. **Mortals** are connected to the Earth. The Earth and sky are connected. The Sky is connected to the divinities. inherent in dwelling is this 'fourfold.'

Then there is the mystery, the unknown. That fleeting combination of **sunset light** against a wooden panel that reminds us of the unexpected, of the divine.

Architecture's greatest opportunity and **responsibility** is to design for, fight for the right to design for that unexpected, for that which happens outside of the prescriptive, to allow room for the divine.

Qualitative elements separated from quantitative elements result in buildings that may function but without feeling. To truly be a dwelling, architects must design for 'the fourfold.'

We must master both set of design elements to design sacred **dwellings for everyday living**.

"Architecture continues the line of human effort to heighten awareness by creating a tangible world that articulates experiences, those deeply felt as well as those that can be verbalized, individual as well as collective." Yi-Fu Tuan

Precedents

Shedsistence
Robert Garlow, Architect

The owners designed and built their home. This home is designed to maximize space and minimize weight while being energy efficient.
One large picture window allows ample natural light.
They focused on having spaces where each of them could occupy independently.
Details include stairs to the loft bedrooom that double as clothes storage.
One of the homes most unique features cannot be seen: there is a one-inch continuous exterior layer of rigid foam insulation. This allowed the home to be very energy efficient while still being lightweight.



Transition to Private:
Entry



Space to Restore:
Sleeping Area



Space to Rejuvenate:
Hygienic Area



Prioritization of Spaces:
Flexibility and Privacy

MiniMotives
Macy Miller, Designer

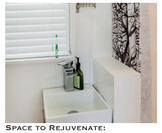
This home was also designed and built by the owner. It is well lit by large windows.
details include brightly colored blown glass fixtures and other pops of color which stand out against mostly white walls. Efficient use of the volume allows for a spacious feel with plenty of room for storage.
Connection to outside includes An exterior covered space. This is the perfect space to sit outside while still being protected against weather.
The house was built with mostly reclaimed materials allowing it to be cost effective while still being high quality.



Transition to Private:
Transitional Area



Space to Restore:
Sleeping Area



Space to Rejuvenate:
Hygienic Area



Space to Replenish:
Cooking Area

The Tale of two Tiny's: To Travel or not To Travel
Is Tiny architecture?
Is Tiny a home?

So you have heard about Tiny Houses...you say you want one? Let's see if you actually do.

Do you currently rent?
- YES
  - Do you want a house?
    - NO
      - Good. You are happy where you are!
        - VALUE
          - CONTENT
    - YES
      - Do you have any money saved for a down-payment?
        - YES
          - Good. A Tiny House may be able to bought or built with that money.
            - VALUE
              - FINANCIAL RESPONSIBILITY, INDEPENDENCE
                - TINY
    - NO
      - Do you want a place to stay?
        - NO
          - Good. You are happy where you are!
            - VALUE
              - CONTENT
        - YES
          - A Tiny House may be a solution for you.
            - VALUE
              - A Tiny House might be an affordable option for you.
                - VALUE
                  - FINANCIAL RESPONSIBILITY, INDEPENDENCE
                    - TINY
- NO
  - Good. Because Tiny Houses have a lot of options to consider.
    - VALUE
      - ENVIRONMENTALLY ACTIVE; FREEDOM
        - TINY
  - You may still be able to live in a Tiny if it is connected to the grid.
    - VALUE
      - ENVIRONMENTALLY ACTIVE; FREEDOM
        - TINY

Do you worry about your electricity bill or carbon footprint or sustainable practices in general and wonder what you can do?
- YES
  - Good. Because Tiny Houses have a lot of options to consider.
    - VALUE
      - ENVIRONMENTALLY ACTIVE; FREEDOM
        - TINY
  - You may still be able to live in a Tiny if it is connected to the grid.
    - VALUE
      - ENVIRONMENTALLY ACTIVE; FREEDOM
        - TINY
- NO
  - NO OTHER OPTIONS
    - TINY

Do you take your connection to infrastructure for granted? Do you have to have water without thought? Electricity without fail?
- YES
  - Ok. Are you willing to use solar and recycle rain water?
    - YES
      - VALUE
        - ENVIRONMENTALLY ACTIVE; FREEDOM
          - TINY
    - NO
      - Good. Because Tiny Houses are sometimes off grid.
        - VALUE
          - ENVIRONMENTALLY ACTIVE; FREEDOM
            - TINY
- NO
  - Good. Because Tiny Houses are sometimes off grid.
    - VALUE
      - ENVIRONMENTALLY ACTIVE; FREEDOM
        - TINY

Do you like small spaces?
- YES
  - Do you like to be connected to nature?
    - YES
      - Good. Because Tiny Houses are, by their nature. No pun intended.
        - VALUE
          - NATURE
            - TINY
    - NO
      - A Tiny House in the City might be for you.
        - VALUE
          - URBAN EFFICIENCY
            - TINY
- NO
  - Then Tiny Houses might not be for you.
    - VALUE
      - DISCERNING
        - TINY

Do you have a lot of stuff?
- YES
  - Are you willing to get rid of your stuff? Or do you want to simplify or downsize?
    - YES
      - Good. Because only your favorite things get a space.
        - VALUE
          - DISCERNING
            - TINY
    - NO
      - Good. Tiny might work for you.
        - VALUE
          - Tiny may still work but it will be cluttered or you will have to store stuff.
            - VALUE
              - NO COMPROMISE
                - TINY
- NO
  - Good. Tiny might work for you.
    - VALUE
      - NO COMPROMISE
        - TINY

Do you need your own space?
- YES
  - How much space do you need? Enough to think or not see past next to the kitchen? We can do that.
    - VALUE
      - SEPARATE ZONES
        - TINY
- NO
  - Good. Because Tiny Houses can be short on privacy.
    - VALUE
      - TOLERANCE, EXTROVERT
        - TINY

Do you have a lot of friends and like to entertain?
- YES
  - Is your idea of a good party out-side around a fire pit?
    - YES
      - Good. Tiny houses may not have a lot of interior entertaining room.
        - VALUE
          - EXPERIENCES OVER STUFF
            - TINY
    - NO
      - Or do you prefer a fancy gour-met sort of affair?
        - YES
          - You may still be able to do this but for a smaller number of friends.
            - VALUE
              - EXPERIENCES OVER STUFF
                - TINY
- NO
  - Good. Tiny might work for you.
    - VALUE
      - TOLERANCE, EXTROVERT
        - TINY

Do you like the standard, status-quo or do you challenge it and like to push the envelope on creativity?
- YES
  - Good. Because Tiny Houses are new and unusual.
    - VALUE
      - FREEDOM, OPTIONS
        - THOW
- NO
  - That is okay! Cutting edge is not for everyone.
    - VALUE
      - CONTENT

Are you unhappy where you live now and would like to be able to move?
- YES
  - Good. A Tiny House on Wheels would afford you that.
    - VALUE
      - FREEDOM, OPTIONS
        - THOW
- NO
  - You are very lucky!
    - VALUE
      - CONTENT

Do you like to travel?
- YES
  - Good. A Tiny House on Wheels would afford you that.
    - YES
      - WUNDERLUS
        - THOW
- NO
  - That is okay! Travelling is not for everyone.
    - VALUE
      - CONTENT

Does your city allow Tiny Houses?
- YES
  - Good. You can try it then!
    - TINY
- NO
  - That is okay! Keep trying or maybe your county allows.
    - VALUE
      - NOT-CONTENT
        - THOW

Do you like to problem solve and come up with creative solutions to problems?
- YES
  - Good. Because Tiny Houses have special problems to solve.
    - VALUE
      - INGENUITY
        - TINY
- NO
  - They might still be for you. You would just use an existing
    - VALUE
      - SELECTIVE
        - TINY

Are you a DIY-er or do you know you need to hire someone else?
- YES
  - Good. Because a lot of the cost savings comes from doing it yourself.
    - VALUE
      - DIY PRIDE, SELF-SUFFICIENCY
        - TINY
- NO
  - Tiny might still be for you. Just buy one already made.
    - VALUE
      - KNOW THY LIMITS

VALUES

The reasons or values that people come to Tiny Houses are varied. The spectrum is wide. And they are very different if you have options or don't. If you are homeless, your values are going to be very different from someone who is downsizing by choice. Let's look at these values in more detail and see how they shape the design of a Tiny House. These values do not necessarily only belong in one category or the other; in fact, most belong in both categories.

TINY HOUSE ON WHEELS
- DIY PRIDE, SELF-SUFFICIENCY
- ENVIRONMENTALLY ACTIVE; FREEDOM
- NATURE
- WUNDERLUS
- EXPERIENCES OVER STUFF
- INGENUITY
- KNOW THY LIMITS
- CONTENT

TINY HOUSE ON A FOUNDATION
- SEPARATE ZONES
- TOLERANCE, EXTROVERT
- FREEDOM, OPTIONS
- SELECTIVE
- URBAN EFFICIENCY
- NO OTHER OPTIONS
- DISCERNING
- NO COMPROMISE
- NOT-CONTENT

32' long

8.5' wide



What are the Elements of a dwelling?

- Entry
- Yard
- Privacy
- Control
- Choice ability to say no ability to say yes
- Ownership
- Shelter
- Safety
- Security
- Social
- Expressive
- Expansive
- Extroverted social
- Introverted intimate
- Freedom
- Express personality
- Preferences

Experiential elements of architecture

Pallasmaa believes "the experience of home is essentially an experience of intimate warmth."

- Sight: Color, Light, Perception
- Touch: Texture, Materials
- Thermal Qualities: Convection, Radiation, Humidity
- Sound: Echo, Ambient, Silence
- Scent: Sweet, Bitter, Sour, Salty, Dry, Rotting
- Space: Proportion, Scale, Perception
- Unnamed: Mystery, Feeling

Language of Architecture

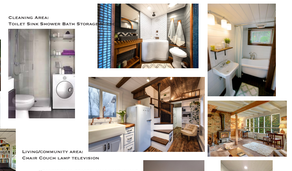
- Elements
  - Analysis
  - Concept
  - Representation
- Givens
  - Program
  - Context
  - Environment
- Physical Substances
  - Mass
  - Structure
  - Surface
  - Materials
- Ephemeral Sturtances
  - Space
  - Scale
  - Light
  - Movement
- Concretizing Devices
  - Archetype
  - Tropes
  - Defamiliarization
  - Transformation
- Organizational Devices
  - Infrastructure
  - Datum
  - Order
  - Grid
  - Geometry
- Constructive Possibilities
  - Fabrication
  - Preparation
- Concluding
  - Presentation

ELEMENTS OF A DWELLING

Transition to entry: Human Sized Vertical Space
Yard Steps Porch Overhang



Cleaning Area: Toilet Sink Shower Bath Storage



Entry: Door



Storage: Closet Pantry Shelves Drawers Attic Basement Garage



Living/Community area: Chair Couch lamp television

Transitional space: hallmaye walls



Cooking Area: kitchen Countertop Sink Stove Refrigerator Storage

Transition from entry: Human Sized Vertical Space
Mud Room Foyer Hall.

Sleeping Area: human sized horizontal
Mat mattress bedding pillows

ELEMENTS OF A HOME

Space to connect





Space to Rejuvenate



Space to Replenish





Space to feel secure



Space to Restore





Space to express one's self



Space to express one's freedom, individual choices, beliefs



Precedents

Shedosistence Washington — Robert Garlow, Architect













MiniMotives Idaho Macy Miller, M. of Arch









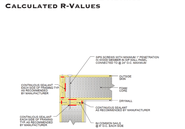




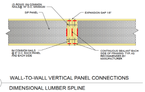




Building Performance Metrics
Calculated R-Values



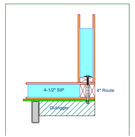
WALL-TO-WALL PANEL CONNECTIONS
CORNER WALL CONNECTION

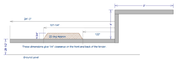


WALL-TO-WALL VERTICAL PANEL CONNECTIONS
DIMENSIONAL LUMBER SPLINE



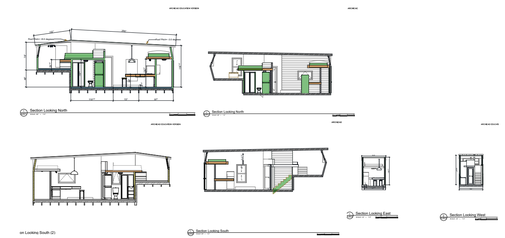
DOOR AND WINDOW FRAMING





Form
Layout
Lighting
Constraints





Materials
R-Value
Blower Door Test Results
Envelope
Wall construction
Mechanical
Moisture Analysis

Sun Path Analysis
Experienced Temperature Analysis
Passive House Standards

Havelock Wool Insulation
Roxul Insulation and sound proofing
Anderson Windows SHGC
Tescon Vana Tape
Structural Insulated Panels
Solitex Mento 1000
Intello Plus
Solitex Weldano Roofing Low Slope Heat Welded
Marmoleum Flooring
Lunos HRV

Sefaira

Excel - temperature vs comfort
AGI32
Climate Consultant
Energy Usage Analysis

Wufi

What are the technical aspects?:

1. Wall assembly (SIPs vs. stick built)
2. Siding (manufactured siding vs reclaimed lumber)
3. Windows (low E vs. low E?) also percentage of windows to wall area
4. House wrap (Intello and Mento vs felt or Tyvek)
5. Adhesives (low VOC vs. ?)
6. Flooring (marmoleum vs vinyl)
7. Plumbing system (self-contained vs city)
8. Waste (grey water dump vs city sewer)
9. Toilet (composting vs city)
10. Electrical system (normal AC (generator, 12 volt, solar vs. city)
11. Ventilation HRV (to use or not to use) (Lunos)
12. Ventilation bathroom (Panasonic Whisper Green)
13. Water heat (indoor gas vs. electric)
14. Room heat (electric Envi vs. electric baseboard)
15. Roof (Low slope metal roof vs. asphalt)
16. Foundation (trailer vs. piers)
17. Insulation (SIPs and Roxul vs. ?)
18. Fasteners (nails vs screws)
19. Refrigerator (electric vs tiny?)
20. Oven (gas vs. hot pot or microwave)
21. Ceiling fan (future vs none)
22. Floor plan (stairs vs one level) square footage decisions
23. Tightness of envelope (blower door tasting)
24. Weight of materials or of assembly (limiter vs. unlimited)
25. Finish materials (lightweight maple plywood vs. gypsum)

Things that can be compared:

1. Temperature inside versus temperature outside (show insulation – R-value)
2. Cost per square foot
3. Humidity
4. Air Tightness
5. Occupant Comfort
6. Light – daylighting levels
7. Electrical use/consumption
8. Fuel use (propane)
9. Water consumption

Jennisse Schule
Thesis Outline
August 6, 2017

Outline

Thesis statement:
The Tiny House on Wheels (THOW) represents a substantial and significant advantage over a mobile home or recreational vehicle (RV) based on its higher energy efficiency, use of sustainable building practices and environmentally friendly materials, long lasting durability, versatility in aesthetics and year-round and all-climate extent of use. These characteristics make the Tiny House on Wheels categorically different than either the mobile home or RV in a variety of different ways that will be detailed and analyzed. These differences make the Tiny House on Wheels to be a unique and viable solution in the increasing challenge to find affordable housing. In short, the THOW is a much-needed alternative to large footprint homes both in energy consumption land use and creating communities.

As a Tiny House on Wheels (THOW) is often compared, in a negatively or skeptical manner, to a mobile home or RV, a deeper analysis in identifying the advantages of the THOW is needed. All three residences have characteristics that allow them to move easily making the comparison particularly relevant.

The construction of an energy-efficient and environmentally progressive THOW will be compared to the construction methods of a traditionally-built mobile home and a comparably sized four-season RV. The comparison will focus on the construction methods and materials of each residence to include a detailing of the walls, roof and floor assemblies. Windows and doors will be analyzed, as well as, the plumbing, electrical and HVAC systems. Finally, the aesthetics of each residence will be compared along with a discussion of NIMBY and other societal viewpoints. All will highlight the differences between the three residences and show why the Tiny House on Wheels is superior.

Objective:
The comparison of a THOW to a mobile home and a four-season RV will show the superiority of the construction methods and materials, as well as highlight the vast flexibility in design choices, bringing to light, the advantages of a THOW. These differences should allow the Tiny House on Wheels to be considered differently than either a mobile home or recreational vehicle to planning and building departments allowing them to be readily and legally used as permanent housing.

Content:
Introduction on the problem of affordable housing including a brief discussion on homelessness.
Introduction and definition into Tiny Houses on Wheels, Mobile Homes and Recreational Vehicles.

Methodology
Detailing of wall assembly
Discussion/comparison of material and their composition (Red Label)

A listing of typical materials used and their compositions, environmentally friendliness or toxicity will be discussed. Perhaps embodied energy.

Discussion of durability
The expected life expectancy of the materials and the residences, as a whole, will be analyzed.

Discussion of affordability
A cost analysis of each residence will be listed and analyzed, as well as financing options (briefly).

Discussion of R-values
The individual layers of each assembly will be calculated to allow a comparison of the air-tightness and insulation values.

Detailing of window and door choices
Same as above discussion for all 4 topics: assembly, durability, affordability, R-values.

Detailing of Plumbing systems, electrical systems and HVAC systems

Same as above with the exception of R-values
Discuss over all energy efficiency comparisons or potentials and environmental effects of various systems instead of R-values

Use of Hobo and other recording devices
A similarly built THOW (to the one described in the thesis) will be analyzed using a HOBO system for temperature, CO_2, light levels, electricity usage, water usage and occupant comfort levels for a period from September 1st through December 1st. Additional analysis will continue after those dates for the period of one year from September 1st to show four season analysis. This discussion will be minor but will validate and quantify the energy efficiency discussion.

Aesthetics
Discuss the typical mobile home design
Discuss the typical RV design
These designs typically result from restriction due to being transported. A THOW can share the same aesthetics but has a much higher degree of flexibility due to its construction. These aesthetics will be explored.
A look at the cultural or societal bias of the Tiny House due to the aesthetics of the RV and the Mobile Home will be brought into the discussion. This is a significant discussion that ends up being the primary consideration when dealing with the public or planning and building officials.
The discussion here will be secondary to the quantifiable data presented but nonetheless, needs to be discussed in some fashion.

Other considerations:
Planning, Zoning, Building Code discussion – The zoning and covenant discussion needs to be brought into the paper but only briefly, allowing a lead in to the conclusion but making sure that all relevant obstacles or considerations of a THOW that make it different have been introduced and briefly discussed.

Conclusion:
Tiny Homes represent an energy efficient, sustainable solution to a housing crisis, as well as, represent sound building practices. They are significantly different and superior to their 'cousins', the mobile home or the RV; therefore, the case they should be considered differently should be solid.

Jennisse Schule
Thesis Outline
September 15, 2017

Outline: A Tale of Two Tiny's: Do they make a good home?

Thesis statement:
The Tiny House represents a much-needed solution in the spectrum of options being considered for the affordable housing crisis. A Tiny House is an affordable option with potentially higher energy efficiency, uses sustainable building practices and environmentally friendly materials, has long lasting durability, increased versatility in aesthetics and year-round and all-climate extent of use. These characteristics make the Tiny House a unique and viable solution in the increasing challenge to find affordable housing. The Tiny House is an alternative to large footprint homes both in energy consumption land use and creating communities.

The construction of an energy-efficient and environmentally progressive THOW will be compared to the construction methods of a traditionally-built Tiny House on a foundation. The comparison will focus on the construction methods and materials of each residence to include a detailing of the walls, roof and floor assemblies. Windows and doors will be analyzed, as well as, the plumbing, electrical and HVAC systems. Finally, the aesthetics of each residence will be compared towards an analysis/discussion of the characteristics of a 'home'.

Objective:
The comparison of the viability and efficacy of a tiny house is inextricably linked to its aesthetics. Aesthetics will be defined; key design elements will be discussed. A Tiny House on Wheels (THOW) built to high air tightness standards with Structurally Insulated Panels (SIPs) will be compared to a traditional stick-built tiny house on a foundation. Energy efficiency will be compared, as well as occupant comfort.

Content:
Introduction on the problem of affordable housing including a brief discussion on homelessness.
Introduction and definition into Tiny Houses (both on wheels (THOW) and on foundations and how they differ and/or how they are similar)

Methodology
Detailing of wall assembly
From roof to floor, a side by side detailing of the construction techniques and materials will be compared.

Discussion of R-values
The individual layers of each assembly will be calculated to allow a comparison of the air-tightness and insulation values.
Projected energy analysis values.

Use of Hobo and other recording devices
A THOW will be analyzed using a HOBO system for temperature, CO_2, light levels, electricity usage, water usage and occupant comfort levels for a period from October 15th through November 15th. This discussion will be minor but will validate and quantify the energy efficiency discussion.
Actual energy analysis

Aesthetics
Define and discuss elements traditionally recognized as a home

Define and discuss how a tiny house can incorporate these elements
Or redefine elements of home.
Define the constraints of a THOW as it needs to be transported versus a tiny house on a foundation as far as aesthetics and what can be done within those constraints to meet the elements of a home rather than an RV or mobile home.

Conclusion:
Tiny Homes represent an energy efficient, sustainable solution to a housing crisis, as well as, represent sound building practices. While they are small and may have some aesthetical constraints (being transported), they still contain critical elements that constitute a home. Because they are small, offer a smaller footprint and therefore are energy efficient per person, rather than per square foot, when designed with aesthetics in mind, they should be considered a viable solution to the housing crisis.

Timeline:
Week 1: Finish construction on Tiny House
Week 2: Revise thesis proposal
Week 3: Clarification and revision of thesis proposal
Week 4: Define elements of home – aesthetic discussion
Week 5: Detail construction techniques
Week 6: Detail R-values calculation
Week 7: Final research paper draft completed
Week 8: Start energy analysis
Week 9: Boards draft: wall assembly
Week 10: Boards draft: energy analysis comparison
Week 11: Boards draft: Elements of home
Week 12: Boards draft: TH specifics
Complete Energy analysis – add to paper – add to boards
Week 13: Boards draft: Conclusions Paper: Conclusions
Week 14: Final revisions of boards
Week 15: Boards printed

Board contents for final presentation:
Board 1: Side by side comparison of the roof to wall to floor connections, annotated
Board 2: Side by side detailing of R-value calculations and energy efficiency potential/projected
Board 3: Energy analysis actual
Board 4: Aesthetical elements of home
Board 5: Tiny House unique characteristics
Board 6: Conclusions

A Tale of Two Tiny's: Do they make a good home?
9.20.17

The Tiny House represents a much-needed solution in the spectrum of options being considered for the affordable housing crisis. A Tiny House is an affordable option with potentially higher energy efficiency, uses sustainable building practices and environmentally friendly materials, has long lasting durability, increased versatility in aesthetics and year-round and all-climate extent of use. These characteristics make the Tiny House a unique and viable solution in the increasing challenge to find affordable housing. The Tiny House is an alternative to large footprint homes both in energy consumption land use and creating communities.

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The comparison of the viability and efficacy of a tiny house is inextricably linked to its aesthetics. Aesthetics will be defined; key design elements will be discussed. A Tiny House on Wheels (THOW) built to high air tightness standards with Structurally Insulated Panels (SIPs) will be compared to a traditional stick-built tiny house on a foundation. Energy efficiency will be compared, as well as occupant comfort.

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Actual energy analysis

Aesthetics
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	Define and discuss how a tiny house can incorporate these elements
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Board 5: Tiny House unique characteristics
Board 6: Conclusions

What does a home look like?
Pattern language book
Elements of a home
Roofline
Walls
Windows
Doors
Entryway
Materials
Foundation

There is clearly a distinction between residential and commercial or corporate. There are different levels of both, levels of quality or expense. Elements are designed to look grand in some cases. There are internal elements that are not seen. I argue that these elements in a tiny home are just as if not more important than the exterior elements. While they may not contribute to what makes the home LOOK like a home, they certainly make the home FEEL and operate like a home.
Ultimately, a tiny home and all homes need to be looked at as a whole. The sum of their parts is greater than their parts. While we can look at each part individually and analyze it for its "homeness" we are really missing the bigger picture. Who are we, as architects to determine or define what makes a home? Wealthy clients may like a lot of space and grand gestures perhaps to validate their successes to themselves and the world. But this is just a generalization that is dangerous and not helpful to anyone.
Architecture is about solving problems; affordable housing solutions are hard to find. What can we do as architects to design homes that fill the gaps in the spectrum for all to be able to afford a home?

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Architecture as Experience

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Master of Architecture
Research Paper towards Thesis
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Abstract

How do we experience architecture? Stated in a different way, how do *humans* experience the built environment? Recall the last time you felt something when you walked into a building or a room. Be it a sense of awe, or calm, perhaps. It probably hasn't happened recently or sadly, maybe not ever.

In today's world, we are so connected to our technology, our quick communication devices, that maybe unless it is flat and blinking at us, we simply do not pay attention to it. Have we lost our ability to connect with our surroundings? Maybe our sense of sight is so inundated, barraged with images from all angles and mediums that we no longer feel.

Architecture is powerful; it can affect our health from the materials that it is constructed with to the way it is constructed. Daylighting in buildings can allow us to be more productive and happier. Framed views through windows and walls of art help us to remember there is more to life than a cell phone if only we will lift our heads. The sounds of water, fresh air allow us to breathe deeply and experience less stress and anxiety. If only we will hear and pause to breathe.

Yet, when is the last time you closed your eyes and listened to the wind, felt it against your skin while you were inside (or outside for that matter)? When is the last time you walked down a dark corridor only to come around a corner to a wide, bright opening that framed a beautiful view of the mountains, trees or ocean? When is the last time you wanted to touch the walls of your classroom or apartment? Too often, architects and builders are designing spaces devoid of feeling. Adding texture and light, sound and smell into the experience of a building is not difficult; and more and more, I believe it is imperative. How we view our world starts with how we view our immediate environment. If our immediate environment continues to be devoid of anything that allows all senses to be engaged and

connected to the natural environment around us, we will continue to not care about the Earth. Because we simply will not know how. We will have forgotten.

Architecture can make a difference in how we perceive our immediate environment; architecture is meaningful and rich; it can reconnect us, engage all senses. Experiential architecture makes us aware of our humanness.

Thesis

Architecture is a combination of art and science. Some argue that a building is not architecture, rather, it is just a building. This type of building may lack artistic expression perhaps, but nonetheless, there is an experience; an interaction with this space, be it positive or negative.

Human and animals are unique in their ability to experience their environment. The snake seeks the warm rock. The spider seeks the stable foundation to spread its web. Humans seek refuge from the elements and predators. Some of our reactions are unconscious, innate and make take a conscious effort to understand them, especially as they relate to our built environment.

We spend 90% of our time indoors, architecture is something we experience every day. One could even argue that architecture is still affecting us when we are outside, just due to proximity. (Think downtown in New York City.)

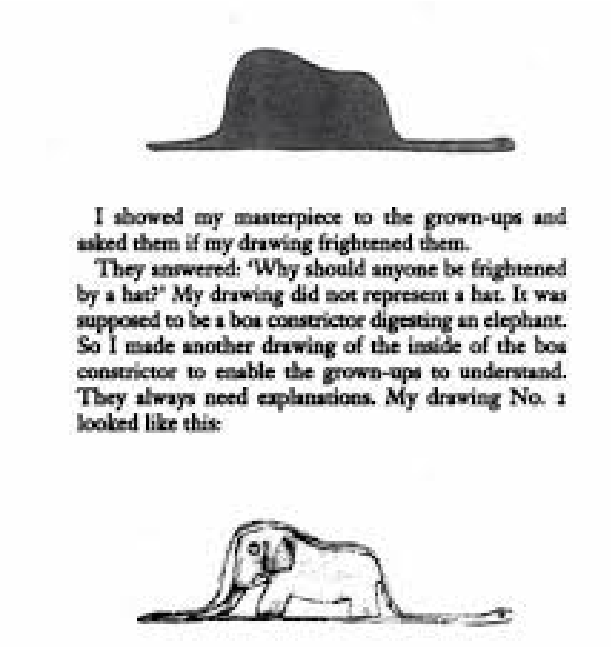
Architecture affects us in a variety of ways, through a variety of means. In the subsequent sections, I will explore what makes architecture experiential; what makes architecture that is meaningful, rich, and experienced through all senses.

Experiential Tools

Perhaps it goes without saying that the primary way of interacting with our environment is through our senses. One sense or a combination of senses may come into play upon initial contact or sight of a building, then shift to another sense as exploration continues. The best architecture awakens, inspires, causes emotion, reflection perspective and allows interaction with our surroundings.

Buildings allow us to be sheltered; they perform their job well. But architecture involves more than just a roof and walls; architecture involves all of the senses.

If I draw a circle and ask you what you see, will you say the sun? Someone else might say a bowl. In one of the best examples of abstraction I know, in the book The Little Prince, the author draws an elephant being consumed by a boa constrictor after reading that the snakes swallow their prey whole[1]:



I showed my masterpiece to the grown-ups and asked them if my drawing frightened them.

They answered: "Why should anyone be frightened by a hat?" My drawing did not represent a hat. It was supposed to be a boa constrictor digesting an elephant. So I made another drawing of the inside of the boa constrictor to enable the grown-ups to understand. They always need explanations. My drawing No. 2 looked like this:

Excerpt from The Little Prince

[1] Antoine de Saint Exupéry, *The Little Prince* (Harcourt, Brace & World, Inc., 1943), 1–2.

An object or image can be represented by its component parts or essence without representing the object itself. In fact, sometimes this distilled image is quite powerful; it is just the essence, what is most important about object. When one starts to ponder on the essence of things, it begins to broaden the way in which objects are seen and experienced.

A question to explore along with the essence of things is the way space is shaped. How do you feel inside your car versus outside of it? How do you feel when you are standing at the edge of a meadow with one foot across the line into a dark, thickly wooded forest? What if the reverse were considered, standing within the forest looking out at the meadow? These are examples of differing concepts of space, how they feel and how you feel in them.

Context and perception are important and change the feeling. Inside your car may feel safe, or confining. Outside your car may feel free or uncomfortably exposed. The perception of the forest may be a product of where you were raised; if you were raised in the mountains, the meadow may feel exposed and the forest safe. While if you were raised on the Plains, the forest may be very scary.

Think about the spaces between the trees and the edge of the meadow as a line, a datum. These are architectural concepts of how space is shaped. The way the light of a dappled forest is different from a desert cavern and realize space is shaped by many different things other than walls, doors and windows. A tree becomes texture and light, angles and movement instead of a tree. One experiences the light through the leaves as movement, the branches swaying in the wind as connected to this movement, the space around the tree defining a place of shade, respite from the sun. One notices the distance to the next tree and may see a pattern or rhythm between all of the trees collectively. Where once you saw a tree or a forest, now, through a new lens, one sees many layers of experiences to inhabit and explore.

In the following sections, I will explore sight, touch, smell, appropriateness, scale, and other elements that make up how we perceive space that has been shaped. My goal is to understand and bring to light

what constitutes inspiring architecture, how to experience architecture, to reconnect with what is missing, what has been lost or forgotten.

Sight – Color, Light, Perception

It has been proven that expert witnesses of crime are notoriously unreliable. Various businesses such as banks, gas stations and convenient stores will have numbers up the side of the exit door; this is distance in feet measured from the floor. It is there to assist a person in identifying the height of someone leaving by association with a fixed number visible on the side of the door. Witnesses are not inherently dishonest; it is simply that no one's primary sense of sight works in isolation from the whole of their experience.

John Berger is his book, Ways of Seeing, describes this phenomenon as it relates to how we perceive and appreciate art but first he relates to something we all see every day, the sun setting, or more accurately stated, the Earth rotating away from the sun.

> "Seeing comes before words. The child looks and recognizes before it can speak. But there is also another sense in which seeing comes before words. It is seeing which establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact that we are surrounded by it. The relation between what we see and what we know is never settled. Each evening we see the sun set. We know that the earth is turning away from it. Yet the knowledge, the explanation, never quite fits the sight. The way we see things is affected by what we know or what we believe. (…) Yet this seeing which comes before words, and can never be quite covered by them, is not a question of mechanically reacting to stimuli. (It can only be thought of in this way if one isolates the small part of the process which concerns the eye's retina.) We only see what we look at. To look is an act of choice."[2]

Sight allows us to see the views framed by windows. But what the experience is deepened by an opening showed a specific view when the seasons changed? For example, a cherry tree that blooms in the spring near an operable window so the smell of the blossom can be smelled, as well as, seen? What if the windows were situated such that one could tell time by the shadows they created on the walls? What if the height of the bed to the ceiling was such that viewing the moon and stars while lying down

[2] John Berger, *Ways of Seeing* (Penguin Books, 1972), 7.

felt like you were in space? What if there were openings that the sun or moon could only be seen through them at specific times of the year indicating solstice and equinox? Designing architecture to fully engage our senses also allows us to connect more with the natural surroundings.

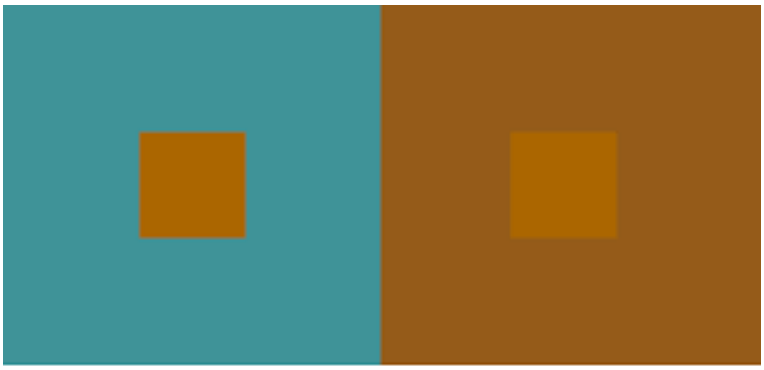


Photo of the St. Ignatius Chapel by Stephen Holl (www.pinterest.com)

Most of us are convinced that how we view an object is not physiologically different from someone else viewing the same thing. An apple is an apple, for instance. Yet like Berger, Josef Albers in his book, Interaction of Color, explains this phenomenon through experiments with color that show how the mind can be tricked by perception or proximity even as it relates to something we all likely experience daily, our morning coffee.

> "For a very different color effect compare the coffee in a cup with the coffee in the stem of a percolator or with the coffee in a silex glass. It is easy to discover that, though all 3 containers

hold the same coffee, the containers show this coffee in 3 different browns: lightest in the stem, darker in the cup, darkest in the silex glass."3



The two small squares are exactly the same colour

Excerpt from Joseph Alber's book, Interaction of Color

This play of light and color can be used powerfully in architecture as combinations and exclusions; the use of light and shadow, color and shape.

Architect Luis Barragán is known for his use of color and light in his designs. They produce powerful effects that go beyond the mere shape of the walls.



Photo of courtyard by Luis Barragán

[3] Josef Albers, *Interaction of Color*, 50th Anniversary Edition (4th edition) (Yale University Press, 2013), 45.

I recently took a pottery class whose focus was how to carve space. We started by hand-shaping a bowl; the first bowl being one shaped in the complete dark. We were given a lump of clay in darkness so black I could not see my hand in front of my face. We were then instructed to make a bowl, completely by feel. When we had finished, still in darkness, we placed our bowls in the center of our circle on a square board. The lights were turned on so we could retrieve our bowls by sight. This was significantly more difficult than expected; one woman could not find her bowl by sight. It was not until she closed her eyes that could again identify her bowl. She needed to 'see' the bowl in her mind's eye again.



Dream Bowl (Photo by JSchule)

If a person is blind or becomes blind, they learn a different way of 'seeing.' As David Seamon explores this through analysis of Gabriel García Márquez's book *One Hundred Years of Solitude*, where the main character uses the family's ritualistic habits she has memorized to hide the fact she is losing her sight.

> "She sets herself to cope with the dimming everyday world by focusing on "a silent schooling in the distances of things and people's voices," so that she can see, via astute mental recollection, what her failing eyes cannot. She becomes keenly aware of odors, which intensify her environmental sensibilities in a way much more acute than the visual presence of "bulk and

> color." She becomes to know so well the placement of everything in her everyday world that she forgets much of the time that she is blind."4

While sight may be the first sense that is developed, being dependent on it may cripple us or narrow or ability to experience the world around us, especially the built environment. If sight is all one uses to evaluate and interact with a building, it isn't architecture.

Sight is indeed important, but not to the exclusion of our other senses. "Seeing" can happen in a variety of ways. When you "see" through your mind's eye, you might actually be touching.

[4] David Seamon, "Situated Cognition and the Phenomenology of Place: Lifeworld, Environmental Embodiment, and Immersion-in-World," *Cognitive Process*, no. 16 (July 31, 2015): S389–92, doi:10.1007/s10339-015-0678-9.

Touch – Texture, Materials

I have a habit of feeling the clothes in a department store as I walk down the isles shopping. We all have an incredible ability to discern changes in texture and materials.

> "Touch, the haptic sense, in fact provides human beings with a vast amount of information concerning the world. It takes no special skill for a person to feel the difference between a smooth pane of glass and one etched in grooves 1/ 2,500 of an inch deep. Blindfolded and with ears plugged to remove auditory cues, a man can nevertheless tell the difference between plastic, metal, paper, or wood by gently tapping the surface with a finger nail."[5]

Rock, brick, gypsum board, wood paneling, tile, in fact, all materials express different surfaces. They appear to have various 'weights' without even hefting them. The materials chosen in a building are too often overlooked, their significance in the experience of the building downplayed or forgotten perhaps due to cost or other pragmatic considerations. But consider the difference in a museum of polished marble and light colored walls to a library with carpeted floors, dark woods and walls of books to know that materials change the experience of the user considerably.

> "To touch something is to situate oneself in relation to it. (Close your eyes, move around the room and notice how the faculty of touch is like a static, limited form of sight.) We never look at just one thing; we are always looking at the relation between things and ourselves. Our vision is continually active, continually moving, continually holding things in a circle around itself, constituting what is present to us as we are."[6]

Frank Lloyd Wright contributed to one of the ten additions on The Imperial Hotel in Tokyo. He utilized an interesting kinesthetic design element. "Wright, an artist in the use of texture, used the roughest of bricks, then separated them by smooth, gilded mortar set in from the surface a full half-inch.."[7]

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[5] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values* (Columbia University Press, 1974), 7.
[6] John Berger, Ways of Seeing, 8–9.
[7] Edward T. Hall, The Hidden Dimension (Anchor Books, Doubleday, 1966), 51.



Image of the walls in the Imperial Hotel, Tokyo, Japan, (http://blog.jtbusa.com)

This wall creates visual texture without touching it. The roughness of the brick, the irregular shapes, colors and uneven textures combine to emanate a 'feel' from it, even from a distance. This wall makes a statement in its texture and in its verticality juxtaposed against the long horizontal lines of brick. How different of a feeling would this room be with a flat, white wall instead?

> "Most of us don't go around deliberately touching buildings, yet without thinking about it, we touch them all the time. The textures we walk on or feel with our hands (or eyes) make all the difference between places which are approachable and which aren't: few people prefer a concrete bench or steel table to a wooden one. Few of my clients ask for any particular materials in their buildings, yet a lot of them ask for wooden floors."[8]

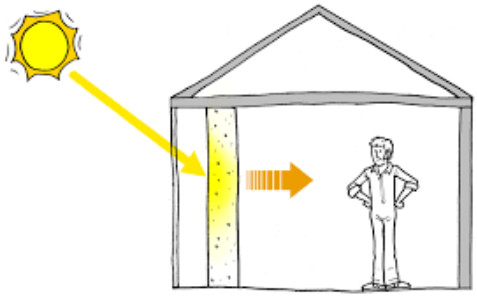
Not only can a finger tap or a simple touch identify much about an object, humans are capable of distinguishing materials simply by being in close proximity to them.

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[8] Christopher Day, *Places of the Soul: Architecture and Environmental Design as a Healing Art*, Second (Architectural Press, 2004), 74.

Thermal Qualities

Edward T. Hall brings sight and thermal sensitivity together when interviewing people who have lost their sight on their perception of space in distancing and using thermal way marks. "During the interview the subject had mentioned the currents of air around windows and how important windows are to the blind for non-visual navigation, enabling them to locate themselves in a room and also to maintain contact with the outdoors. (…) A brick wall on the north side of the a given street was identified as a landmark to the blind because it radiated heat over the total width of the sidewalk."[9]



Graphic of a Trombe Wall, a passive heating system (www.sustainabilityworkshop.autodesk.com)

Lisa Heschong, in her book Thermal Delight, tells us while we do not normally count thermal sensitivity in one of the senses or lump it in with touch, it is a distinct and separate sense.

> "We have specialized nerve endings whose only function is to tell us if some part of our body is getting cooler or warmer. (…) There is a basic difference, however, between our thermal sense and all of our other senses. When our thermal sensors tell us an object is cold, that object is already making us colder. If, on the other hand, I look at a red object it won't make me grow redder, nor will touching a bumpy object make me bumpy. Thermal information is never neutral; it always reflects what is directly happening to the body."[10]

Our bodies are very sensitive, particularly to heat and cold. We, as humans, only have a small range of temperatures that we can tolerate without becoming ill or injured. Also, our bodies adapt or acclimate to new temperature differences quickly. What is 't-shirt weather' in the spring, might be 'jacket

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[9] Edward T. Hall, *The Hidden Dimension*, 59.
[10] Lisa Heschong, *Thermal Delight in Architecture* (Cambridge, MA: MIT, 1979), 18–19.

weather' in the fall as we have become accustomed to different temperature norms. This is important to keep in mind when designing because a sunny room can be pleasant to sit in, within a certain range of degrees; if it is too hot, we will not be comfortable. The opposite of this is also true.

In addition, appropriateness of materials is significant. Sitting on a cold bench may have been planned if looking at a memorial wall, where a warm, comfortable bench may seem insensitive. Perhaps a cold, uncomfortable bench is what is required in a meditation room to foster a sense of alertness but certainly, find would find reading on a cold, concrete window seat to be pleasurable. The Norwegian Wild Reindeer Pavilion is a good example of appropriate (warm and comfortable) materiality while incorporating thermal comfort from the heat from the fireplace.



Norwegian Wild Reindeer Centre Pavilion by Snøhetta (www.dezeen.com)

As a point of fact, a discussion on thermal qualities in architecture would be incomplete without a discussion of fire. The fireplace is often designed into a home where the climate does not demand this as a heat source, but instead, it is designed for social reasons. "In many cultures a thermal place plays an

important role as a setting identified with the cohesion of the family, the clan, or some other social group. The special thermal conditions provide a reason for the group to come together."[11] A hearth is a physical thing in a stove or fire location but it also signifies the center of a family or home, perhaps because it is so close to the word, heart. Indeed, one of the fond memories I have as a child being at the lake with my parents and grandparents is of roasting marshmallows over a fire to make S'mores. Over the years, I have honed my marshmallow roasting technique to ensure the perfect level of melted interior and browned crisped exterior. I still enjoy the odd S'more now and then but regardless, I always enjoy sitting around a fire. I find the sight of the flames to be relaxing; the flicker and quality of light is unlike anything artificially created. Even a candle flame has a certain light and movement quality. The crackle of the wood is distinctive, enjoyable. Even without being able to see or hear the crackle or flames, the heat from a fire is somehow more enjoyable than electric heat. Lisa Heschong probably summed it up best when she says, "Perhaps the human fascination with fire stems for the totality of its sensory stimulation."[12]

Sight, touch, sense of heat are only three of the senses used to experience the spaces around us. Both of my parents played musical instruments and encouraged me to play as soon as the public school system allowed. In the fourth grade, I chose to learn to play the flute and I still play. Through school I learned to appreciate music but also the sounds of nature. In architecture, unless one is in a concert hall perhaps, sound may be an overlooked or underappreciated. There is a reason for that.

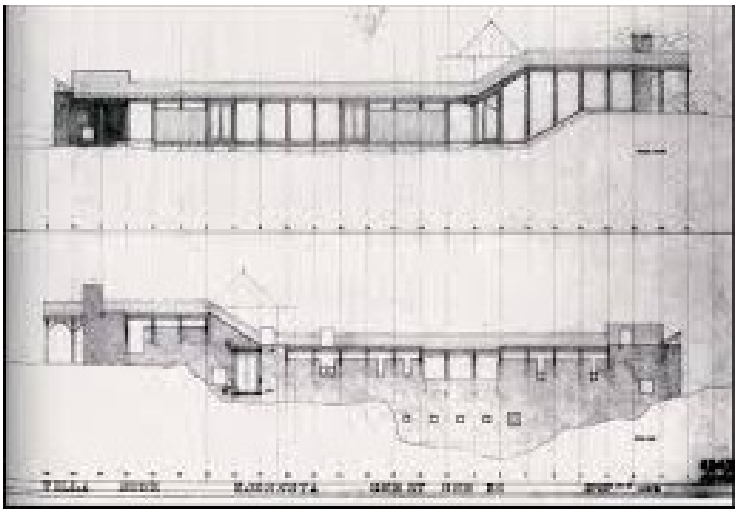
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[11] Ibid., 46.
[12] Ibid., 29.

Sound – Silence, Solitude, Rhythm

"Auditory sensitivity in man is not especially acute."[13] Yi-Fu Tuan reports in his book Topophilia, that man's sense of hearing, compared to other animals, is simply not as developed as it is not required for survival. Indeed, a human's hearing is limited to a much narrower range of the hearing spectrum. That being said, just as in the case of the woman going blind but having her hearing and other senses heightened, we can train our sense of hearing to be more acute and discerning. After receiving musical training, many people report a heightened awareness of an even appreciate a wider range of sounds.

Musical systems can be present in architecture in more ways than simply acoustics. Music is very rhythmic, sequential and dynamic.



Line drawing of Villa Busk (www.pinterest.com)

In the Villa Busk, in Bramble, Norway, designed by architect Sverre Fehn, for a musician and his family, the structure of the building mimics a musical score, as described by Simon Unwin in his book, Twenty Buildings Every Architect Should Understand. The window openings, black in the daylight, appear like quarter notes on the staff of the linear building. The structural grid acts as the 'beat.' Unwin goes to

[13] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values*, 8.

explain the musical analogies in the project that perhaps change the way one views and experiences the building.[14]

Rhythm in architecture is common, almost mundane in part because it happens as a result of building materials and structural grids organically. Columns and beams, trusses, joints, windows repeat at equal intervals, with regular spacing. It is easy to see the correlation to music in architecture.

Yi-Fu Tuan explains "The eyes gain far more precise and detailed information about the environment than the ears but we are usually more touched by what we hear than by what we see. The sound of rain pelting against leaves, the roll of thunder, the whistling of wind in tall grass, and the anguished cry excite us to a degree that visual imagery can seldom match."[16]

While I am particularly moved by music of various kinds, I am also struck by the opposite of music, the opposite of sound; I am moved by silence. In today's world, finding a place that is silent, if one is lucky enough to do so, is often disconcerting. We are so used some degree of mechanical noise or planes overhead or any manner of humming, that absolute absence of all noise is so rare that it is eerie. In fact, I find the silence during exams so unusual to me, any conversation during a test is very disruptive to my train of thought. My solution is to wear headphones with classical music playing. This is my school equivalent of silence.

When I go hiking or camping, there is a different level of silence, one that is not at all disconcerting but still not completely the absence of sound. The sound of nature, of trees creaking, of wind blowing, of insects chirping, birds singing and even the running brook are sounds of a different sort. How can we bring these sounds, sounds of silence, if you will, into architecture?

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[14] Simon Unwin, *Twenty Buildings Every Architect Should Understand*, First (Routledge, 2010), 192–200.

[16] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values*, 8.

Scents

Prior to visiting the St. Ignatius Chapel on the Seattle University Campus, I would not have listed smell in the top five senses one uses to experience architecture. Recalling the musty basement, the dusty attic are common occurrences in life, but these are products of the environment rather than a purposeful experience of scent built into the design of a building.

There are many memorable spaces in the St. Ignatius Chapel, designed by Steven Holl. There is one room, in particular, that is unusual. It is a room where the walls have been coated with beeswax. This has created a subtle sweet smell, strangely comforting in the scent and in the light-yellow color but not cloying. In the middle of the room is a stark bare branch tree with a single lit lantern; this contrast brings one back to the solemn contemplation of the sacred space. After visiting the chapel, I find myself recalling that specific room most; the room where the walls are coated with beeswax.



Photo of the room with the Beeswax walls, St. Ignatius Chapel, Steven Holl (www.pinterest.com)

I read somewhere long ago that a dog on a walk, smelling as they go, is our equivalent to reading or watching TV. In that knowing, I found patience for the prolonged sniffing of things my dogs could smell but I couldn't. Yi-Fu Tuan explains our lack of smell in comparison to man's best friend.

> "A man cannot project himself into a dog's world if for no other reason than the chasm in the olfactory sensitivity of the two species. The dog's sense of smell is at least a hundred times more acute than that of man. Though carnivores and some ungulates have sharp vision, they place greater reliance on their olfactory receptors to survive in their world, in comparison with the primates. Of course, the sense of smell is also important to primates. It plays a large part in the fundamental processes of feeding and mating. Modern man, however, tends to neglect the olfactory sense."18

The smell of rain is special combination of atmospheric changes and water disturbing earth. The uniqueness of the smell of rain is locationally specific. A rain storm in the Olympic Peninsula smells differently than in the Badlands of North Dakota.

The smell of sea versus a lake versus a river is discernable and affects our memory of a place.

"Odor is one of the earliest and most basic methods of communication. It is primarily chemical in nature and it is referred to as the chemical sense. Serving diverse functions it not only differentiates individuals but makes it possible to identify the emotional state of other organisms."[19]

Hall describes the smells of a 'typical French town,' and sends my thoughts to the 'typical Montana town.' While he describes 'the smell of coffee, spices, vegetables, freshly plucked fowl, clean laundry and the characteristic odor of outdoor cafés,' I am thinking about fresh cut alfalfa, sage brush, the special metallic smell of Montana dirt and drying algae at the edge of a summer river bank. He expands, "olfaction's of this type can provide a sense of life; the shifts and the transitions not only help to locate one in space but add zest to daily living."[20]

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[18] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values*, 9.
[19] Edward T. Hall, *The Hidden Dimension*, 46.
[20] Ibid., 50.

How can we use our sense of smell to affect our feeling and memory of spaces?

A cavernous space can affect the sound. A tight, well acoustically insulated space can feel even smaller.

Sound and space are intricately related.

Space – Proportion, Scale, Perception

"Man's sense of space is closely related to his sense of self, which is in an intimate transaction with his environment. Man can be viewed as having visual, kinesthetic, tactile, and thermal aspects of this self which may be either inhibited or encouraged to develop by his environment."[21]

"Inside a big theater, if the designer has left ample room around our seats, we can feel festive rather than lost in a sea of other fans. The degree of comfort we experience in a crowd often depends on how wee we are able to maintain our "personal space" – a kind of invisible bubble that surrounds the body."[22]

Le Corbusier observed a proportion to humans that he formalized into Le Modulor and used it to size and frame his buildings. Along with the golden section, instinctually, I believe we sense proportion as pleasing and unpleasing.

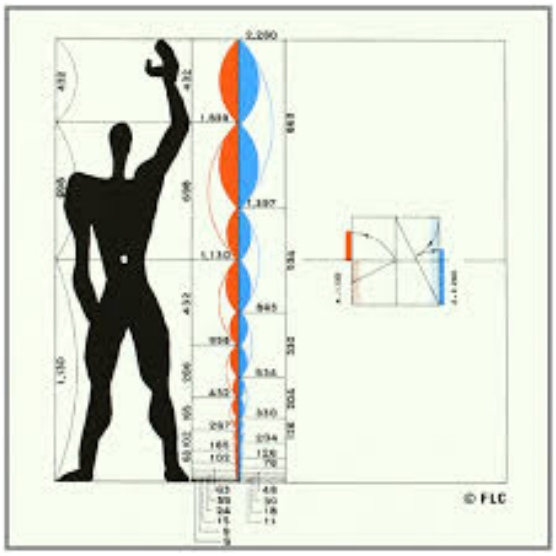


Figure showing the proportions of Le Modulor (www.pinterest.com)

[21] Ibid., 63.
[22] Winifred Gallagher, *The Power of Place: How Our Surroundings Shape Our Thoughts, Emotions, and Actions* (Harper Perennial, 1994).

Another proportioning system found to be used since antiquity is the Golden Section. Otherwise known as the Golden Ratio and the Greek letter, Phi; it corresponds to the value of 1.618.



Figures showing the golden section superimposed on the Greek Acropolis (left). A Nautilus shell on the right showing that this ratio appears naturally in nature. (www.pinterest.com)

When this ratio is applied architecturally, to room dimensions, window placements, door heights and other elements, it has been noted these elements tend to 'feel' more comfortable. Perhaps it is because this number is engrained biologically in us and we are simply attuned to it. Perhaps there is a less deep, less scientific reason.

There is a long history of using proportion and placement in our built environment.

> "Ancient ruins, from "Nazca lines" in Peru to the monoliths of Stonehenge, offer spectacular testimony to the importance long accorded to what Pliny the Elder first called geomancy or people's propensity for using external sings to figure out what to do next. Although this tradition tended to decline with the rise of modern science and Judeo-Christian religion, some of the practical Chinese continue to rely on the system their ancestors developed to help people find and create settings both pretentious and propitious."

It is not uncommon for *feng shui* consultants to recommend everything from charms to ward off bad energy from exposed beams to removing plants with pointy leaves and rearranging furniture. The system is based on ancient science and is as complicated as it is layered and steeped in mystery. While this makes *feng shui* (literally translated as wind water) seemingly nonsense for Westerners, it has been observed that places and spaces with 'good *feng shui'* not only feel better to be in, more comfortable in ways that are hard to describe but the fortunes of the occupants often are prosperous.

I believe there is something to this ancient mixture of art and science. It may simply be perception or proportion; it may be deeply unconscious or rooted in science. I may never fully know why but I do know certain spaces and proportions feel better than others.

Unnamed

Maybe we have forgotten how to listen, to look, to see. Maybe we no longer notice the sublime, the beautiful, the miracles. Maybe we have become so accustomed to recreated objects rather than the real, the quick fix, the push to accept the mundane as spectacular that we have forgotten what is real, what is awe-inspiring.

> "We have to listen to the unspoken, listen with all of our senses. It is this listening as an exercise that develops our sense of what is right – our sense of beauty. If we look at the world around us, the places most rich in life are meeting places – and not only cafes and city squares. In nature, life is at its most vigorous where the elements meet – warm sun-drenched marches, humid jungle. When we seek rejuvenation in natural surroundings we're drawn to those places where the spirit of place is strongest – where there are meetings between elements – paces which emphasize the meeting of, for instance, earth and sky or water and rock."[27]

If we design elements into our buildings that allow us to reconnect to our senses, this will permeate our daily experiences. The buildings we inhabit will allow us to see ourselves differently; change how we view our daily life. "Changes in styles of architecture reflect changes in technology, economy, and in people's attitude toward what is desirable in the physical environment."[28]

The texture of the walls, the quality of the light will remind us of the earth, of sunrises. The smell of rain will remind us of rivers, oceans and clean water. "The messages are also subtle: only when we *touch* polyurethane-coated wood do we know there's something wrong. (….) It looks like wood but our other senses say it is a lie."[29]

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[27] Christopher Day, *Places of the Soul: Architecture and Environmental Design as a Healing Art*, 34–35.

[28] Yi-Fu Tuan, *Topophilia: A Study of Environmental Perception, Attitudes, and Values*.

[29] Christopher Day, *Places of the Soul: Architecture and Environmental Design as a Healing Art*, 75.

It is possible to redesign, to resend the messages, to be subtle, yet true. It is possible to reconnect to our senses, to our natural surroundings. It is possible.

"If you trust in Nature, in what is simple in Nature, in the small Things that hardly anyone sees and that can so suddenly become huge, immeasurable; if you have this love for what is humble and try very simply, as someone who serves, to win the confidence of what seems poor: then everything will become easier or you, more coherent and somehow more reconciling, not in your conscious mind perhaps, which stays behind, astonished, but in your innermost awareness, awakeness and knowledge."[33]

"And now here is my secret, a very simple secret: It is only with the heart that one can see rightly; what is essential is invisible to the eye."[34]

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[33] Rainer Maria Rilke, *Letters to a Young Poet* (Stephen Mitchell, 1984), 33–34.
[34] Antoine de Saint Exupéry, *The Little Prince*, 87.

Precedents

Hotel Valle Sagrado by Luis Longhi

The work of this architect exemplifies what it means to design work that is 'of the landscape.' Luis Longhi teaches an intuitive way of creating architecture that is tactile, textural and filled with varying degrees of light, creating a structure that sits on the land in a way that is sublime. While his way may not be intuitive for all, he starts his projects with a connection to the site first and foremost. His projects, including this one, make one sense the building is growing out of the land; that it has always been there. One feels as though you are inhabiting not just the building but the surrounding atmosphere, as well.



Image of the hotel, (http://www.longhiarchitect.com/h-valle-sagrado)



Image of the hotel, (http://www.longhiarchitect.com/h-valle-sagrado)



Image of the hotel, (http://www.longhiarchitect.com/h-valle-sagrado)



Image of the hotel, (http://www.longhiarchitect.com/h-valle-sagrado)

Villa Mairea by Alvar Aalto

This precedent is in a wooded landscape and blends in despite the varied materials on the exterior, or rather *because of* the varied materials. The space both interior and exterior speak to a connection with the natural surroundings and affect all senses as you experience both.

The way the columns meet the floors and the ceiling mimic the forest meeting the sky and the forest floor. The color and texture and acoustic qualities of the wood create a softness that is very different from concrete or stone; it is very natural. The setting of this building is deep in a forest. And while the varied materials on the exterior make it visible, the way the trees wrap around this building, make it blend into its environment. Again, not unlike being IN a forest. The white mimics the visible portion of the sky that can be seen through the trees and the vertical and horizontal geometries of the exterior mimic the distances, gaps and geometries between trees and the ground.



Image of the exterior of Villa Mairea, (http://archeyes.com/villa-mairea-alvar-aalto/)

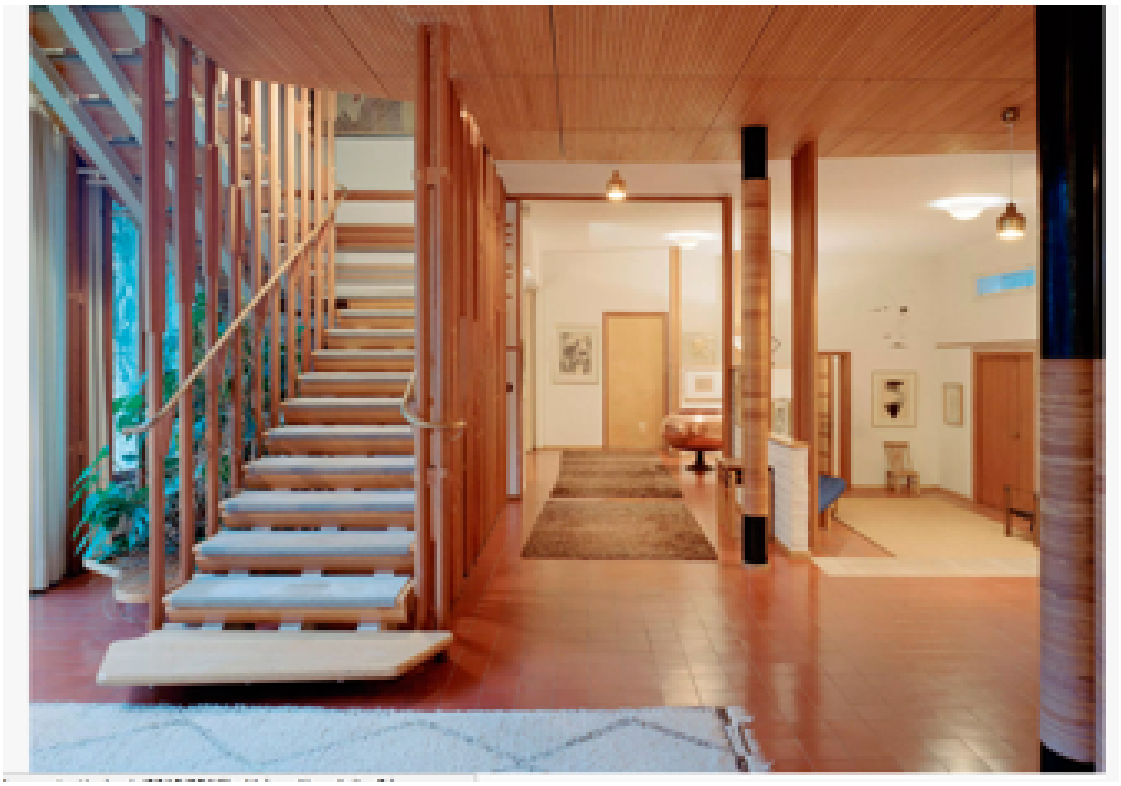


Image of the interior of Villa Mairea, (http://archeyes.com/villa-mairea-alvar-aalto/)

Tippet Rise Art Center, Fishtail, Montana

This precedent exemplifies the experiential nature of architecture. The sculptures as art installations are experiential in sound, sight and texture. They are interactive, not only allowing one to touch them, walk around them, but to also play with them. I realize now, somehow, they shift your perception of the space around you with their size and the views some of them frame. I was fortunate enough to have tickets to listen to an amazing pianist in the Oliver Music Barn. This concert venue is intimate, seating maybe 100 people but the sound was amazing and the architecture warm with the light-colored wood.

Tippet Rise has several permanent art installations that are of the most experiential and architectural qualities.

Several of the concrete sculptures were poured in place over sheets of heavy plastic. This created almost glass-like smooth surfaces; the light was reflected but it was still concrete. You had to touch it to believe it was that smooth. The plastic created cracks and folds in the concrete that leave it feeling like it is not solid but almost fluid. While the top of the pour was left exposed to the elements; it has a rough texture of dirt and pockets left by melting snow. The edge where the polished side meet the rough side is knife sharp; it was hard to look at without feeling a bit uncomfortable.



Image of Inverted Portal sculpture, (Photo by JSchule, 2017)

The Duomo was poured in place; the earth dug away to reveal its cavernous nature. It amazed me this monolith was what was left. The top of the sculpture still grows the native plants and drips down the side. As the sculpture ages in place, the minerals and weather will create individual colorings that will speak to, act as a witness to all that the sculpture has seen as it sits and frames views of the mountain ranges. Acoustically designed, the caverns wrap and present music to listeners sitting close or even on the next nearest ridge.



Image of Domo sculpture, (Photo by Jschule, 2017)

The other sculptures vary from wood to metal to enclosed or open. Each can be experienced in a different way, with a different sense.

The Oliver Music Barn was built according to the traditions of small music halls in European hamlets and other small villages where musical performances both scheduled and spontaneous would allow all of the village inhabitants to feel as friends. The acoustics are pure; the setting intimate. The musicians are world-class. The wood on the inside allows the perfect combination of reverberation and absorption. The light wood is soft and bright and clean.



Image of interior of Oliver Music Barn, (Photo by Iwan Baan; http://tippetrise.org/photography)



Image of exterior of Oliver Music Barn, (Photo by Iwan Baan; http://tippetrise.org/photography)

Vals Thermal Baths by Peter Zumthor

This precedent is a study in light, thermal qualities, acoustic qualities and water, separately and combined. Peter Zumthor created the Baths in 1996. The primary material is locally quarried Valser Quarzite slabs

Zumthor's own words regarding his design intent are particularly on point and relevant to this design thesis and project.

He states, "Mountain, stone, water – building in the stone, building with the stone, into the mountain, building out of the mountain, being inside the mountain – how can the implications and the sensuality of the association of these words be interpreted, architecturally?"

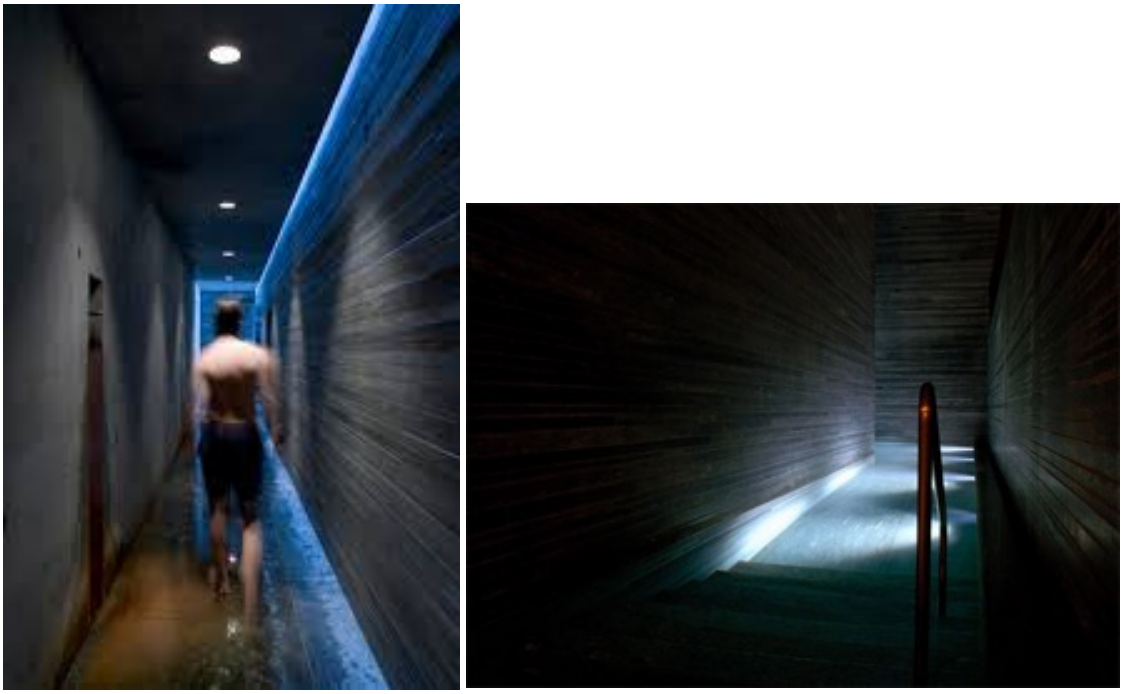




"The fascination for the mystic qualities of a world of stone within the mountain, for darkness and light, for light reflections on the water or in the steam saturated air, pleasure in the unique acoustics of the bubbling water in a world of stone, a feeling of warm stones and naked skin, the ritual of bathing – these notions guided the architect. Their intention to work with these elements, to implement them consciously and to lend them to a special form was there from the outset. The stone rooms were designed not to compete with the body, but to flatter the human form (young or old) and give it space…room in which to be."



“The meander, as we call it, is a designed negative space between the blocks, a space that connects everything as it flows throughout the entire building, creating a peacefully pulsating rhythm. Moving around this space means making discoveries. You are walking as if in the woods. Everyone there is looking for a path of their own.”



All photos from Feb. 11, 2009 ArchDaily:(http://www.archdaily.com/13358/the-therme-vals)

Design Project:

Scope

Demolish a small 1970's three-season cabin on Flathead Lake, known as the Lakeplace and rebuild according to the site characteristics listed below while creating an experiential architecture as described in the thesis above. Note: While the property lines extend up the hill past the road, the project will focus on the property that borders the lake.

Quantitative

- A multi-family space where spaces are tiered to allow for a variety of interactions; spaces which are both public and private. Approximately 2,500 square feet.
    - Three separate spaces within the larger complex to allow for multiple families to stay at the same time.
    - Aging-in-place characteristics for one residence.
    - All residences to have separate entrances but ease of travelling between them, separate but joined.
    - One large group kitchen and eating area (for everyone together). Central hub/hearth.
    - One kitchenette (for couple).
    - Three (3) full bathrooms with compositing toilets.
    - Closets
    - Mechanical rooms
    - Circulation
    - Storage
    - Parking
    - Water activities

Qualitative

Multi-faceted spaces that feel spacious yet allow for private space. Spaces that allow for interaction with the natural surroundings, particularly the water. Residential but all inhabitants but also allow space for remote work spaces such as writing, reading, computer work. Hobby spaces for stained glass and sewing. Spaces for quiet. Spaces to be alone. Spaces to interact with family. Spaces to balance out family time. Quiet contemplation spaces. Spaces where you can hear the water moving the gravel in the bay. (This is why the bay is named Gravel Bay.)

Sight

- Captalize on views of the lake.

- View of the bent over tree.
- Views of the mountains and the stars.

Sound

- Acoustically private spaces to allow for isolation between early risers, late sleepers and nap takers.
- Protection from boating and traffic noises with operable walls, windows and other openings.
- Allow the sound of water crashing when the waves are high and the water moving through the gravel with the waves are just swells. Perhaps with sleeping porches.

Touch

- Natural wood and stone materials to emphasize the connection to nature.
- Materials very textural.

Light

- Abundant natural light allowing for daylit rooms and a connection to the sky
  - Shaded elements particularly so the glare from the sun becomes warmth rather than too hot.
  - Windows positioned to allow for time keeping and solstice/equinox awareness.
  - Rooms open to the sky with large skylights for viewing the trees, the clouds and the stars. To experience the rain acoustically and visually.
  - Shading devices for the west side of the house to protect from the summer heat while still allowing thermal masses to collect heat for the cool mornings.

Breezes

- Open design so natural ventilation can cool, but also flow through house.

Scents

- Pine and lake smells will permeate.
  - Sleeping porch.
  - Operable windows.
  - Porches with overhang and other protective, shading devices.

Size

- Human sized spaces with efficient storage.

Shape

- Rounded wooden edges and surfaces to soften the rock and concrete materials and blend the distinction between indoors and outdoors.
    - Stacked or tiered to take use of the topography and to provide an element of height that has been previously not used.
    - To mimic the natural slope of the land but also provide for vertical privacy in that separation that is usually horizontal.
    -

Center

- Hearth
    - Where the kids play, grandma and grandpa sit in their chairs, rocking and watch and interact.
    - Where mom and dad can catch up with grandma and grandpa while they supervise.

Spokes or pods

- Spaces where individuals or couples or families can go to be away from the hearth.
    - To sleep, to read, to discipline, to decompress, to have a private conversation, to rest.
    - Some spaces will be contained with a large space, like a reading nook.
    - Other spaces will be closed off and private, like a sewing or meditation room.

Site

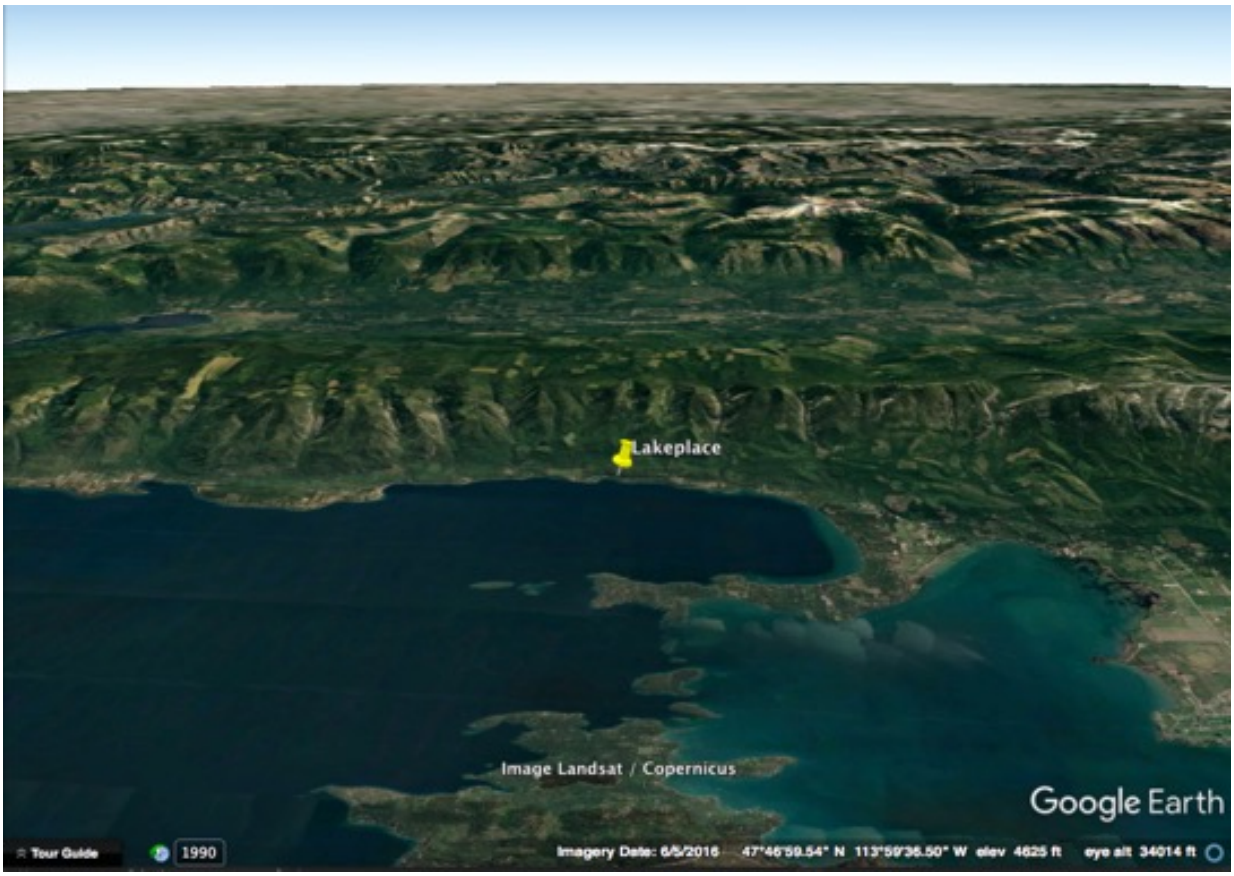
Location

The site is the bottom of a hilly parcel located on the East Shore of Flathead Lake near Polson, Montana. Polson, Montana is at the southern most part of the lake. Montana is mountainous on the western half of the state with the eastern half being more flat. The mountains effect the climate at the site location as will be discussed more fully below.

Flathead Lake is a glacially fed lake and is what is left from Glacial Lake Missoula from the last Ice Age. It is the largest freshwater lake west of the Mississippi River. It is approximately 27 miles long and 3 miles wide at it widest.



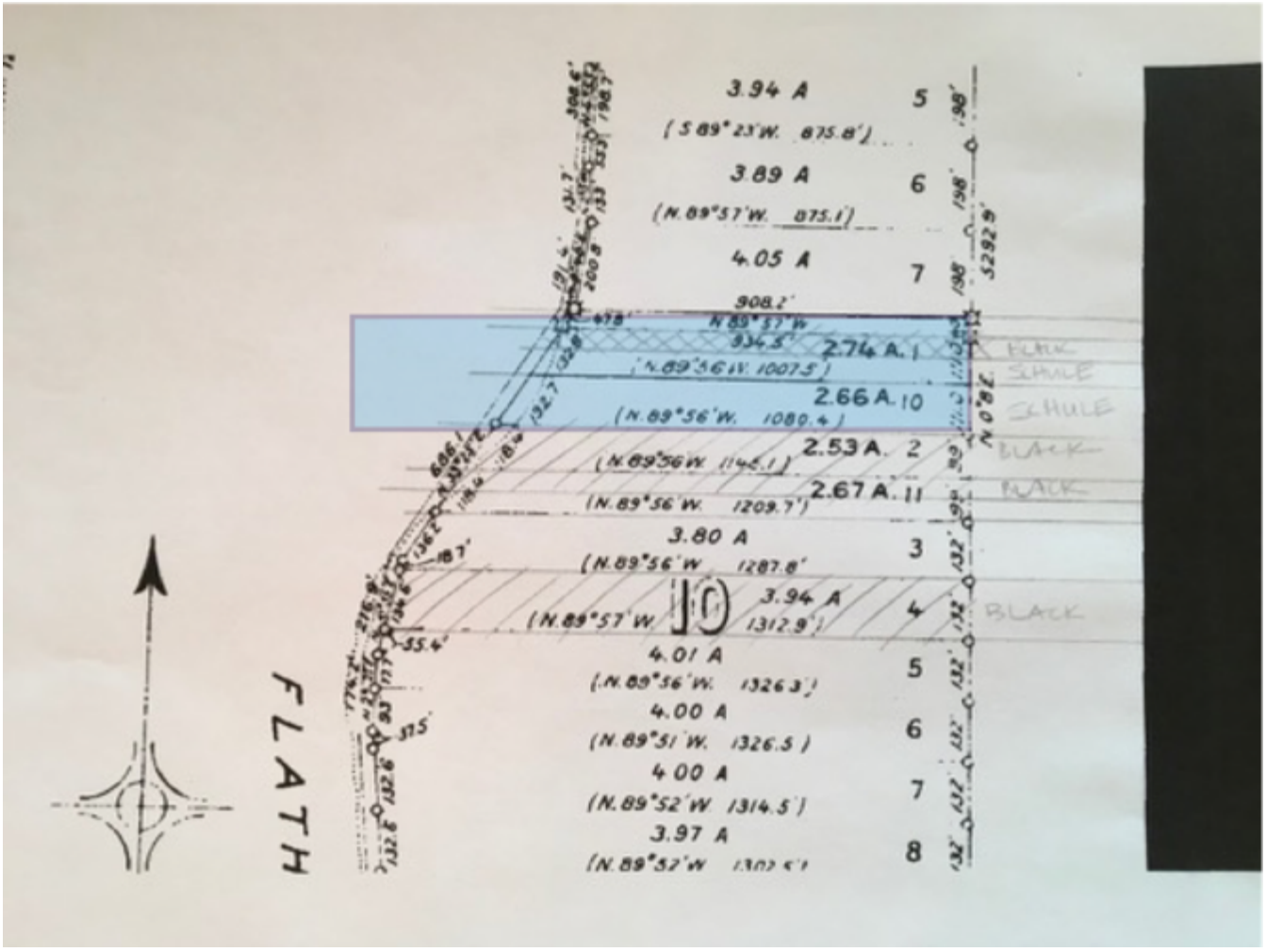
Map showing Montana with Flathead Lake inside blue box. Scale=1”-0”=150 miles (http://maps.google.com)



Map showing section along Highway 35 east and northeast of Polson (right) where site is located (http://maps.google.com)

Legal description of the property

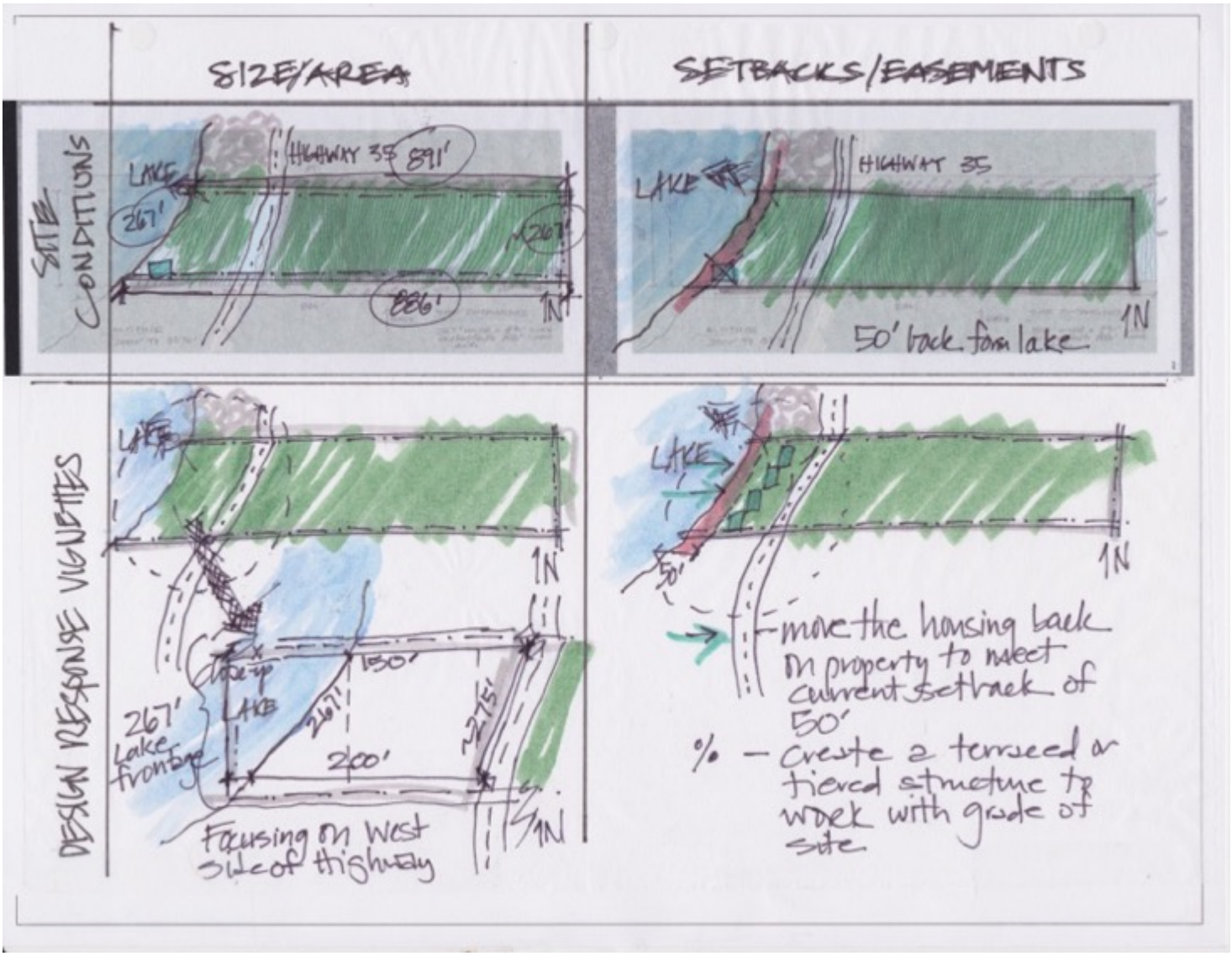
FESTOU VILLA SITE SUBDIVISION, S03, T23 N, R19 W, BLOCK 10, Lot 1, ACRES 0.78, N1/2 ASSR#0000036266 AND S1/2 LT 1 AND LT 10 BLK 10



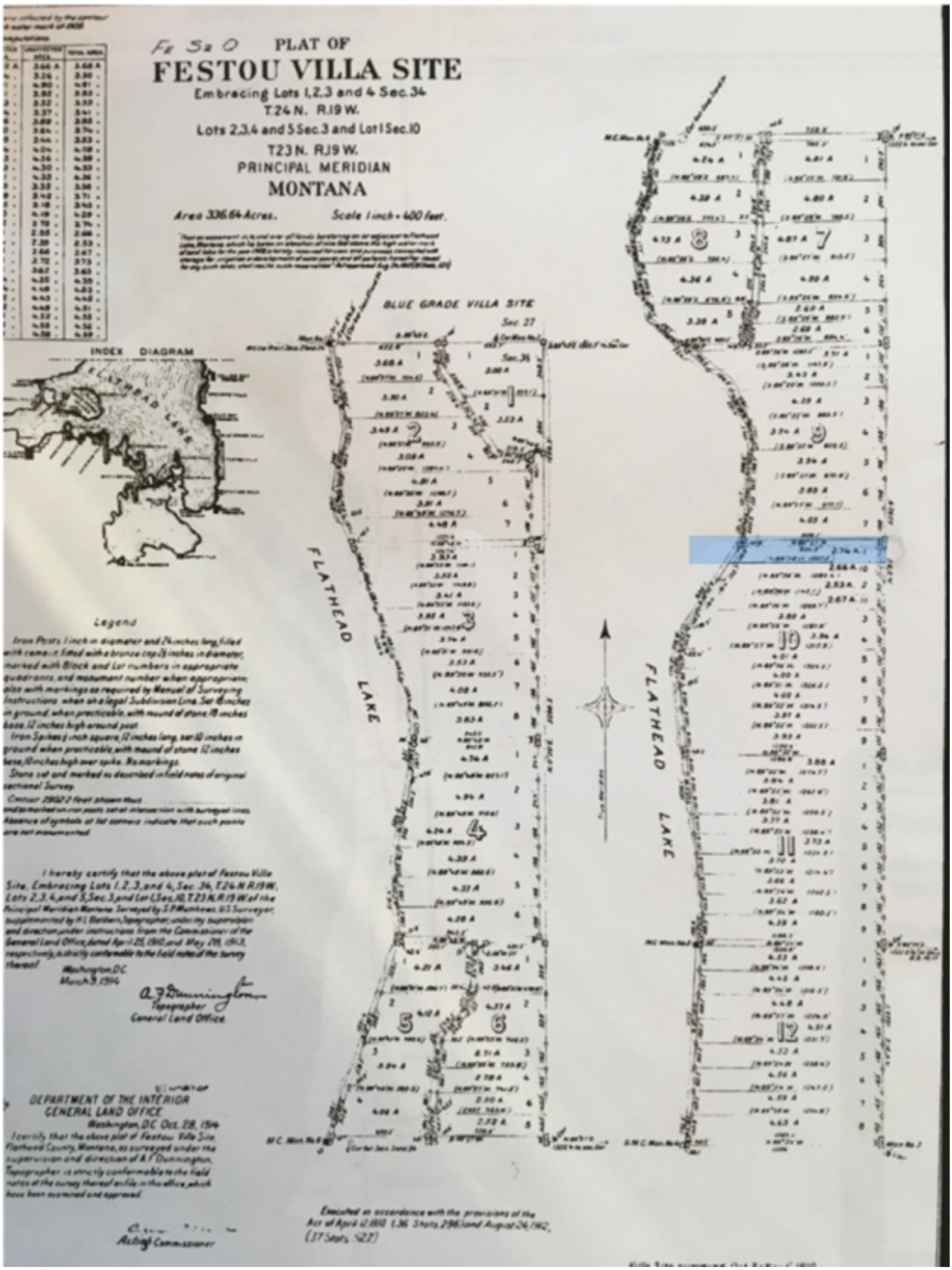
Plat showing property lines. 2.66A and 2.74A in blue, are now Schule owned and present the full property lines of the site. (Lake County Planning Office; JSchule notations)

Size and Zoning

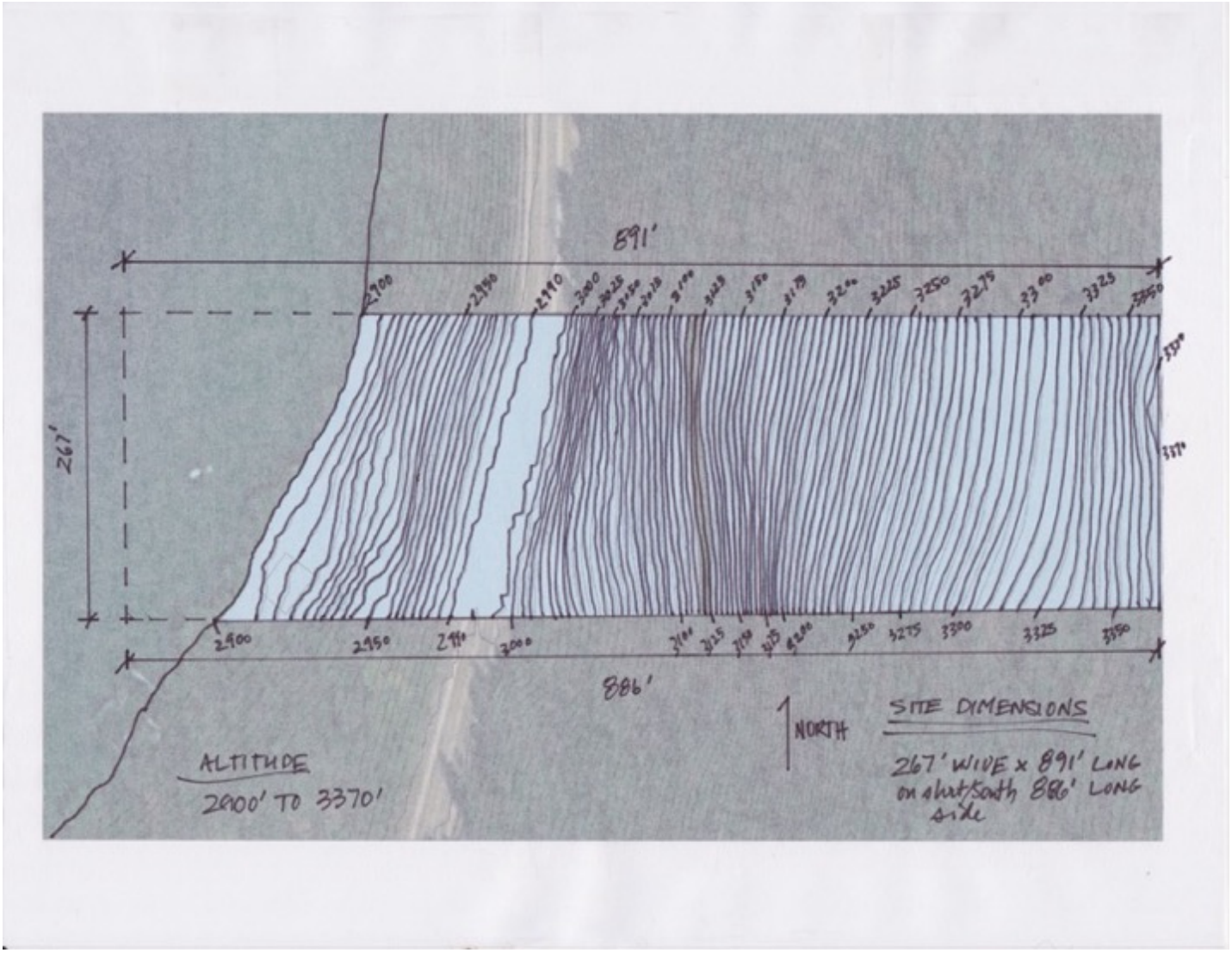
The site is comprised of two plots that total 267 feet of lake frontage an 867 and 891 feet up the mountain to the east.



Drawing showing the property lines, and current lake setbacks. (JSchule)



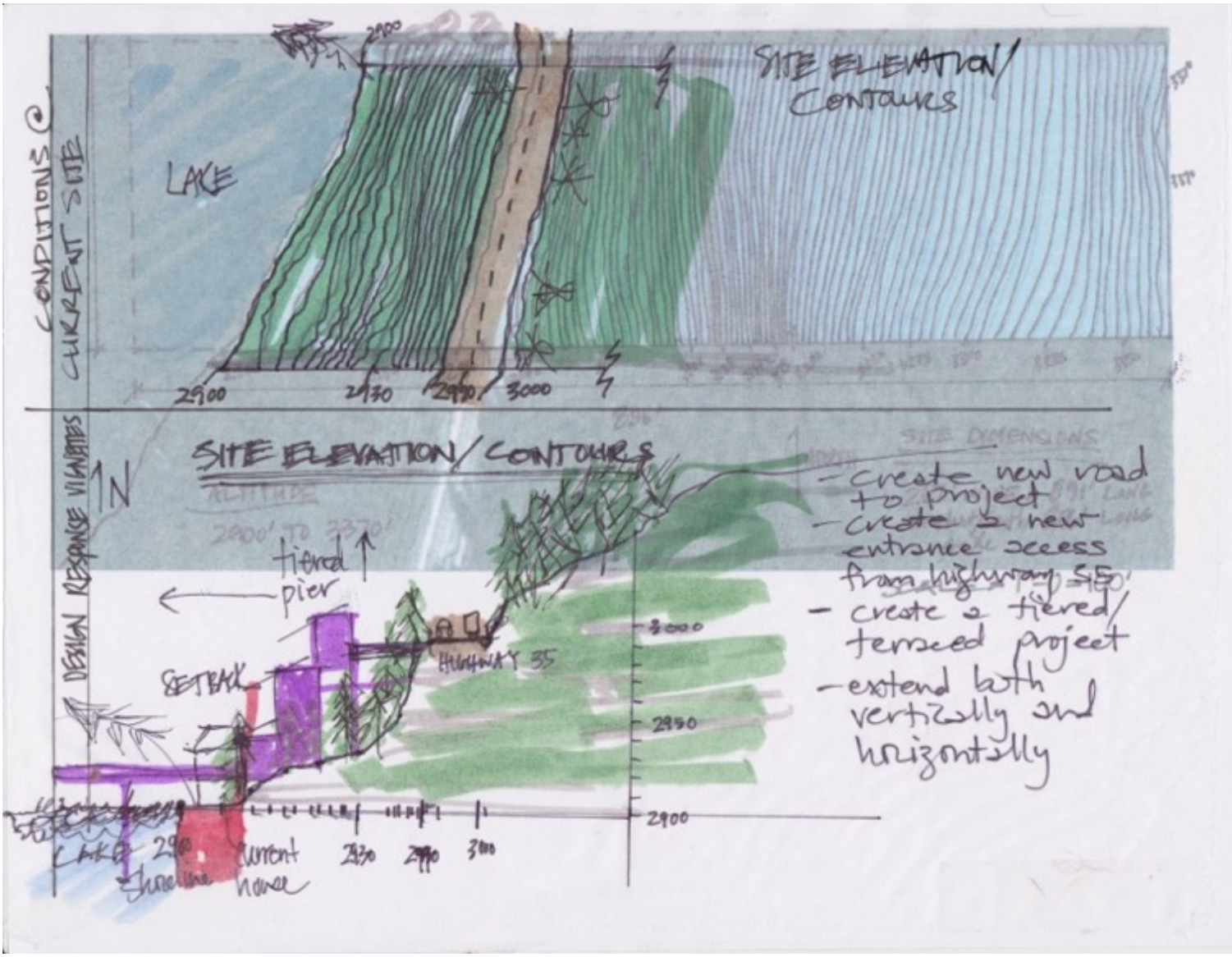
Plat showing plots along lake. (Lake County Planning Department)



Line map showing the topographic lines and the property extents. (JSchule)

Topography

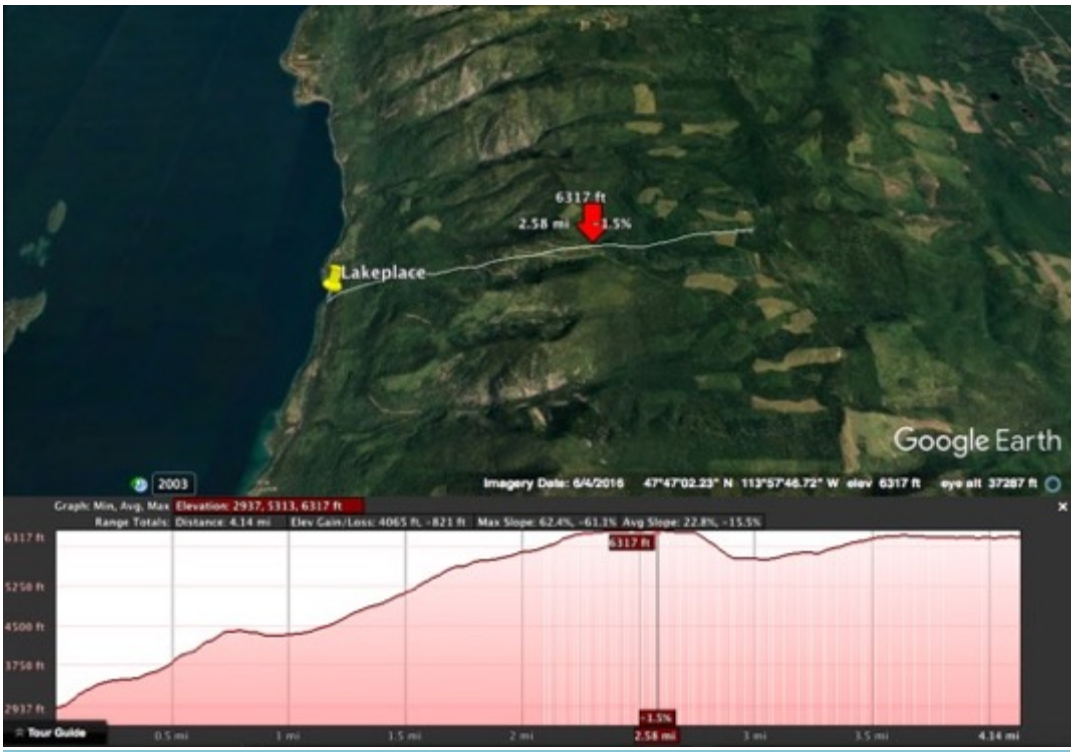
The site is very steep. The portion to the east above the highway is approxmiately 45% grade. The site below, to the west of the highway down to the lake is varied steepness with the current building site being a flat spot that was expanded upon by the lake edge. The rest of the project site as proposed will work with the elevation as a design element.



Drawing showing the current site elevation and contours in plan and section, as well as, a potential design response to the steepness of the grade. (JSchule)



Map showing the elevation of the property lines of the site from the lake and up the mountain to an elevation of approximately 3’500’. (http://maps.google.com)



Map showing the elevation of the Mission Mountain range an elevation of approximately 6’300’. (http://maps.google.com)

Natural Physical Features

The project site, known affectionately as the Lakeplace, is approximately 20 miles north of Polson along Highway 35. The Lakeplace is a small 3-season cabin, less than 1000 square feet. The cabin was built by my grandparents and parents. The cabin will not be a part of this theoretical project. Rather, this project will design a new structure according to the thesis posited above.

The mountain range behind the site, to the East, is the Mission Mountain Range. The site at the water's edge of the lake is at elevation 2900'. The mountains rise to an elevation of 6,300'. The eastern most property line extends 891' feet east from the water's edge and rises to 3,350' of elevation.

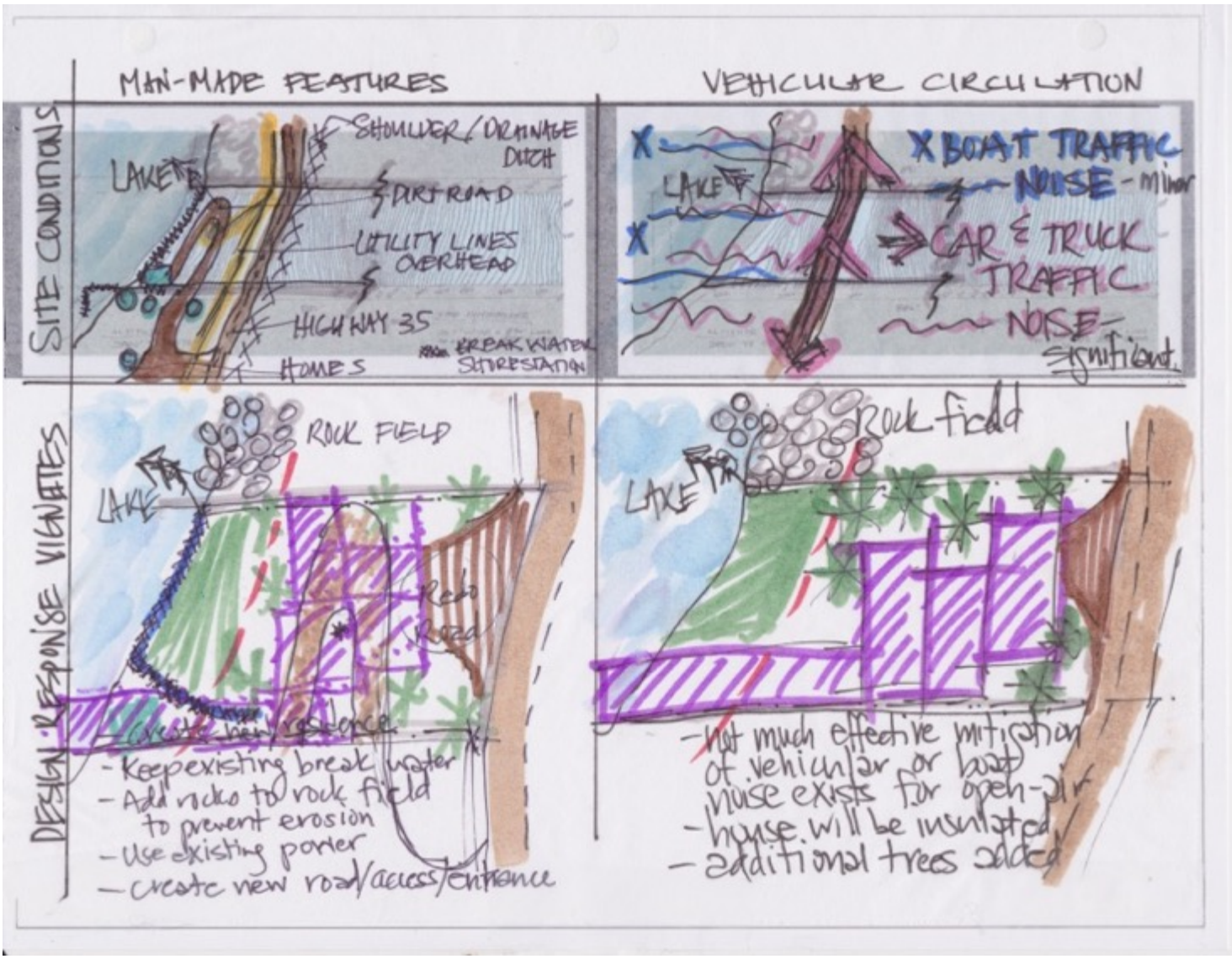
The previous images illustrate the location of the site in relation to the mountains and illustrate the elevation of the property extents, as well as the highest point of the mountain range as it affects when the sun hits the property.

The trees on the site are primarily Ponderosa Pines. There is a mix of small shrubs and some decidous trees such as Cottonwood trees. The Ponderosa pine trees affect the ability of th sun to reach the site as it is heavily wooded with these tall trees some reaching 60 feet in height. The average height of the trees is 40'.

Flathead Lake is dammed at the south end, by Kerr Dam. This generates electricity for the town of Polson and neighboring areas, as well as moderating the water depth in both the lake and the river. In the winter, the water level is lowered to allow the spring run off to fill the lake back to full pool. In recent years, the water level at full has been higher. This has contributed to more erosion at the shore level and more damage to properties on the lake during storms as the waves can now reach the buildings and other built structures, such as docks and storage.

Man-Made Features

There is a moderately busy highway (Highway 35) thatintersects the site from north to south. This highway creates traffic noise that can be heard at all times of the day or night. Heavy semi-truck traffic creates the majority of the noise that is a pretty consistent level all year round. During the summer, the traffic noise level increases as the summer tourist traffic increases around the lake. Traffic noise will be a contributing factor to consider in the design.



Drawing showing the manmade features, vehicular circulation and the potential design responses to those conditions. (JSchule)

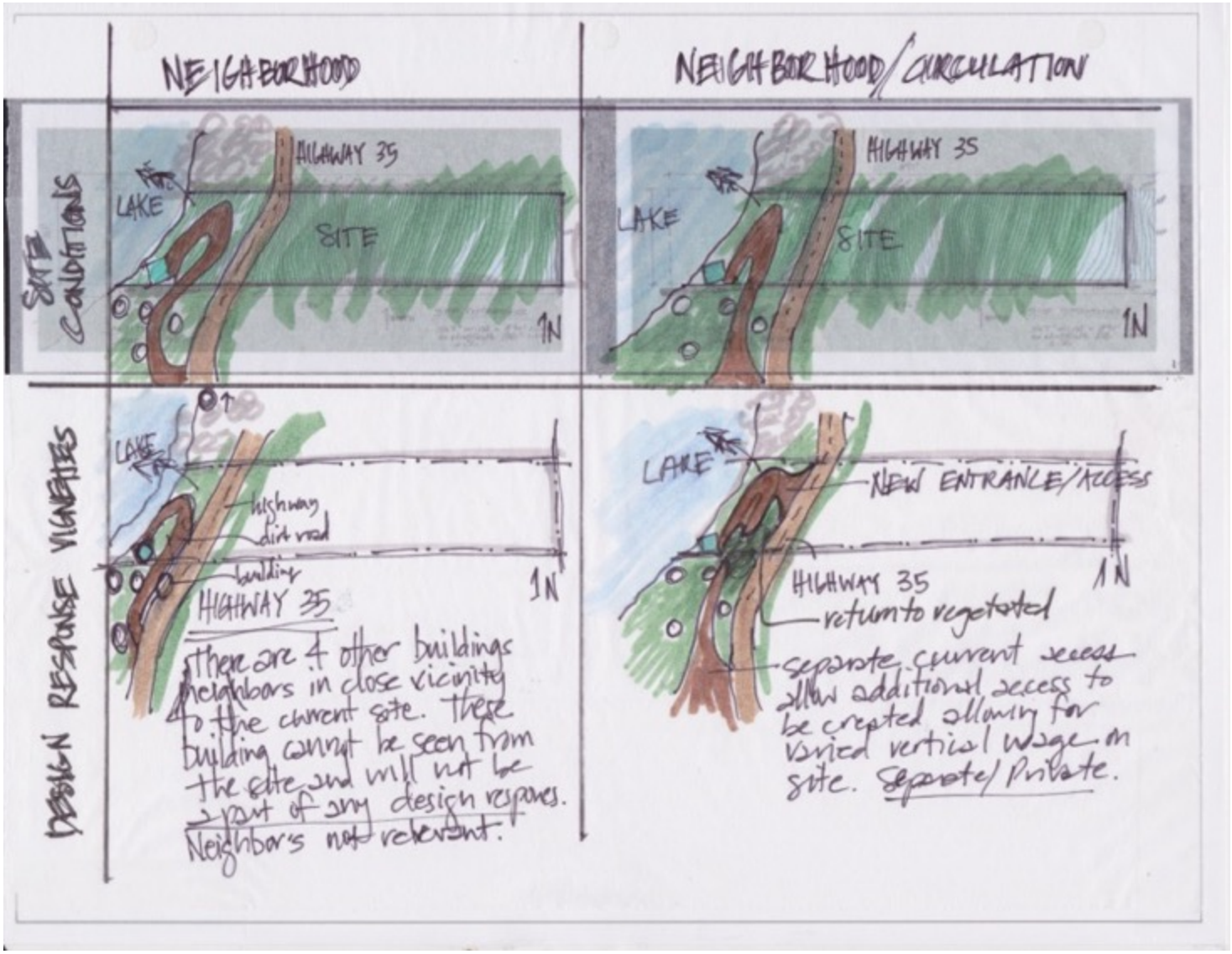
Utilities

Additional site characteristics include power lines parallel to the highway and a single electrical line to the switchback and across to the back of the Lakeplace.

The current property pulls water from the lake for showers and toilet useage. All black and grey water goes into the septic system.

Neighborhood context

The site is in a lake/resort type of environment with a very rural setting. Most residences around the lake are not utilized year round. The closest towns are Polson to the south and Bigfork, then Kalispell to the north. These towns do not have the industries to support the cost of living on the lake for the majority of the residents. The Lakeplace has three neighbors in close proximity; only one of those neighbors lives on the property year-round. All of the neighbors properties are older properties (older than 40 years) with the exception of the full-time property being built in the last 20 years. It is the most 'modern' in styling and amenities. It is the first property next to the highway. All of the neighbors prefer their privacy. Very little interaction occurs.



Drawing showing the neighborhood (other houses in the relative area of the project) and the circulation paths along the dirt road and highway. (JSchule)

Circulation

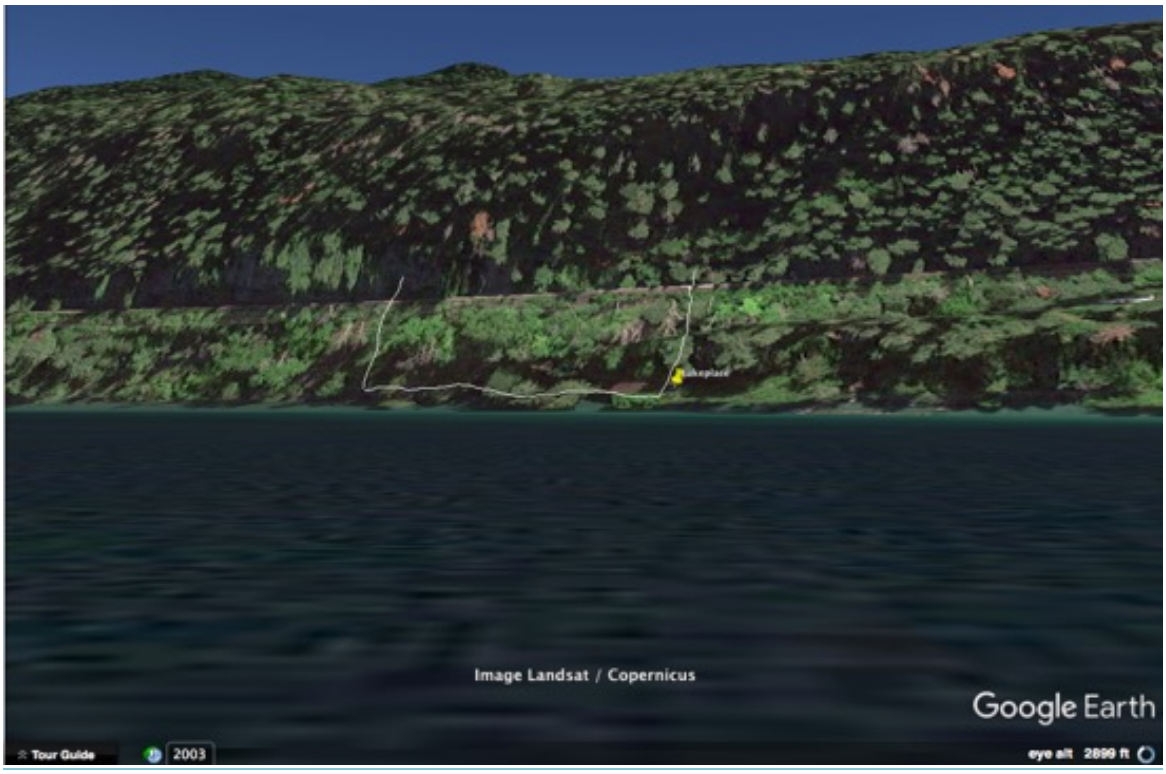
There is a single lane dirt road from the highway to the site. This road is often used for exercise to walk up and down the hill for the residences and the pets.

Because the highway has moderately heavy and fast traffic, walking is unpleasant and dangerous along the highway. There are minimal shoulders and no sidewalks. In fact, my sister-in-law and I do not ride our bicycles along the highway but put the bikes in the truck and drive to Polson or a dirt road to ride safely. The highway roadway, including shoulders, is simply too narrow to allow additional pedestrians or recreational cyclists to travel safely.

The boat traffic on the lake is minimal. There is an increase in boat traffic and noise during the summer months on weekends, but it is still within 5 boats a day that pass by the front of the Lakeplace property. During other times of th year and during the weekdays, it is not uncommon to go a full day without hearing a boat.

Sensory

The lake creates its own sounds with the water. The noise when the waves crash along the gravel beach and the breakwater can be enjoyable or mildly frightening. The noise when the swells in the morning rumble the rocks and create a spell kind of suction noise happens only on the gravel beach to the south of the current house. The wind through the pines is to the east but because there are few windows on this side of the current home, this noise is not often heard from inside.



Map showing site from the lake and up the mountain past the highway cut. (http://maps.google.com)

Scents

Scents include a strong pine scent most times of the year but most strong in the spring and fall. In the very early spring, when the lake is down, the algae that has dried on the rocks has a faint musty odor.

There are several small springs around the lake, one is off of the property to the north.

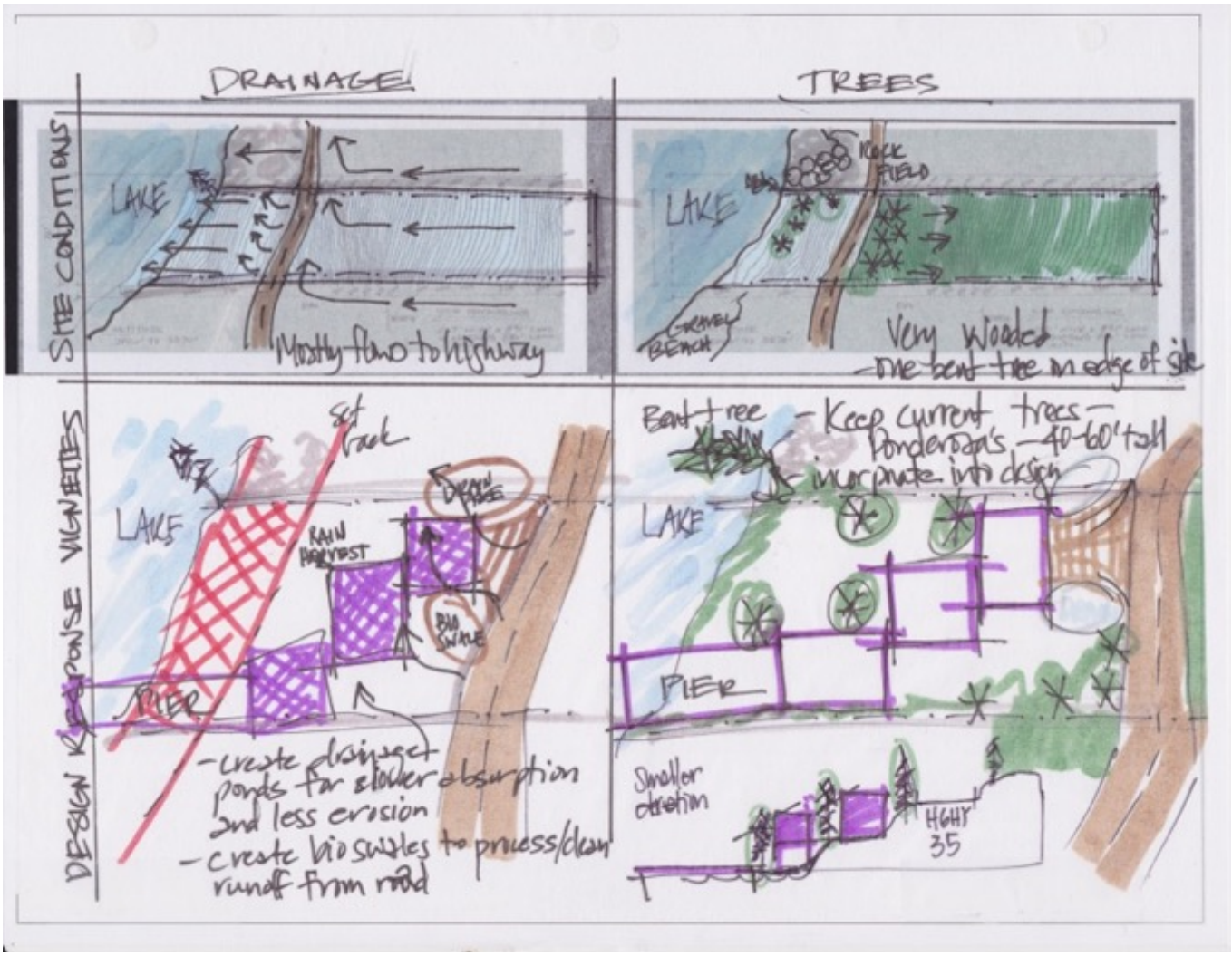
Wetlands

There are no wetlands. The environmental factors include Bull Trout habitat. There used to be salmon in the lake but it was destroyed by a non-native shrimp introduced by the Montana Fish and Game.

Drainage

Along the manmade dirt path to the property, there is a small run off ditch. Erosion is a problem due to the steepness and soil quality. Erosion along the lakefront is also a problem. The waves undercut the

vegetation along the water's edge. Mitigation of run-off from the highway down the slope to the water's edge and from the water's edge up will both need to be considered in the design.

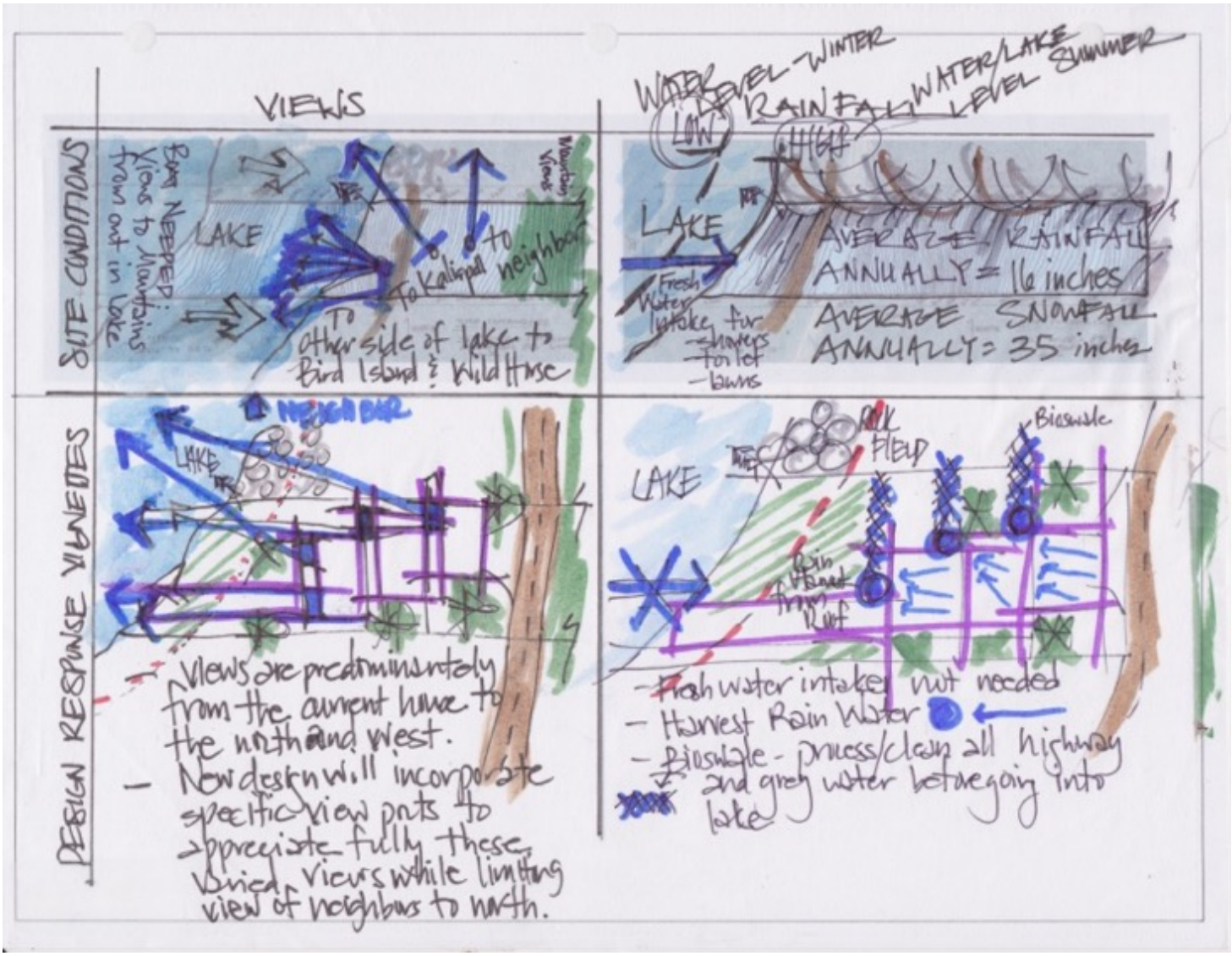


Drawing showing the current drainage patterns (left) and locations of trees and their heights (right). (JSchule)

Views

The views from the project site are predominantly towards the West, out across the lake. The lake view itself is quite pleasant, as well as the islands to the west and mountain ranges in the West. The sun sets over those western mountains so the sunset view can be capitalized upon. The view towards Kalispell and Bigfork, towards the Northwest, is also pleasant. Typically, weather comes from this direction so it

is interesting to watch a storm roll in from that direction. Views to the East are possible from a boat or a long pier, perhaps.



Drawing show the views and direction of the views. On the right, the map shows the different water level of Winter versus Summer. (JSchule)

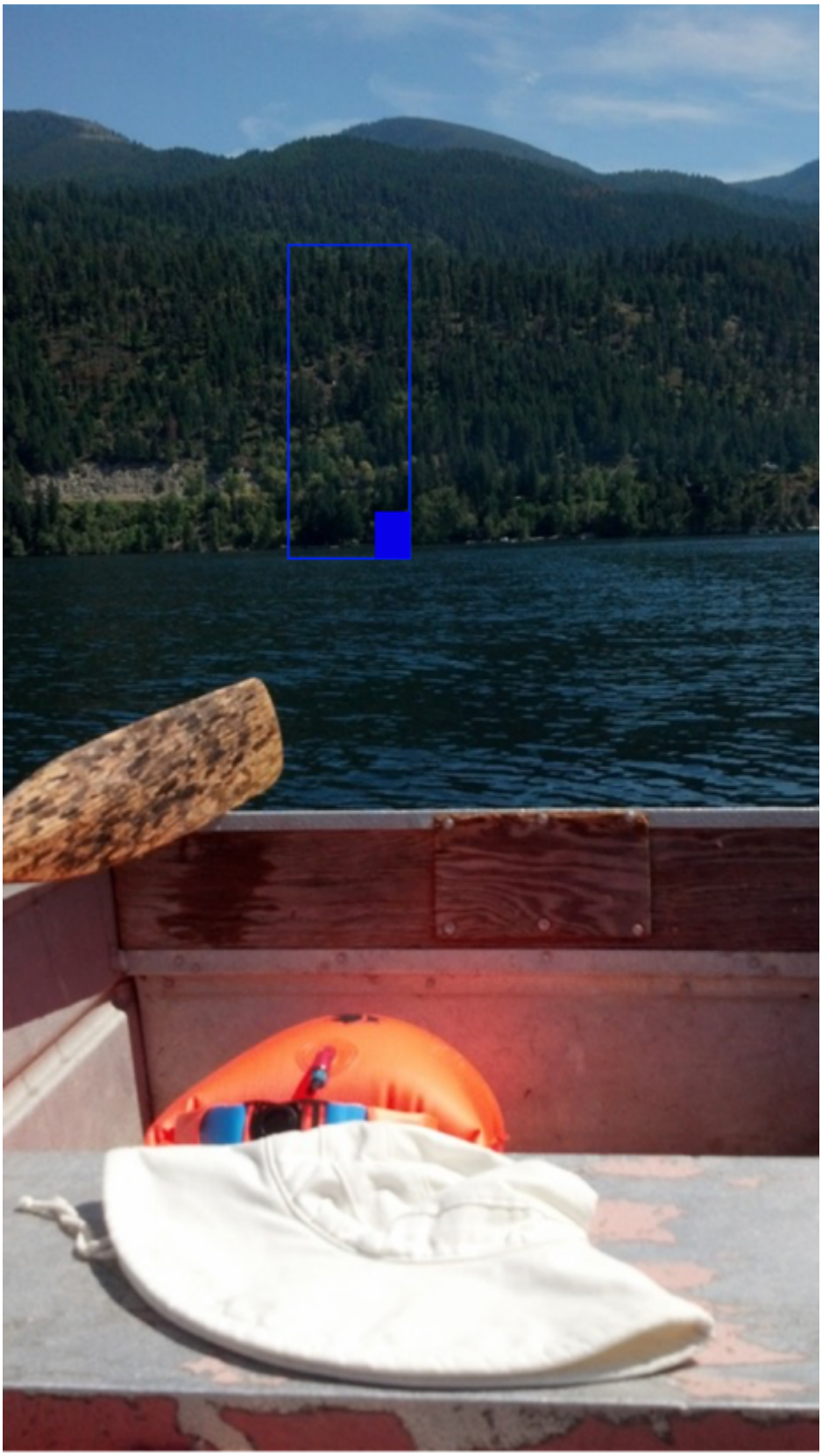


Photo of the Mission Mountains and Lakeplace house to the right of the highway cut through. (Photo by JSchule)

Flathead Lake characteristics

The depth of the lake has been documented to be as deep as 300'. This deepest location is approximately due west 1 mile from the Lake place. From the photo below, the shelf dropping off to a depth of 35' can be seen in the shades of green.

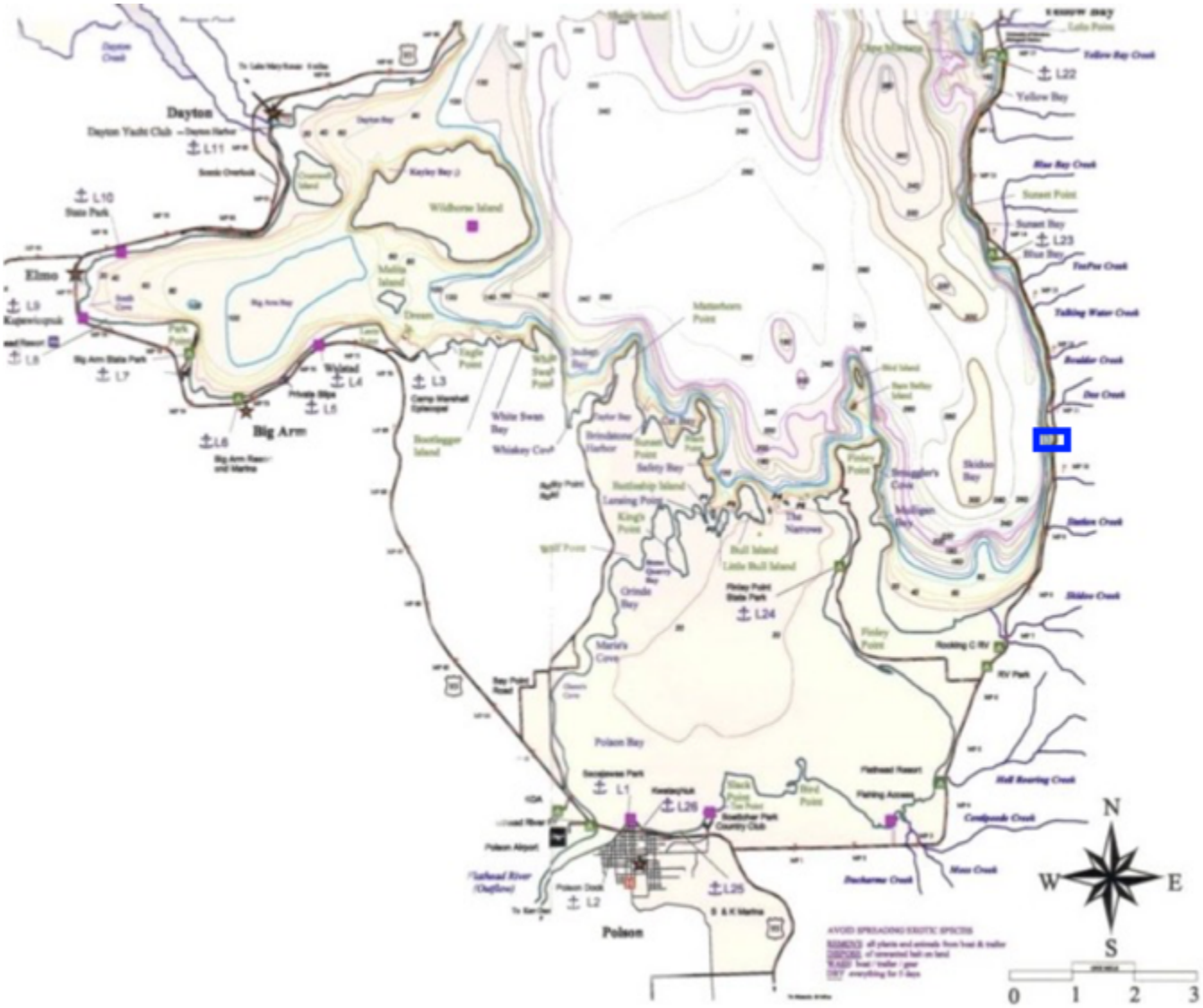
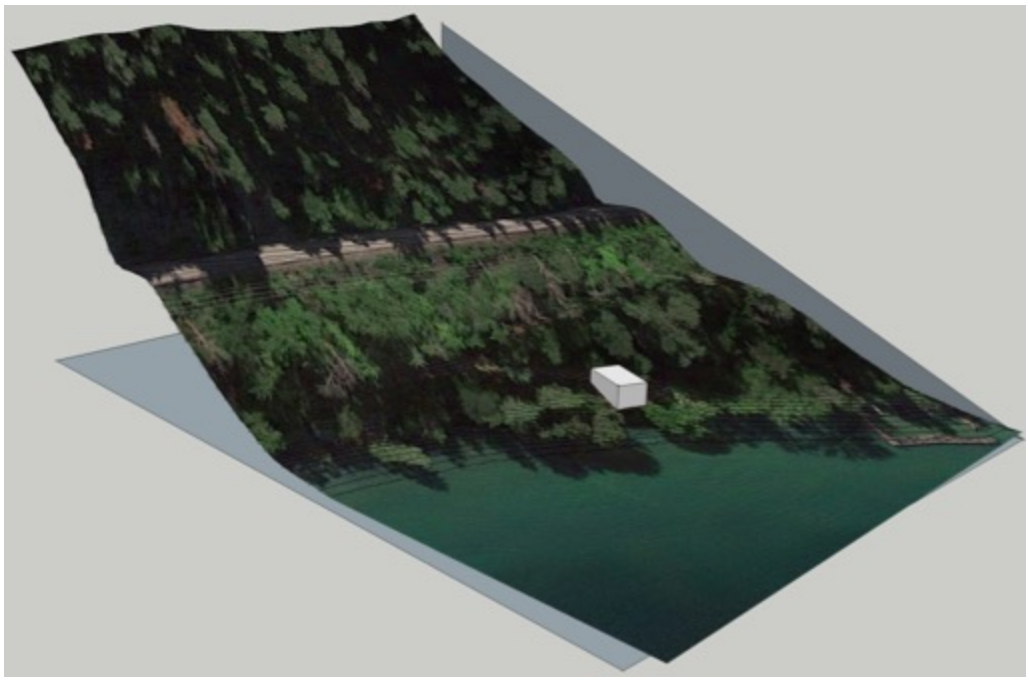


Image of South end of Lake. Annotated with a blue square where the current house is located. (http://flatheadlake.us/lake-map/)



Rooftop view of current house in light blue square. The blue gradient line indicates approximately 35' of water depth. Scale 1"-0=100 feet (http://maps.google.com)

Additional research will need to be conducted to get more accurate depths in smaller increments, such as 1 foot increments from the shoreline out to the drop off point. Currently, the data found indicates the large picture of the whole lake at large increments of depth rather than the specifics of this particular site.



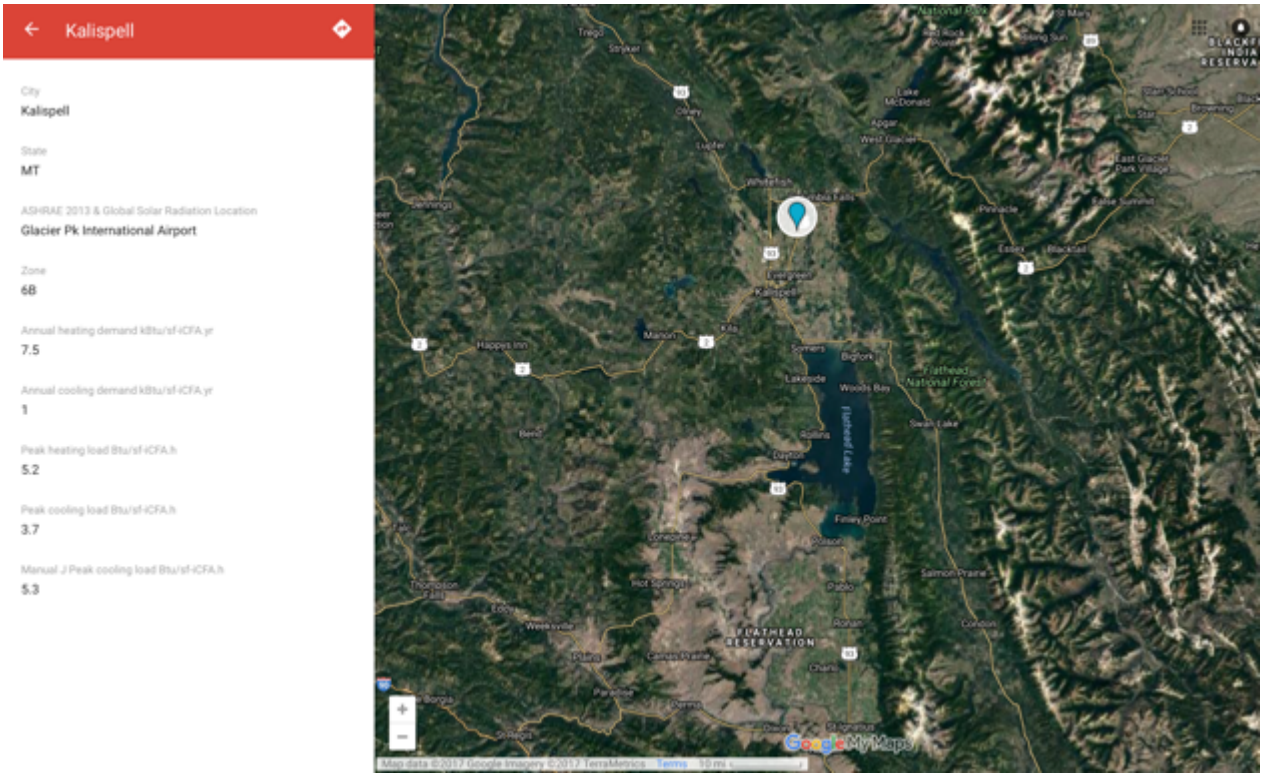
Map from SketchUp using topography from Google Earth. Shows high cut through above project and white box where current house is sited. (SketchUp and Google Earth, Jschule)

The above image is not intended to be to scale but rather to give a broad bird's eye view of the topography along with some shading and the general house location. The image is intended to give a feel for the site rather than any specifics.

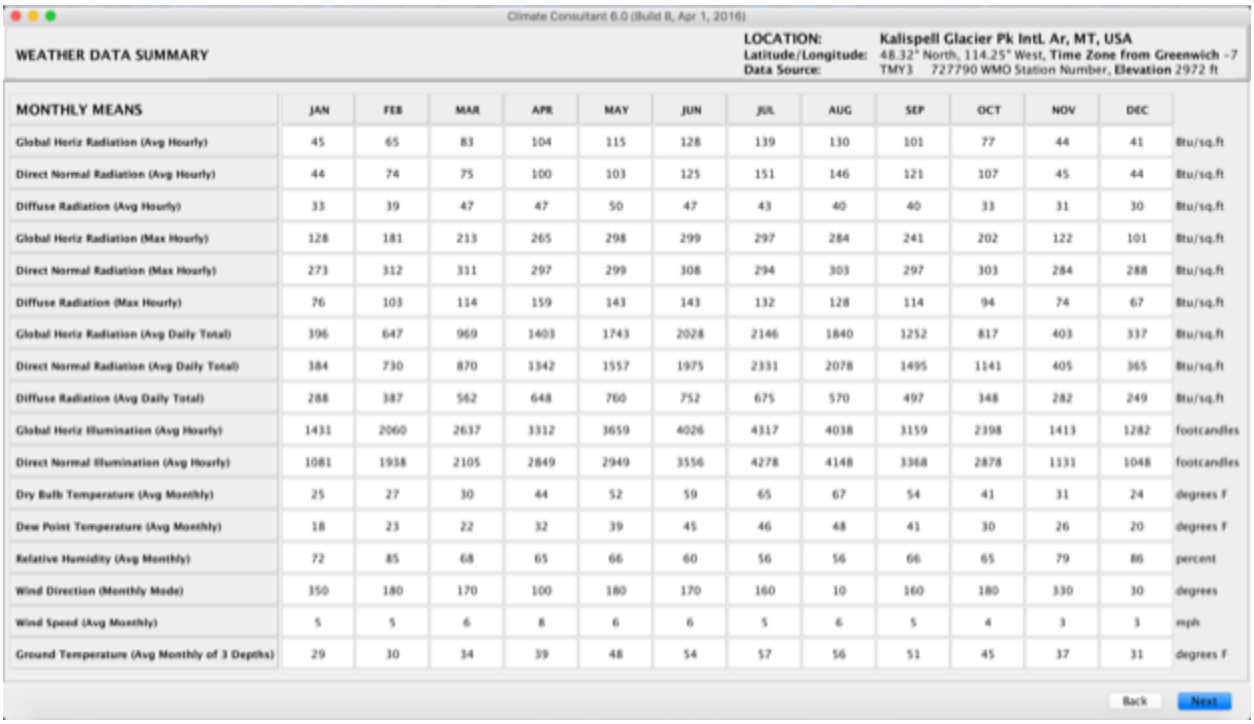
Climate Data

The climate zone is 6B. This is a cold climate.

Meteorologically, the weather patterns are enhanced by the mountains directly to the east of the property. The Mission Range runs north to south on the east side of the lake at an elevation of over 9,700 feet. This forest has ponderosa and other evergreen trees that average 45 feet in height or more. The mountain range and the tall trees combine to create shade over the site almost until 11 a.m. on most summer mornings. This creates cold mornings when the sun does not come around until late morning and hot afternoons. This negatively affects the current home as it is not insulated to capitalize on the cooling nor is it protected from the afternoon sun.



Map of closest climate data location showing Annual Heating Demand and other data points (https://www.google.com/maps/d/u/0/viewer?mid=1B7z39oT7PnWQxIWx33U4n62uRZM&ll=46.88842134904346%2C-111.07427074062502&z=7)



Climate Consultant 6.0 (Build 8, Apr 1, 2016)

WEATHER DATA SUMMARY

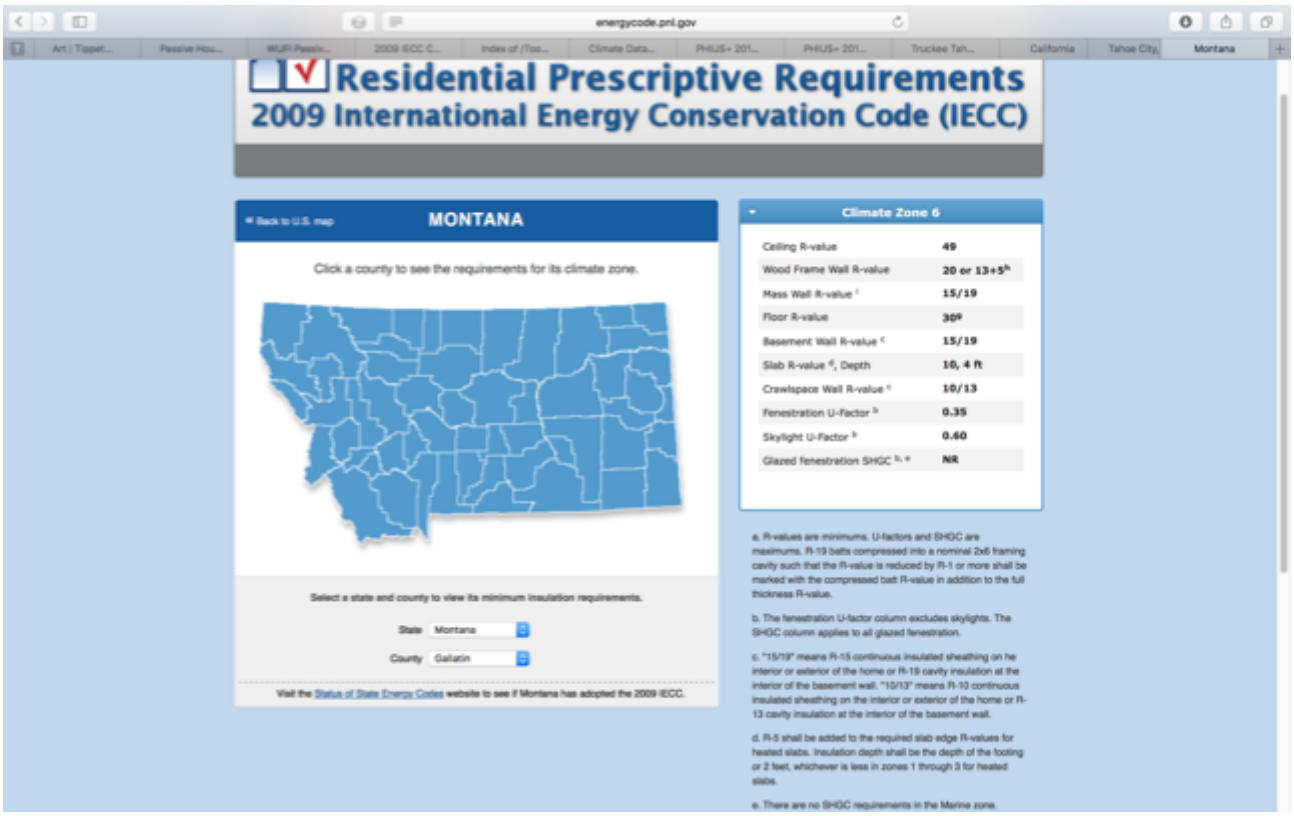
LOCATION: Kalispell Glacier Pk Intl Ar, MT, USA
Latitude/Longitude: 48.32° North, 114.25° West, **Time Zone from Greenwich** -7
Data Source: TMY3 727790 WMO Station Number, **Elevation** 2972 ft

MONTHLY MEANS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Global Horiz Radiation (Avg Hourly)	45	65	83	104	115	128	139	130	101	77	44	41	Btu/sq.ft
Direct Normal Radiation (Avg Hourly)	44	74	75	100	103	125	151	146	121	107	45	44	Btu/sq.ft
Diffuse Radiation (Avg Hourly)	33	39	47	47	50	47	43	40	40	33	31	30	Btu/sq.ft
Global Horiz Radiation (Max Hourly)	128	181	213	265	298	299	297	284	241	202	122	101	Btu/sq.ft
Direct Normal Radiation (Max Hourly)	273	312	311	297	299	308	294	303	297	303	284	288	Btu/sq.ft
Diffuse Radiation (Max Hourly)	76	103	114	159	143	143	132	128	114	94	74	67	Btu/sq.ft
Global Horiz Radiation (Avg Daily Total)	396	647	969	1403	1743	2028	2146	1840	1252	817	403	337	Btu/sq.ft
Direct Normal Radiation (Avg Daily Total)	384	730	870	1342	1557	1975	2331	2078	1495	1141	405	365	Btu/sq.ft
Diffuse Radiation (Avg Daily Total)	288	387	562	648	760	752	675	570	497	348	282	249	Btu/sq.ft
Global Horiz Illumination (Avg Hourly)	1431	2060	2637	3312	3659	4026	4317	4038	3159	2398	1413	1282	footcandles
Direct Normal Illumination (Avg Hourly)	1081	1938	2105	2849	2949	3556	4278	4148	3368	2878	1131	1048	footcandles
Dry Bulb Temperature (Avg Monthly)	25	27	30	44	52	59	65	67	54	41	31	24	degrees F
Dew Point Temperature (Avg Monthly)	18	23	22	32	39	45	46	48	41	30	26	20	degrees F
Relative Humidity (Avg Monthly)	72	85	68	65	66	60	56	56	66	65	79	86	percent
Wind Direction (Monthly Mode)	350	180	170	100	180	170	160	10	160	180	330	30	degrees
Wind Speed (Avg Monthly)	5	5	6	8	6	6	5	6	5	4	3	3	mph
Ground Temperature (Avg Monthly of 3 Depths)	29	30	34	39	48	54	57	56	51	45	37	31	degrees F

Back Next

Graph of Weather Data Summary for Kalispell Glacier International Airport (Climate Consultant 6.0)

This image shows the monthly average temperatures for Kalispell, the nearest weather data center. There may be slight variations from these temperatures and other climate data to the actual site, however, these will be accurate enough for use as a design basis. Further temperature analysis will need to be performed prior to any design conculsions being reached.



Screen shot of 2009 IECC Residential Prescriptive Requirements for Montana (https://energycode.pnl.gov/EnergyCodeReqs/?state=Montana)

This above image shows the required building R-values for a building to be built and approved according to code. These insulation and window specifications will be instructive for the design. Choices will need to be made to meet these requirements and will affect the design.

Sun Angles

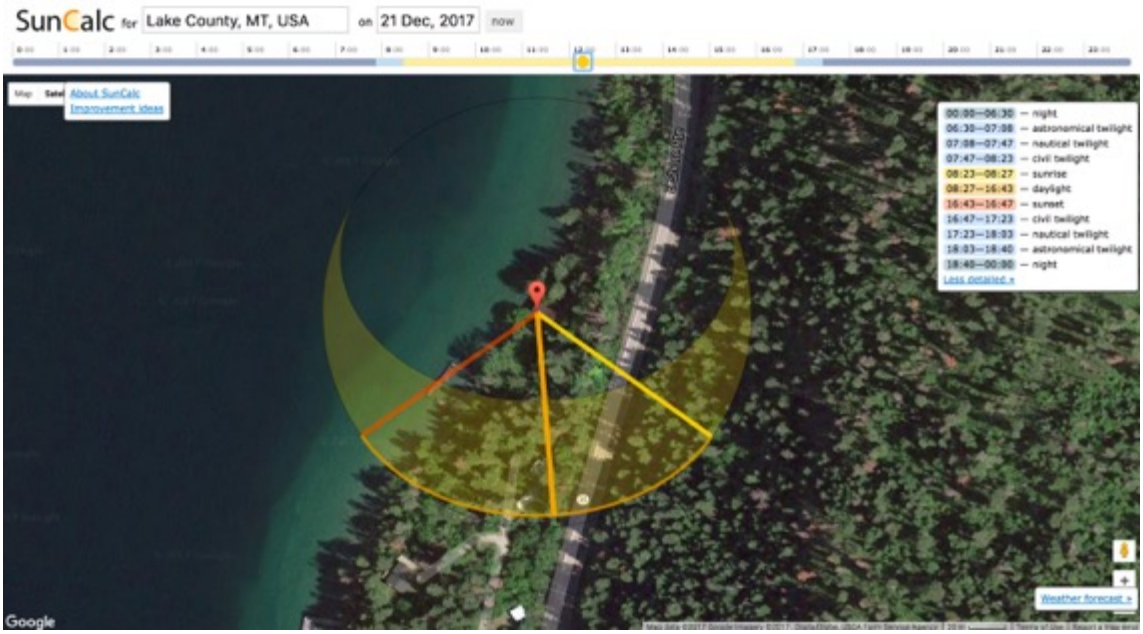


Image showing the path of the sun on the Winter Solstice.

The altitude of the sun on Winter Solstice at noon is 18.5 degrees.
The highest altitude of the sun being at 1 p.m. at 18.7.
The sun's path is the shortest from 121.0 degrees to 247.7.

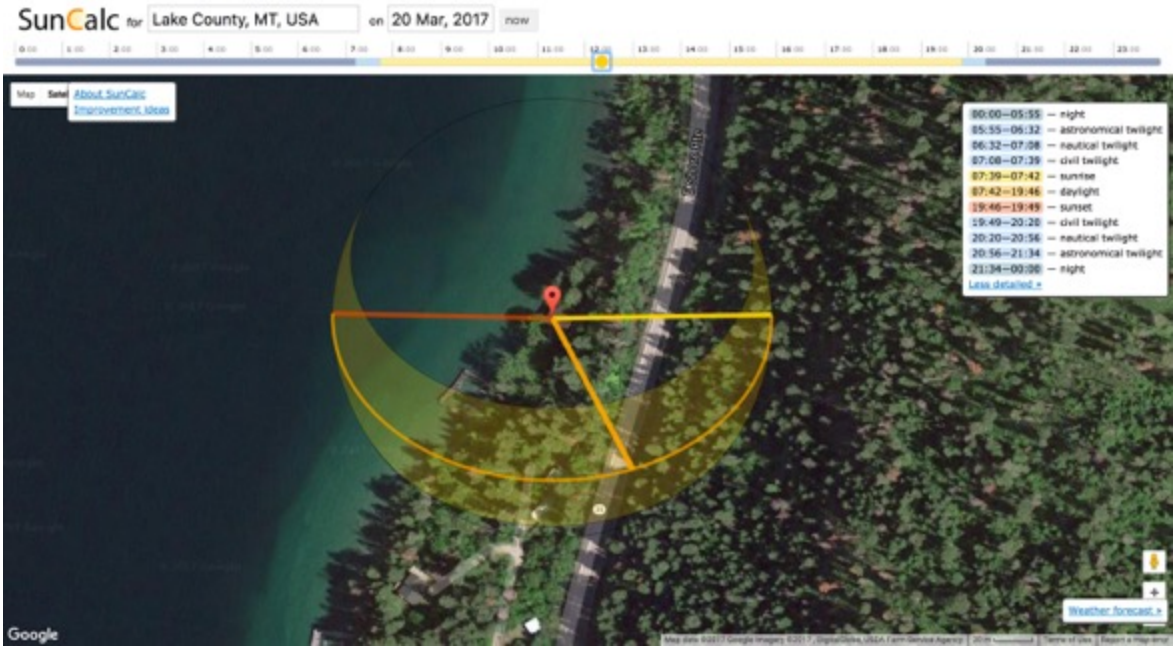


Image showing the path of the sun on the Spring Equinox

The altitude of the sun at noon on Spring Equinox is 37.8 degrees.
The highest altitude of the sun being at 2 p.m. at 42.7.

The sun's path is increasing from the Winter Solstice to 81.6 degrees to 273.5.

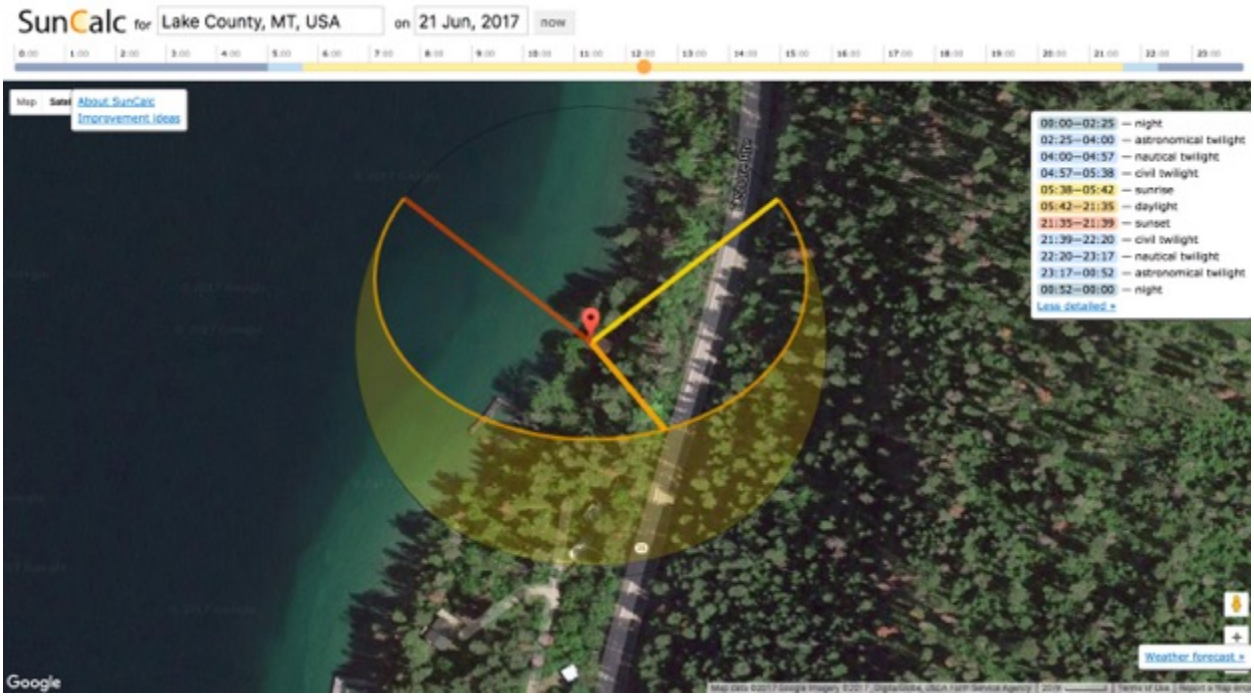


Image showing the path of the sun on the Summer Solstice.

The altitude of the sun at noon on Summer Solstice is 58.8 degrees.
The highest altitude of the sun being at 2 p.m. at 65.4.
The sun's path is the longest from 45.3 degrees to 323.5.

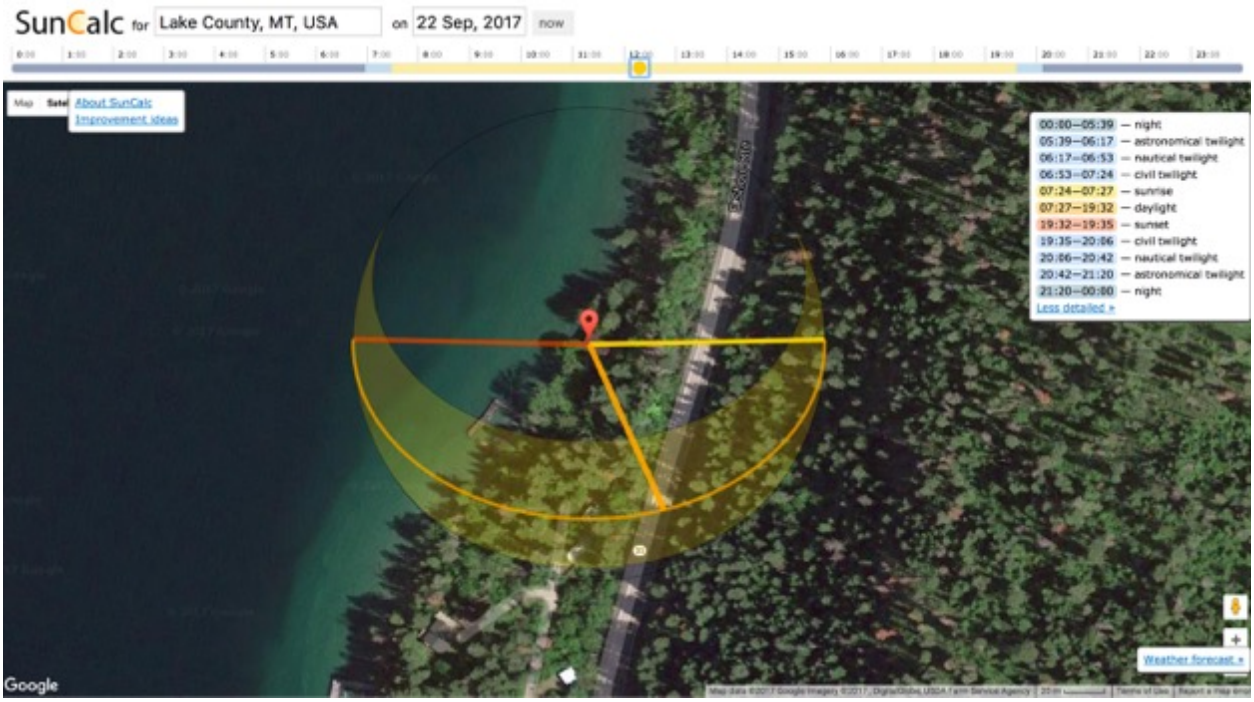


Image showing the path of the sun on the Autumn Equinox.

The altitude of the sun at noon on the Autumn Equinox is 38.9 degrees.
The highest altitude of the sun being at 2 p.m. at 42.3.
The sun's path is from 84.2 degrees to 275.9.

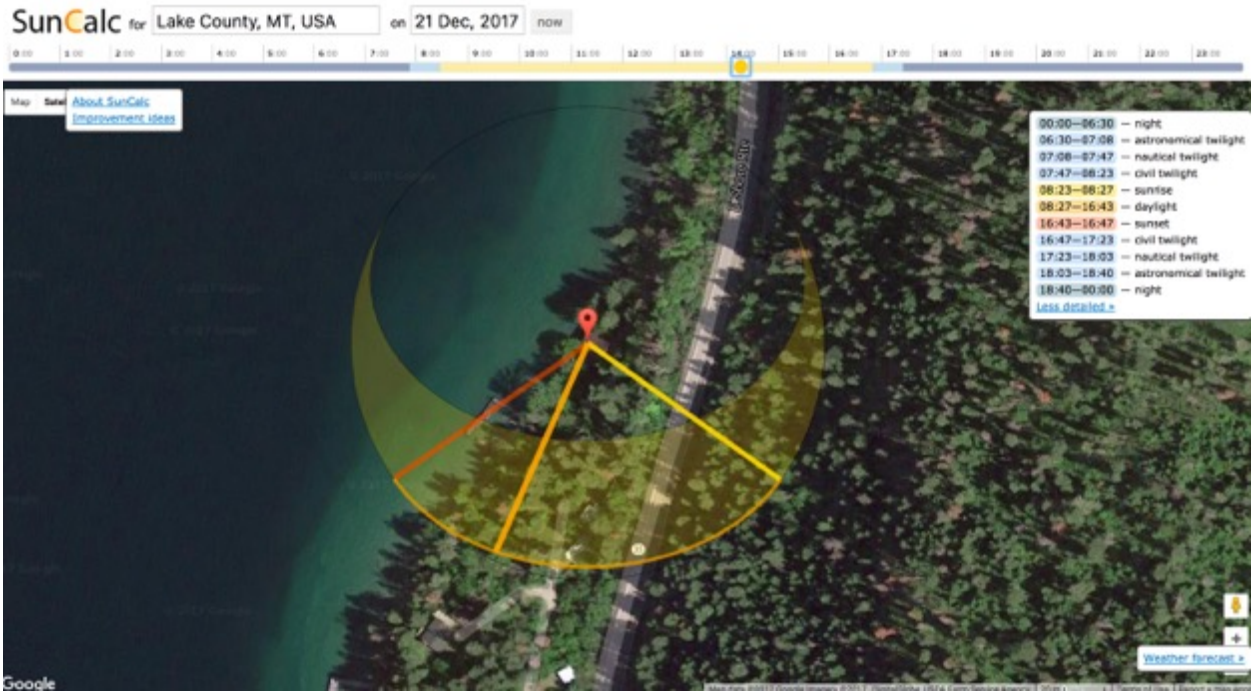


Image showing the path of the sun on the Winter Solstice.

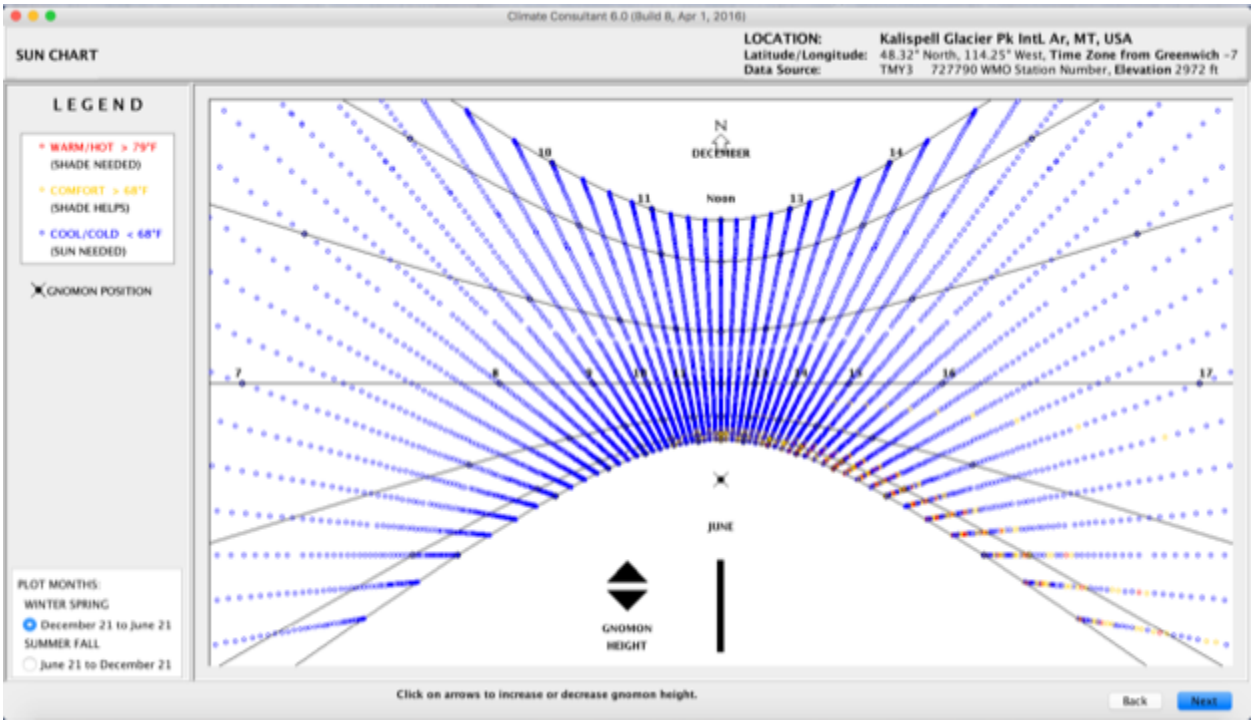
All webshots taken from (Suncalc.com and Naval Observatory Website for Altitude and Azimuth of the Sun for Polson, Montana. Longitude and Latitude of W114 degrees 10', N47 degrees 41')

Sun Angle analysis

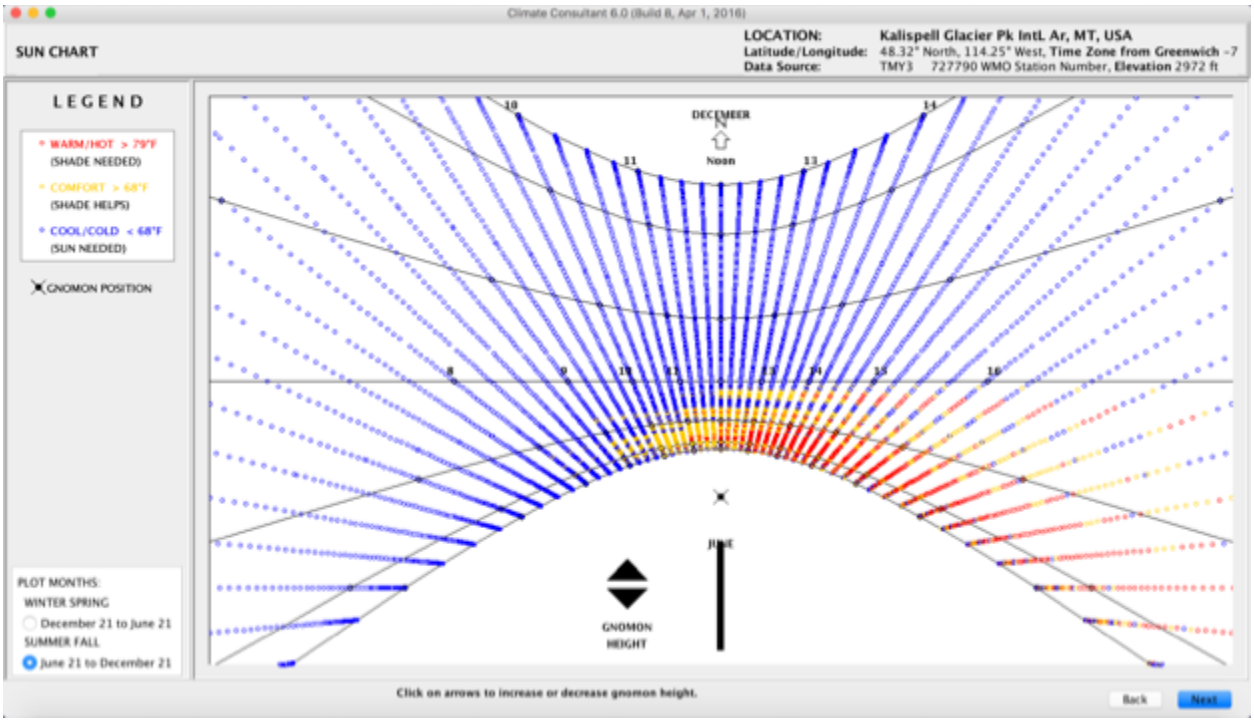
The mountain range and trees prevent the direct sun from hitting the house until the sun comes in line with the house at a southwestern orientation. This occurs at 2 p.m. throughout the season as indicated by the highest altitude expressed in all of the previous slides. This has a direct impact on several important design factors including solar gain and human comfort, especially in the morning (too cold) and late afternoon (too hot).

Futher diagraming and analysis will need to occur to determine length and location of shading devices and other sun related elements within the design. A sectional view of the various angles would be useful.

The following two graphs are simply different graphical ways of looking at the previously stated sun angles.



Graph of Sun Chart for Winter for Kalispell Glacier International Airport (Climate Consultant 6.0)



Graph of Summer Sun Chart for Kalispell Glacier International Airport (Climate Consultant 6.0)

Wind

The wind rose (below) shows the prevailing winds but the mountains and lake seem to create their own breezes. In this microclimate that is created by the mountains, as the sun rises from behind Mission Range, the temperature differential creates a breeze from east to west down the hill through the afternoon. Once the sun comes around the front of the site to the west, the sun warms the lake and the existing house, the breezes are not enough to cool the house as it currently is designed. Capitalizing on the breezes and providing sufficient shading will be one response to analyze. These breezes occur through all summer months from July through September. The usage of the site has been limited to the late spring, summer and early fall months. The wind patterns during the spring and fall have not been recorded. As the Lakeplace is not utilized in the winter, very little data currently exists for these months that is not from Kalispell. Actual winter experience is limited due to lack access due to snow and no

plow service. Winter data exists from Kalispell and will be used for design solutions, while also taking into account all antedotal evidence available.

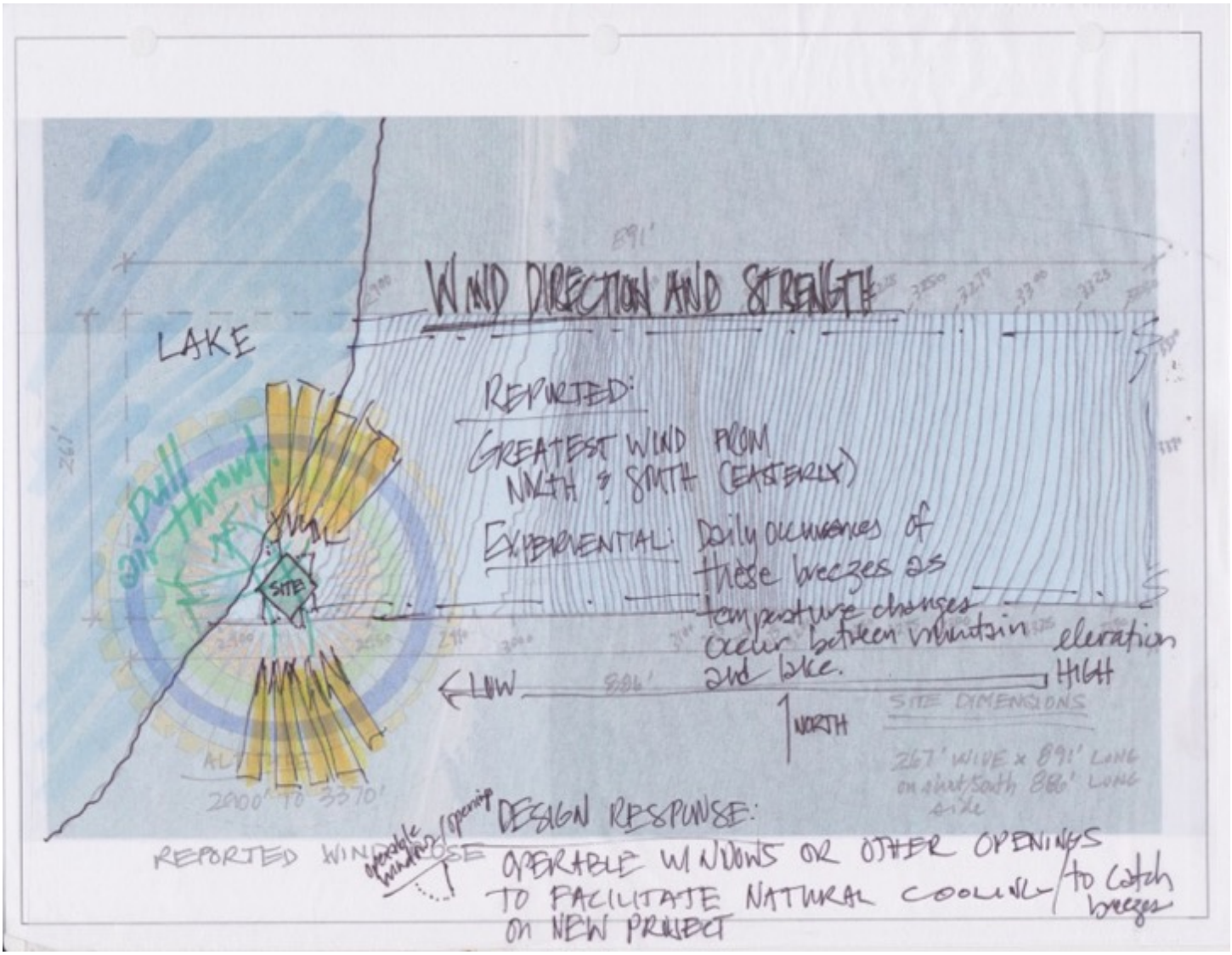
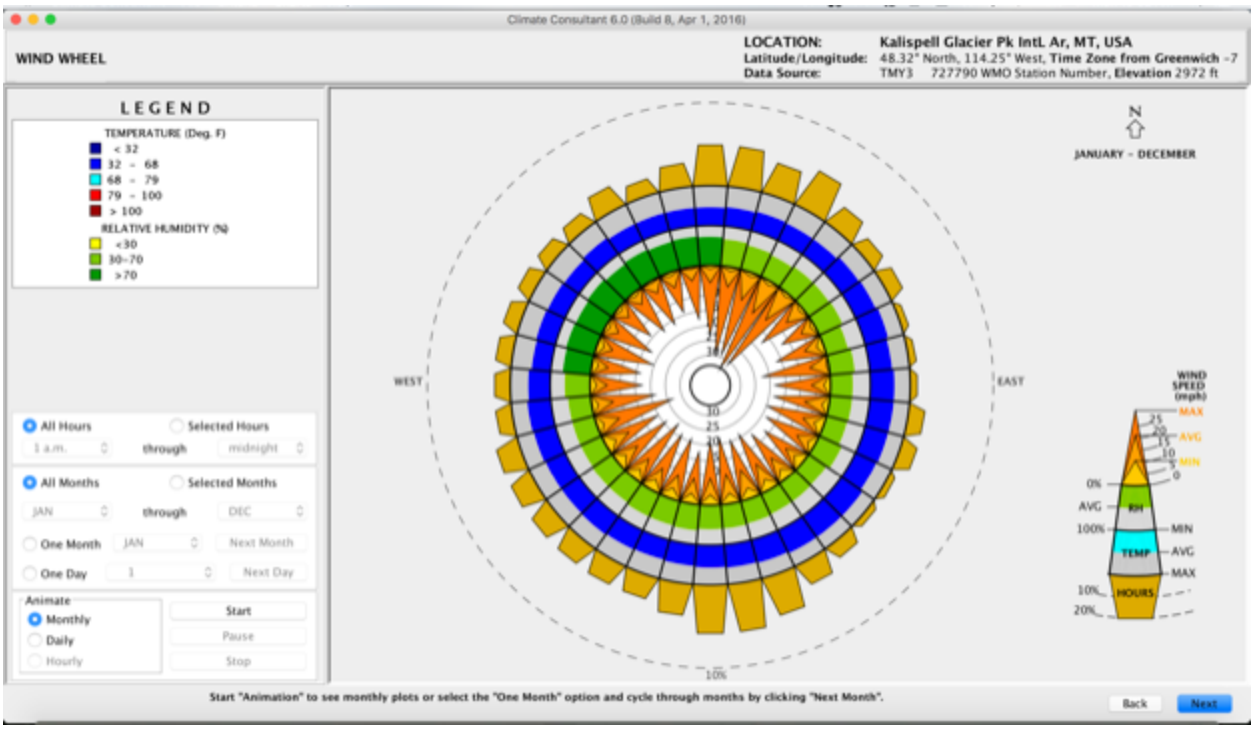


Figure showing the wind rose superimposed over the site map. (JSchule)



Graph of Wind Rose for Kalispell Glacier International Airport (Climate Consultant 6.0)

Human and Cultural

Building guidelines are restricted due to environmental issues, as well as, the property being on the Indian Reservation. For the purposes of this thesis, the application and permits will assume to have been applied for and received.



The Lake County Lakeshore Protetction Regulations, July 2001 still in use (Photo JSchule)

There is a potential danger of personal histories or agendas interfering with objectivity of design objectives. While this is a family property, with an undeniable history, not only is this project theoretical but it is my objective to explore the sensory tools to designing an experiential architecture. This particular site holds interest for me in its combined beauty and challenge of terrain but also, affords me access that another property may not. It is my intention that the depth of my experiences at this site location allow a richness of analysis, rather than any preconceived idea. The potential design options of this project, at this site have yet to be realized.



Photo of lawn and northern elevation of the Lakeplace. (Photo by JSchule)



Crooked tree that used to mark the edge of the Schule property. Now the property line extends another 50 feet to the north. (Photo by JSchule)



Eastern elevation and lake fronting lawn; concrete breakwater in foreground; gravel beach and neighbor's deteriorating breakwater in the rear. (Photo by JSchule)

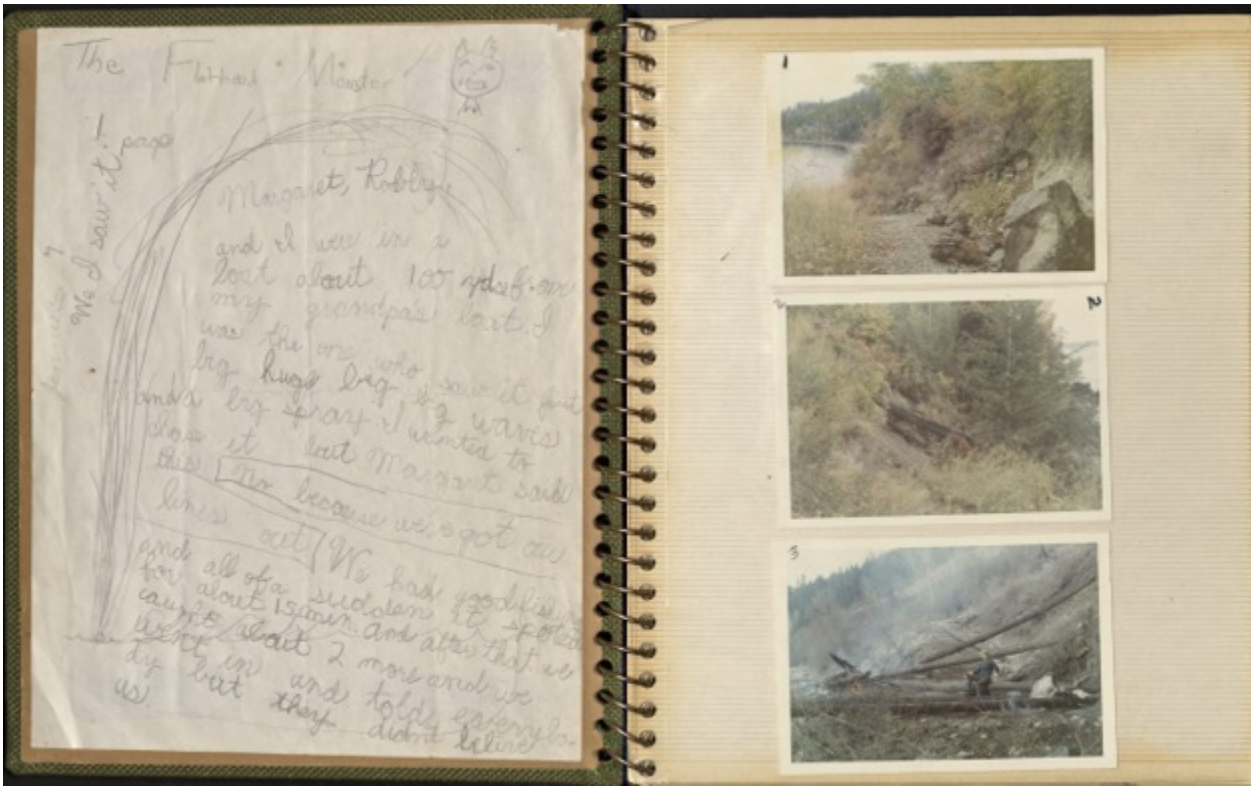


Dirt Road coming to switchback and down to Lakeplace. (Photo by JSchule)

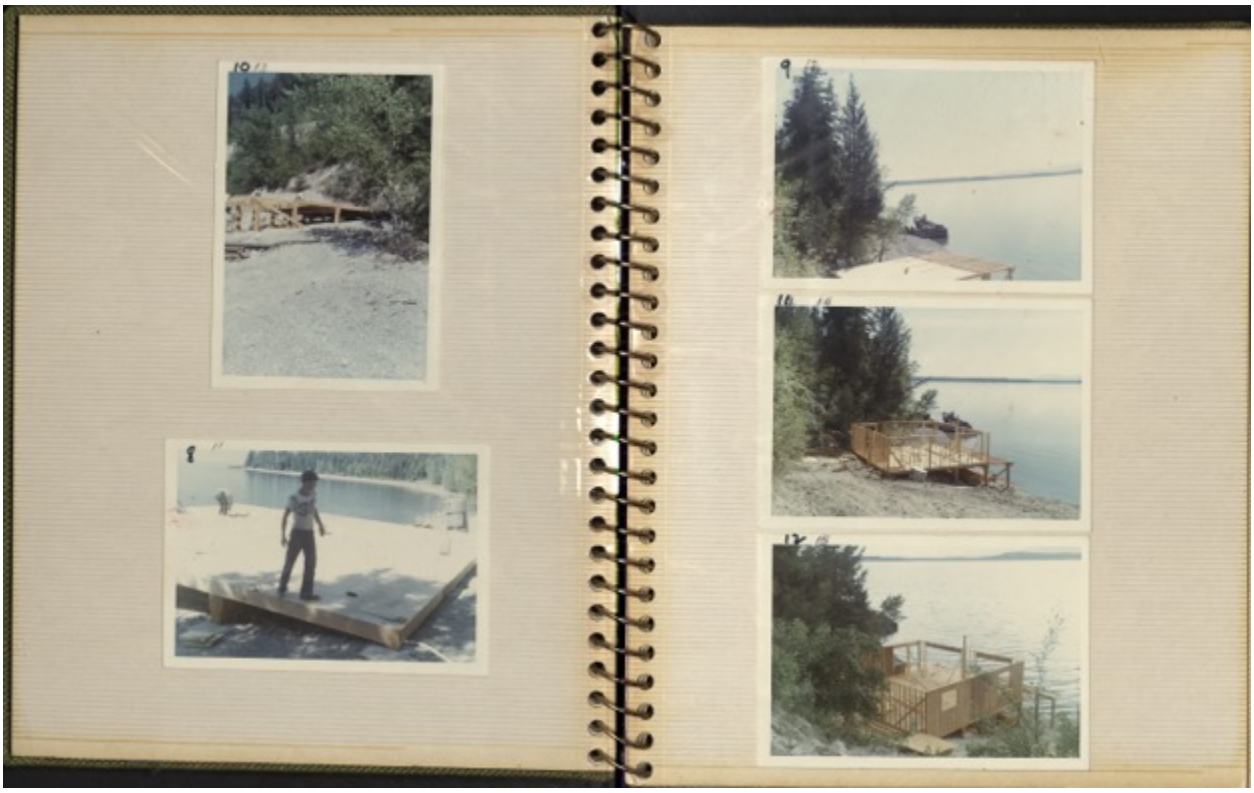


Photo at northern edge of property showing erosion. Cynthia Schule, mother in picture. (Photo by JSchule)

The Lakeplace was built by my grandparents and their children including my parents. Below is the build journal. (All photos by Schule family members.)











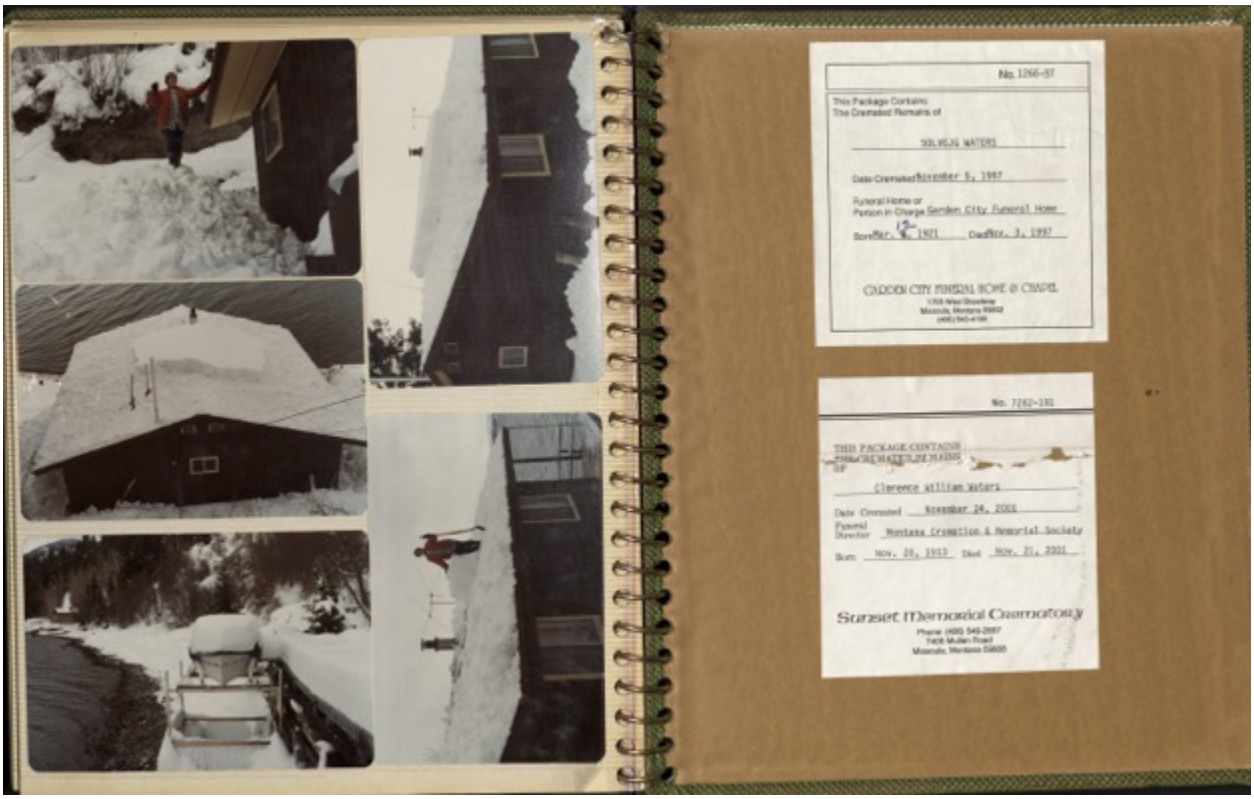












No. 1266-97

This Package Contains
The Cremated Remains of

SOLVEJG WATERS

Date Cremated November 5, 1997

Funeral Home or
Person in Charge Garden City Funeral Home

Born Mar. 12 1921 Died Nov. 3, 1997

GARDEN CITY FUNERAL HOME & CHAPEL

No. 7282-101

THIS PACKAGE CONTAINS
THE CREMATED REMAINS
OF

Clarence William Waters

Date Cremated November 24, 2001

Funeral Director Montana Cremation & Memorial Society

Born Nov. 28, 1919 Died Nov. 21, 2001

Sunset Memorial Crematory

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