Weber River Pre-Disaster Mitigation Study

-South Weber City-

Presented by: Current Solutions

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Site Introduction

- 200± ft elevation difference between Weber River and bottom of pit

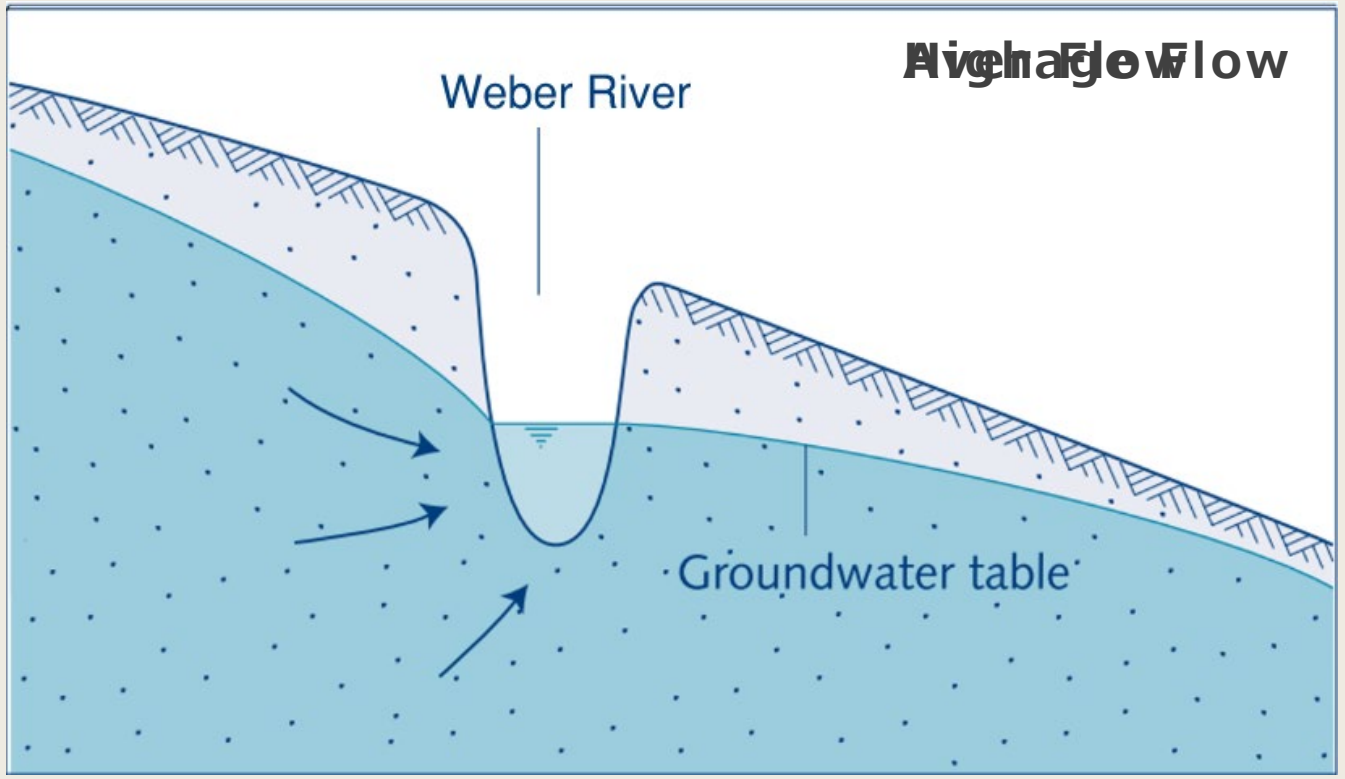
Hydrologic History

- In 2011, the river saw flows 20 times greater than average
- Gravel pit employees observed water seeping through the ground
- Fortunately, seepage was encountered and stopped before the river rerouted into the pit

Staker Parson gravel pit north bank seepage and sluffing circa June 8, 2011.
Provided by Jones and Associates: Consulting Engineers

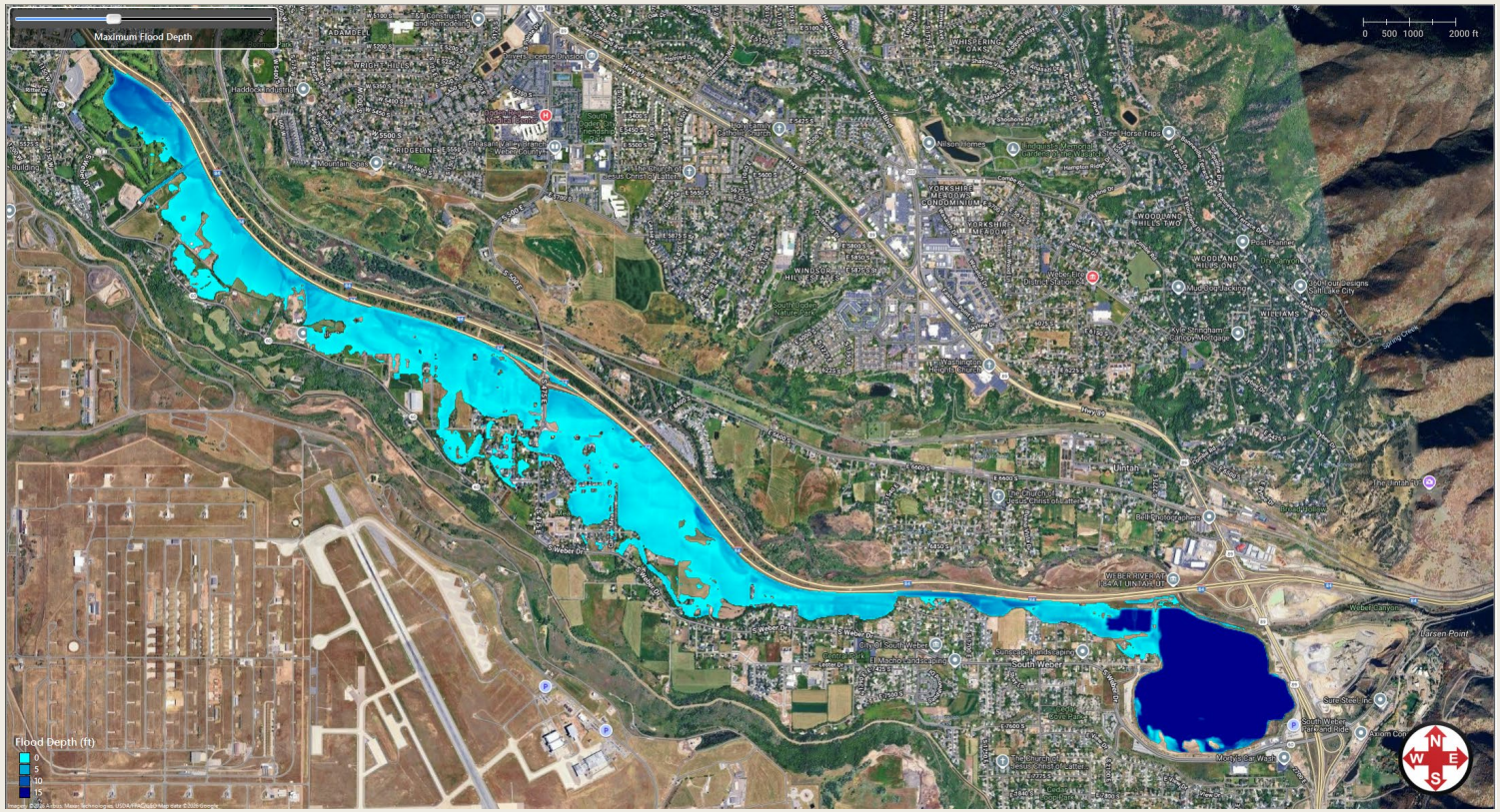
Groundwater Flow

- These graphics explain how water moves underground
- River flows greater than 2011 flowrate will cause seepage and potential for the river to reroute into the pit
- A geotechnical report may be required to investigate groundwater flow paths



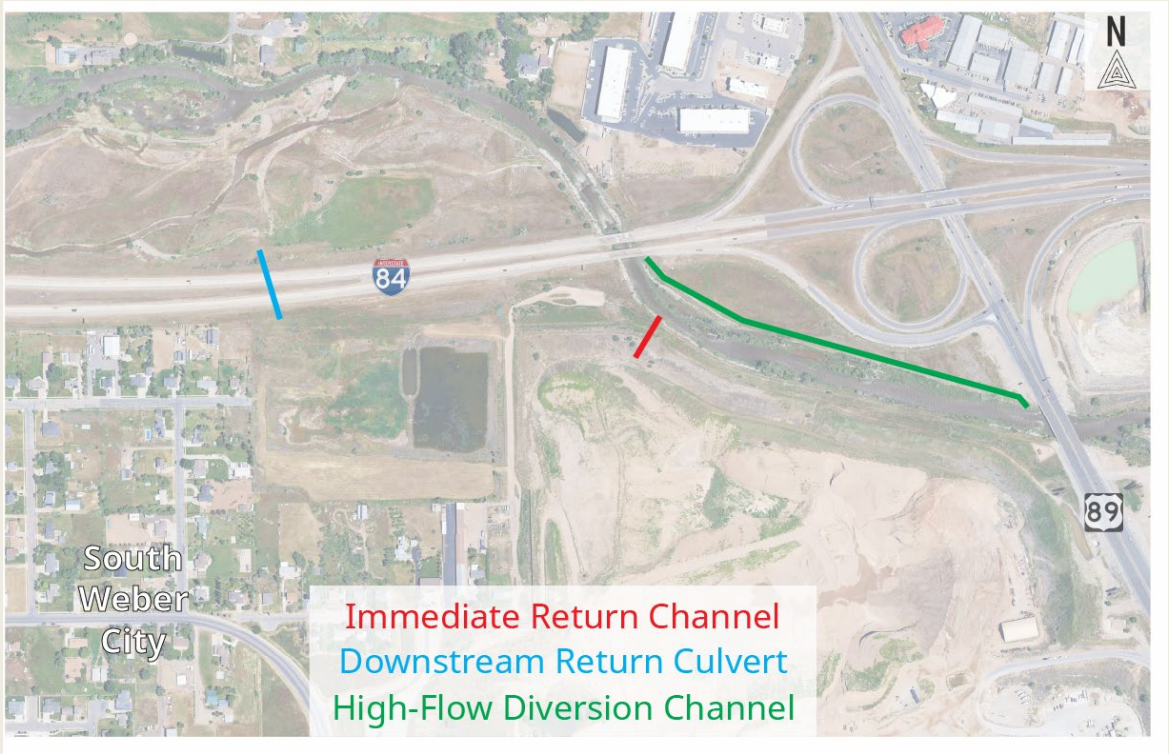
Flood Inundation Risk

1. Between 400-600 homes located within the flood path
2. Potential sewer main backup
3. Erosion of riverbank upstream and likely destruction of HWY 89 bridge



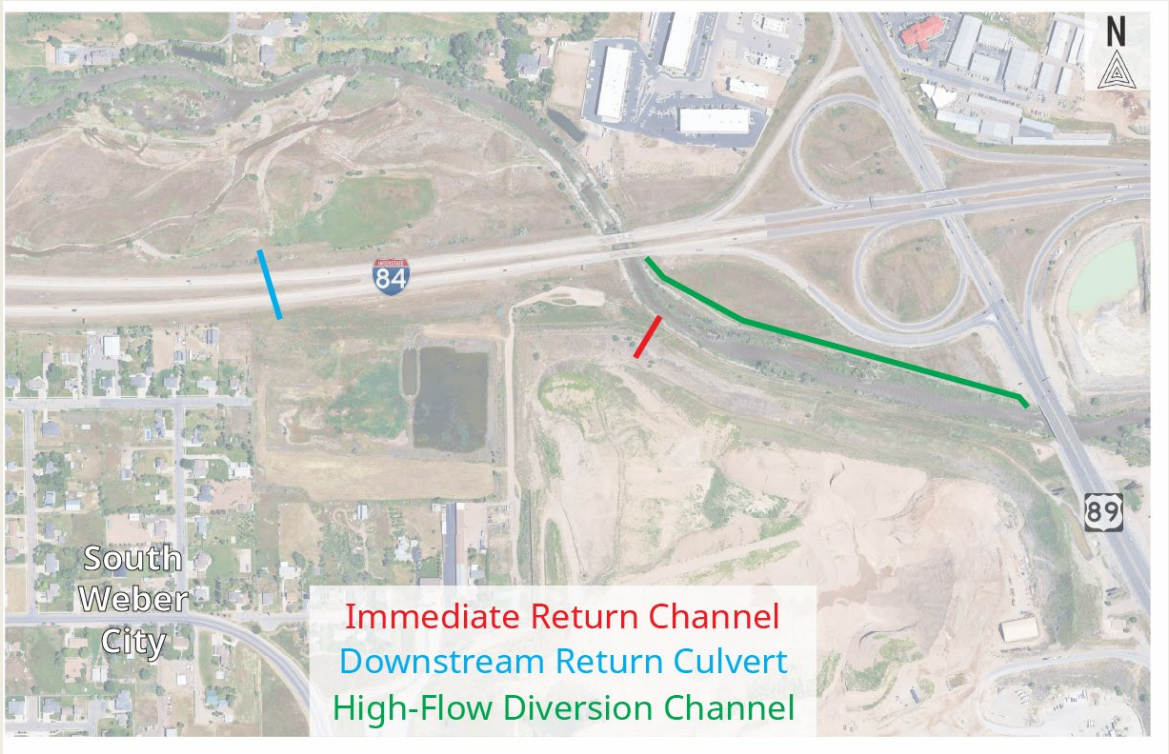
Alternative #1: Alternate Flow Channels

- Different alignments
- Prevents flooding in South Weber
- Proposed structures would not affect normal flow
- $2-2.8 million

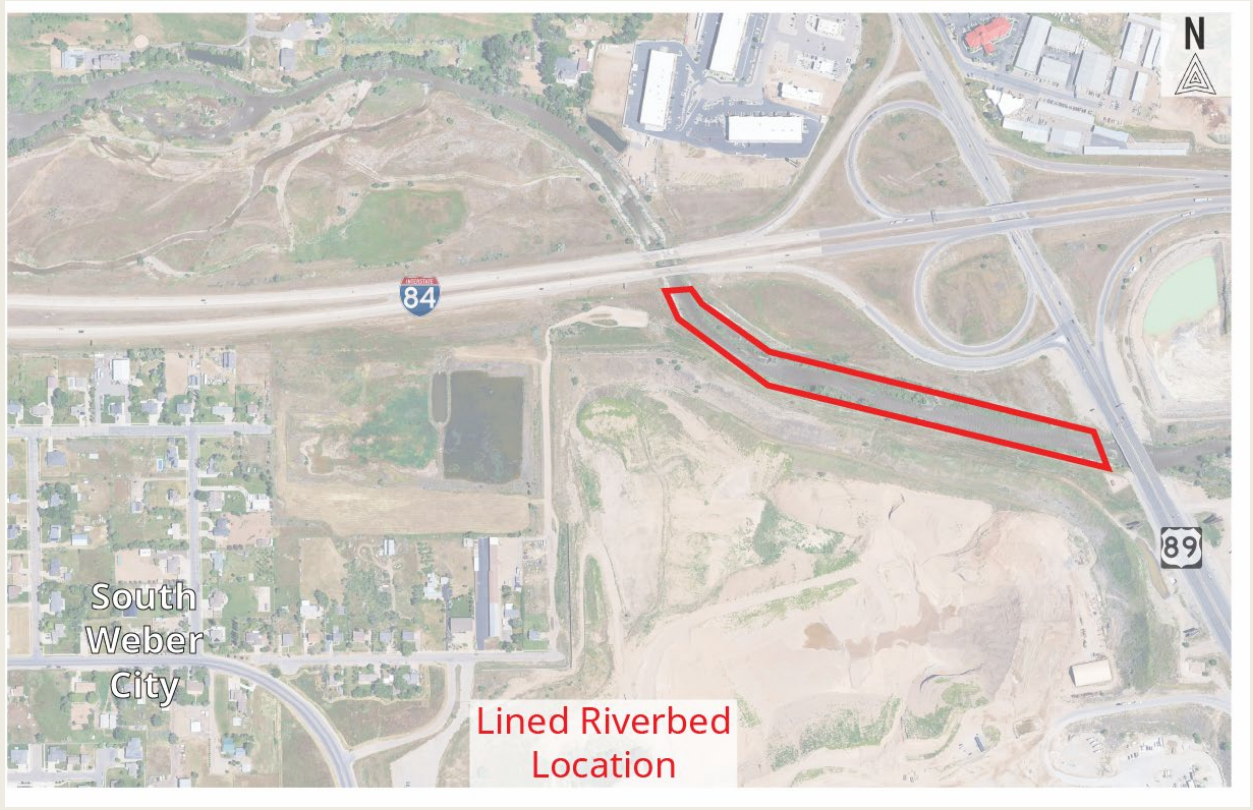


Alternative #1: Alternate Flow Channels

- Takes 1/3 of the river's flow
- Puts water in places other than original channel to prevent failure
- Relieves stress on the main channel



Alternative #2: Lined Riverbed



- Prevent erosion and seepage
- Proactive prevention of bank failure, not an emergency solution
- Ideal for long-term stability
- $2-2.4 million
- Cost potentially doubles with environmental studies and permitting

Alternative #2: Lined Riverbed

- Two approaches:
  - Traditional Open Channel: A designed channel lined with cast-in-place or precast concrete
  - Fabric-Lined: Geotextile fabric underneath existing material

Alternative #3:
Berm and Diversion Channel

- Assumes complete failure of riverbank & flooding of Gravel Pit
- Berm on northwest side of pit at lowest rim elevations
- Channel elevation requirements
- $700k-800k

Alternative #3:
Berm and Diversion Channel

- Maintenance issues
- Environmental effects
  - Stop flow of river (Up to 2 days)
  - Kill fish
  - Pollute water
- Erosion issues

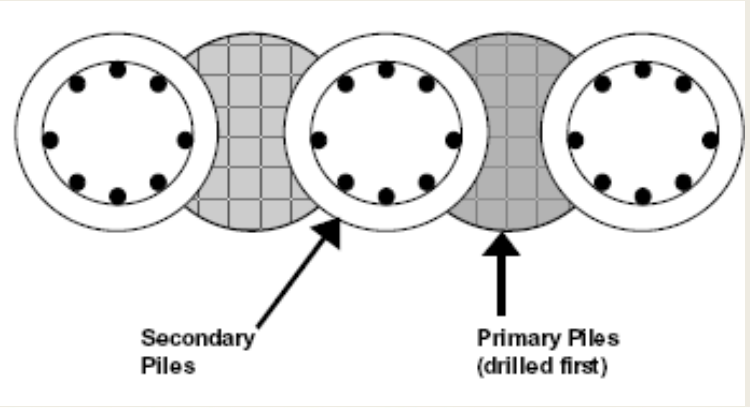
Alternative #4: Cutoff Wall

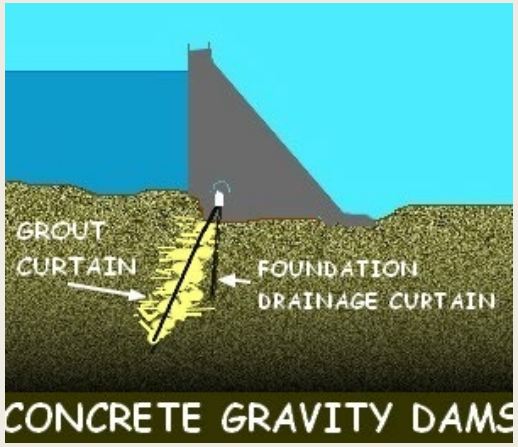
Purpose

- Cutoff water flow
- Reinforce ground

Three options

- Sheet Piles
- Grout Curtain
- Secant Pile Wall





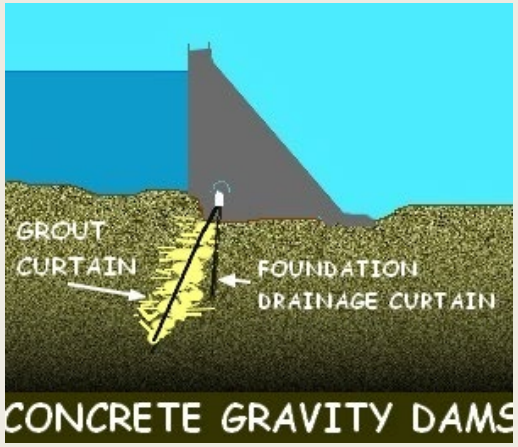
Alternative #4: Cutoff Wall

Advantages

- Near complete cutoff of groundwater infiltration
- Earth stabilization

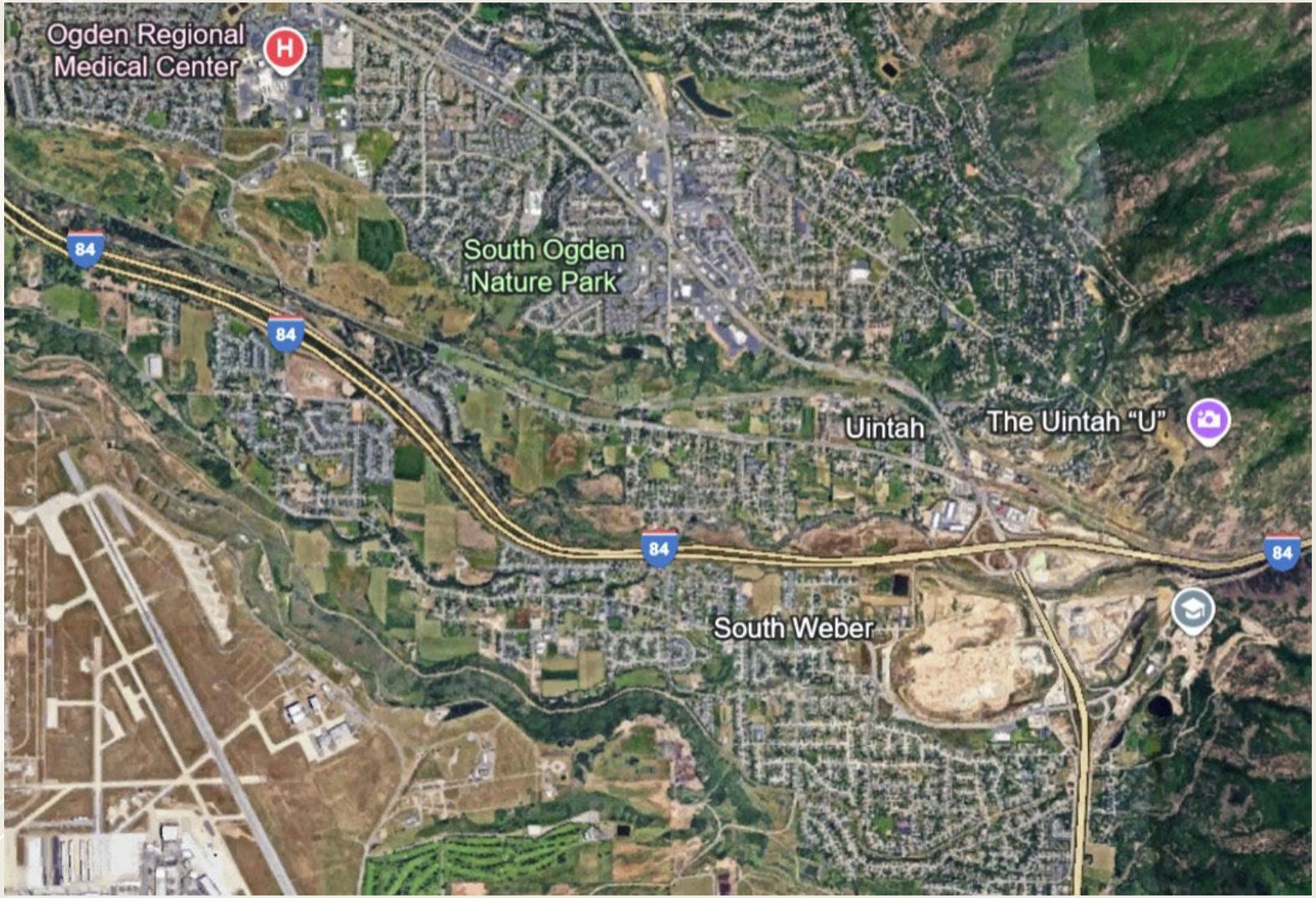
Disadvantages

- High cost ($3-4 million)
- Geotechnical uncertainty – would require in depth report before design and construction
- Potential groundwater cutoff



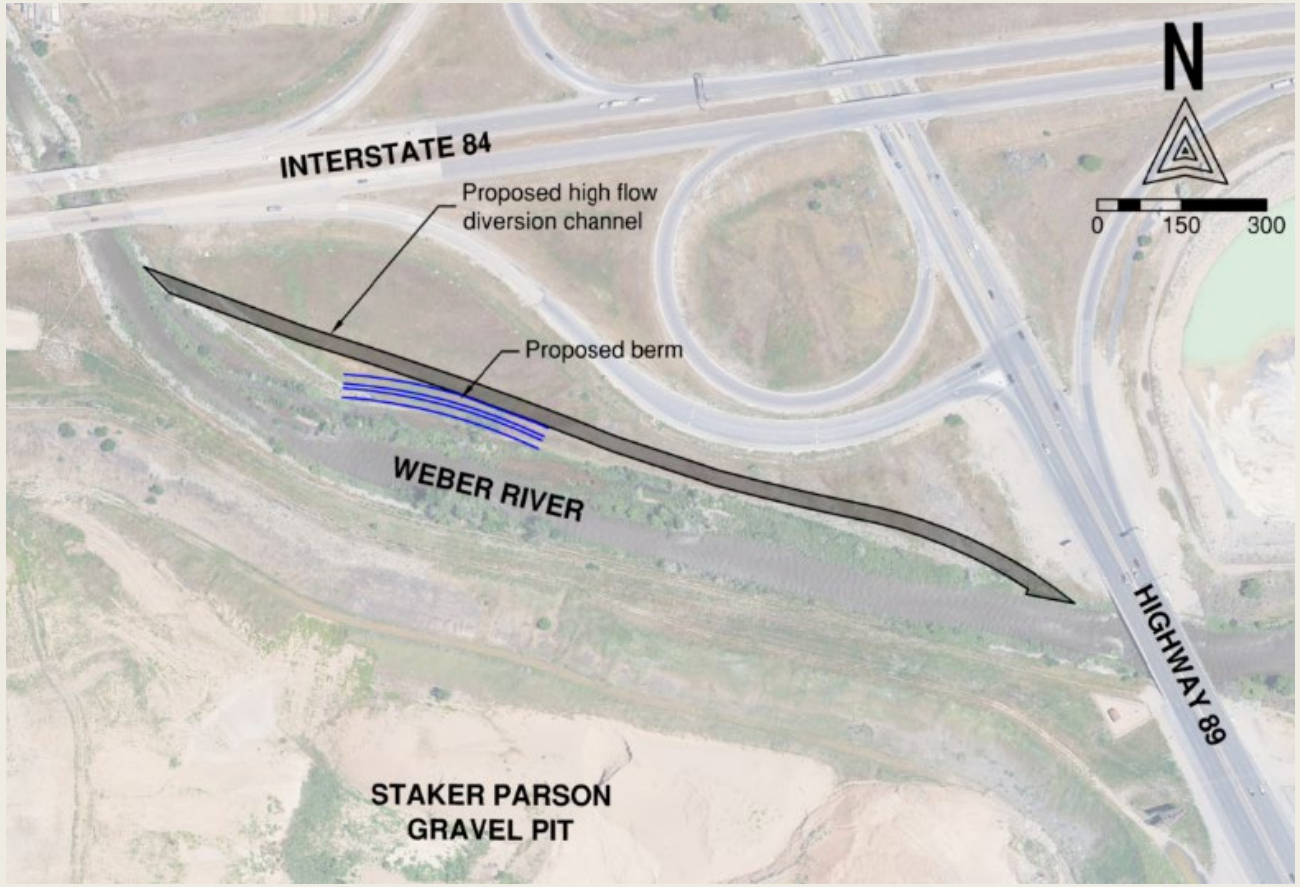
Evaluation Process

1. **Human Safety is Priority**
2. **Cost to the City**
3. **Environmental Impacts**
4. Permitting Ease
5. Maintainability or Longevity
6. Risk to Staker Parson Pit
7. Other Economic Impacts
8. Social and Cultural Effects



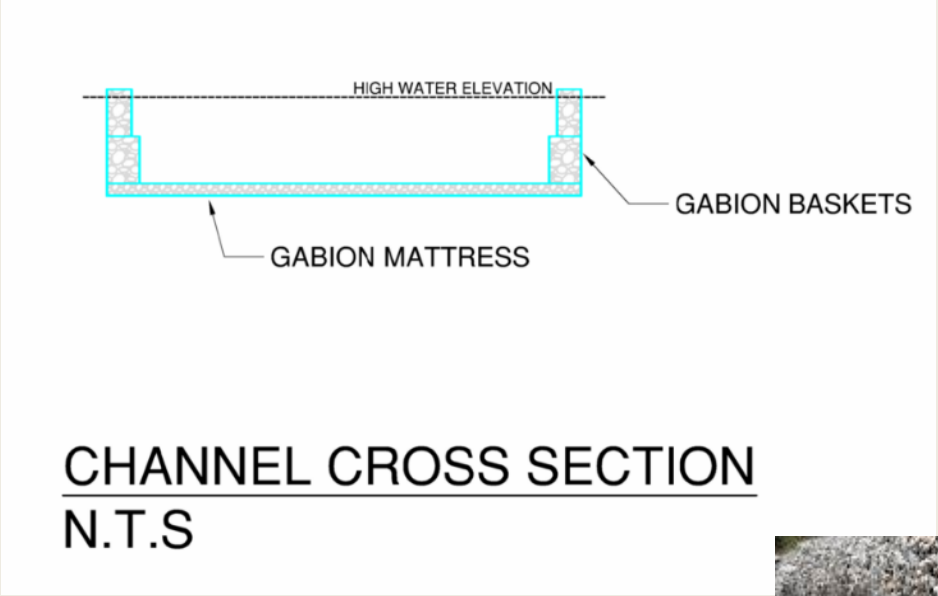
Recommended Alternative – Alternative #1

- High flow diversion channel
- Assumes that seepage was caused by high flows
- Includes repairing the existing berm



Recommended Alternative

- Cons
  - Based on studied assumptions
- Pros
  - Practical
  - Avoids high construction cost
  - Reduces environmental impacts
    - Does not stop flow of river
    - Minimal effect on wildlife
    - Reduce possible permitting issues
- Channel Dimensions
  - Accounts for a part of flood flow (~1/3)
  - Gabions



Conclusion

- We have limited resources and information
- Our recommendation was made to the best of our current ability
- We encourage a more in-depth geotechnical and flood analysis of the site
- Come to senior design night April 28th at 5:00pm-8:00pm

Sources

- https://www.ayresassociates.com/culverts-the-essential-infrastructure-you-never-knew-you-needed/
- https://www.reddit.com/r/HalfLife/comments/h8qpcl/new_real_life_locations_city_17_route_canals_in/
- https://www.kevinszabojrplumbing.net/blog/2024/4/23/a-deep-dive-into-sheet-pile-retaining-walls
- https://rockgrout.sweets.au/use.php
- https://www.schnabel.com/services/secant-piles/
- https://waterportal.ca/dam-and-reservoir-design/
- https://www.archiexpo.com/prod/farcimar/product-149371-1653151.html
- https://geofantex.com/geotextile-fabric-rolls-sizes-widths-and-uses.html
- https://wedc-knowledge.lboro.ac.uk/my-resources/graphics-browse-display.html?x=SPRI