Ruhenstroth Area Drainage Master Plan

Carson Water Subconservancy District
Douglas County
FEMA

CWSD Board Meeting Presentation

October 20, 2021

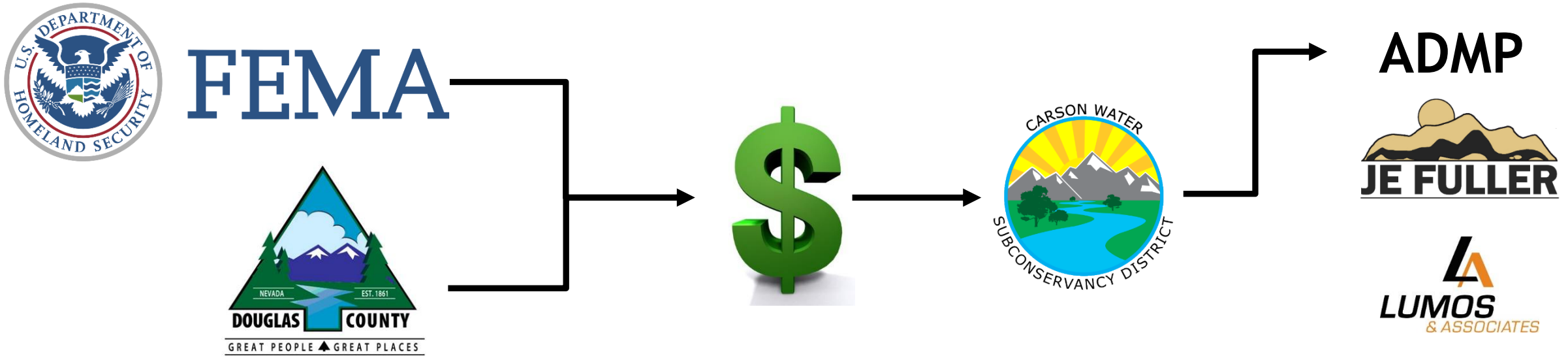
What is an Area Drainage Master Plan (ADMP)?

- Planning-level study of offsite flood risk within a watershed

- Goals:
  - Develop a comprehensive understanding of the off-site existing condition flood risk
  - Develop alternative mitigation solutions

Project Funding

- FEMA Cooperative Technical Partner (CTP) grant
- Douglas County



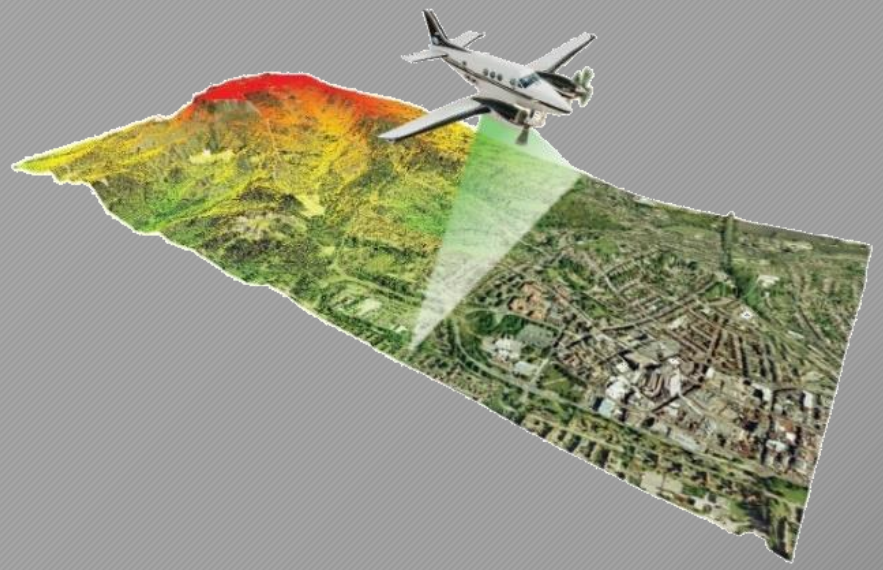
Data Collection

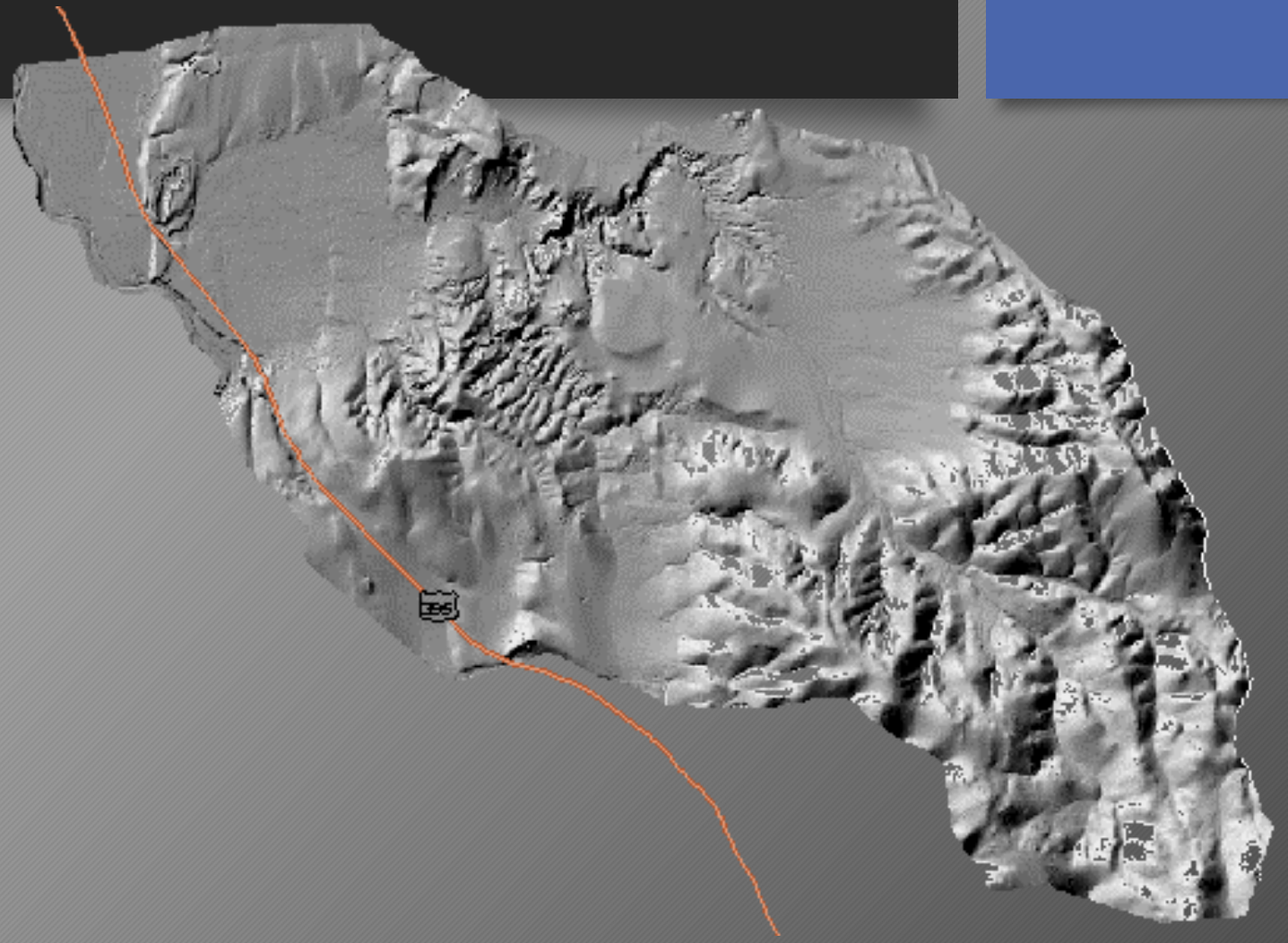
- Resident Flood Experience
  - ADMP Open House (January 14, 2020)
    - Flooding experience locations
    - Photographs/Videos
  - ADMP Flood Experience Website

Used to help calibrate and verify modeling

Topographic Mapping

- High-resolution LiDAR mapping
  - October 2019

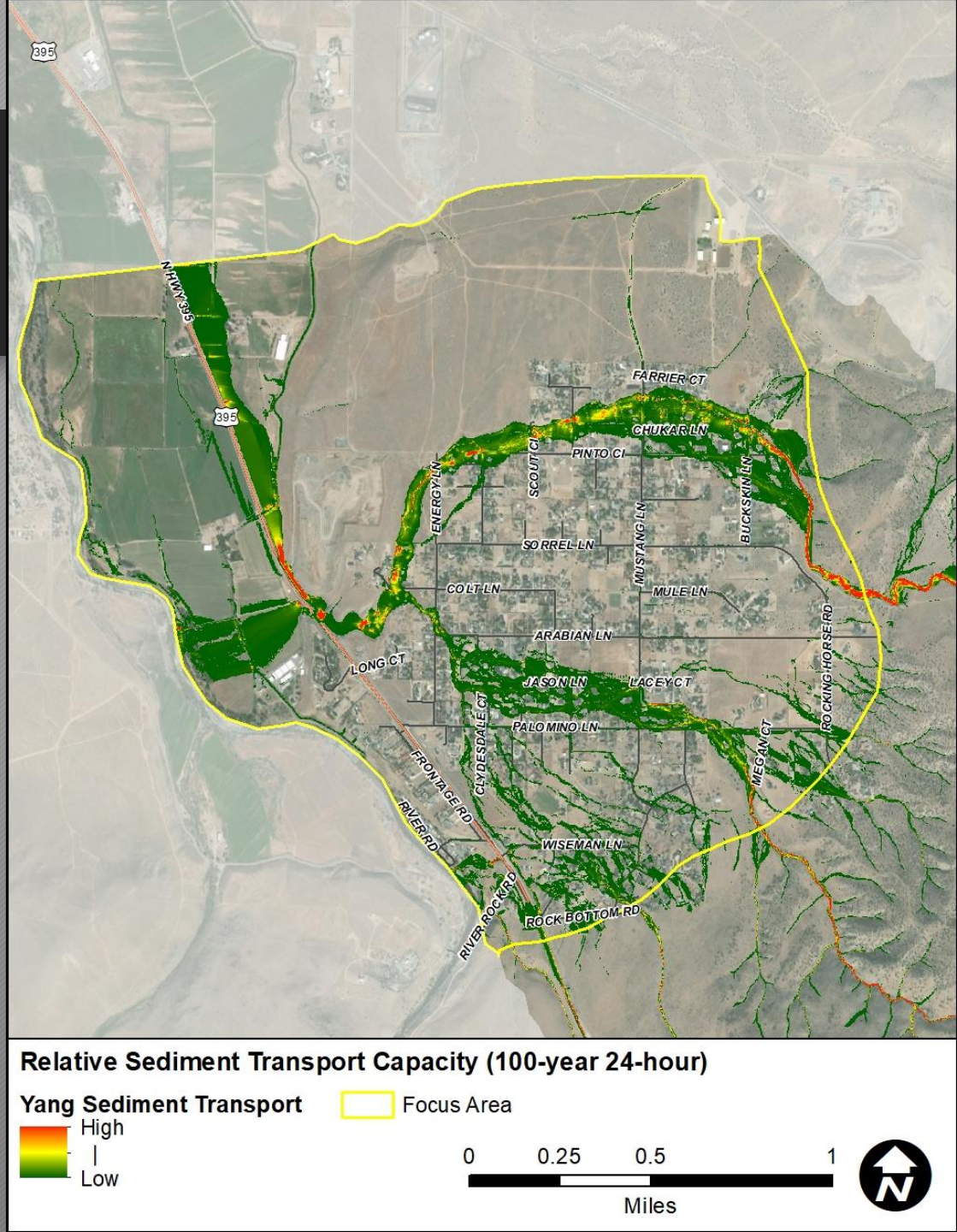


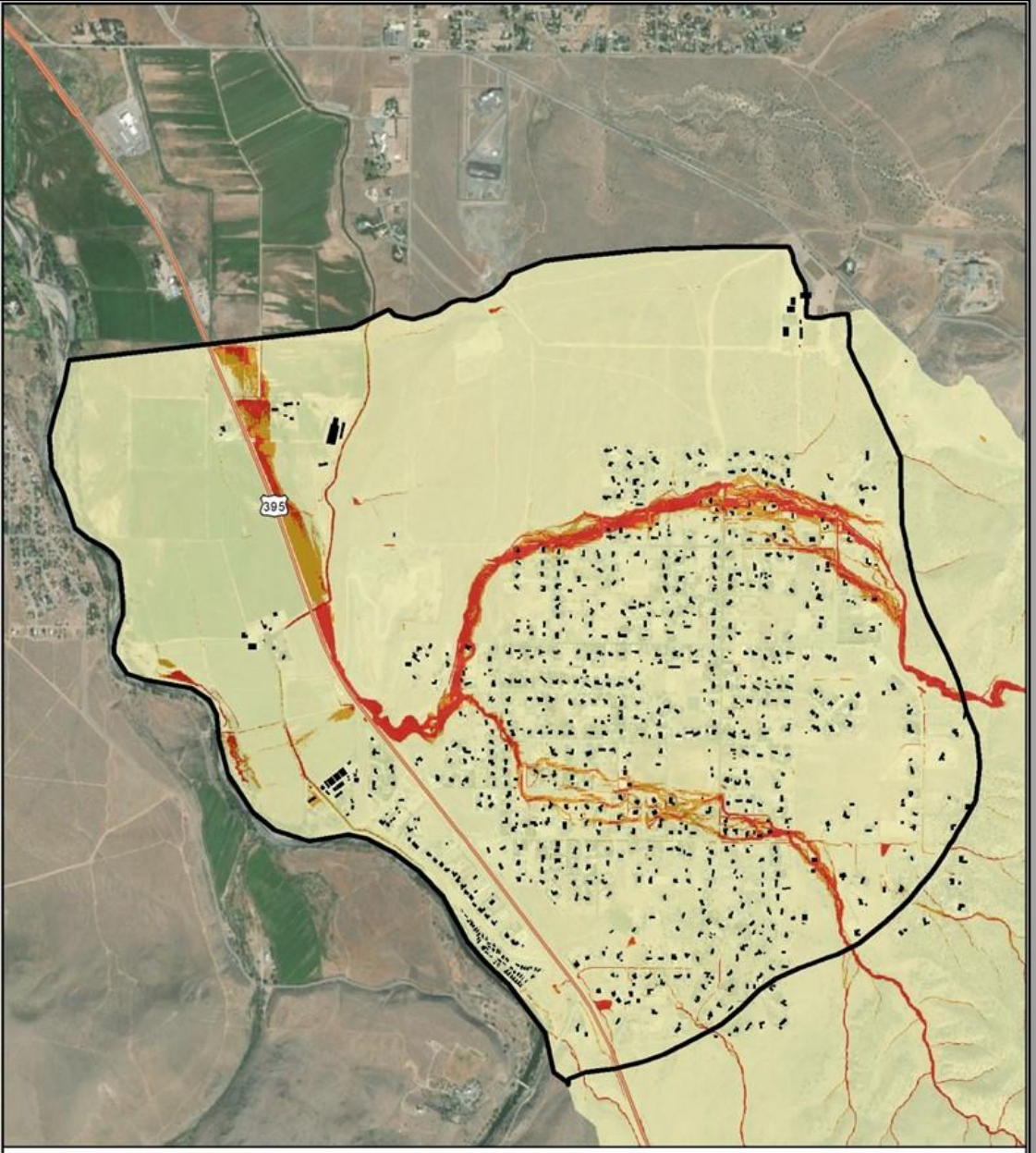


25-Year, 24-Hour Storm: Existing Conditions

Flood Risk Assessment

- Sediment Engineering
  - Collected 7 samples
  - Quantify sediment yield

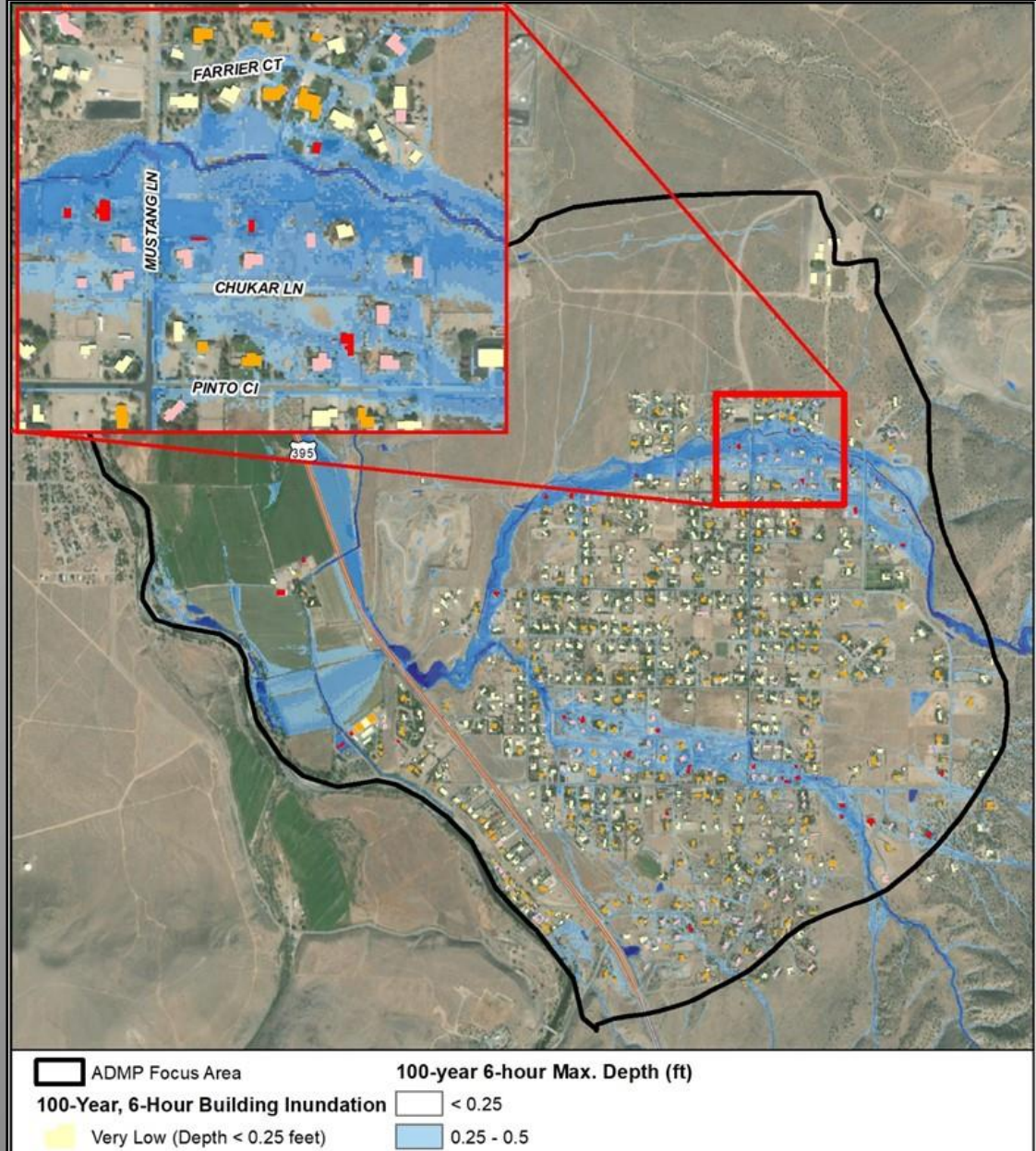




100-Year, 6-Hour Flooding Hazards to Pedestrians (Children)

Low
Moderate
High
ADMP Focus Area
Buildings

0 0.25 0.5 1
Miles



ADMP Focus Area

100-Year, 6-Hour Building Inundation

Very Low (Depth < 0.25 feet)
Low (Depth 0.25 feet to 0.5 feet)
Moderate (Depth 0.5 to 1 foot)
High (Depth > 1 foot)

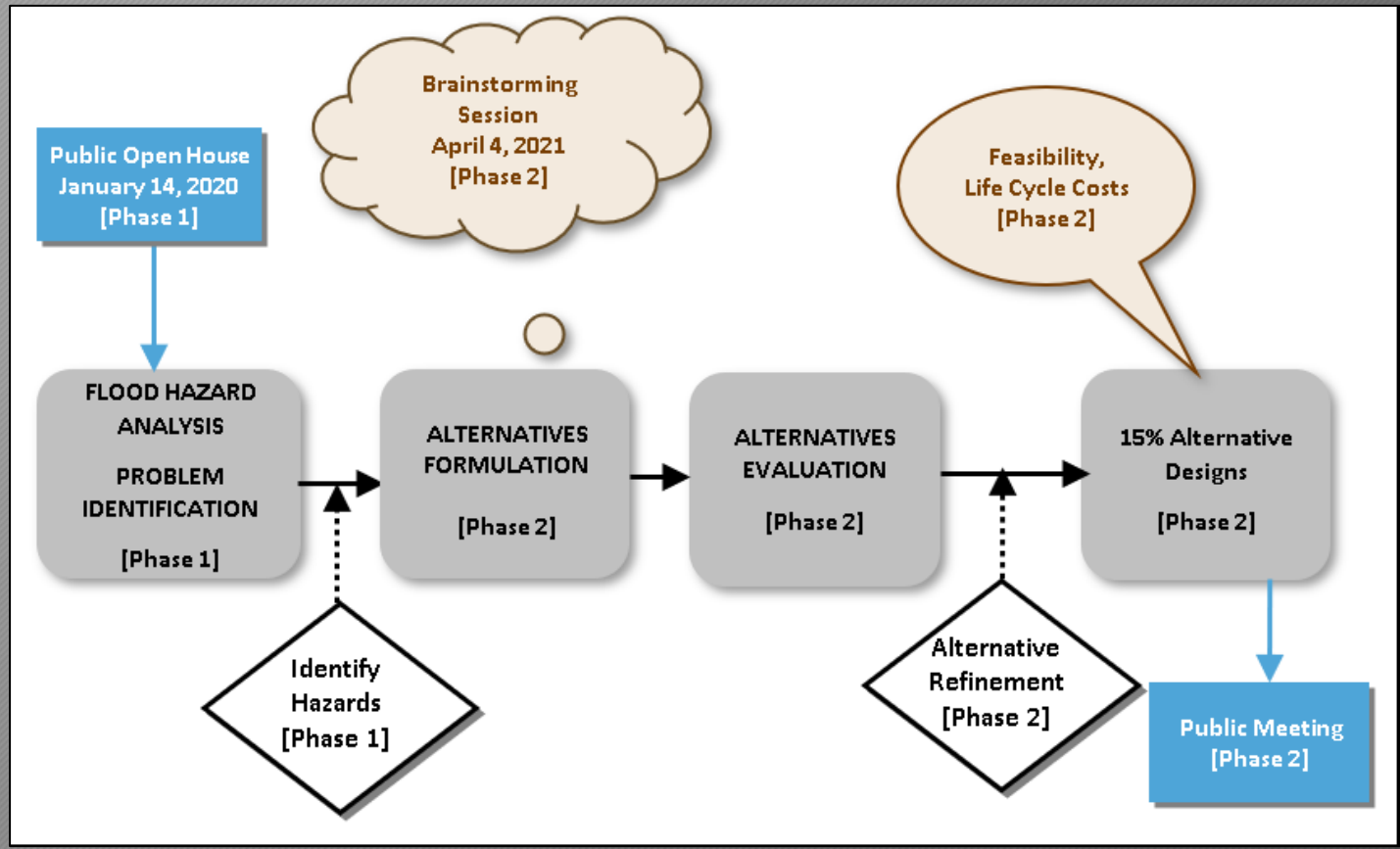
100-year 6-hour Max. Depth (ft)

< 0.25
0.25 - 0.5
0.5 - 1
1 - 2
2 - 3
3 - 6
> 6

0 1,000 2,000 4,000
Feet

Alternatives – Regional Mitigation Alternatives

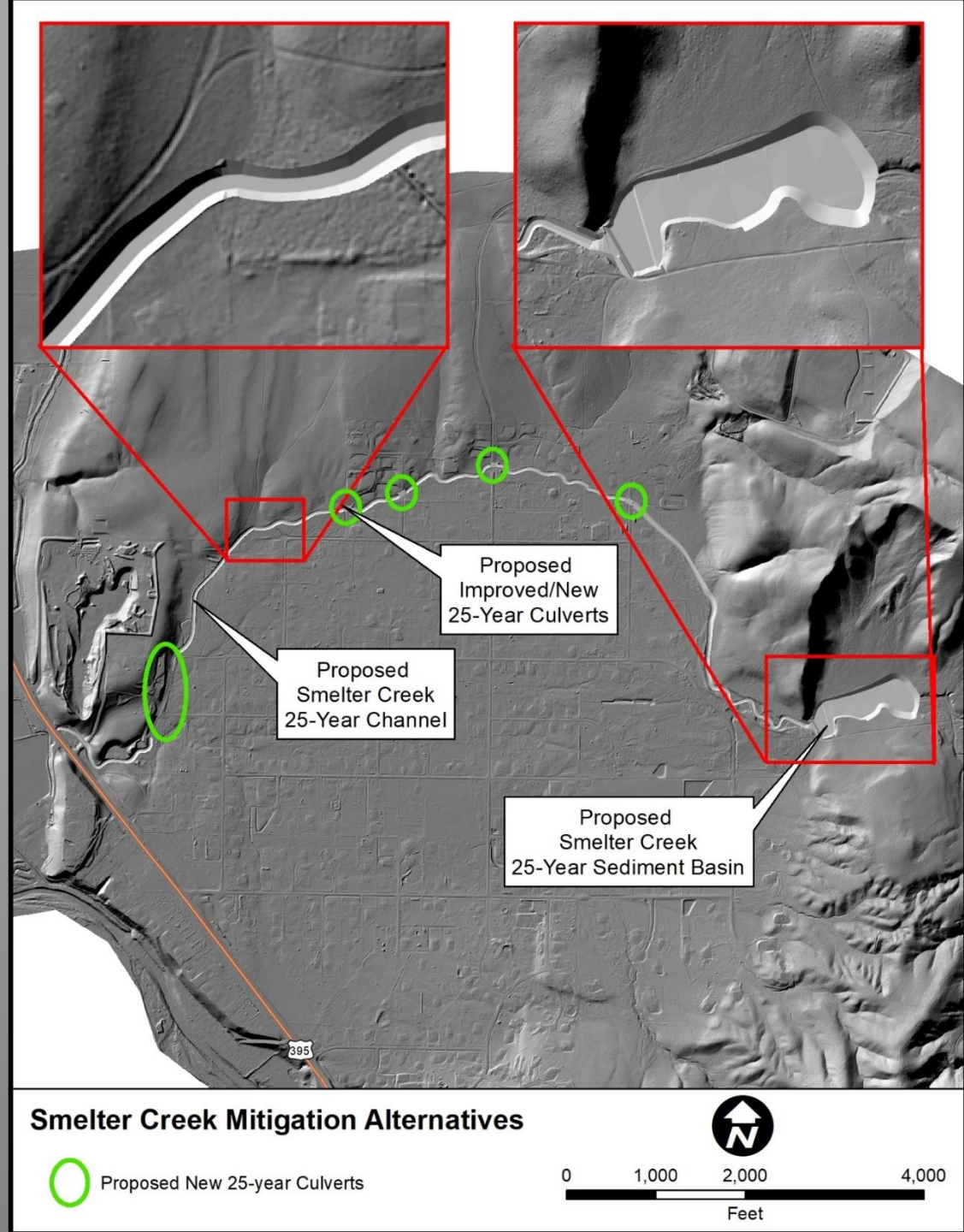
- Ruhenstroth unique challenges
  - Minimal drainage infrastructure
  - Distributary flow
- Community-wide solutions



Mitigation Alternatives

- 25-Year, 24-Hour Storm
- Smelter Creek
  - Flooding
  - Sedimentation
- Unnamed Tributary
  - Flooding

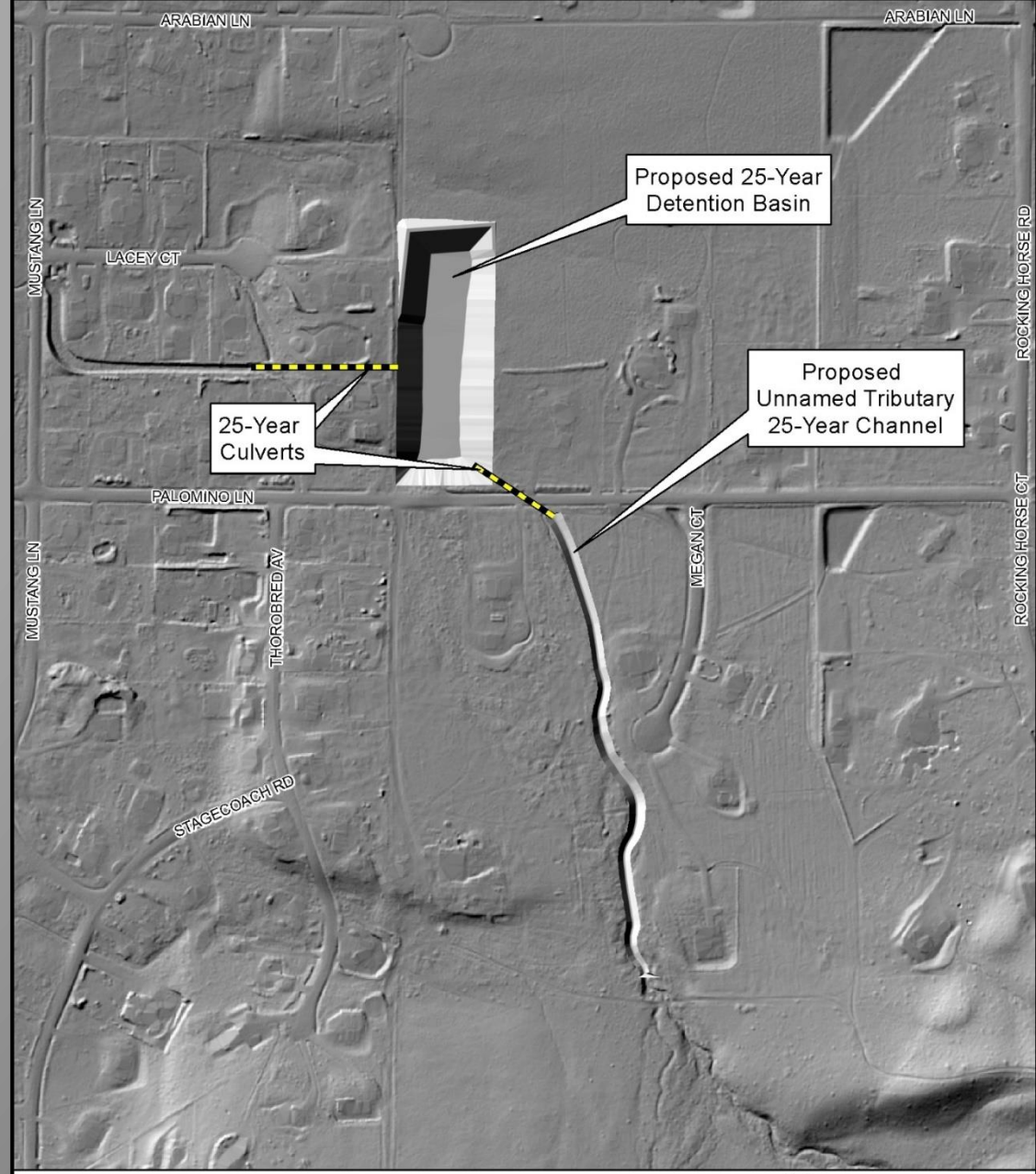
- Smelter Creek
  - Sediment Basin
  - Channel Improvements
  - Culvert Improvements
    - Buckskin Lane
    - Mustang Lane
    - Cayuse Drive
    - Horseman Court
    - Between Pinto Ct and Sullivan Ln



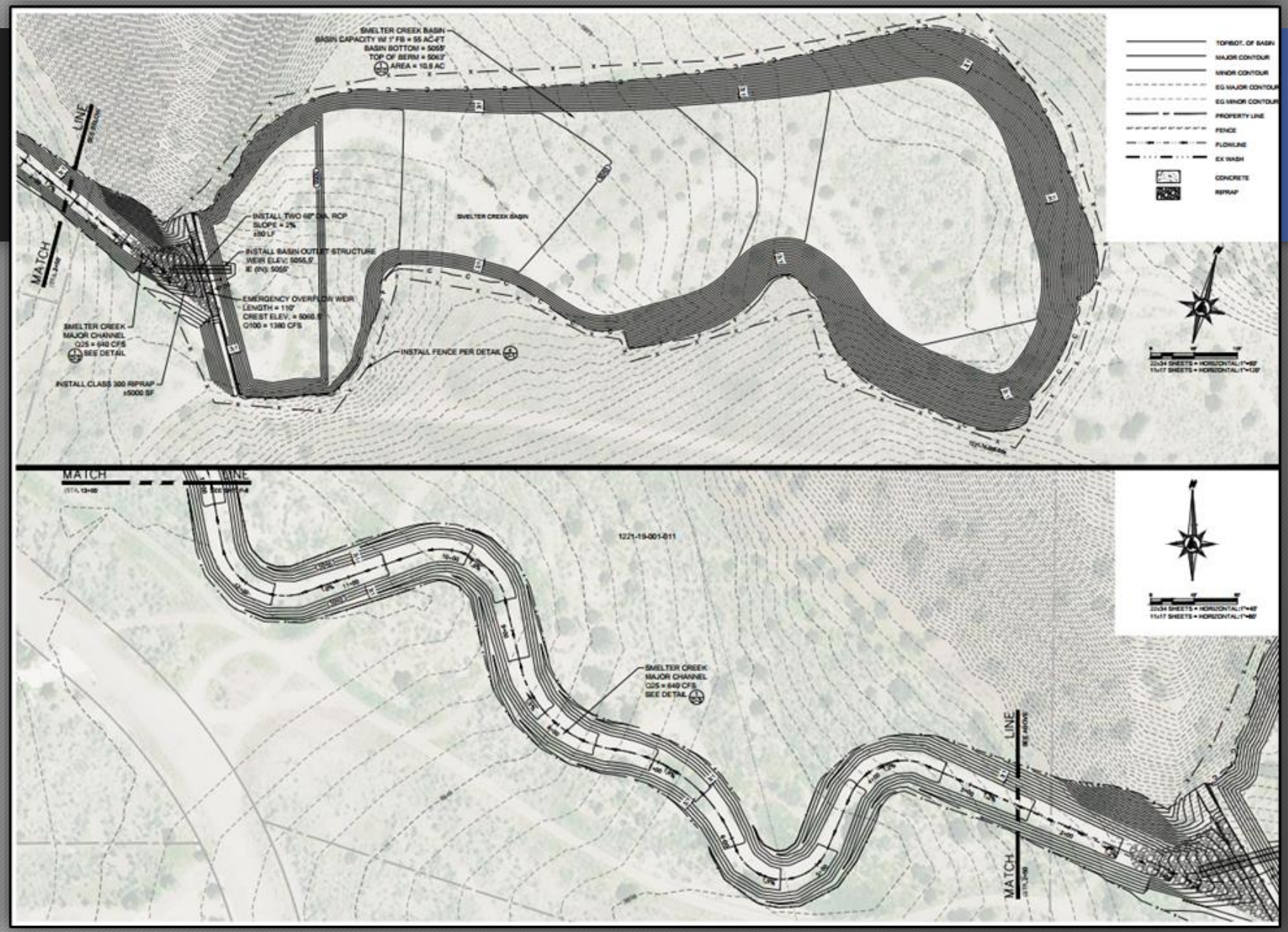
Mitigation Alternatives

- 25-Year, 24-Hour Storm
- Smelter Creek
  - Flooding
  - Sedimentation
- Unnamed Tributary
  - Flooding

- Unnamed Tributary
  - Alternative 1 – Storm Drain
  - Alternative 2 – Detention Basin

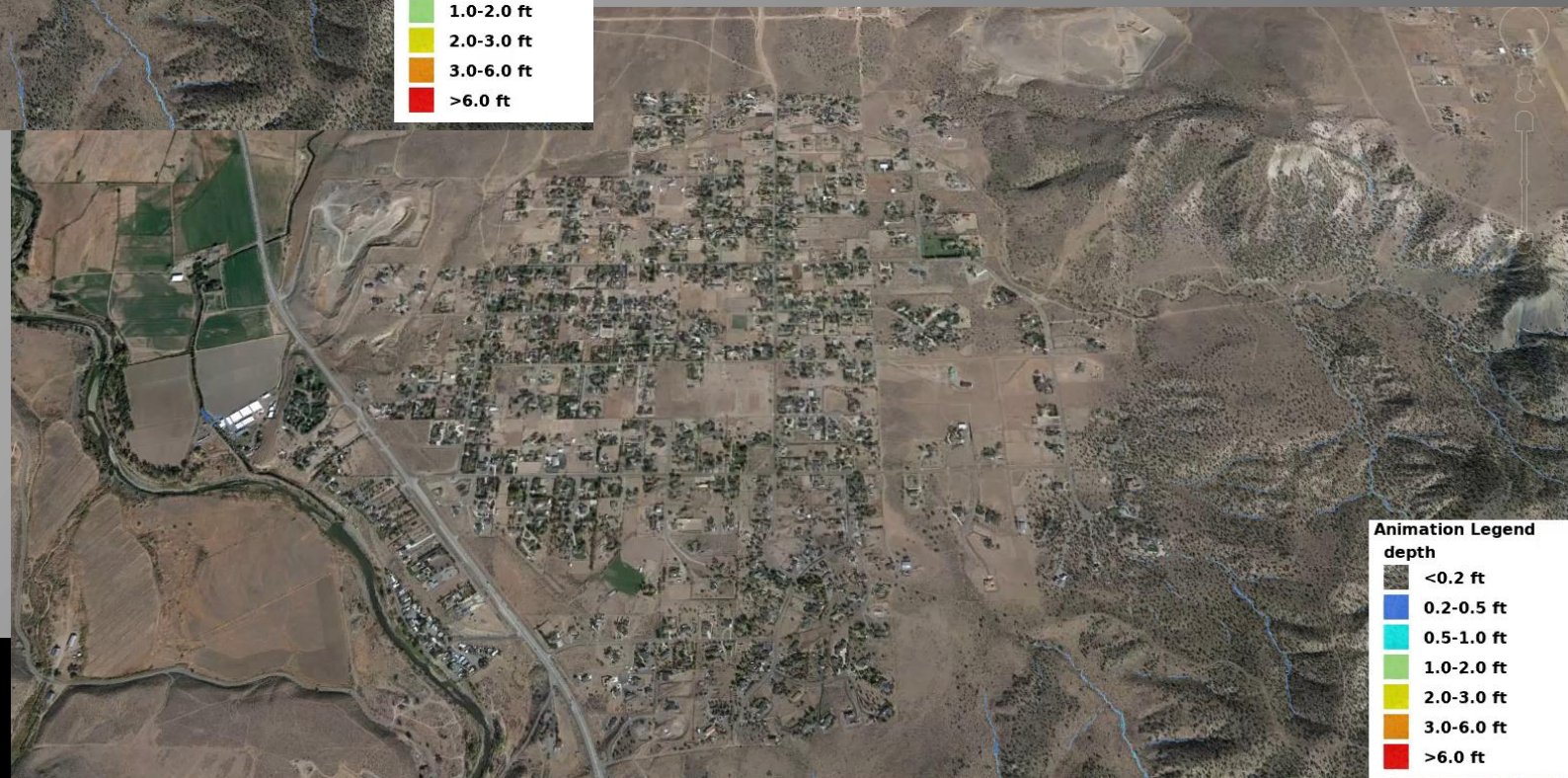


25-Year 15% Design Example



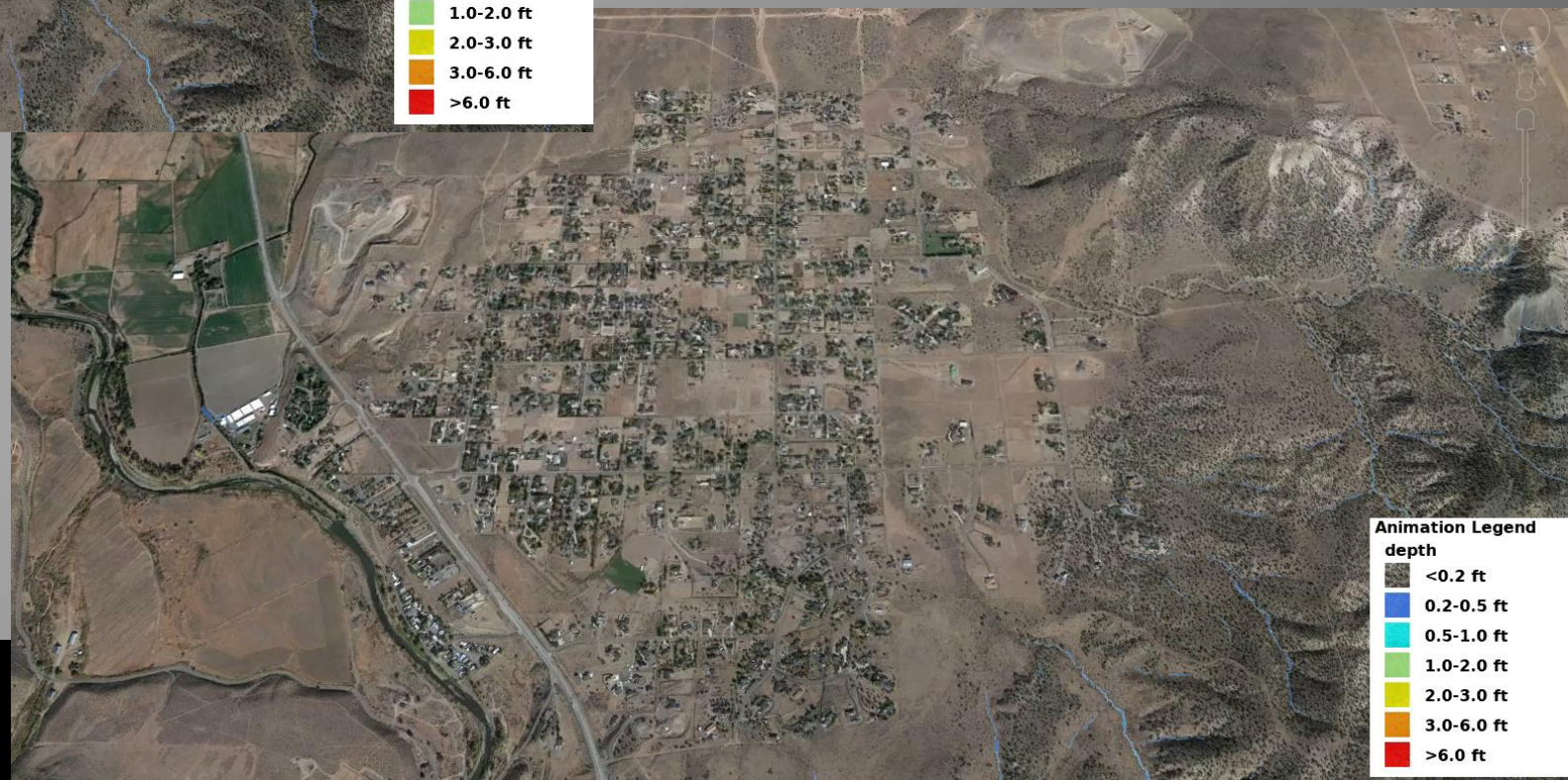
25-Year, 24-Hour Storm
Existing Conditions

25-Year, 24-Hour Storm
Smelter + Unnamed Trib Alt 1



25-Year, 24-Hour Storm
Existing Conditions

25-Year, 24-Hour Storm
Smelter + Unnamed Trib Alt 2



Building Impacts

Condition	Building Count Flow Depth (feet) 0.25 < h ≤ 0.5 (Low)	Building Count Flow Depth (feet) 0.5 ≤ h ≤ 1 (Moderate)	Building Count Flow Depth (feet) 1 < h (High)	Total Building Count	Benefit (Buildings Removed)
25-Year, 24-Hour Storm					
Existing	135	68	17	220	-
Smelter Creek + Unnamed Trib Alternative 1	107	32	6	145	**75**
Smelter Creek + Unnamed Trib Alternative 2	118	36	6	160	**60**
100-Year, 6-Hour Storm					
Existing	281	149	43	473	-
Smelter Creek + Unnamed Trib Alternative 1	264	113	16	393	**80**
Smelter Creek + Unnamed Trib Alternative 2	270	84	12	366	**107**
100-Year, 24-Hour Storm					
Existing	162	106	32	300	-
Smelter Creek + Unnamed Trib Alternative 1	145	57	10	212	**88**
Smelter Creek + Unnamed Trib Alternative 2	137	74	11	222	**78**

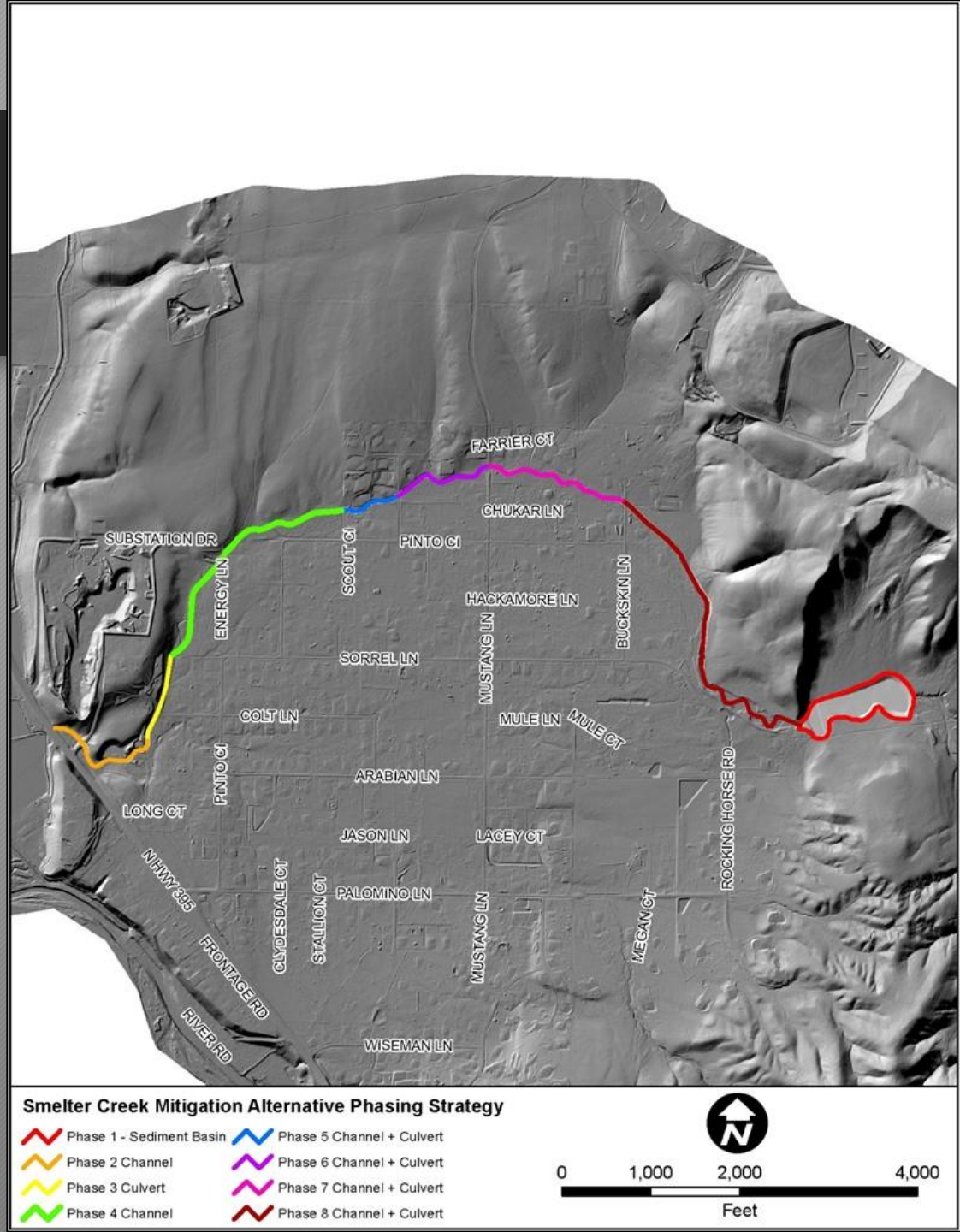
Flood Risk Area Impacts

Condition	Total Flood Risk Area (acres)	Benefit (acres removed)
	h ≥ 0.25 feet	
25-Year, 24-Hour Storm		
Existing	218	-
Smelter Creek + Unnamed Trib Alternative 1	135	**83**
Smelter Creek + Unnamed Trib Alternative 2	147	**71**
100-Year, 6-Hour Storm		
Existing	318	-
Smelter Creek + Unnamed Trib Alternative 1	243	**75**
Smelter Creek + Unnamed Trib Alternative 2	219	**99**
100-Year, 24-Hour Storm		
Existing	301	-
Smelter Creek + Unnamed Trib Alternative 1	215	**86**
Smelter Creek + Unnamed Trib Alternative 2	237	**64**

Project Phasing – Smelter Ck

Phase	Structure Elements[1]	25-Year Structure Cost Estimates[2,3]
Smelter Creek Phase 1	Sediment Basin	$4,576,000
Smelter Creek Phase 2	Channel (~1,450 LF)	$1,030,000
Smelter Creek Phase 3	Box Culvert (~1,030 LF)	$ 3,090,000
Smelter Creek Phase 4	Channel (~2,800 LF)	$1,995,000
Smelter Creek Phase 5	Channel (~580 LF) Box Culvert (Horseman Ct)	$412,000 $240,000
Smelter Creek Phase 6	Channel (~1,115 LF) Box Culvert (Cayuse Dr)	$792,000 $240,000
Smelter Creek Phase 7	Channel (~1,600 LF) Box Culvert (Mustang Ln)	$1,133,000 $240,000
Smelter Creek Phase 8	Channel (~3,780 LF) Box Culvert (Buckskin Ct)	$2,682,000 $240,000

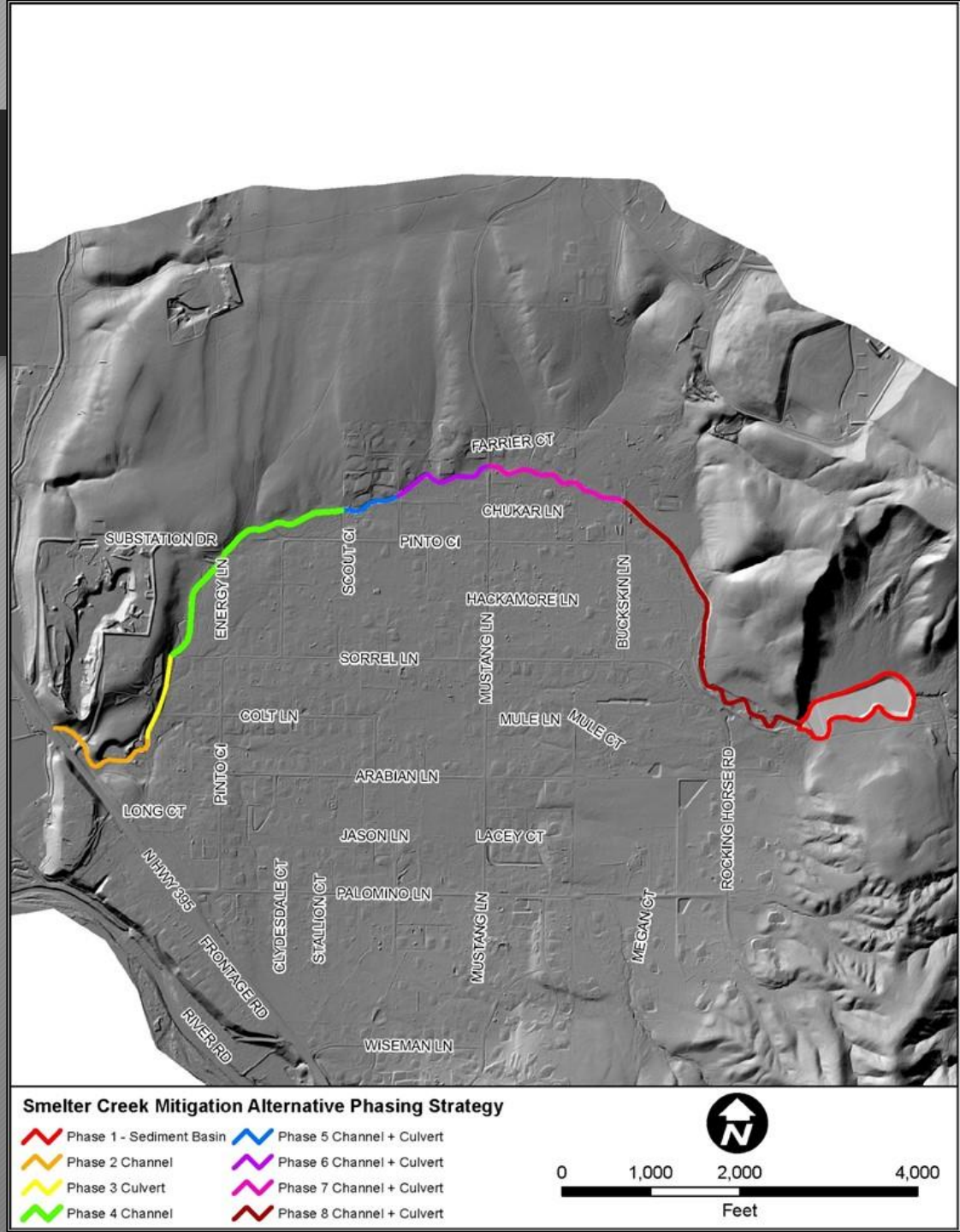
1. LF = linear feet (approximate)
2. Construction costs have been rounded for simplification. See Appendix B for a detailed breakdown of cost estimates.
3. Does not include right-of-way acquisition or property acquisition costs.



Project Phasing – Unnamed Trib

Phase	Structure Elements	25-Year Structure Cost Estimates[1,2]
Unnamed Tributary Alternative 1	Channel Sediment Inlet Basin Storm Drain	$11,432,000
Unnamed Tributary Alternative 2	Channel Culvert (Palomino Ln) Detention Basin Outlet Culvert	$2,500,000

1. **Construction costs have been rounded for simplification. See Appendix B for a detailed breakdown of cost estimates.**
2. **Does not include right-of-way acquisition or property acquisition costs.**



Questions?

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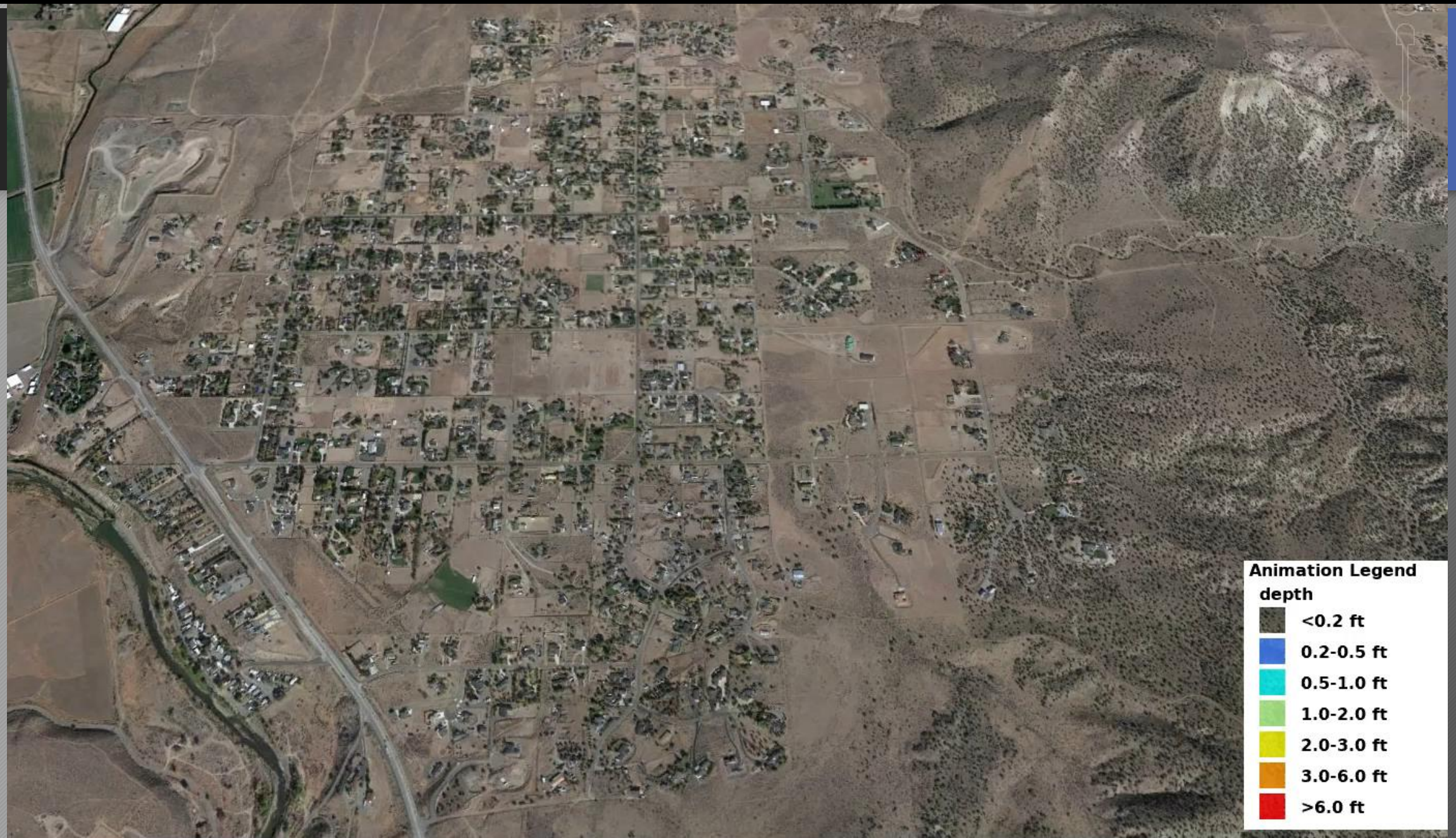
100-Year, 6-Hour Storm: Existing Conditions

25-Year, 24-Hour Storm: Smelter Creek + Unnamed Tributary Alternative 1

25-Year, 24-Hour Storm: Smelter Creek + Unnamed Tributary Alternative 2

100-Year, 6-Hour Storm: Smelter Creek + Unnamed Tributary Alternative 1



100-Year, 6-Hour Storm: Smelter Creek + Unnamed Tributary Alternative 2