Dayton Valley Area Drainage Master Plan

Lyon County Public Meeting
Dayton Valley Community Center
164 Pike Street
August 13, 2019 | 5:30pm

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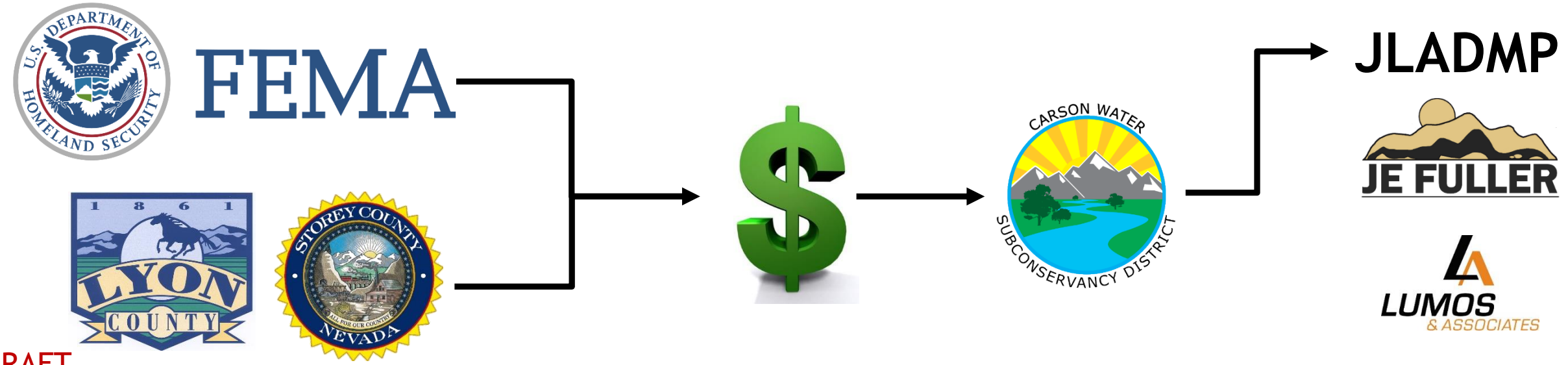
What is an Area Drainage Master Plan (ADMP)?

- Planning-level study of flooding hazards within a watershed
  - Multiple watercourses
- Goals:
  - Develop a comprehensive understanding of the drainage existing conditions
  - Develop alternative mitigation solutions

Project Funding

- FEMA Cooperative Technical Partner (CTP) grant
- Lyon County | Storey County



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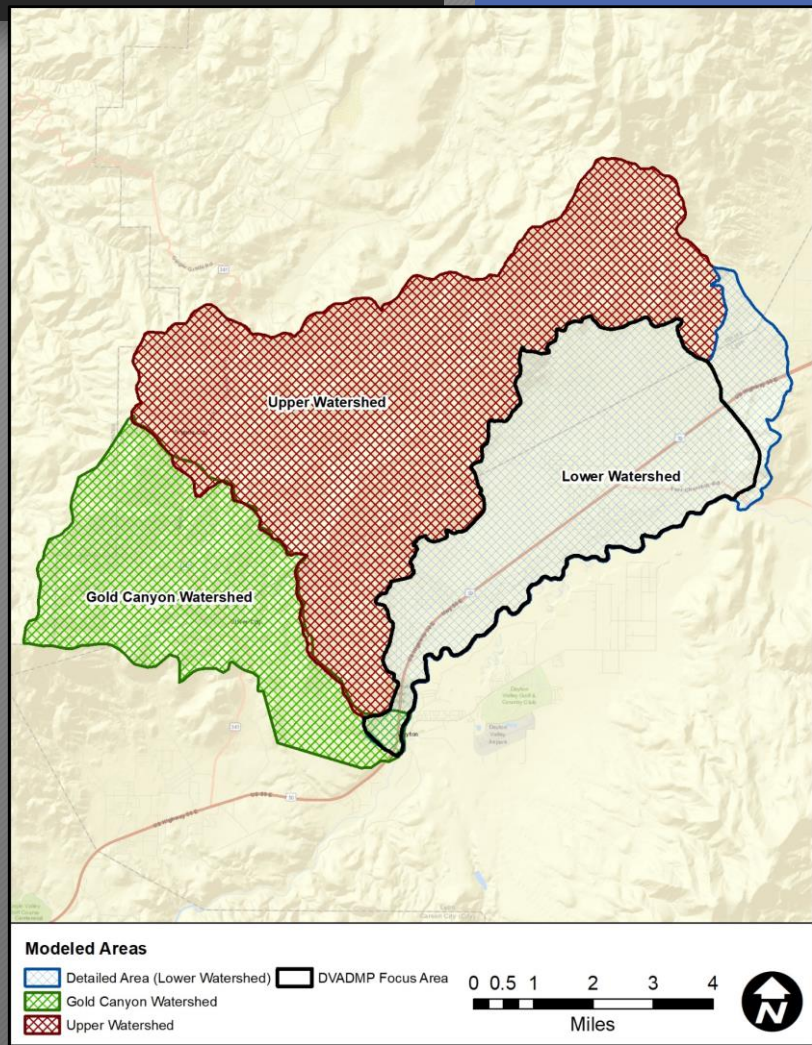
ADMP Major Project Elements

- Data Collection
- Topographic Mapping (USGS LiDAR)
- Watershed Assessment
- Flood Hazard Assessment
  - Hydrologic Modeling
  - Hydraulic (2D) Modeling
- Flood Hazard Classification



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ADMP Major Project Elements

- Flowpath Uncertainty Analysis
- Sediment Engineering
- Economic Loss Estimates
- Regional Alternatives

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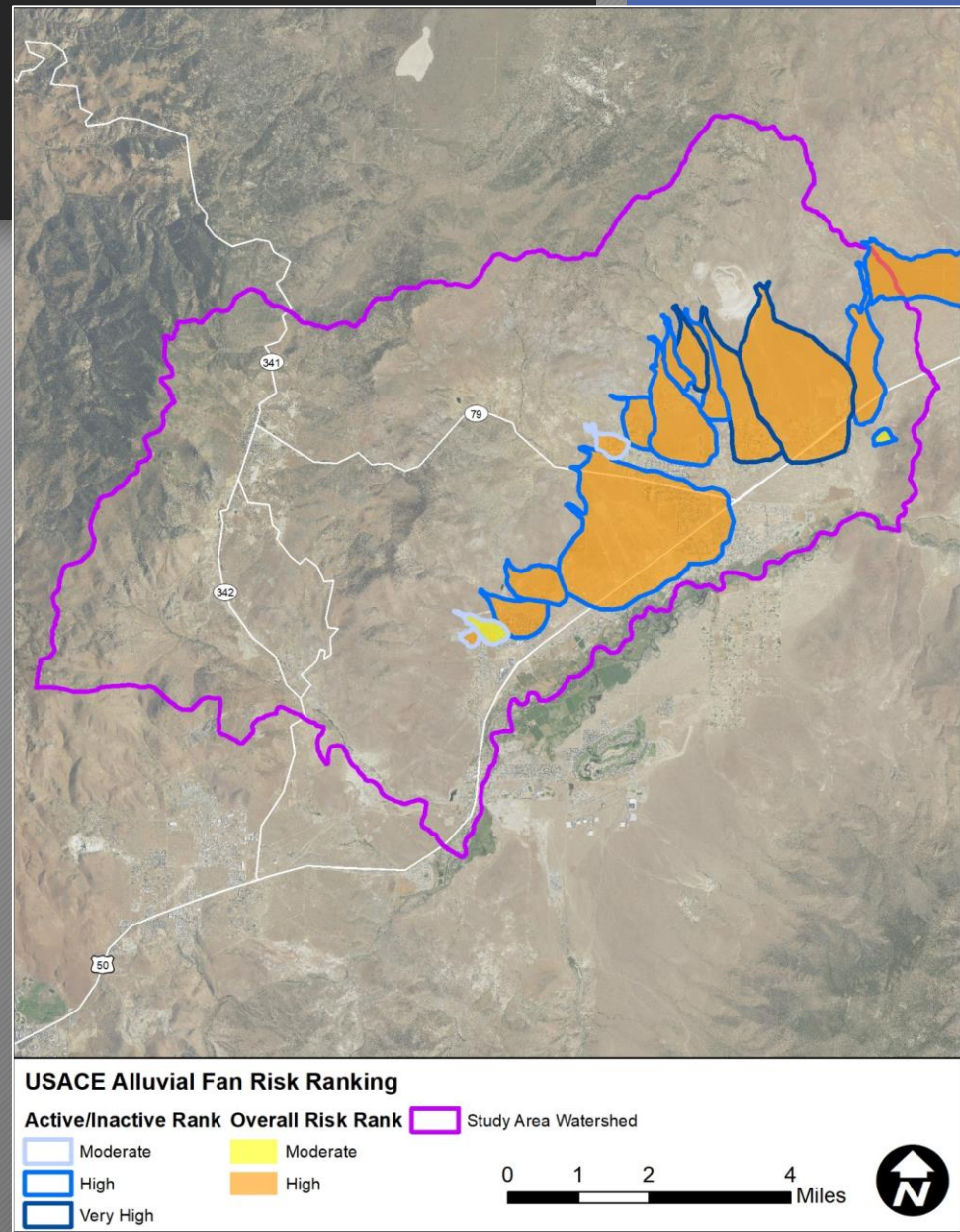
Data Collection

- Subdivision Drainage Reports
- Previous Studies
  - Flood Insurance Studies
  - FEMA Floodplain Mapping
  - USACE Alluvial Fan Mapping
  - NBMG/USGS Geologic Mapping
  - County GIS Layers
    - Land Use
    - Building Footprints
    - Assessor Parcels



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Data Collection

- Resident Flood Experience
  - ADMP Open House (May 8, 2018)
    - Flooding experience locations
    - Photographs/Videos
  - ADMP Flood Experience Website

Used to help calibrate and verify modeling

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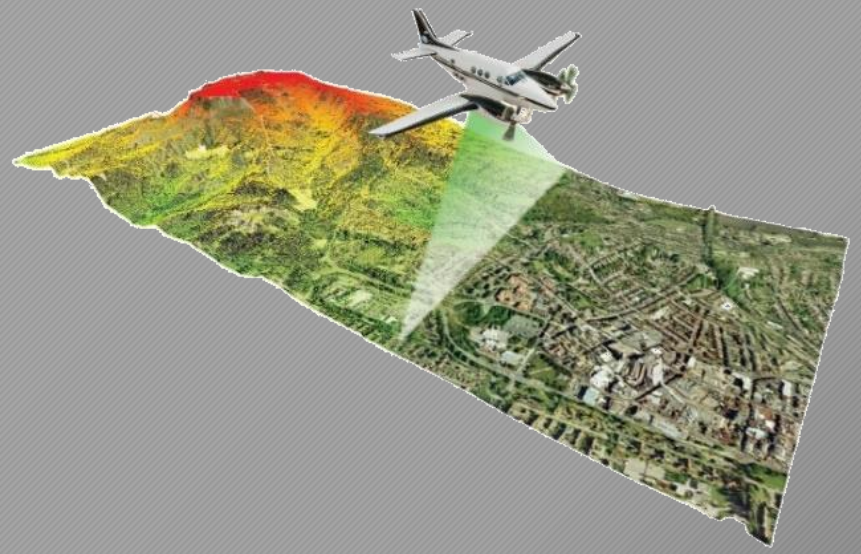
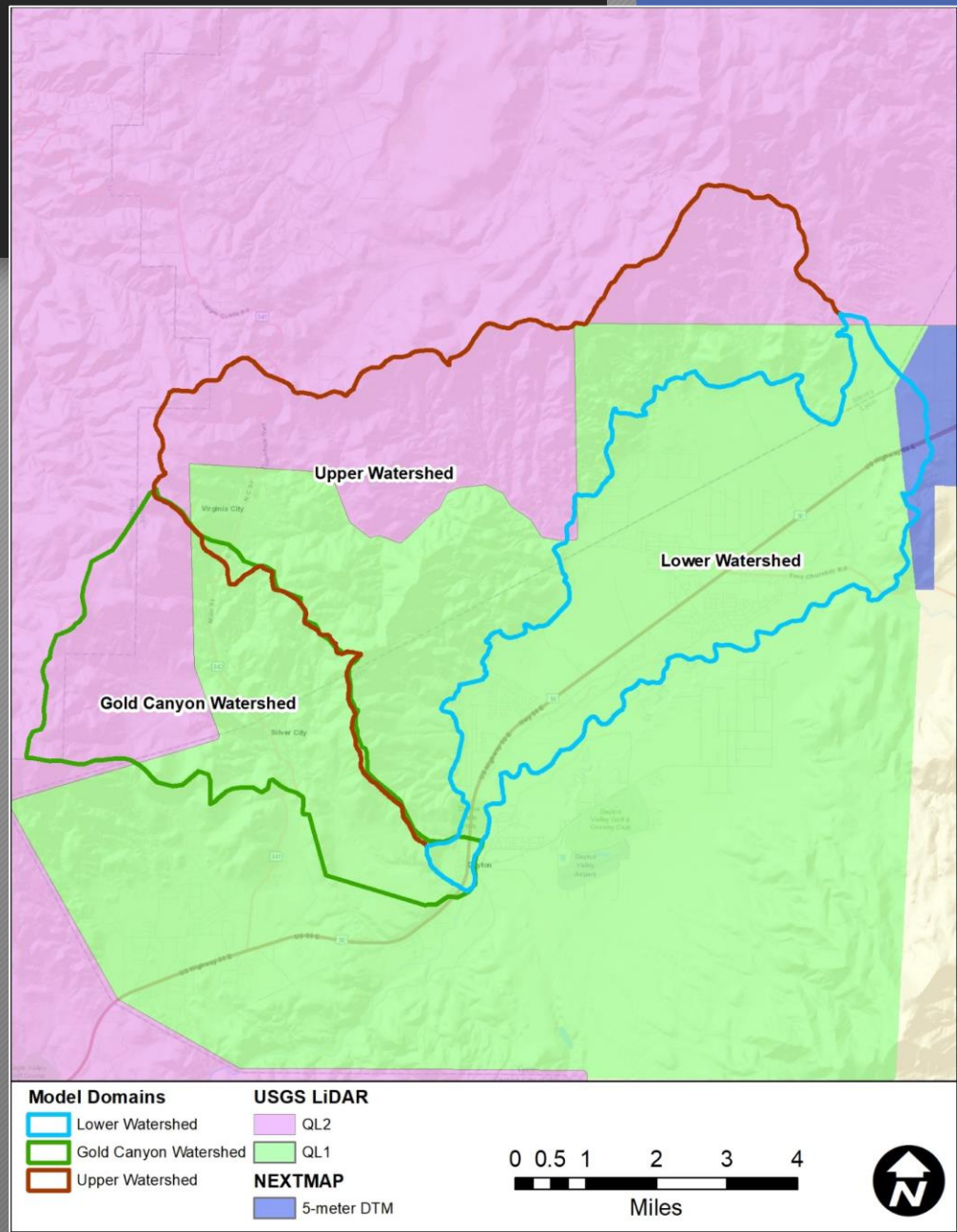
Topographic Mapping

- High-resolution USGS LiDAR mapping
  - October 27, 2017





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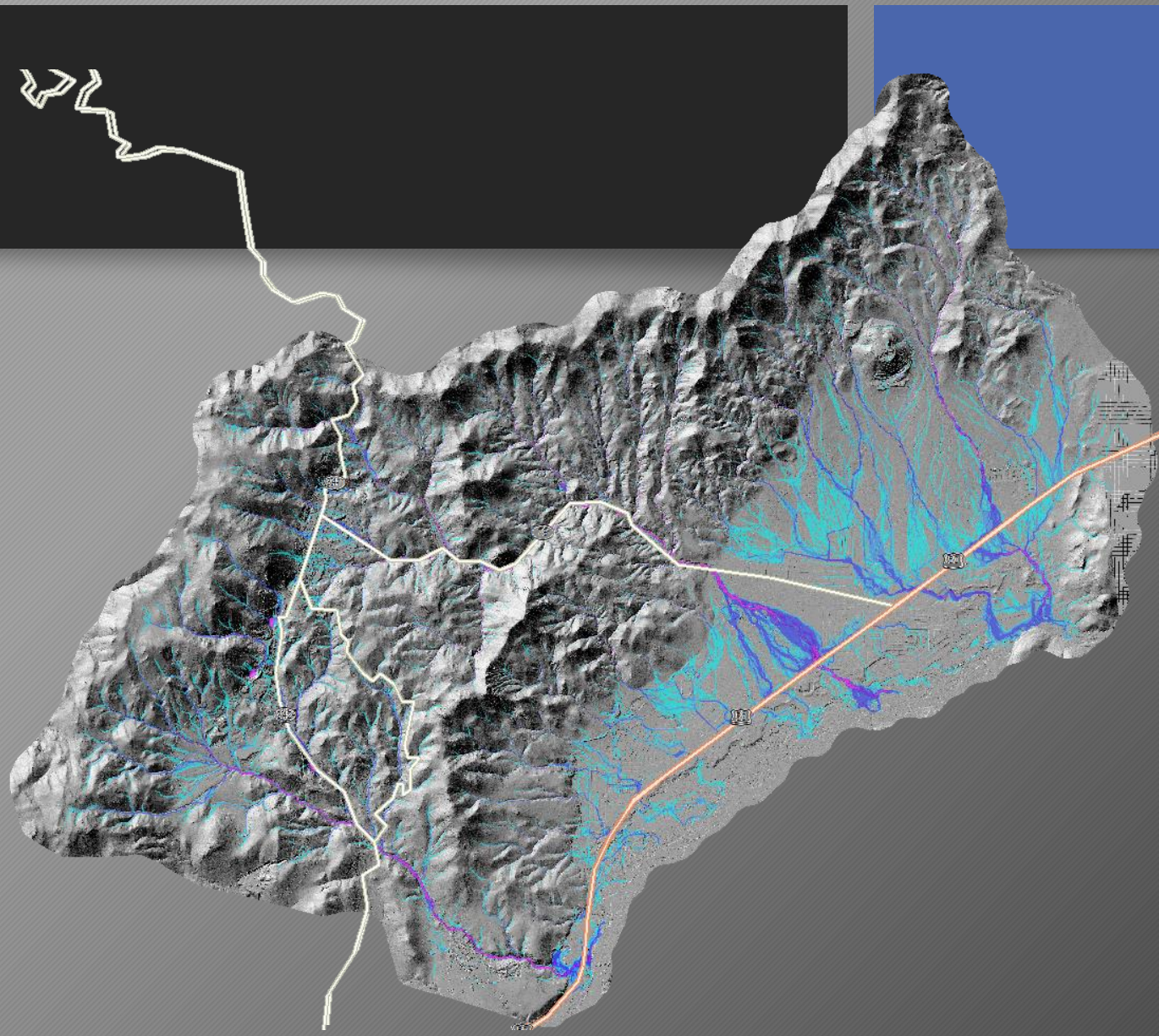
Watershed Assessment

- Many watercourses impacting study area
- Upper Watershed Geologic Setting
  - Tributary flow patterns (mountain streams)
- Lower Watershed Geologic Setting
  - Sloping piedmont surface (alluvial fan)
  - High sediment transport
  - Flow is distributary, shallow



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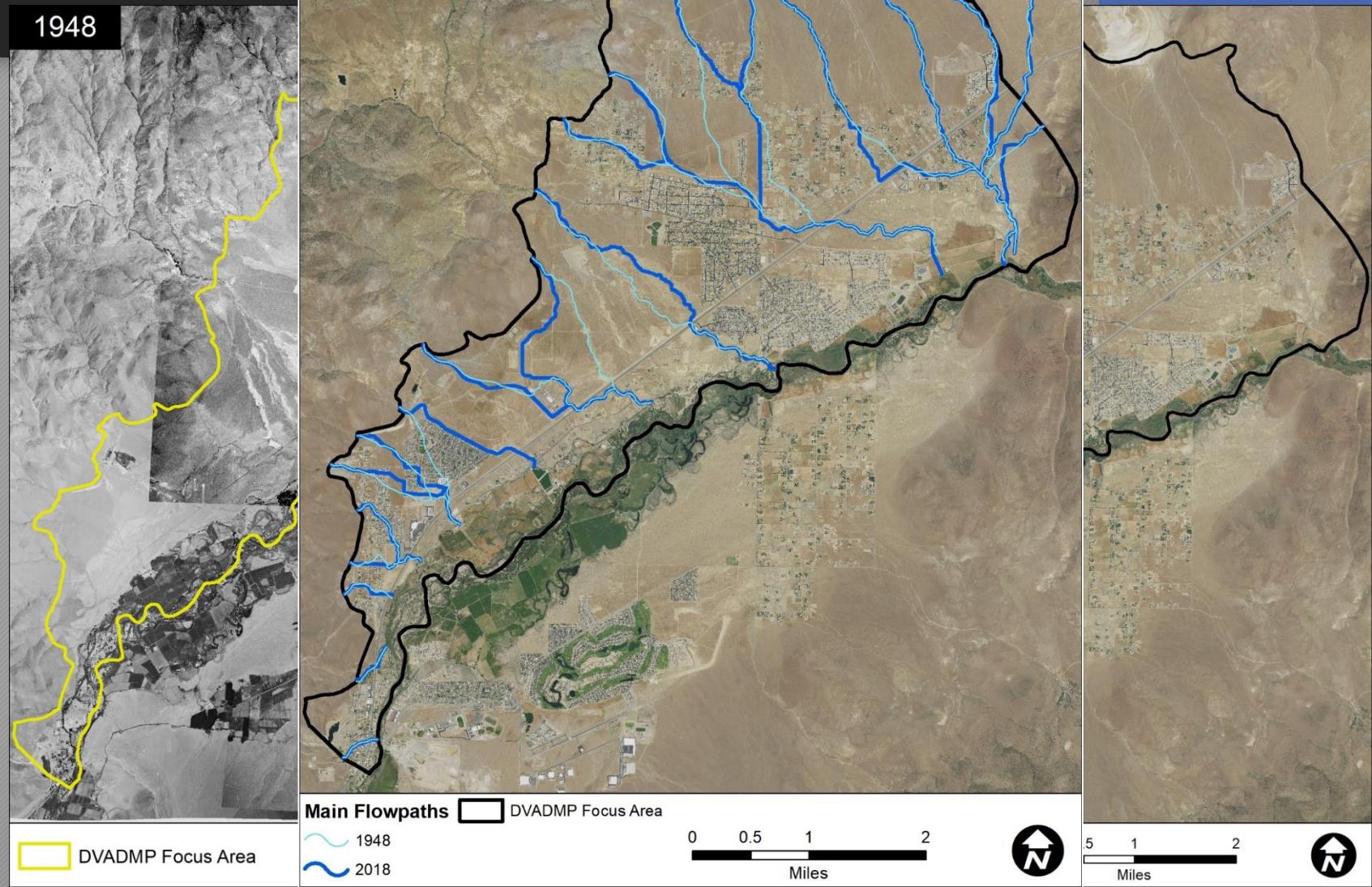
Watershed Assessment

- Historical Flow Path Assessment



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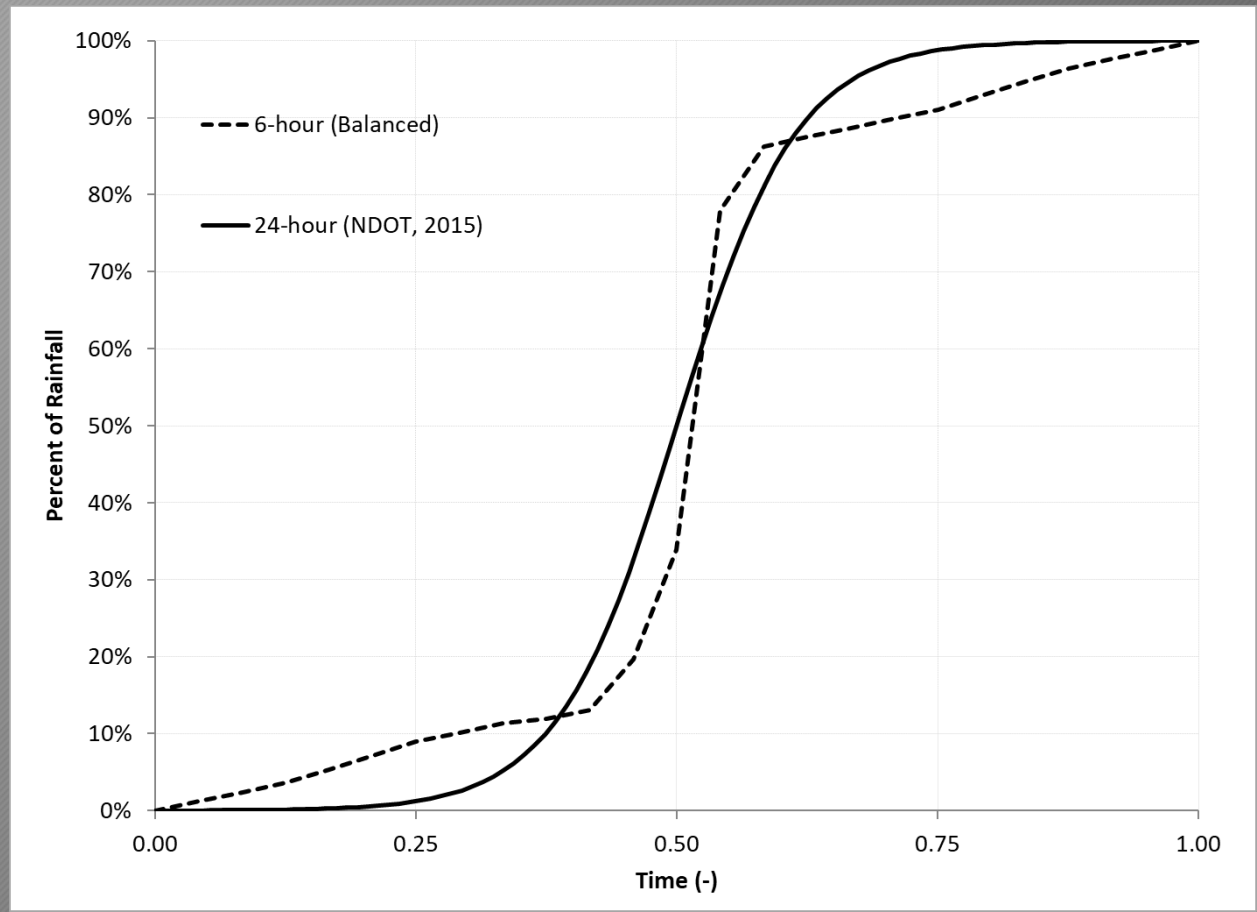
Flood Hazard Assessment

- Hydrologic Modeling
  - New NDOT Method for Storm Shape
  - 25-year, 24-hour storm
    - County Design Standards
  - 100-year, 6-hour storm
  - 100-year, 24-hour storm



Flood Hazard Assessment

- Hydraulic Modeling (FLO-2D)
  - Three Separate Models (15ft Grid Size)
    - Upper Watershed (4.1M Grid Cells)
    - Lower Watershed (2.6M Grid Cells)
    - Gold Canyon (2M Grid Cells)
  - Topography (LiDAR)
  - Land Use
  - Hydraulic structures (culverts, storm drains, etc.)
  - Floodplain cross-sections (200+)
  - Verification
    - Resident information
    - USGS Regression

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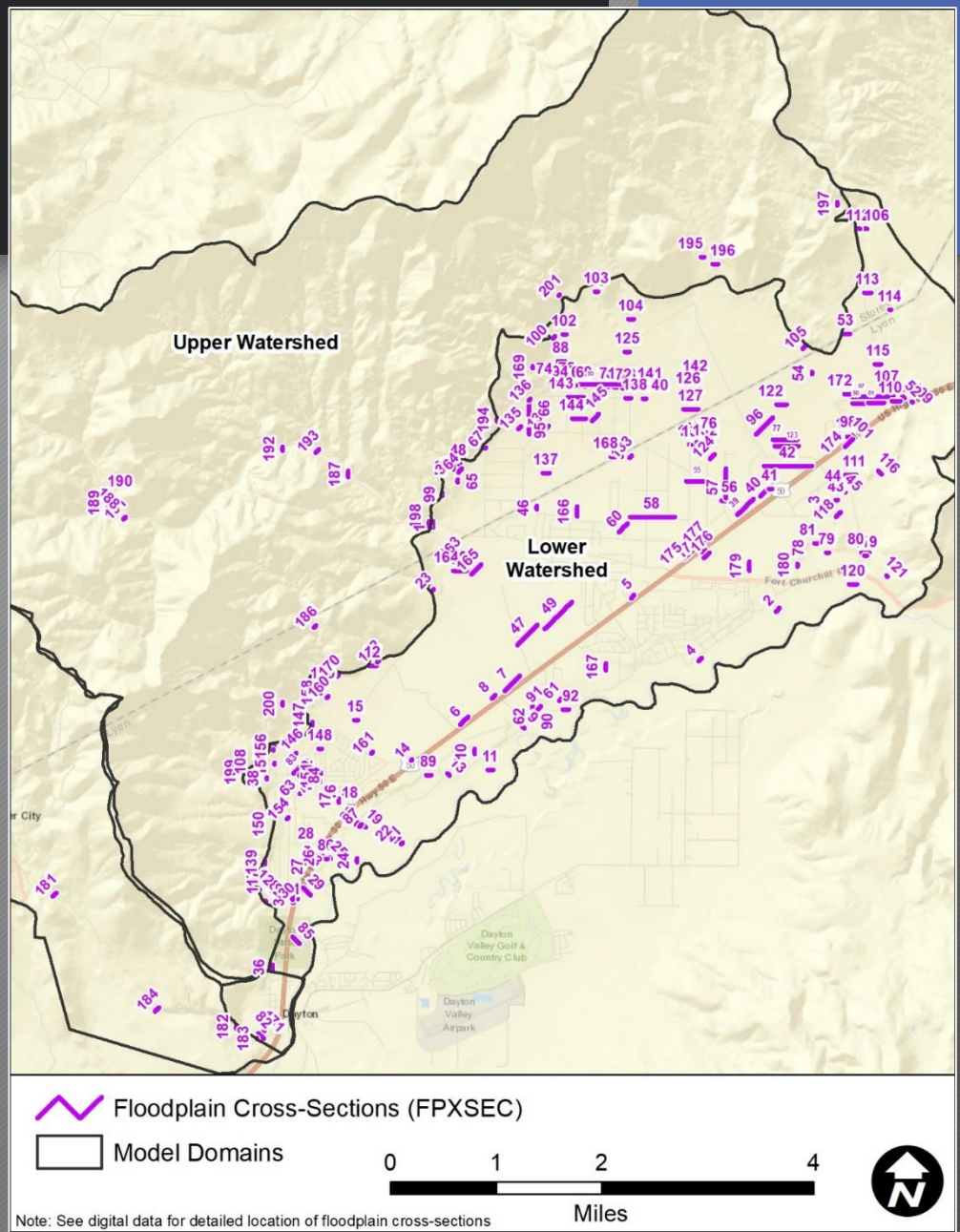

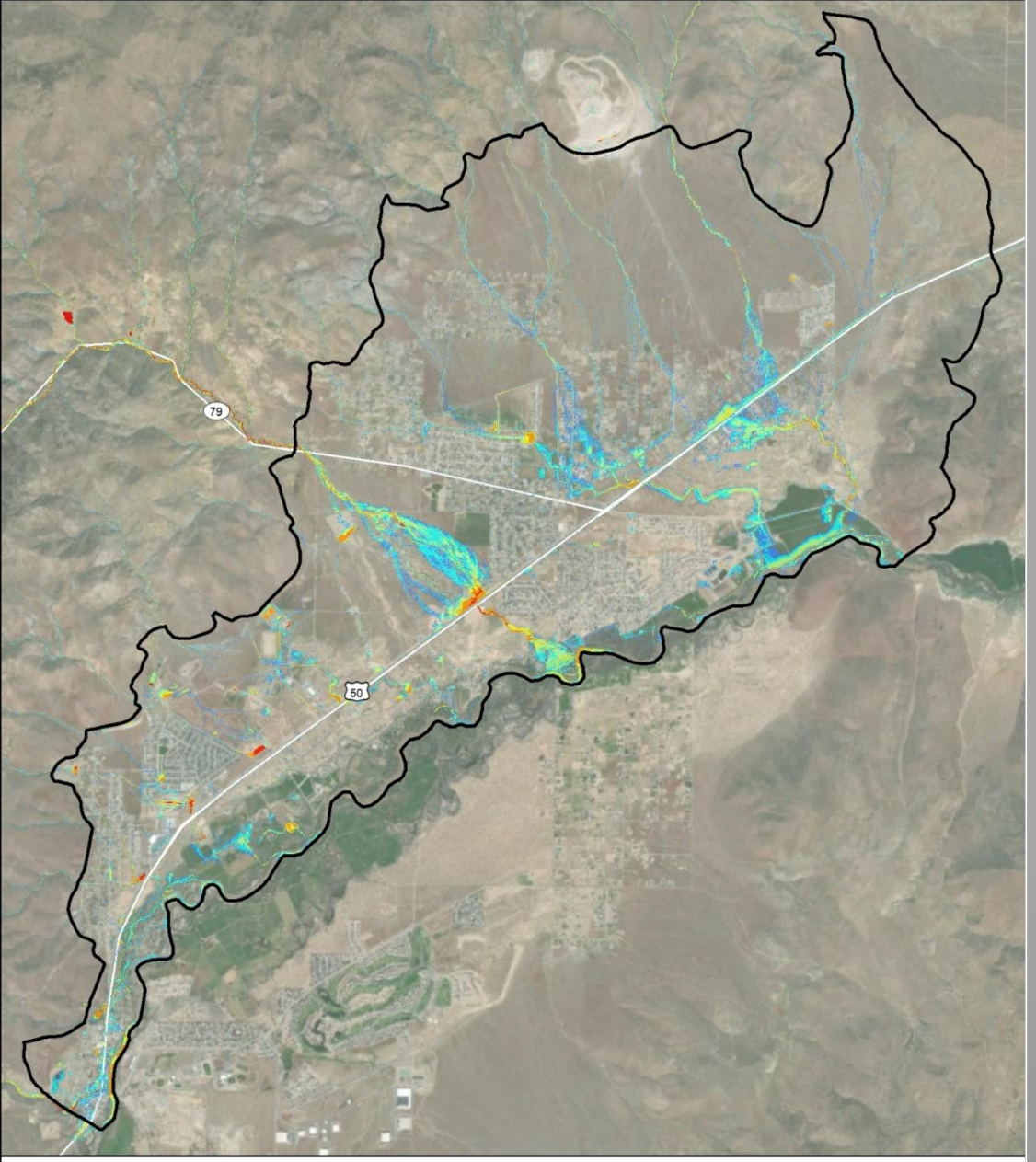

25-Year, 24-Hour Flow Depth (feet)

< 0.3	2 - 3	Lower Watershed Model Domain
0.3 - 0.5	3 - 6	
0.5 - 1	> 6	
1 - 2		

0 1 2 4

Miles

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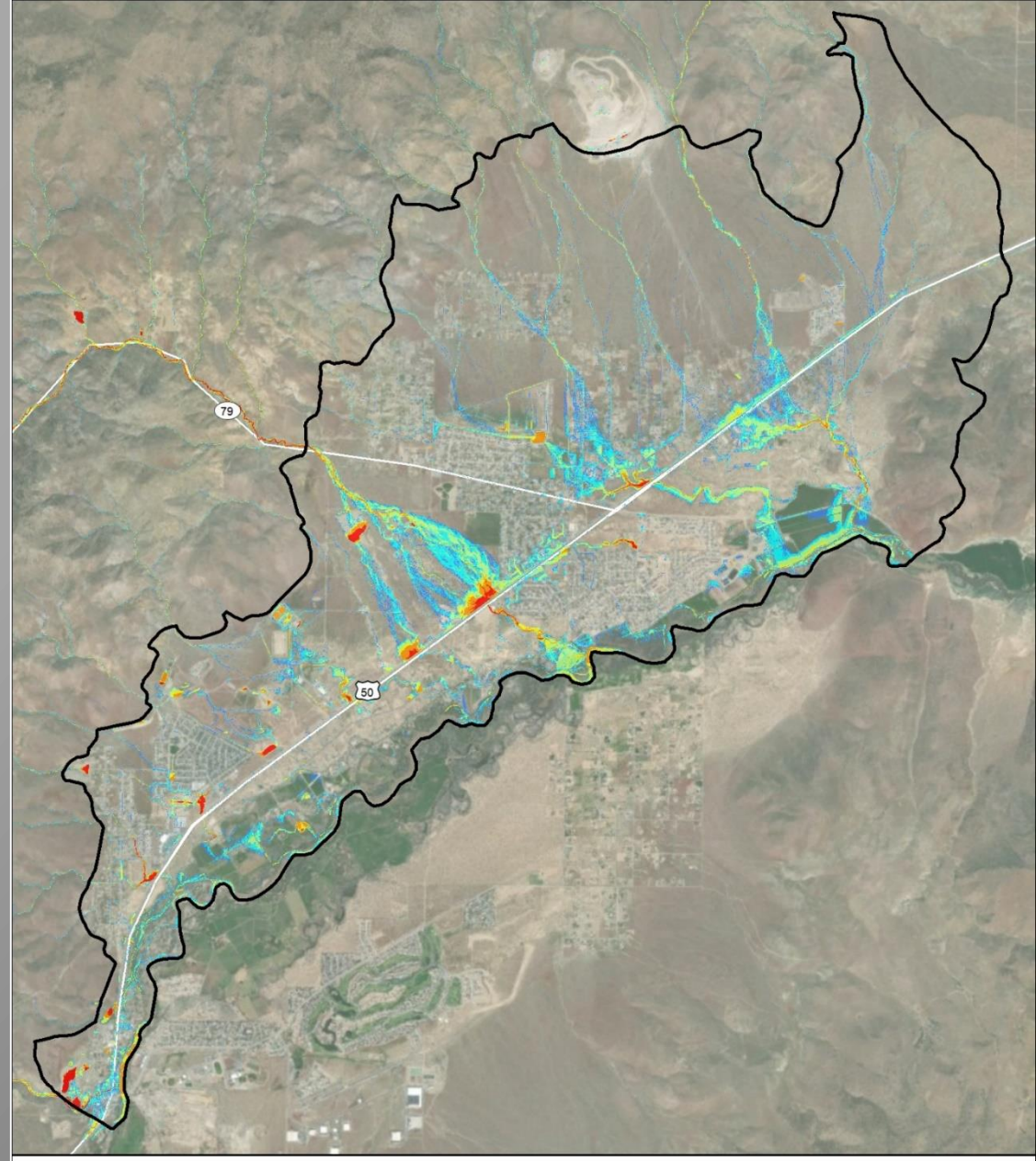

100-Year, 24-Hour Flow Depth (feet)

< 0.3	2 - 3	Lower Watershed Model Domain
0.3 - 0.5	3 - 6	
0.5 - 1	> 6	
1 - 2		

0 1 2 4

Miles


Video Slide
Animation Legend
depth
<0.15 ft
0.15-0.3 ft
0.3-1.0 ft
1.0-2.5 ft
2.5-5.0 ft
5.0-7.5 ft
7.5-10.0 ft
>10.0 ft
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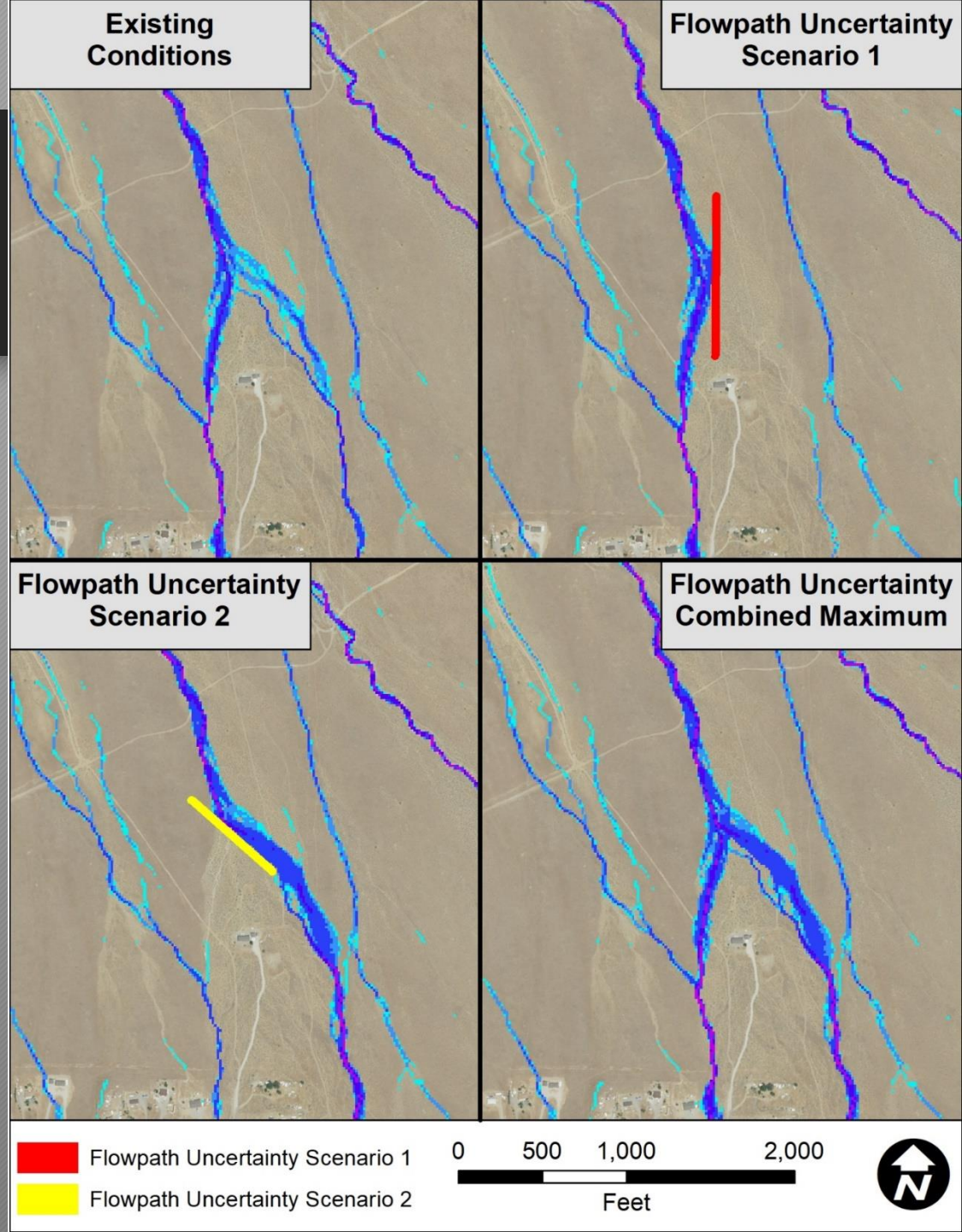
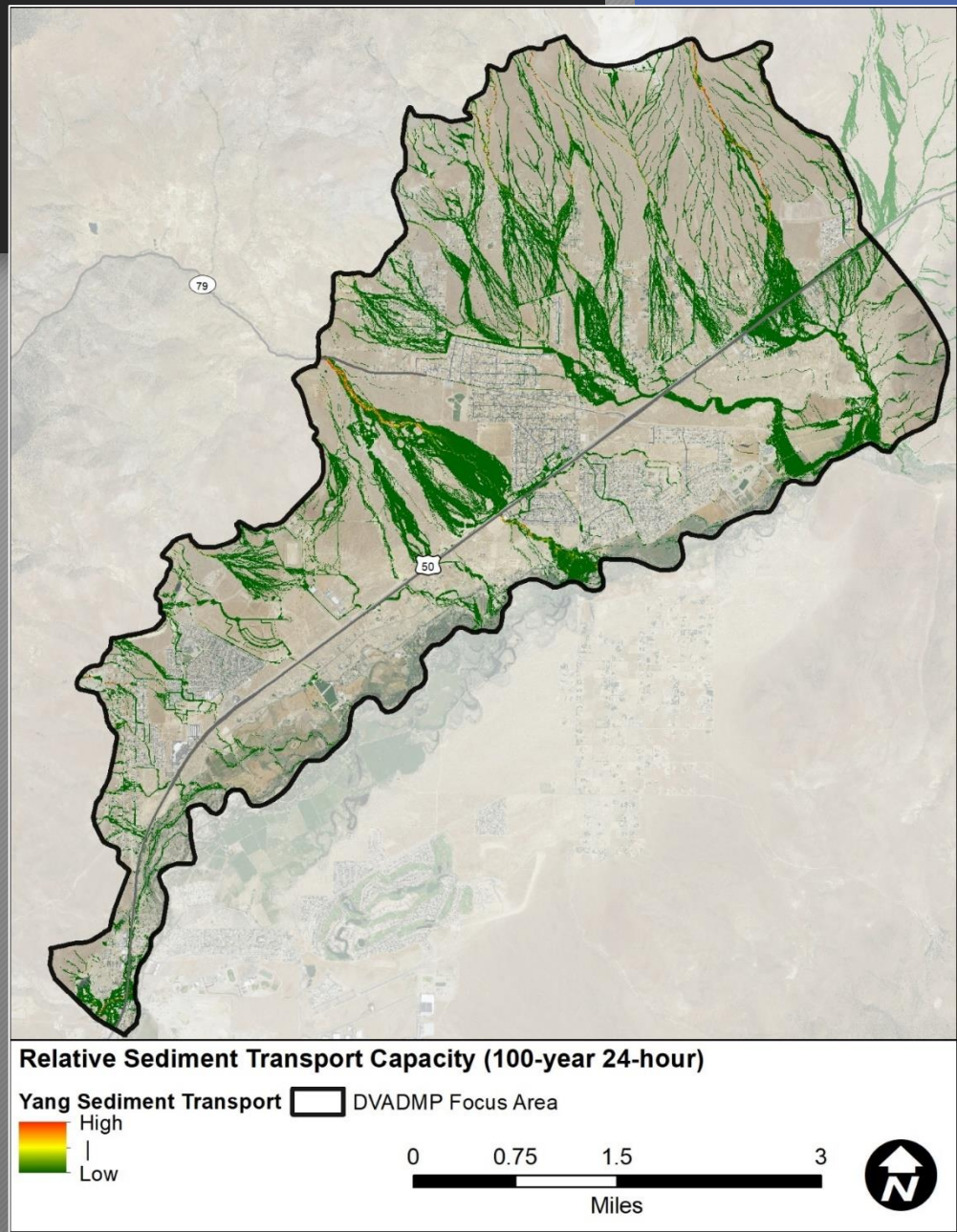
Flowpath Uncertainty Analysis

- Active Alluvial Fan Flooding
  - Flow direction/magnitude can change
    - Over time
    - Single flood event
  - Simulate changing flowpaths
  - “Virtual Levees”



Flood Hazard Assessment

- Sediment Engineering
  - Collected 24 samples
  - Washes with high sediment transport capacity
  - Identify watercourses with high sediment transport
  - Quantify sediment yield



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Sediment Sampling Locations

- Pebble Count
- Sieve Analysis

Model Domains

0 0.75 1.5 3

Miles

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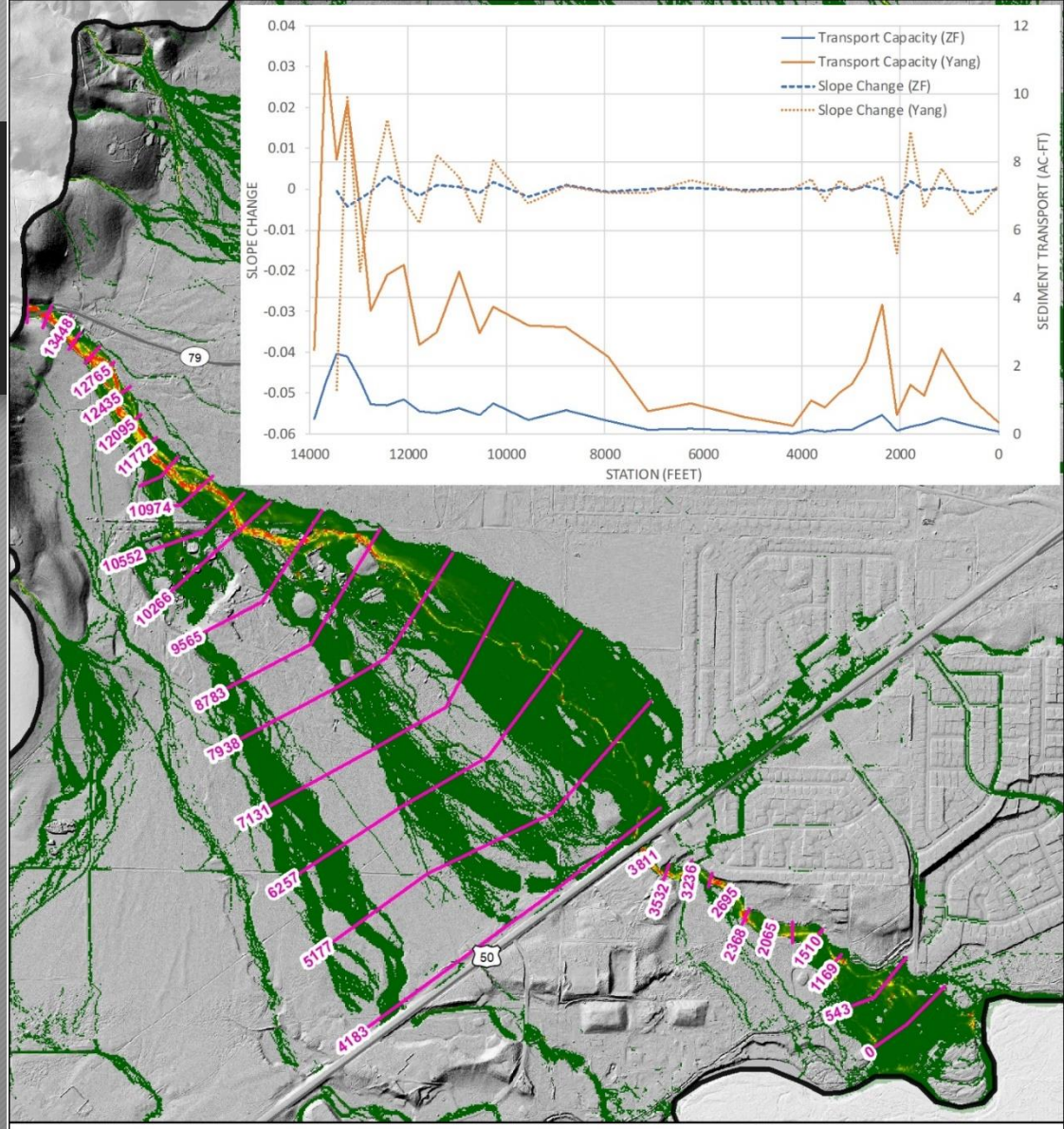


Relative Sediment Transport Capacity (100-year 24-hour) at Sixmile Canyon

Yang Sediment Transport

High

Low

DVADMP Focus Area

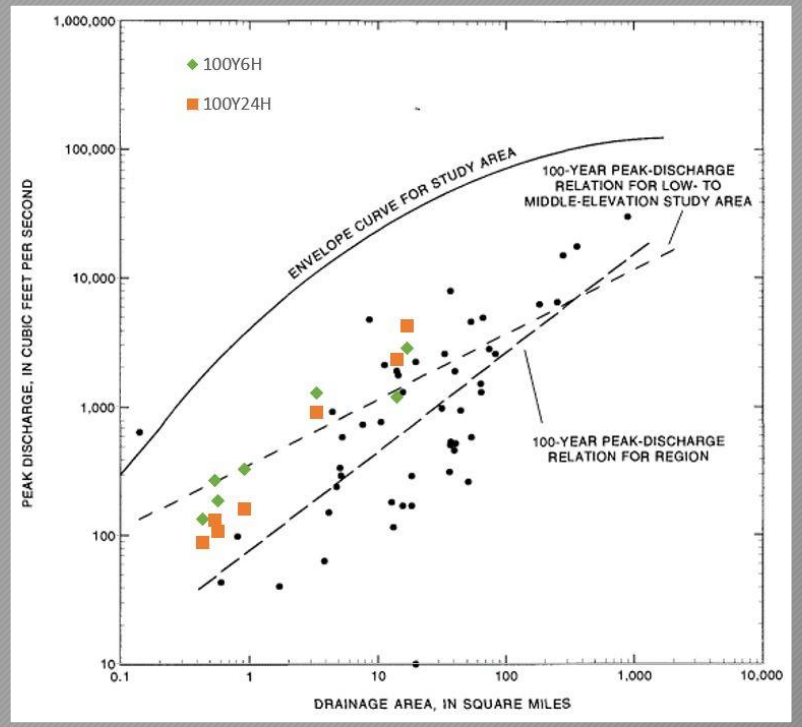
Station — Sediment Cross-sections

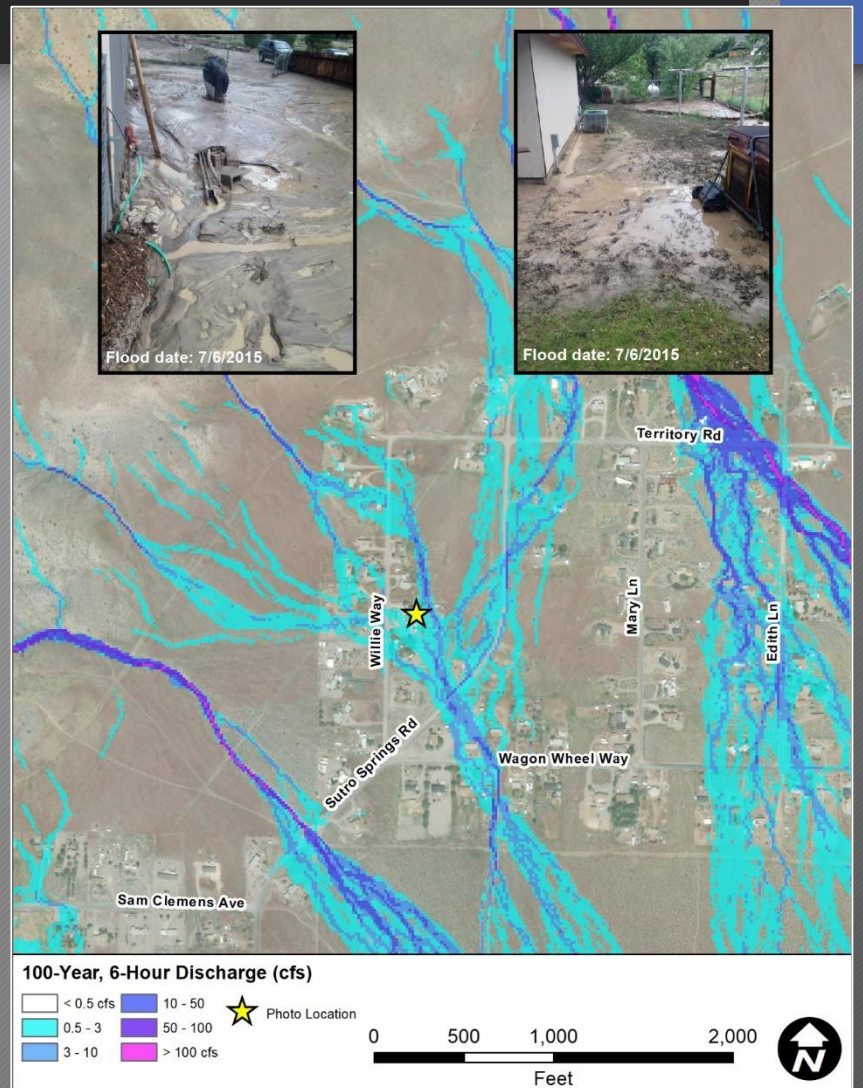
0 0.25 0.5 1

Miles

Verification of Existing Condition Results

- Models should be verified if possible
  - USGS Regression
  - Resident flooding experience





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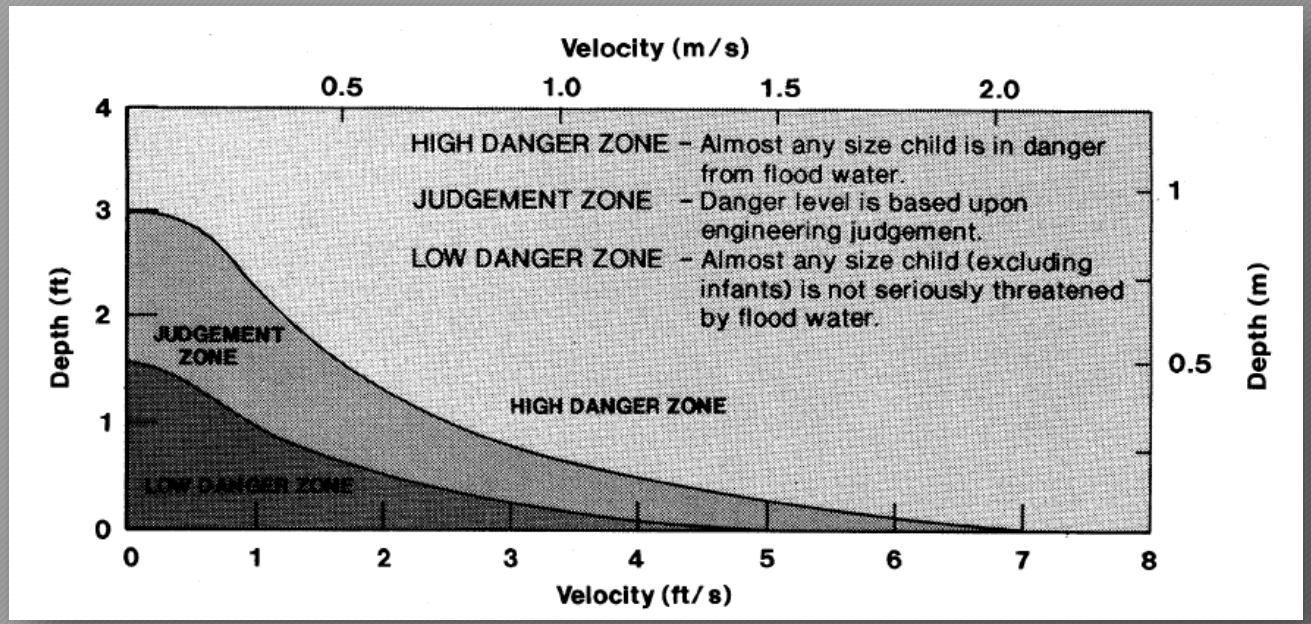
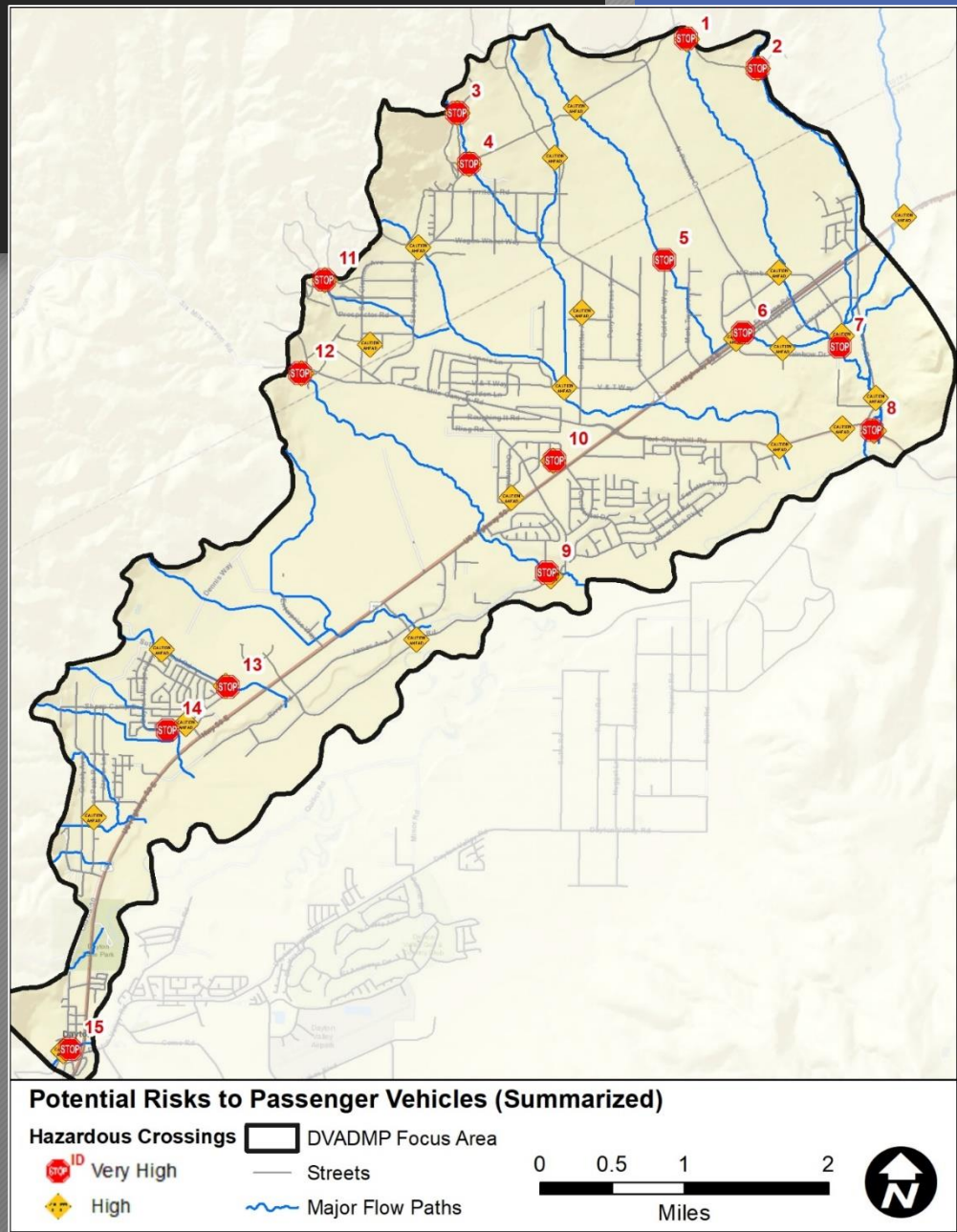
Flood Hazard Classification

- Identify specific hazard areas for:
  - USBR Guidelines
    - Pedestrians
    - Vehicles
    - Buildings





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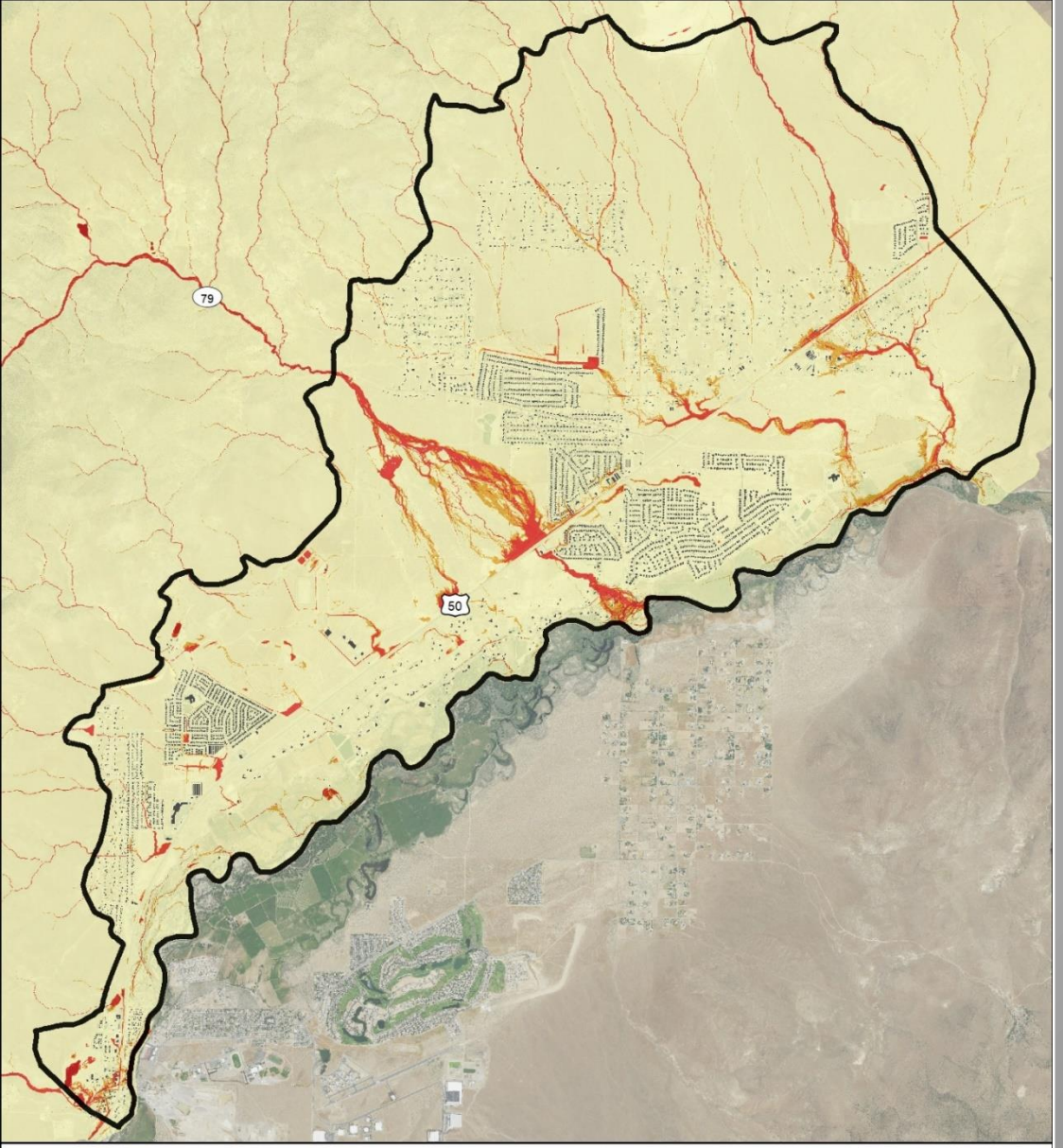

Flooding Hazards to Pedestrians (Children)

Low
Moderate
High
DVADMP Focus Area
Buildings

0 0.5 1 2
Miles

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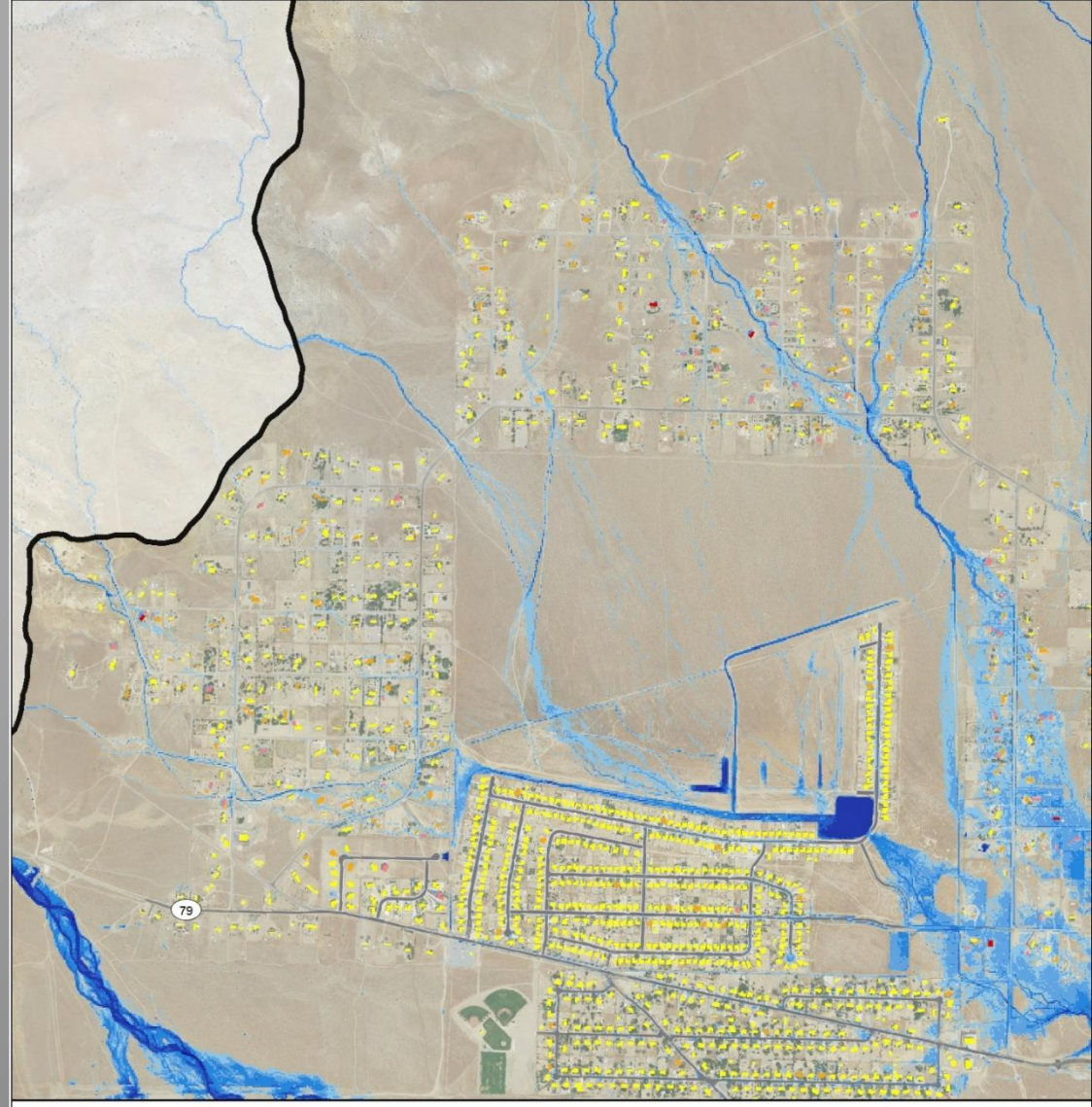

DVADMP Focus Area

Inundated Buildings

Very Low (< 3 inches)
Low
Moderate
High (> 1 foot)

100-year 24-hour Max. Depth (ft)

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

0 0.25 0.5 1
Miles

Flood Hazard Classification

- HAZUS Analysis
  - FEMA model used for estimating potential economic losses from natural disasters

Base Conditions					
Recurrence Interval	Direct Building Economic Loss				
	Residential	Commercial	Industrial	Others	Total Property*
	$ millions	$ millions	$ millions	$ millions	$ millions
25Y24H	6.93	0.89	0.22	1.28	9.32
100Y24H	12.11	1.43	0.45	1.43	15.41
100Y6H	6.25	0.73	0.16	1.05	8.20
*May not be additive due to rounding in internal HAZUS calculations					

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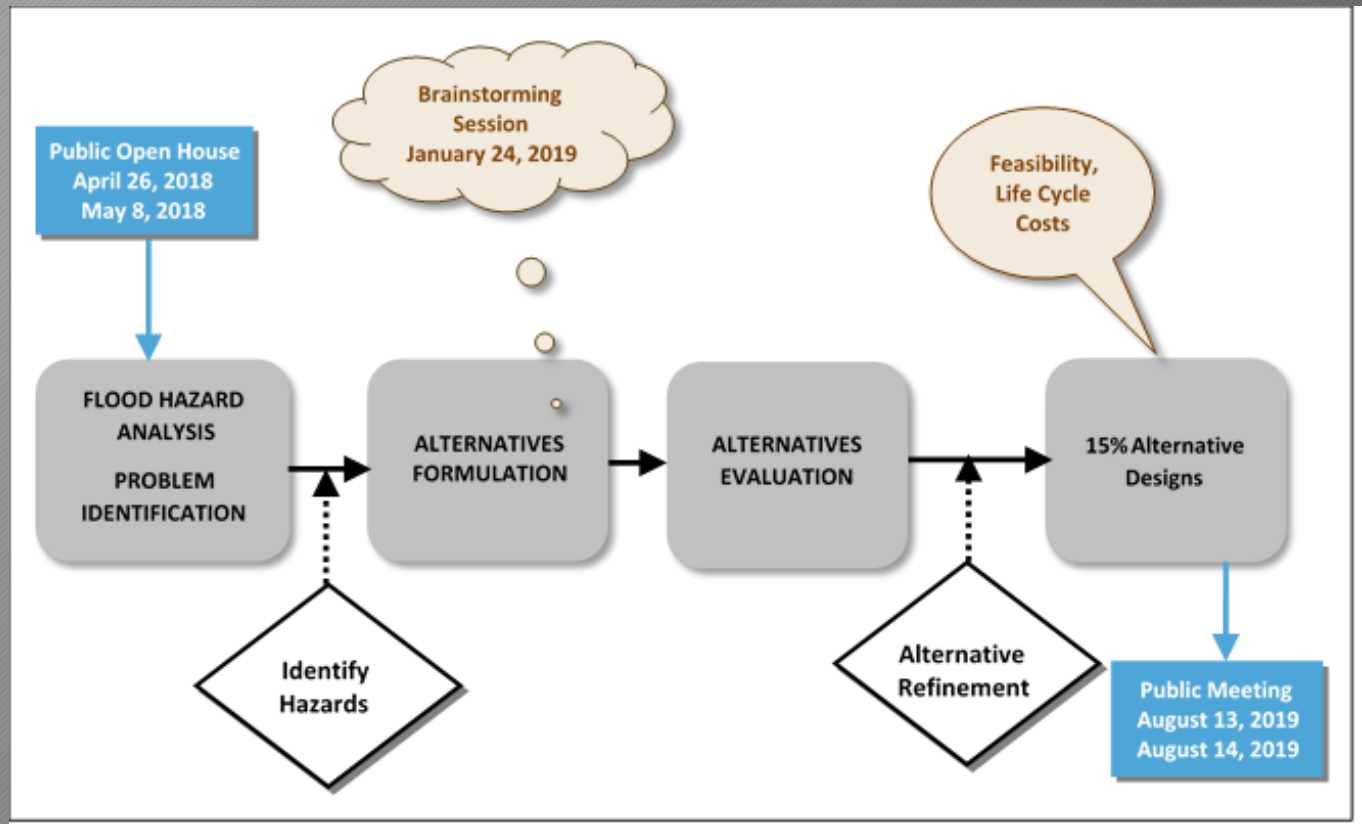
Alternatives – Regional Mitigation Alternatives

- Dayton Valley unique challenges
  - Minimal drainage infrastructure
  - Alluvial Fans
  - Highly distributary flow
- Community-wide solutions



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7 "Systems"

- Detention Basins
- Collector Channels
- Conveyance Channels
- Upsized Culverts
- New Culverts
- Storm Drain
- Lateral Weir (Gold Canyon)

Cardelli Ditch

- Siphons
- Pipes

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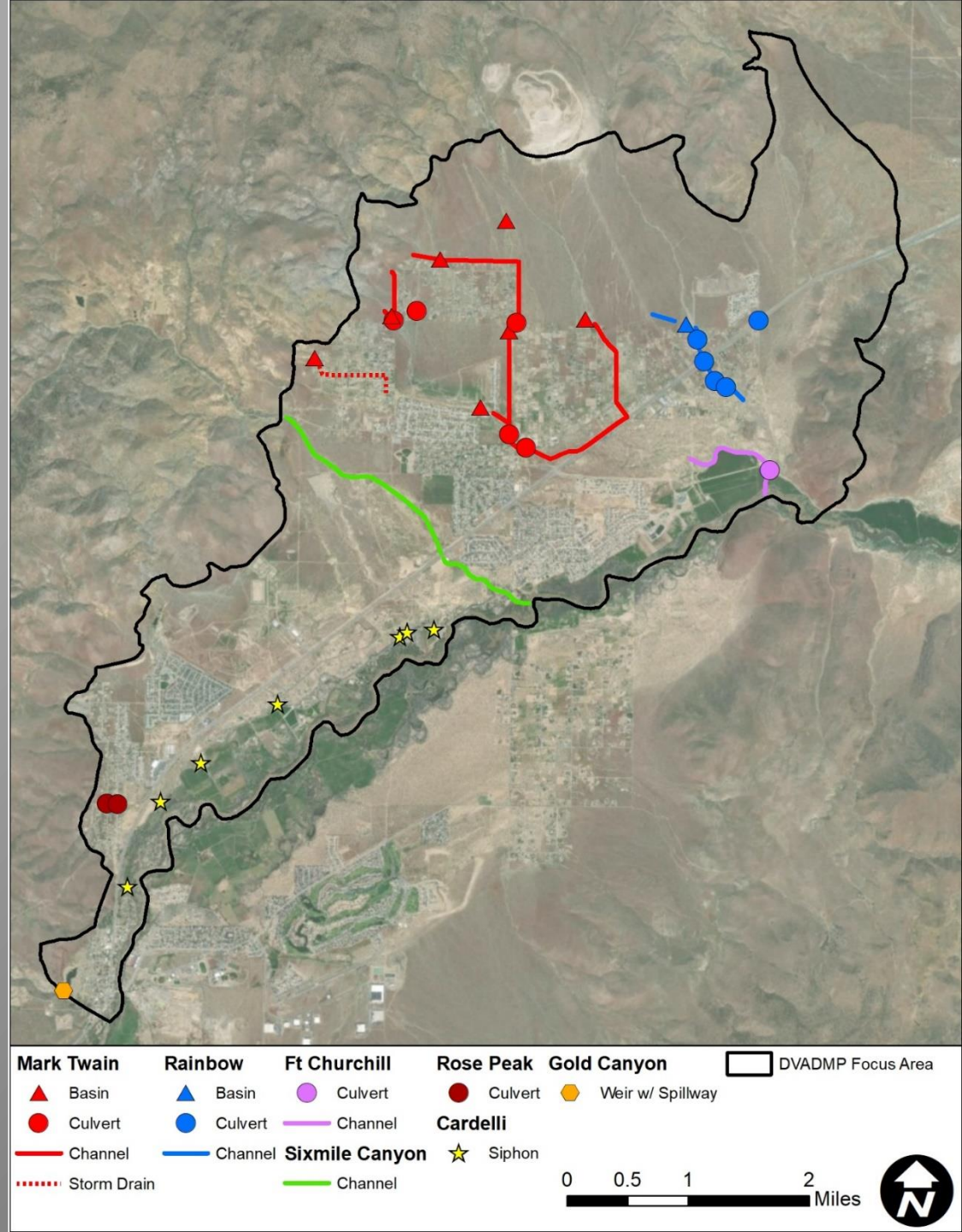
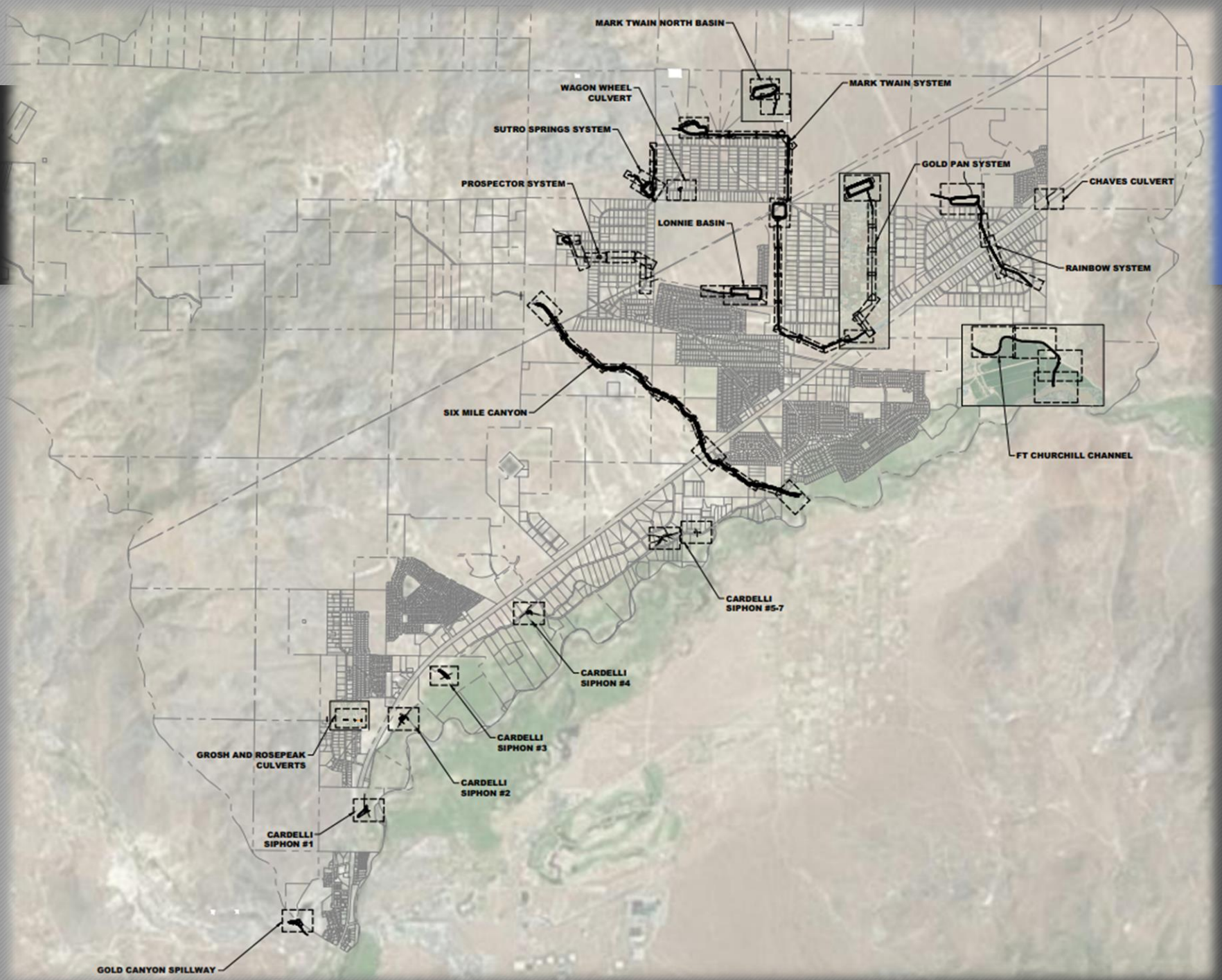


100-Year 15% Design Overview



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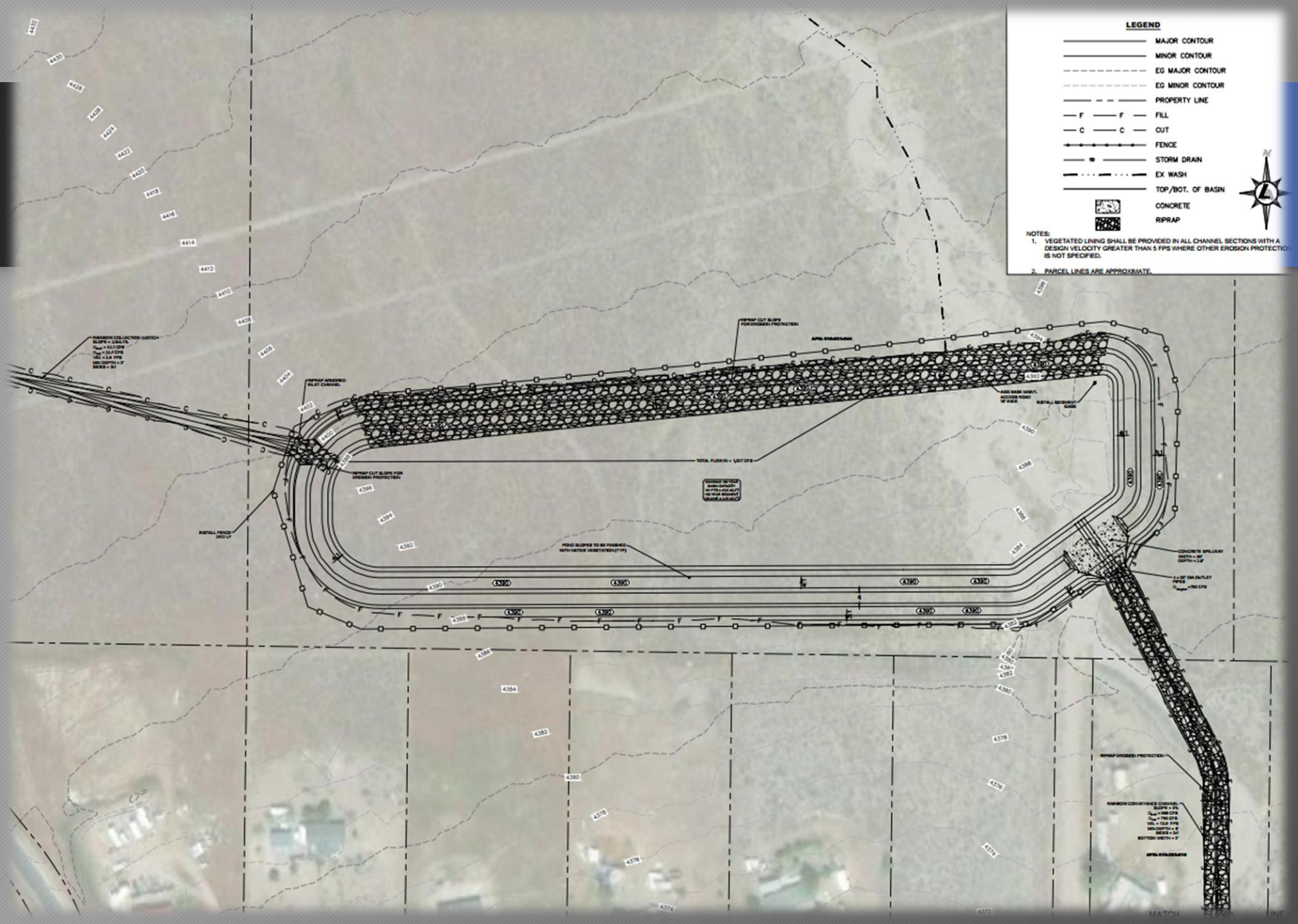
Rainbow 100-Year Basin and Channels



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Cardelli Ditch Siphons

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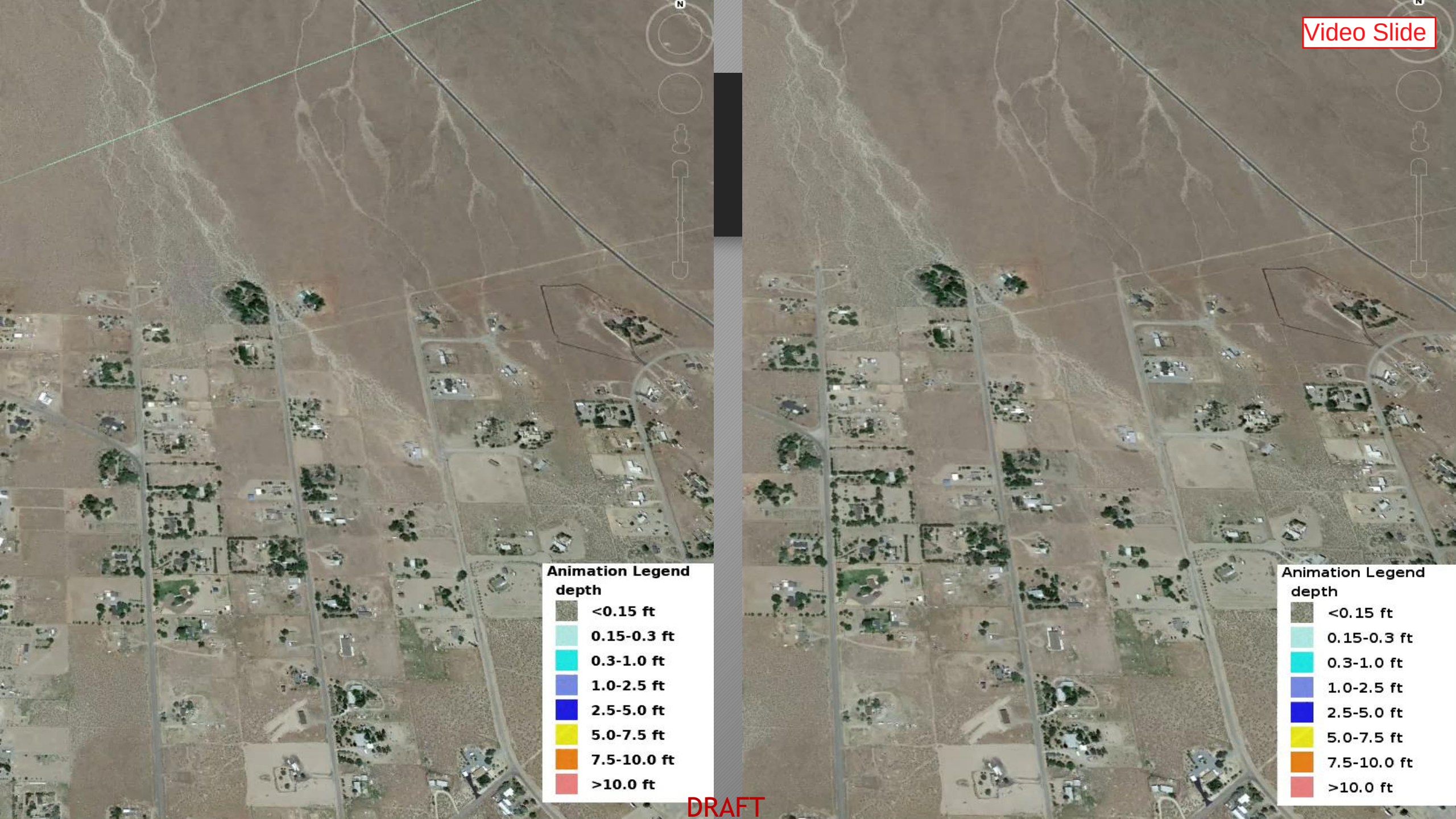
Video Slide
Animation Legend
depth
<0.15 ft
0.15-0.3 ft
0.3-1.0 ft
1.0-2.5 ft
2.5-5.0 ft
5.0-7.5 ft
7.5-10.0 ft
>10.0 ft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>10.0 ft

Building Impacts

Number Buildings Removed (potential inundation >0.25 feet)				
Regional Alternative System	25-Year Alternatives		100-Year Alternatives	
	25-Year, 24-Hour Storm	100-Year, 24-Hour Storm	25-Year, 24-Hour Storm	100-Year, 24-Hour Storm
Gold Canyon	38	42	38	40
Rose Peak	0	0	1	1
Six Mile	0	-23[1]	4	33
Mark Twain	151	151	157	191
Rainbow	60	45	61	70
Ft. Churchill	1	0	1	1
TOTALS	**250**	**215**	**262**	**336**

1. Negative value indicates an adverse impact to buildings that aren't currently impacted by flood depths >0.25 feet.

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Relative Benefit Comparison

Alternative System	Potential Percent Buildings Removed[1] from Inundation (100-Year Alternatives)	Potential Percent Buildings Removed[1] from Inundation (25-Year Alternatives)	Current Inundated Buildings in System Area[1] (100-Year Alternatives)	Current Inundated Buildings in System Area[1] (25-Year Alternatives)	Construction Cost[2] (100-Year Alternatives)	Annual Maintenance Cost[2] (100-Year Alternatives)	Construction Cost[2] (25-Year Alternatives)	Annual Maintenance Cost[2] (25-Year Alternatives)
	100-year 24-hour	25-year 24-hour	100-year 24-hour	25-year 24-hour				
Gold Canyon	58%	58%	69	66	$960,000	$1,900	-	-
Rose Peak	11%	0%	9	7	$300,000	-	$156,000	-
Six Mile	75%	0%	44	13	$17,500,000	$17,400	$3,800,000	$25,000
Mark Twain	69%	71%	277	213	$28,540,000	$85,000	$20,600,000	$74,000
Rainbow	61%	65%	114	93	$5,500,000	$12,300	$3,600,400	$12,000
Ft. Churchill	100%	100%	1	1	$2,530,000	$15,100	$1,900,000	$15,000
Cardelli Ditch Siphons	-	-	-	-	$1,310,000	-	-	-

1. Flow depth > 0.25 feet. Buildings greater than 600 square feet.

2. Construction and Maintenance costs have been rounded for simplification. See Appendix D for a detailed breakdown of cost estimates.

Potential Funding Sources (examples)

Grant	Funding Agency	Qualifications	Description
Pre-Disaster Mitigation (PDM)	FEMA	FEMA approved Hazard Mitigation Plan[1,2].	Funds the planning, design and construction of mitigation projects and provides opportunities for raising public awareness about reducing future losses before disaster strikes. PDM grants are awarded to projects that show a net benefit, i.e. a benefit cost ration greater than 1.
Flood Mitigation Assistance (FMA)	FEMA	Structures insured under the NFIP. Projects submitted for consideration must be consistent with the goals and objectives identified in the agency's Hazard Mitigation Plan.	Funds awarded to projects and planning efforts that reduce or eliminate long-term risk of flood damage to structures insured under the NFIP.
Hazard Mitigation Grant Program (HMGP)	FEMA	Presidential Major Disaster Declaration. 25% cost share from applicant.	Funding for projects listed in the community's Hazard Mitigation Plan. Funds are only released if there is a Federally declared disaster.

1. https://www.lyon-county.org/DocumentCenter/View/8670/Lyon-County-MJHMP--FINALDec-10-2018
2. https://www.storeycounty.org/DocumentCenter/View/14776/Appendix-I---SC-Hazard-Mitigation-Plan-2015-PDF?bidId=

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Alternative Priority Recommendation

ADMP Study Area		
Priority	System	Design Level
1	Rainbow	100-Year
2	Mark Twain	100-Year
3	Gold Canyon	100-Year
4	Ft Churchill	100-Year
5	Six Mile	100-Year

Mark Twain Alternatives Priority Recommendation

Mark Twain System		
Priority	**Structure**	**Design Level**
1	Gold Pan Basin and Storm Drain	100-Year
2	Prospector Basin and Storm Drain	100-Year
3	Sutro Springs Basin and Channels	100-Year
4	North Basin, West Basin, South Basin, and Channels	100-Year
5	Lonnie Basin	100-Year

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Open House for Questions

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