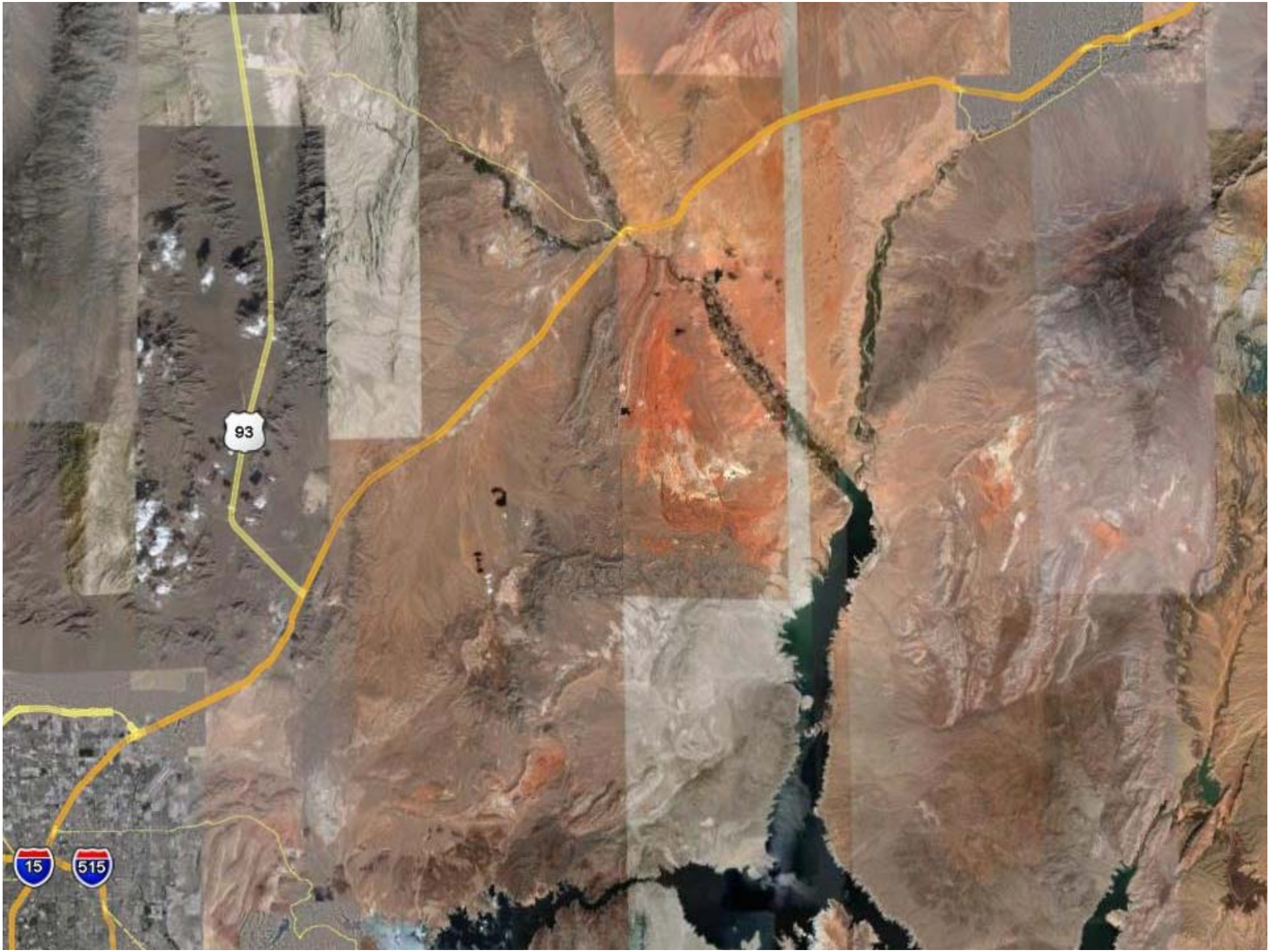
Muddy River

Proposed Revisions To Water Quality Standards

Proposed Regulation R083-08

Nevada Division of Environmental Protection Water Quality Planning Bureau

March 2008


93
15
515

Muddy River

Background

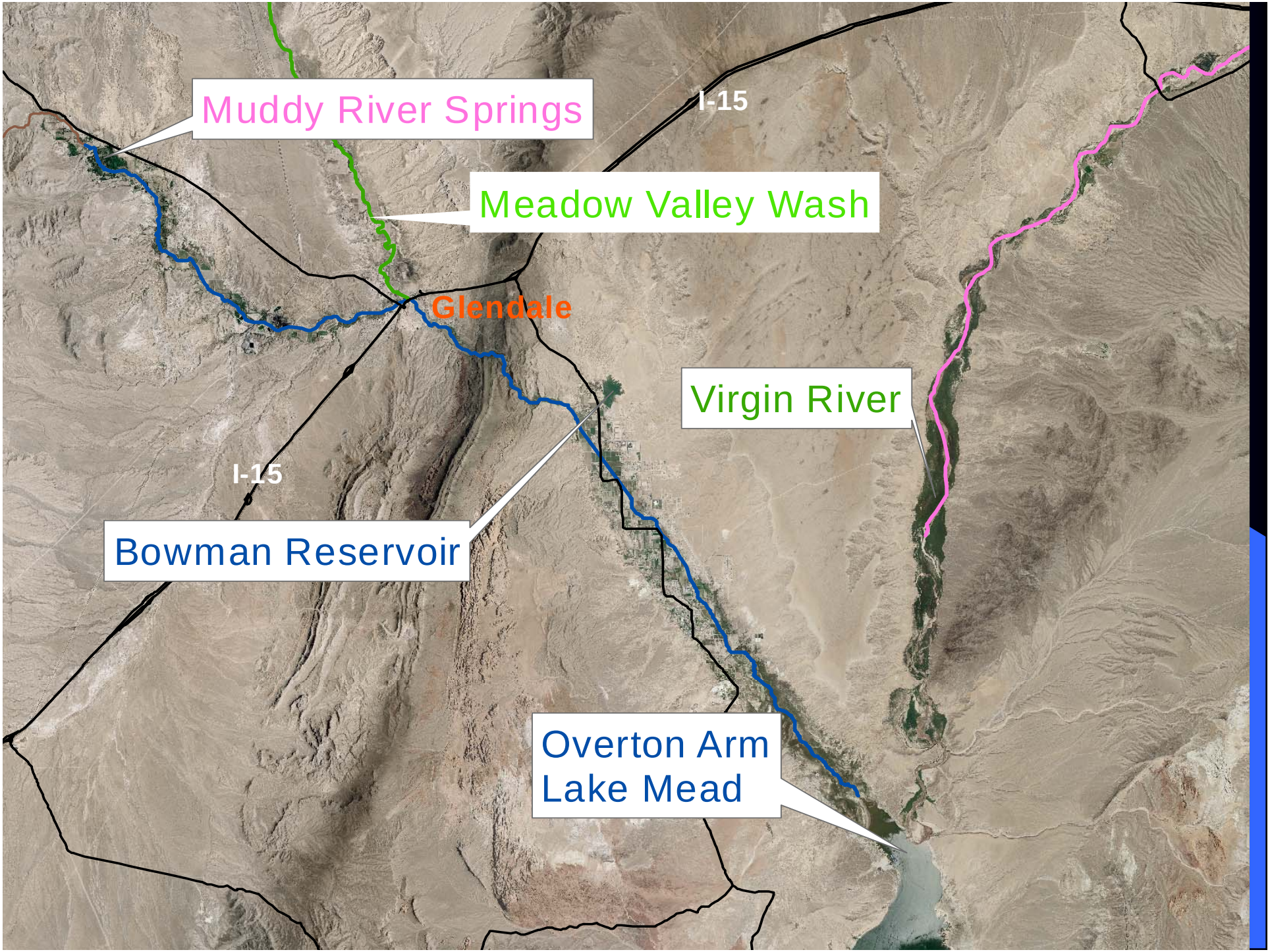
- Northeast Clark County
- Colorado River Hydrographic Basin
- Origin: Springs
- Flows 32(+) miles

Moapa-Glendale-Logandale-Overton

Muddy River

Background (continued)

- Overton Arm of Lake Mead Boulder Basin
- Prior to Hoover Dam – flowed into Virgin River
- Meadow Valley Wash
- Bowman Reservoir


Muddy River Springs
I-15
Meadow Valley Wash
Glendale
Virgin River
I-15
Bowman Reservoir
Overton Arm
Lake Mead

Muddy River Water Quality Standards Review

- Changes to Water Quality Regulations
- Revisions to Water Quality Criteria

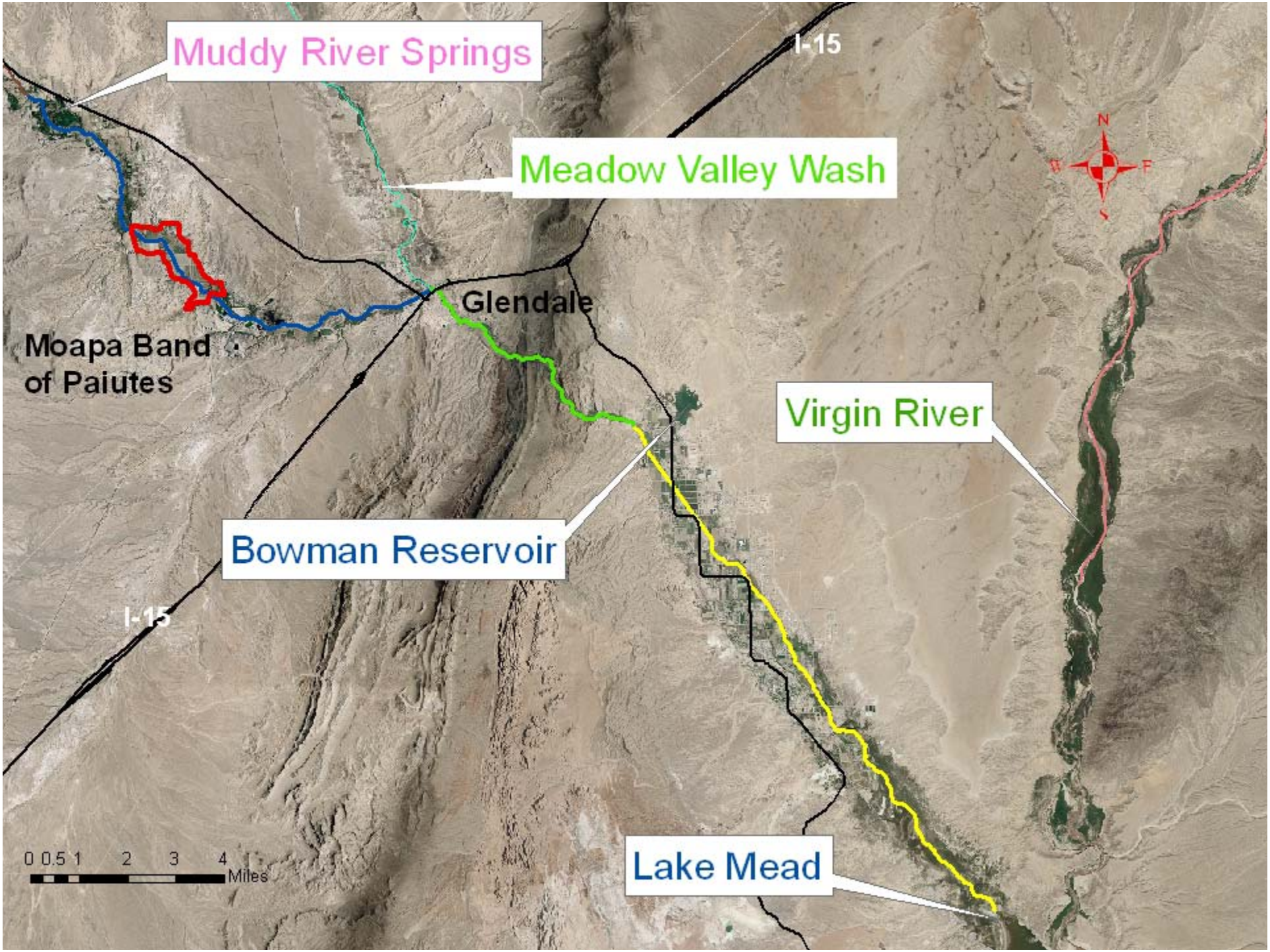
Proposed Changes
Water Quality Regulations

- Separate Muddy River Into 3 Reaches

  Upper Reach: Source to Glendale Bridge

  Middle Reach: Glendale Bridge to Wells Siding Diversion

  Lower Reach: Wells Siding to Lake Mead


Muddy River Springs
I-15
Meadow Valley Wash
Glendale
Moapa Band
of Paiutes
Virgin River
Bowman Reservoir
I-15
Lake Mead
0 0.5 1 2 3 4
Miles
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Proposed Changes
Water Quality Regulations

- Beneficial Uses

  Add "Recreation Involving Contact With Water"
  All Sections River

- Exclusion–Moapa Paiutes Tribal Land

Proposed Revisions Water Quality Criteria

E. Coli bacteria
Temperature
Fluoride
Color (upper reach)
Boron (lower reach)

Proposed Revisions Water Quality Criteria

***E. Coli* bacteria**
Temperature
Fluoride
Color (upper reach)
Boron (lower reach)

Proposed Revisions *E. coli* Bacteria Criteria

Rationale

- Clean Water Act Goals
- Water Recreation Activities

Proposed Revisions

E. coli Bacteria Criteria

Existing: ≤ 630 per 100 ml (AGM)

Proposed: ≤ 126 per 100 ml (AGM)

≤ 410 per 100 ml (SV)

Proposed Revisions Water Quality Criteria

E. Coli bacteria
Temperature
Fluoride
Color (upper reach)
Boron (lower reach)

Muddy River Temperature Water Quality

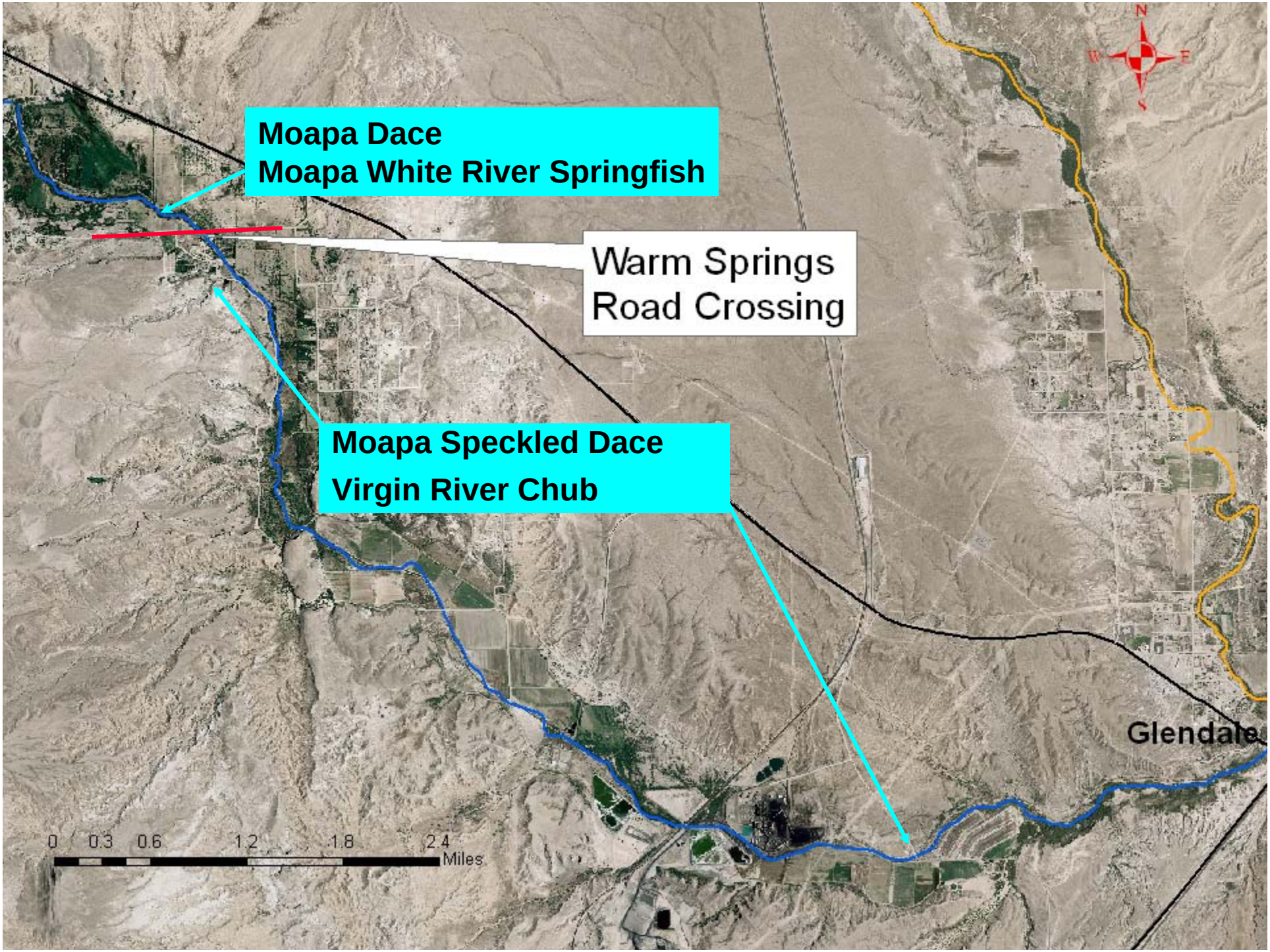
Seasonal Criteria

- $\leq$ 21 °C (November to June)
- $\leq$ 32 °C (July to October)
- $\Delta T \leq 2$ °C (BUS)
- $\Delta T = 0$ °C (anti-degradation)

Proposed Revisions Temperature Water Quality Criteria

Approach

- Distribution of native fish species
- Habitat temperature preferences
- Consultation meetings NDOW & USFWS


Moapa Dace
Moapa White River Springfish
Warm Springs
Road Crossing
Moapa Speckled Dace
Virgin River Chub
Glendale
N
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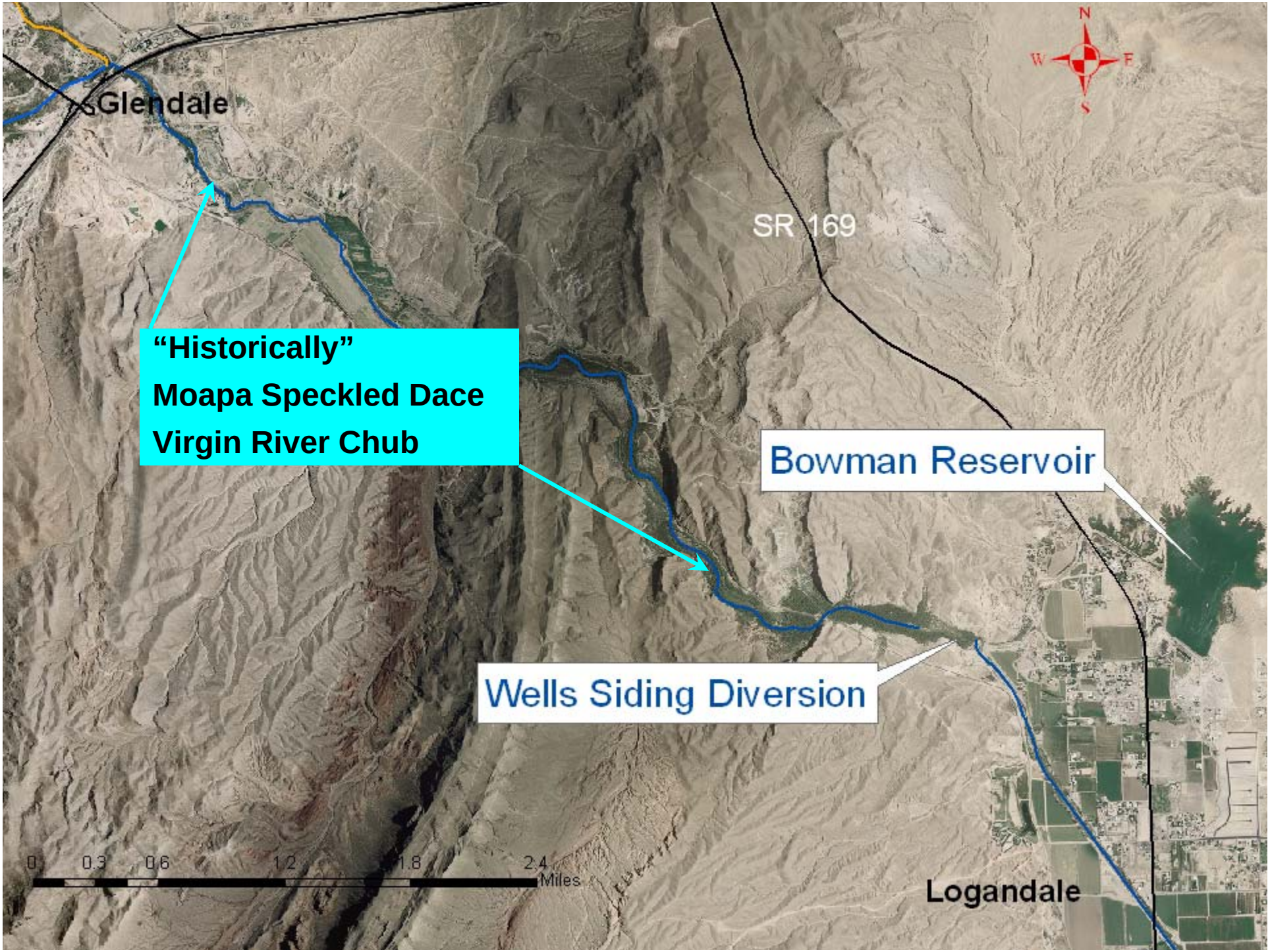
0 0.3 0.6 1.2 1.8 2.4
Miles


Glendale
SR 169
"Historically"
Moapa Speckled Dace
Virgin River Chub
Bowman Reservoir
Wells Siding Diversion
Logandale
N
W
E
S
0
0.3
0.6
1.2
1.8
2.4
Miles

Proposed Temperature Water Quality Criteria

Upper Reach	
Above Warm Springs Rd.	$19\ °C \leq T \leq 32\ °C$
Below Warm Springs Rd.	$15\ °C \leq T \leq 30\ °C$
Middle Reach	$15\ °C \leq T \leq 30\ °C$
Lower Reach	$T \leq 32\ °C$
For all reaches	$\Delta T \leq 2\ °C$ (BUS) & $\Delta T = 0\ °C$ (RMHQ)

Proposed Revisions Water Quality Criteria

E. Coli bacteria
Temperature
Fluoride
Color (upper reach)
Boron (lower reach)

Fluoride Criteria

- Statewide Fluoride Criteria – NAC 445A.144
- EPA Blue Book 1972 Recommendations

  Irrigation Criteria

  1 mg/l for continuous irrigation

  [15 mg/l for irrigation (20 yrs) on neutral alkaline soils]

  Livestock Watering Criteria

  2 mg/l recommended as upper limit for fluoride in livestock drinking waters

Muddy River Fluoride Levels

- Source Springs – Upper River
  - Elevated Natural Background Levels
    - > 2 mg/l
- Lower Section River
  - Reduced Flow (≈ 70 pct)
  - Evaporative Concentration of Fluoride Levels (≈ 20 pct increase)

Proposed Revisions
Fluoride Water Quality Criteria

Approach

- 95th Percentile of Measured Levels

Proposed Criteria

- Upper River 2.6 mg/l
- Lower River 3.6 mg/l

Evaluation
Proposed Fluoride Criteria

- Beneficial Uses

  Support - Protect
- Irrigation and Livestock Watering

Irrigation - Fluoride

- Recent scientific studies have shown:

  Alkaline soils with clays, calcium, and organic material limit fluoride mobility and availability.

  Secondary transfer of fluoride to livestock not as critical of an issue as once thought to be.

Irrigation
Fluoride Toxicity

- Deposition of soluble fluoride salts on plants rather than root uptake.
- Work published by Kabata-Pendias (2001)

  Growth of certain species of plants able to withstand high fluoride concentrations

Barley grass/sorrel	24 mg/l
Oats	32 mg/l

Proposed Fluoride Criteria Irrigation

Evaluation

- Moapa Valley soils are alkaline (pH 7-9) with clays, calcium, & organics (USGS and NRCS soil surverys)

Proposed Fluoride Criteria Irrigation

Evaluation

- Flood irrigation techniques used in Moapa Valley
- Alfalfa hay is major forage crop grown

Livestock Watering Fluoride

- Recent scientific studies have shown:
  - Cattle most sensitive livestock
  - Fluoride effects – chronic
  - Dairy Cattle – target group

Fluoride Thresholds

	Diet dry matter (mg/kg F)	Drinking Water (mg/l F)
Young Dairy Cattle	30	2.5 - 4.0
Mature Dairy Cattle	40	3 - 6
Mature Beef Cattle	50	4 - 8
Slaughter Cattle	100	12 - 15

Source: Puls (1994) Mineral Levels in Animal Health

Proposed Fluoride Criteria
Livestock Watering

Evaluation

In Moapa Valley

- No active dairy operations
- Small-scale cattle production

Proposed Revisions Water Quality Criteria

E. Coli bacteria
Temperature
Fluoride
Color (upper reach)
Boron (lower reach)

Proposed Revisions Color Criteria

Rationale

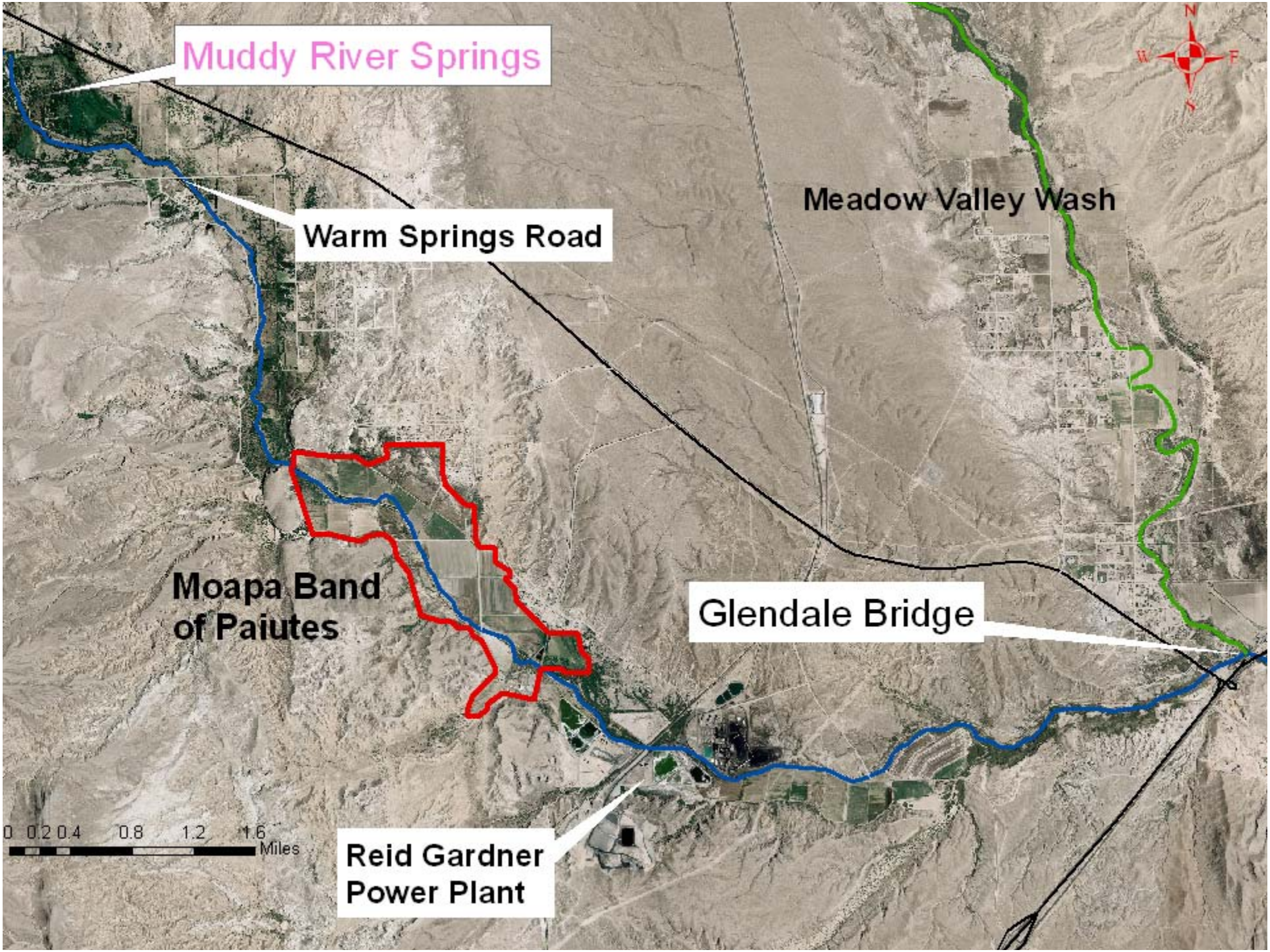
- Upper Muddy River – Municipal and Domestic Supply Beneficial Use
- ≤ 75 color units (EPA Gold Book 1986)

Summary
Upper Reach

Water Quality Regulations

- Beneficial Uses

  Add contact recreation
- Exclusion – Moapa Band of Paiutes Tribal Land


Muddy River Springs
Warm Springs Road
Meadow Valley Wash
Moapa Band
of Paiutes
Glendale Bridge
Reid Gardner
Power Plant
0 0.2 0.4 0.8 1.2 1.6
Miles
N
W
E
S

Summary
Upper Reach

Water Quality Criteria

NAC 445A.210 with following exceptions:

Temperature

19 °C - 32 °C (source to Warm Springs Rd)

15 °C - 30 °C (Warm Springs Rd to Glendale Br)

Summary
Upper Reach

Water Quality Criteria

NAC 445A.210 with following exceptions:

Color	≤ 75 PCU
E. coli	≤ 126 per 100 ml (AGM)
	≤ 410 per 100 ml (SV)
Fluoride	≤ 2.6 mg/l

Upper Reach – Water Quality Temperature

Warm Springs Road

July 1989 – Oct 1993 USGS

18 °C – 31 °C

June 2005 – Jan 2008 NDEP

25 °C – 30 °C

Glendale Bridge (Apr 1985 – Jan 2008)

15 °C – 28 °C

Upper Reach – Water Quality Glendale Bridge

Color (Apr 1985 – Jan 2008)

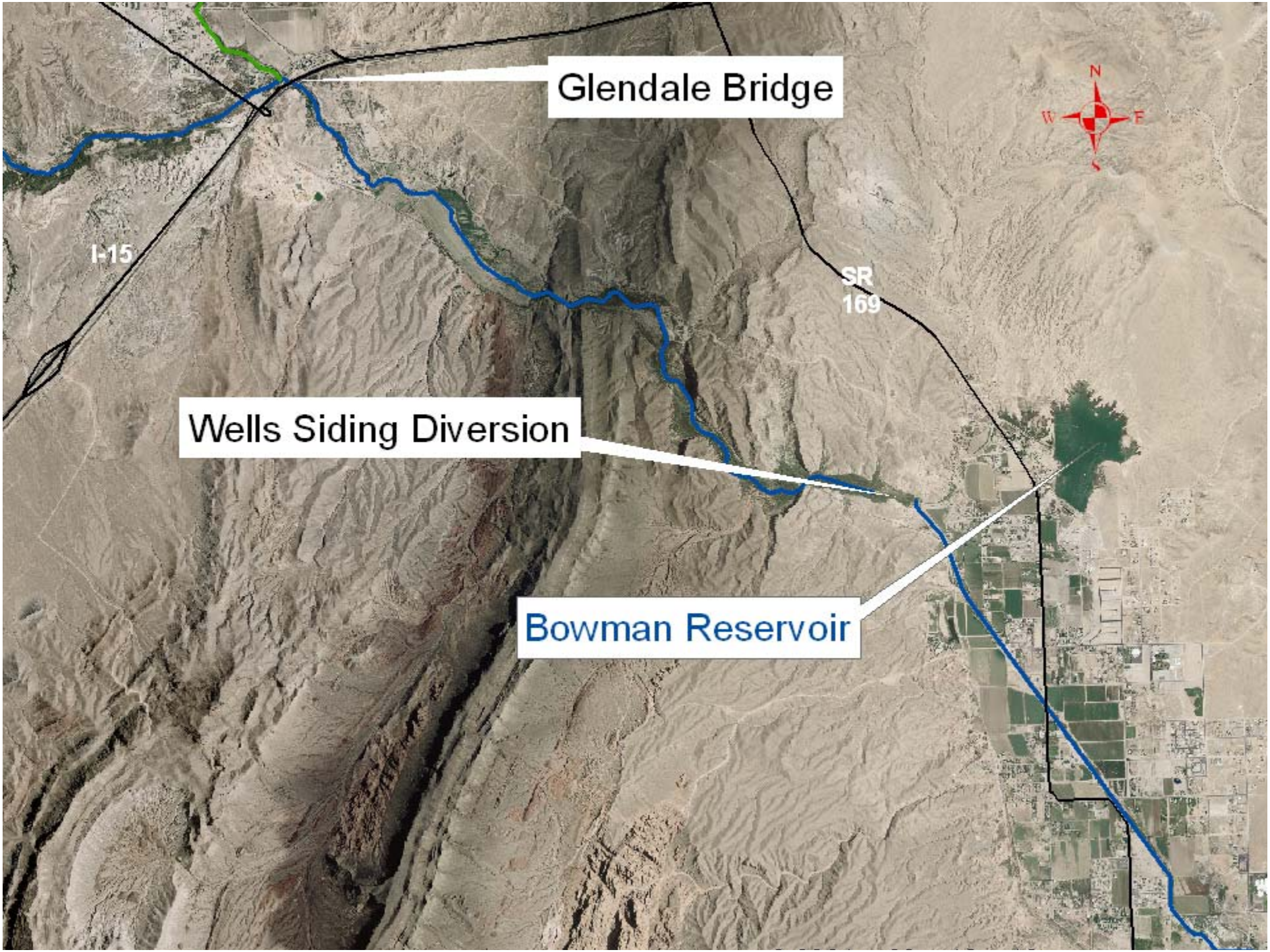
3 PCU – 45 PCU Ave. 12 PCU

E. coli (SV) (May 1995 – Jan 2008)

4 to 2005 (no/100ml) Ave. 257 no/100ml

Fluoride (July 2004 – Jan 2008)

2.3 mg/l to 2.6 mg/l Ave. 2.4 mg/l


Glendale Bridge
I-15
SR
169
Wells Siding Diversion
Bowman Reservoir
N
W
E
S

Summary
Middle Reach

Water Quality Regulations

- Create middle reach
- Beneficial Uses

  Add contact recreation

Summary
Middle Reach

Water Quality Criteria

NAC 445A.211 with following exceptions:

Temperature 15 °C – 30 °C

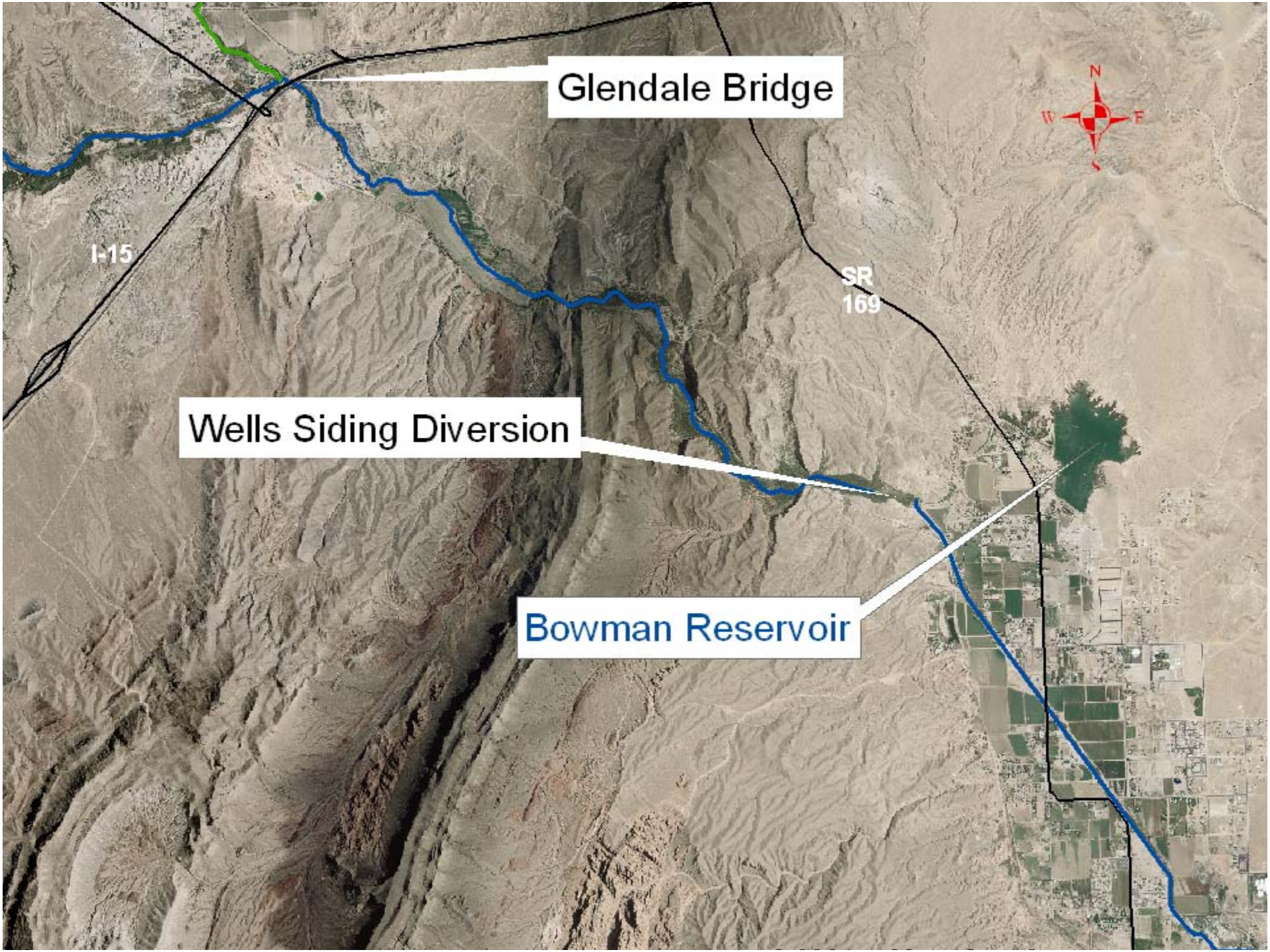
E. coli ≤ 126 per 100 ml (AGM)

≤ 410 per 100 ml (SV)

Fluoride ≤ 2.6 mg/l

Middle Reach – Water Quality Wells Siding Diversion Dec. 2006 – Jan 2008

Temperature	16 °C – 27 °C	
E. coli (no/100ml)	20 to 306	Ave. 136
Fluoride (mg/l)	2.3 to 2.4	Ave. 2.35


Glendale Bridge
I-15
SR
169
Wells Siding Diversion
Bowman Reservoir
N
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S

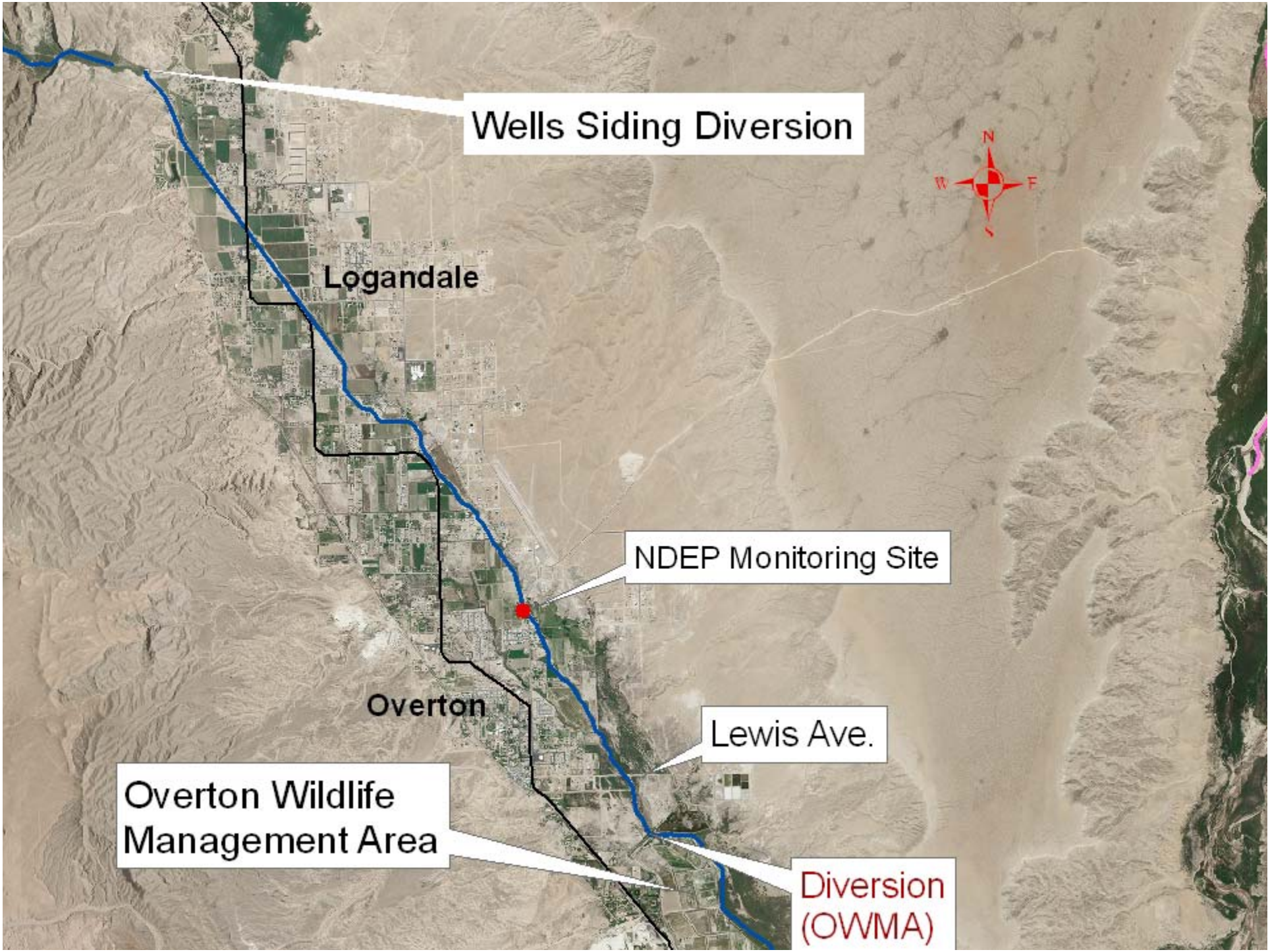
Summary
Bowman Reservoir

- Class Waters Restructuring (NDEP-BWQP)
- Water Quality Criteria

  NAC 445A.126 with following exceptions:

  Fluoride: 2.6 mg/l

  TDS: change to reflect water of Colorado River basin


Wells Siding Diversion
N
W
E
S
Logandale
NDEP Monitoring Site
Overton
Lewis Ave.
Overton Wildlife
Management Area
Diversion
(OWMA)

Proposed Revisions Water Quality Criteria

E. Coli bacteria
Temperature
Fluoride
Boron (lower reach)

Lower Muddy River Boron Irrigation Criteria

- Existing Irrigation Criteria: 0.75 mg/l
  Tolerance level for "sensitive" plants to boron
- Propose Revised Criteria
  Based on "how & where" water used
  Types of crops/plants grown
  Boron tolerance level for "non-sensitive" plants

Boron Tolerance Limits

Boron (mg/l)	Crops
< 0.75	Lemon, Orange, Peach, Grape, Walnut, Pecan
0.75 to 1.0	Garlic, Wheat, Bean, Sunflower, Strawberry
1.0 to 2.0	Broccoli, Pea, Carrot, Radish, Potato, Lettuce
2.0 to 4.0	Cabbage, Barley, Oats, Corn, Artichoke, Clover (sweet), Squash
4.0 to 6.0	Alfalfa, Parsley, Beet, Tomato

Source: Maas, (1990) Salt Tolerance of Plants, CRC Handbook of Plant Science in Agriculture.

Summary
Lower Reach

Water Quality Regulations

- Revise reach
- Beneficial Uses

  Add contact recreation

Summary
Lower Reach

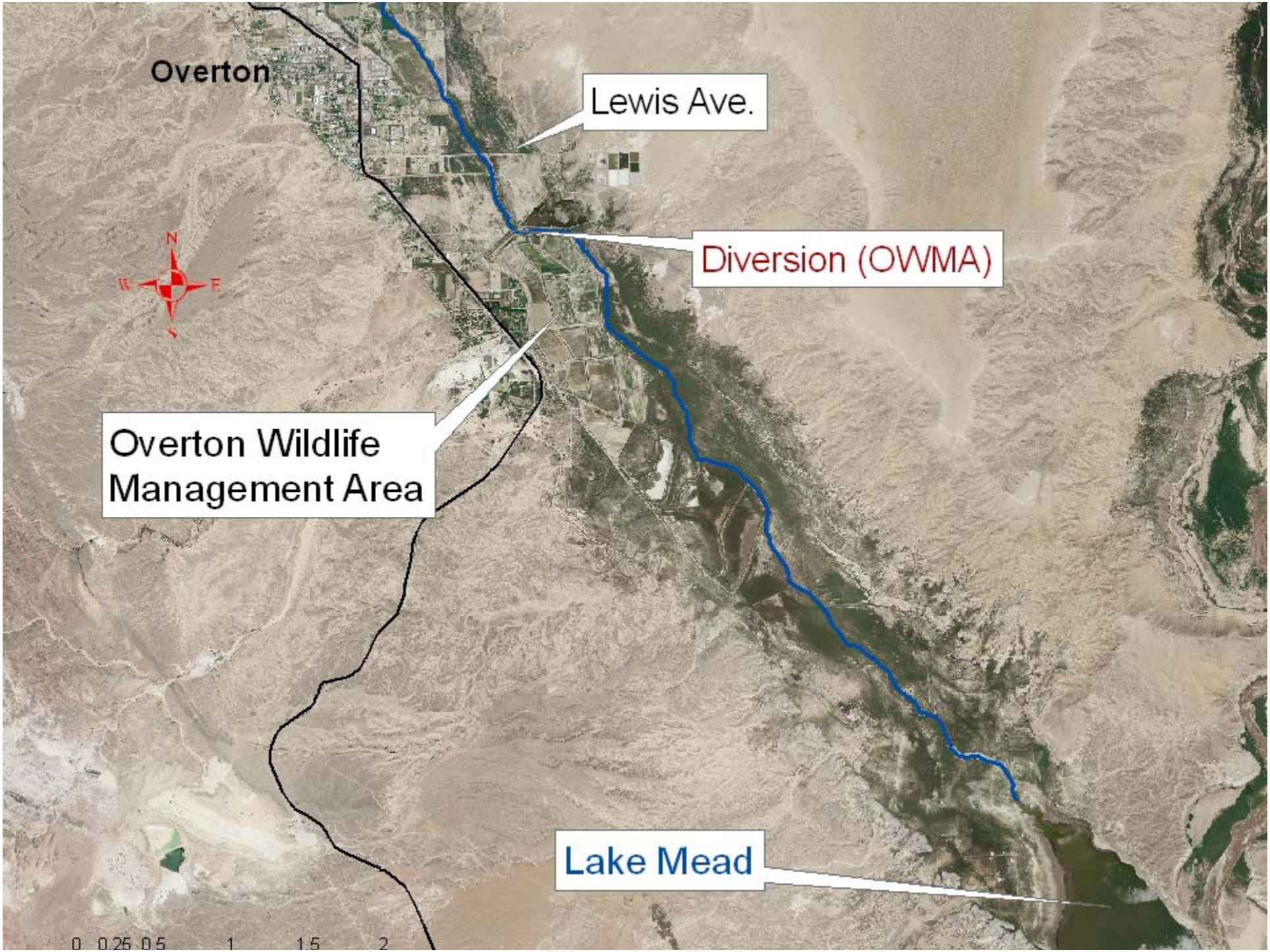
Water Quality Criteria

NAC 445A.211 with following exceptions:

Temperature	≤ 32 °C
E. coli	≤ 126 per 100 ml (AGM)
	≤ 410 per 100 ml (SV)
Fluoride	≤ 3.6 mg/l
Boron	≤ 2.0 mg/l (irrigation)

Lower Reach – Water Quality Overton – Wildlife Refuge

Temperature	11 °C – 29 °C
E. coli (SV)	10 to 1200 (no/100ml)
Fluoride	0.5 mg/l to 4.0 mg/l
Boron	0.6 mg/l to 2.1 mg/l


Overton
Lewis Ave.
Diversion (OWMA)
Overton Wildlife Management Area
Lake Mead
N
W
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S
0 0.25 0.5 1 1.5 2

Impacts to Lake Mead

- Fluoride
- Overton Arm Monitoring

  Historical and On-going

  Fluoride Levels (mg/l)

  July 1965 – Jan 1966: 0.26 to 1.0

  Aug 2007 – May 2008: 0.33 to 0.56

Impacts to Lake Mead

- Boron
- Overton Arm Monitoring

  Historical and On-going

  Boron Levels (mg/l)

  July 1965 – Jan 1966: 0.12 to 0.46

  Aug 2007 – May 2008: 0.13 to 0.54

Muddy River Water Quality Standards Review

- Schedule

Public Workshops – Mid-March
(Carson City, Overton, Las Vegas)

SEC Hearing – June 17, 2008 (Las Vegas)

Submission to Nevada Legislative Commission and EPA-Region 9 for approval

Questions / Additional Information

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http://ndep.nv.gov/bwqp

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations