RECLAMATION
Managing Water in the West

Henrys Fork Basin Study Workgroup Meeting May 8, 2012

In Cooperation with:
Idaho Water Resource Board

and

Henrys Fork Watershed Council

U.S. Department of the Interior
Bureau of Reclamation

Today's Basin Study Agenda

- Study Process Review
- Basin Study Status & Schedule, Status of TMs
- Decision Support System
- Alternatives Evaluation
  Municipal & Industrial, Dam Raise, Managed Recharge, Ag Conservation, Teton Dam
- Facilitated Discussion to Receive "Factual Feedback"

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Study Process – Review

1. Initial Scoping – 40+ ideas
2. “Reconnaissance” – 17 ideas – information provided in Tech Memos

------ We Are Here ------

3. Formulation of Appraisal Scenario(s). 9/12
4. Appraisal Report – Recommendations. 10/13

------ End of Basin Study ------

5. Action? – Federal, State, Local

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Status

- Schedule
  - May – all technical memos posted
  - May → August
    - Small Group Meetings
    - Formulate Scenarios
  - September – Workgroup Meeting
  - October
    - Interim Report
    - Begin Appraisal Analysis

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Technical Memos

1. Drafts – Input Required

2. Factual – Provide Information

3. Questions Raised

4. Technical Needs

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Formulate Appraisal Scenarios

1. Chance to be Creative
2. Emphasis on Meeting Needs
3. Acceptability

Decision Support System

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Workgroup Review of TMs

Workgroup Review of TMs

- Dam Raise Alternatives
  - Methodology (Section 2) very similar to New Surface Storage.
  - Focus on Sections 3 and 4 – Alternative-specific results (costs, benefits, impacts).

- Managed Recharge Alternatives
  - Methodology (Section 2) explains how recharge events were modeled.
  - Focus on Sections 3 and 4 – Alternative-specific results:
    - Groundwater level increases.
    - Seasonal flow increases in local stream segments (timing dependent on input timing).
    - Relative aquifer storage improvements.
    - Basin Needs – comparison to other recharge opportunities.
    - Exhibits, especially those presenting impacts-related information.

Workgroup Review of TMs, cont.

- Municipal and Industrial Conservation
  - Introduction to municipal conservation measures and new non-potable water supply options.
  - Case studies – other municipalities implementing these measures.
  - Implementation (range of water savings and costs):
    - Package 1 – Water conservation measures
    - Package 2 – New non-potable water supply options

Municipal and Industrial Conservation Alternative

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Municipal and Industrial (M&I) Conservation Overview

- Participant Location
- Observations
- Introduction to Measures
- Trends
- Water Use & Potential Savings
- Cost Estimate

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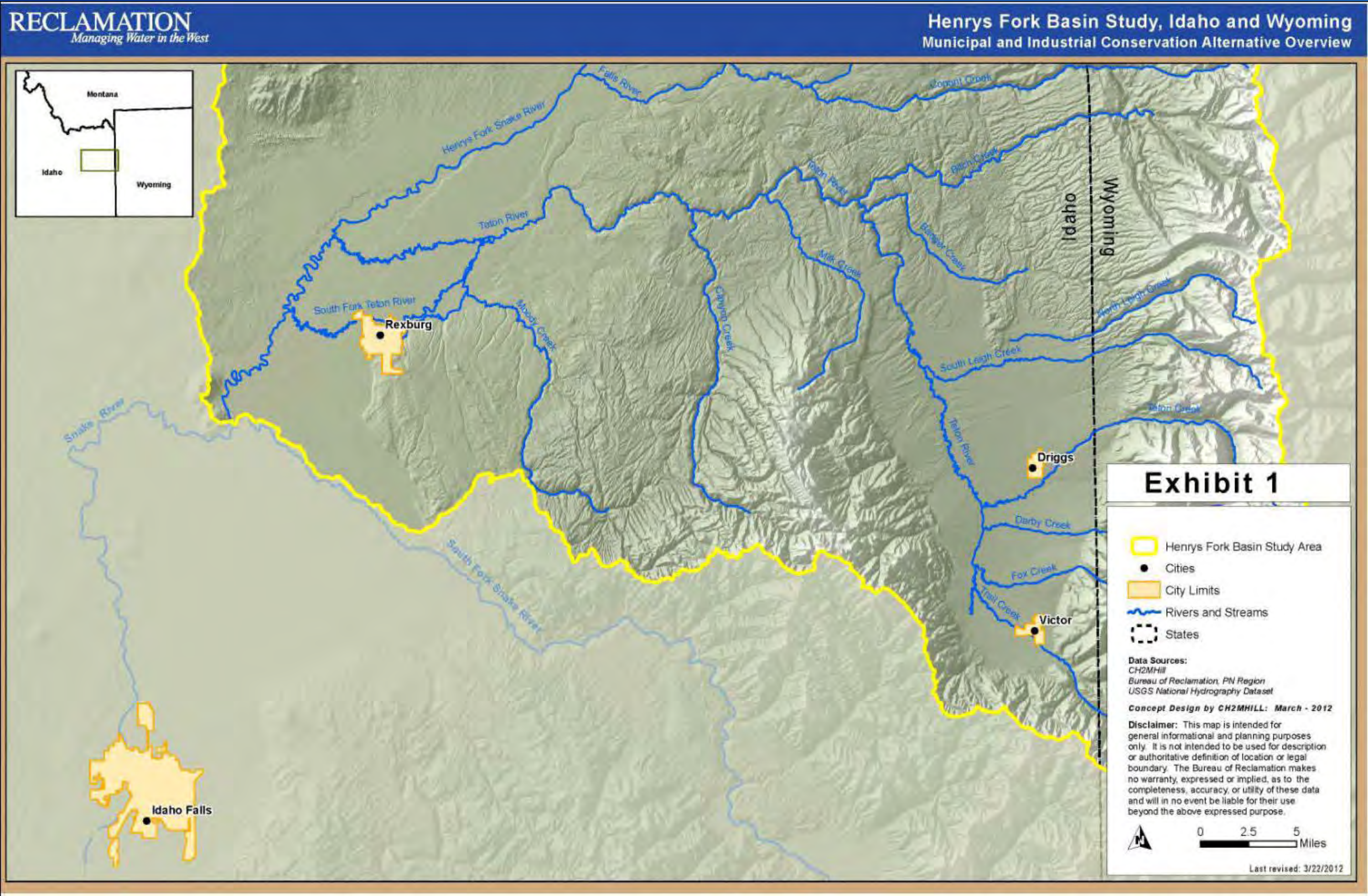
M&I Conservation Alternative Participants



M&I Conservation – Water Usage Observations

- Water supply to municipal and industrial users in the Henrys Fork Basin is almost exclusively from groundwater sources. Wells are constructed in shallow, often alluvial, aquifers. A portion of the water used in the Henrys Fork Basin includes spring water.

- A low percentage of the water used in these municipalities is indoor usage, which suggests that a majority of the water used is for outdoor purposes such as irrigation.

- A low percentage of the water used in these municipalities is accounted for as industrial use. Idaho Falls has two large industrial water users, the Anheuser-Busch malting plant and Grupo Modelo malting plant; however, these breweries have private wells that they own and operate.

M&I Conservation – Introduction to Measures & Supply Sources

- Municipal water conservation measures
  - Metering
  - Public education
  - Replace water lines currently buried above frost depth

- New non-potable water supply
  - Reuse treated domestic wastewater effluent (reclaimed water)
  - Raw water non-potable systems
  - Industrial conservation

M&I Conservation – Summary of Existing City Water Production

	Cities In and Near the Henrys Fork Basin				Case Study Cities		
	City of Driggs	City of Victor	City of Idaho Falls	City of Rexburg	City of Nampa	City of Meridian	City of Caldwell
Maximum month (million gallons)	409	31	1,717	277	348	476	266
Maximum day (mgd)	13.6	1.0	57.2	9.2	11.6	15.9	8.9
Average month (million gallons)	60	12	692	140	227	251	151
Average day (mgd)	2.0	0.4	23.1	4.7	7.6	8.4	5.0
Population[h]	2,105	1,928	56,813	25,484	81,557	75,092	46,237
Maximum month use (gpcm)	194,300	16,068	30,227	10,870	4,267	6,336	5,746
Average month use (gpcm)	28,504	6,000	12,183	5,480	2,785	3,336	3,261
Maximum day use (gpcd)	6,460	536	1,008	362	142	211	192
Average day use (gpcd)	**950**	**200**	**406**	**183**	**93**	**111**	**109**

M&I Conservation – Trends

- Lack of meters installed on every connection or metering but not collecting water data and not charging customers on the basis of the amount of water used. Both practices give little incentive for users to conserve water.

- Smaller municipalities have aging, shallow water distribution systems leading to excessive leakage. Replace distribution systems with pipes at proper depth of bury to reduce leakage and pumping requirements from groundwater supplies.

M&I Conservation – Trends, cont.

- The City of Rexburg makes efficient use of water, averaging 183 gpcd. This value may provide a reasonable target for other municipalities in the vicinity to achieve through implementation of basic conservation measures like metering, education, and replacement of pipes currently buried above frost depth.

- The case study cities, which have an average use of 104 gpcd, provide an upper threshold of water savings that may be achieved if all water conservation measures and non-potable supply options (including dual pipe systems) described in Section 3 are implemented.

M&I Conservation – Package 1: Municipal Water Conservation Measures

- Metering
  - Installation of meters
  - Charging customers based on water usage
- Public education
  - Development and distribution of brochures, school programs, and an informative website to inform customers about the benefits of reduced usage.
- Replace water lines currently buried above frost depth
  - Minimizes water loss through leakage and decreases energy use (pumping costs).

M&I Conservation – Package 1 Potential Water Savings

Summary of Potential Water Saved through Implementation of Package 1 Elements

Municipal and Industrial Conservation Alternative

	Driggs	Victor	Idaho Falls	Rexburg
Population[a]	2,105	1,928	56,813	25,484
Current average day water use (gpcd)	950	200	406	183
Projected future average day water use (gpcd)	150	150	150	150
Projected water savings (gpcd)	800	50	256	33
Projected water savings[b] (af/year)	1,890	110	16,290	940

M&I Conservation –
Package 2: New Non-Potable Water Supply

- Reuse treated domestic wastewater effluent (reclaimed water)
  - Wastewater treated to Class A standards and reused as irrigation, industrial supply, or for ASR.
- Raw water non-potable systems
  - Installation of dual pipe systems to utilize untreated surface water for irrigation.
- Industrial conservation
  - Industry-specific, but an example could be treating effluent to Class A standards for use as reclaimed water.

M&I Conservation –
Package 2 Potential Water Savings

Summary of Potential Water Saved through Implementation of Package 2 Elements

Municipal and Industrial Conservation Alternative

	Driggs	Victor	Idaho Falls	Rexburg
Population[a]	2,105	1,928	56,813	25,484
Average day water use following Package 1 Implementation (gpcd)	150	150	150	150
Projected future average day water use following Package 2 Implementation (gpcd)	104	104	104	104
Projected water savings (gpcd)	46	46	46	46
Projected water savings (af/year)	110	100	2,930	1,310

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M&I Conservation – Cost Estimate

Cost Estimate for Package 1 Elements
Municipal and Industrial Conservation Alternative

Conservation Measure[b]	Total Implementation Cost[a]				Total
	Driggs	Victor	Idaho Falls	Rexburg	
Metering	$80,000 - $450,000	$70,000 - $410,000	$2,130,000 - $12,070,000	$960,000 - $5,420,000	$3,240,000 - $18,350,000
Education	Minimal	Minimal	Minimal	N/A	Minimal
Replace water lines buried above frost depth	$1,000,000	$1,000,000	N/A	N/A	$2,000,000
Combined Total Implementation Cost					$5,240,000 - $20,350,000
Combined Anticipated Water Savings (af/yr)					19,230
Cost Per Unit Yield ($/af)					300 – 1,100

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Dam Raise Alternatives

Dam Raise Alternatives – Overview

- Alternatives Overview and Introduction of Sub-Alternatives
- Storage Volumes
- Water Needs
- Environmental Impacts
- Cost Estimates

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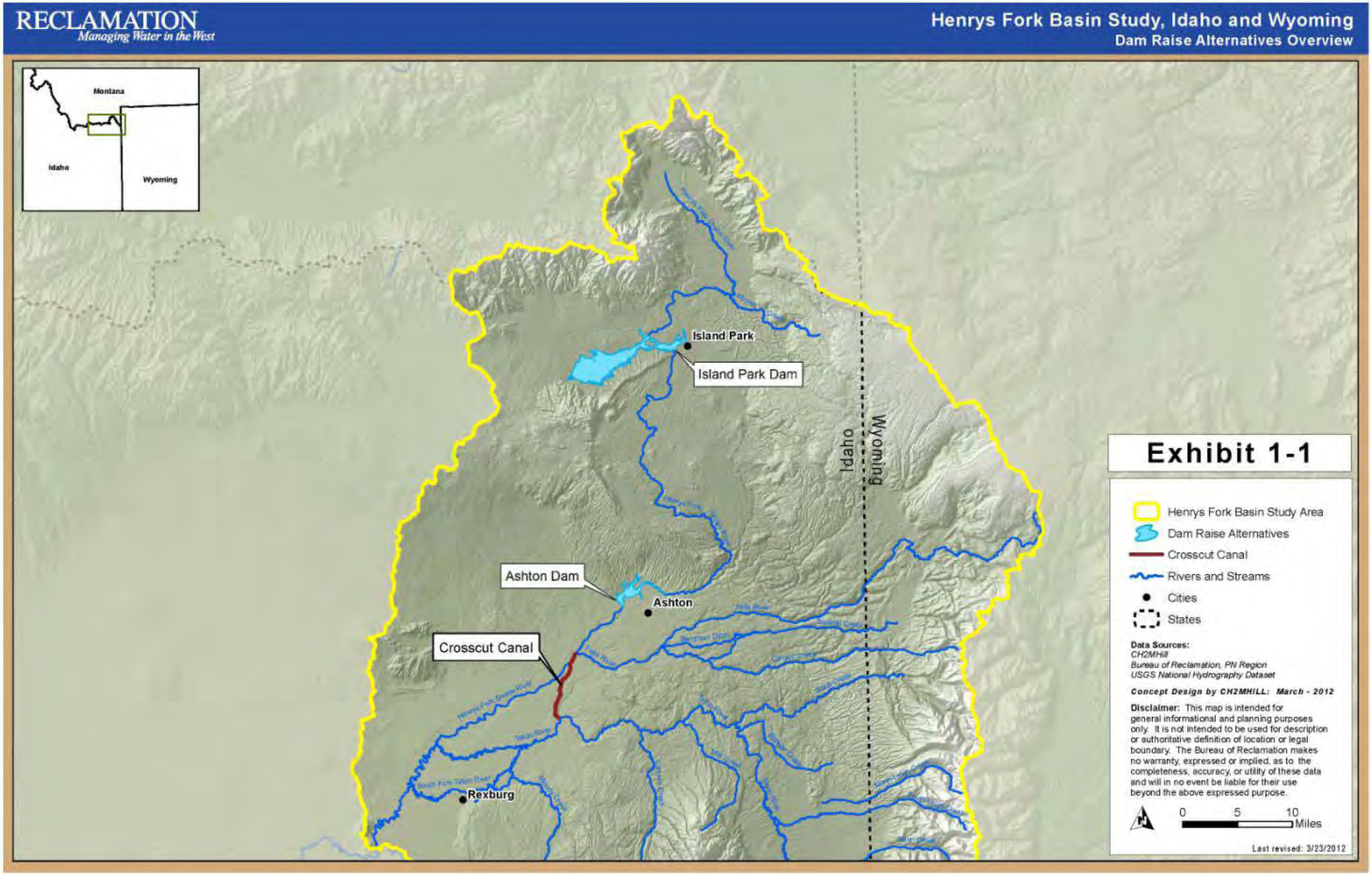
Locations of Dam Raise Alternatives



Dam Raise Sub-Alternatives

- Sub-alternatives were identified to utilize different dam design concepts and potential Crosscut Canal expansion.
- Costs and potential impacts were assessed for each sub-alternative.

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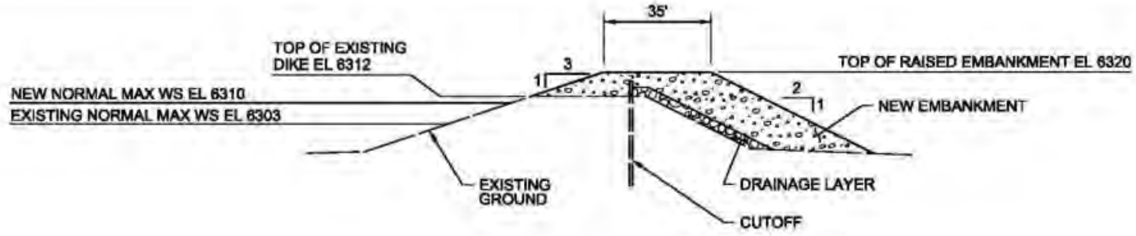
Island Park Dam

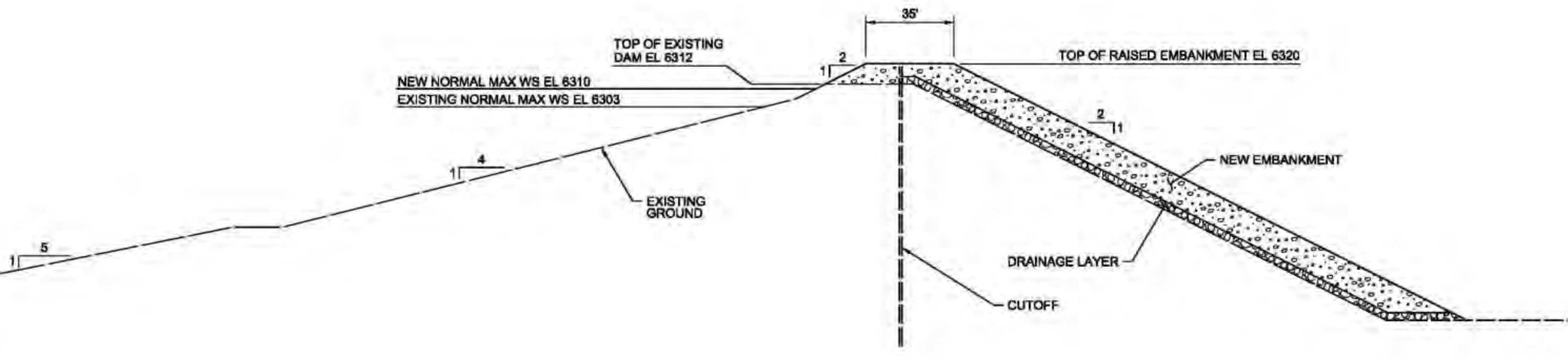
1-foot Bladder Raise Sub-Alternative

Island Park Dam

8-foot Embankment Raise Sub-Alternative



8000'-LONG DIKE



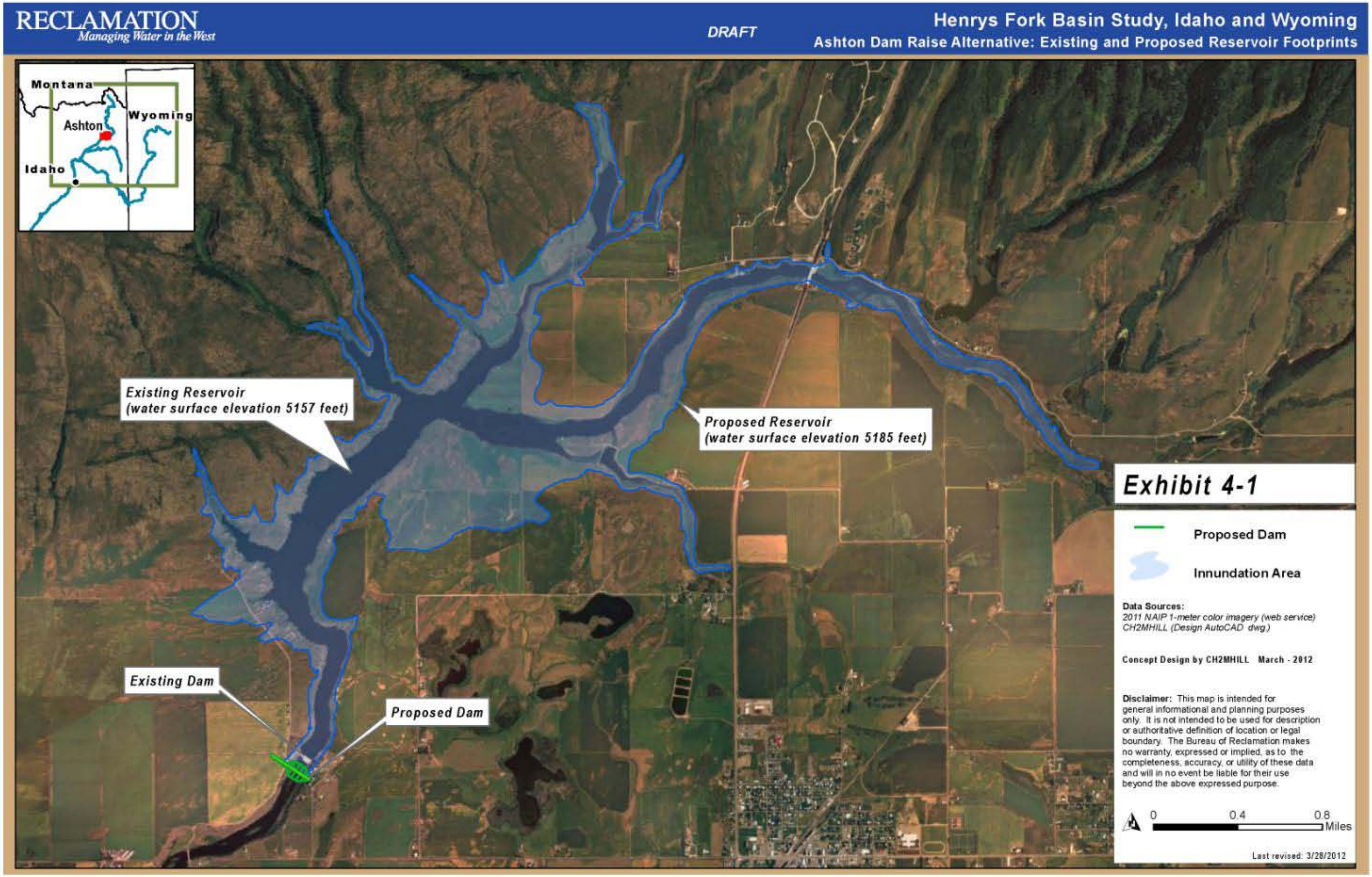
MAIN DAM

Island Park Dam

8-foot Embankment Raise Sub-Alternative, cont.

Ashton Dam

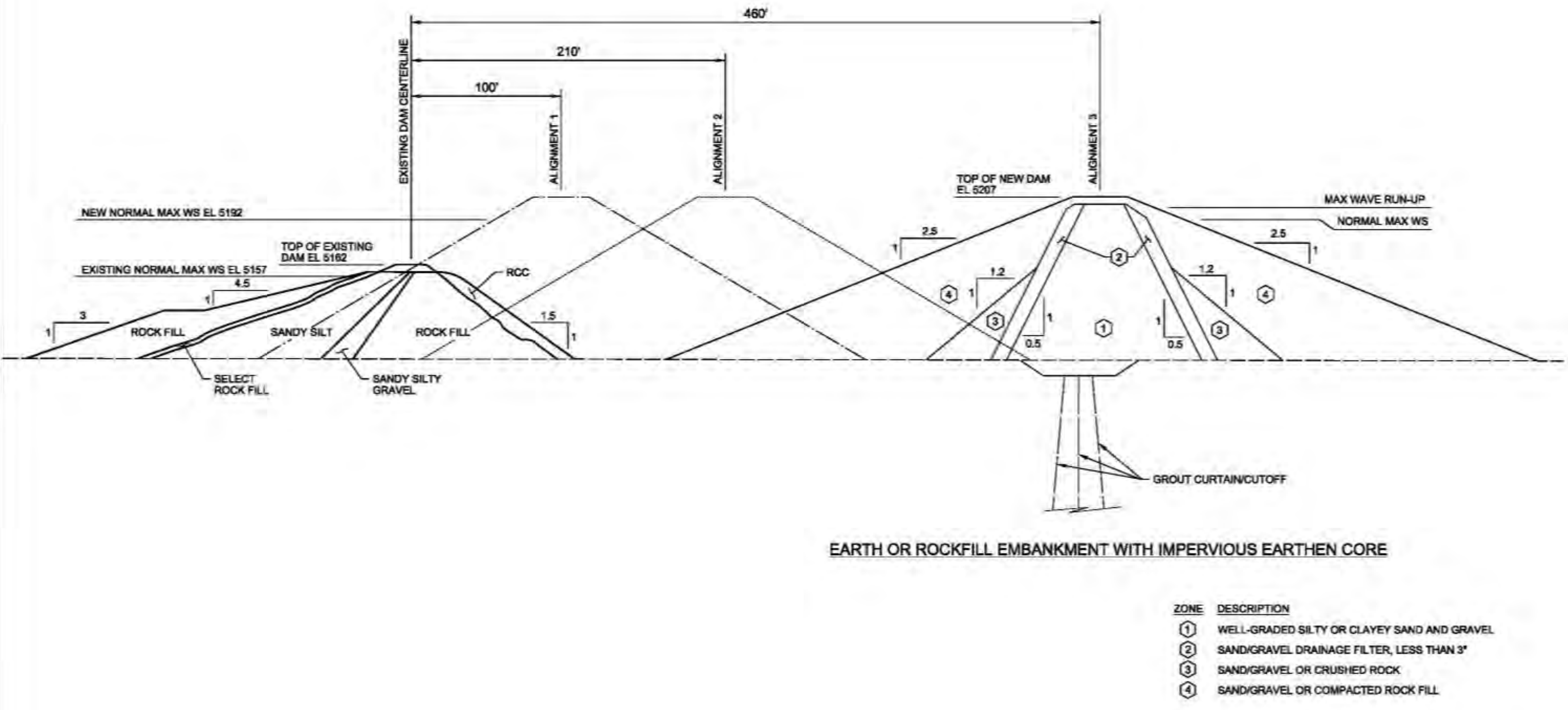
Dam Reconstruction



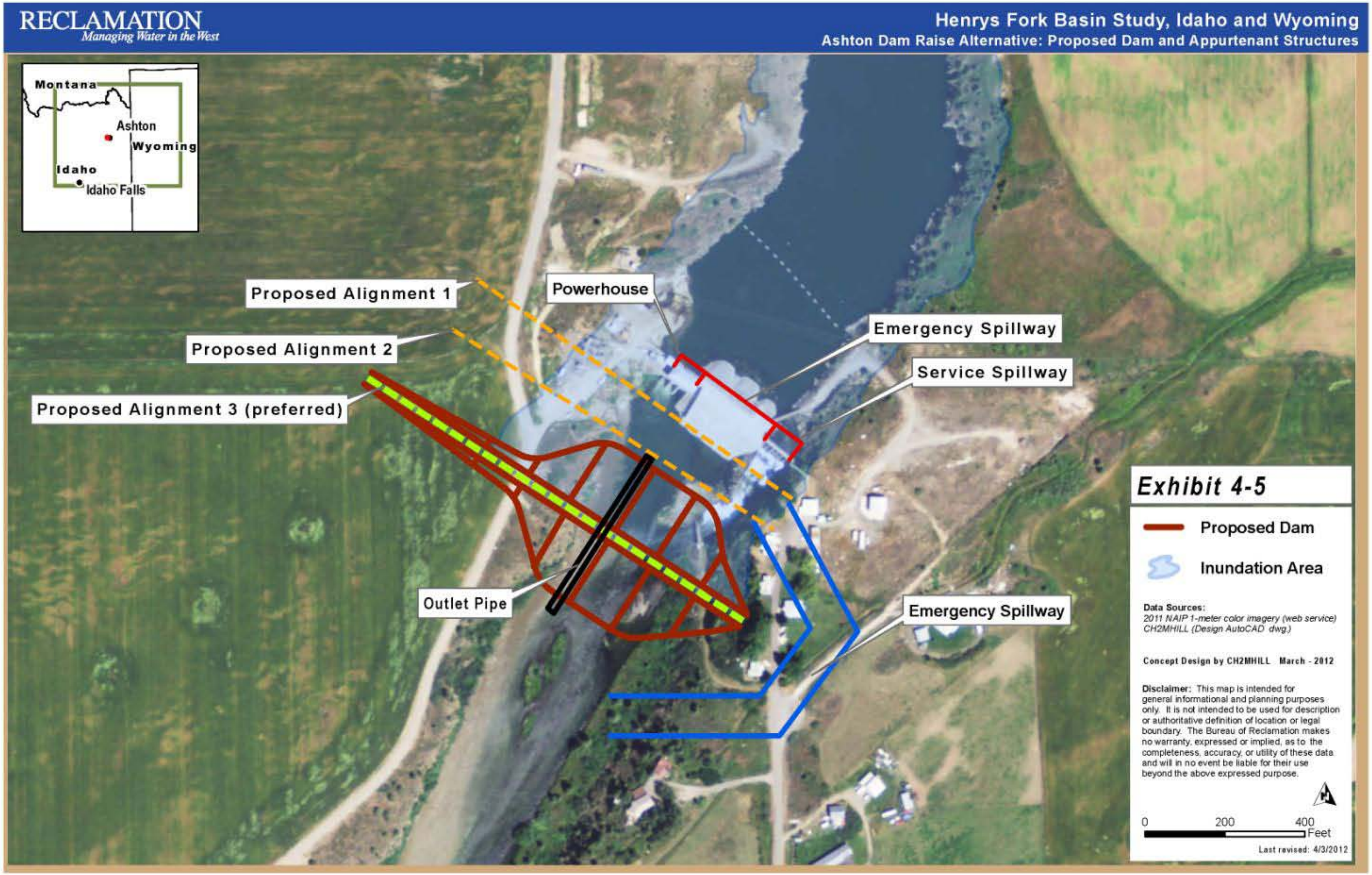
Ashton Dam

Proposed Alignment

- New downstream location avoids existing structure.
- Dam crest raised by 43-feet.
- Pool elevation raised by 28-feet (freeboard).



Ashton Dam
Proposed Alignment, cont.



Storage Volumes

- Potential storage volume maximized given:
  - Topographic constraints
  - Freeboard requirements

Reservoir	Sub-Alternative	Storage Volume Increase (acre-feet)
Island Park	1-foot bladder raise	8,000
	8-foot embankment raise	74,000
Ashton	Reconstruction (43-foot raise)	20,000

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Water Needs

- Stored water could be used for the following uses:
  - In-Basin
    - Agricultural demands
    - M&I demands
    - Environmental flows
  - Out-of-Basin

Reservoir	**Irrigated Regions Receiving Benefit**	**River Segments with Enhanced Environmental Flows**
Island Park*	North Fremont Egin Bench	Henrys Fork
Ashton*	“ “	“ “
* w/Crosscut Canal	Lower Watershed	Teton South Fork Teton

Environmental Impacts

- The following factors were reviewed:
  - Change in connectivity
  - Presence of Yellowstone cutthroat trout (YCT)
  - River reach special designations
  - Wildlife habitat
  - Federally-listed species
  - Wetlands
  - Land ownership/management
  - Recreation/economic value
  - Infrastructure

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Environmental Impacts, cont.

Exhibit 3-13

Land Management Implications and Impacts to Recreation/Economic Value and Infrastructure at the Reservoir Site

		Land Management Data[a]					Recreation/Economic Value								Infrastructure[d]				
Surface Storage Site	Sub-Alternative	Private	Federal	State	Conservation Easements[b]	Rating	Boating	Fishing	Yellowstone National Park	Guiding/ Outfitting	Scenic/ Natural Features[c]	Cultural/ Historic Resources[c]	Land Recreation[c]	Rating	Roads	Structures	Habitation	Additional Infrastructure Notes	Rating
Island Park	IP-1, IP-8	•	•	•		[illegible]		•[b]						Low	•				Few
Island Park	IP-1_CC, IP-8_CC	•	•	•		[illegible]		•[b]						Low	•	•	•	Approximately 100 structures affected	[illegible]

Notes:

[a]Land management data per the BLM Idaho Surface Management Agency (2010). For federal government lands, the data displays the managing agency which may or may not be the same as the agency that "owns" the land.

[b]Per feedback from Trout Unlimited, Friends of the Teton River, American Rivers, and the Henry's Fork Foundation.

[c]Per the Resource Evaluation (IWRB 1992)

[d]Preliminary impacts based on cursory review of aerial photography.

Legend

Land Management

[illegible]	Federal, Conservation Easement
State	State
Private	Private

Recreation/Economic Value

[illegible]	Significant Impacts to Recreation/ Economic Values
Moderate	Moderate Impacts to Recreation/ Economic Values
Low	Minimal Impacts to Recreation/ Economic Values

Infrastructure

[illegible]	Impacts to major infrastructure/development
Moderate	Moderate impacts to human environment
Few	Few impacts to human environment

Environmental Impacts, cont.

Alternative	Environmental Considerations
Island Park Dam	• No conservation population of YCT in Henrys Fork; Crosscut Canal could provide water to conservation populations in Teton and South Fork Teton. • Supply source has no special designations. • Many (18) federally-listed wildlife species. • Few impacts to wetlands and recreation. • Minimal infrastructure impacts for 1-foot raise; substantial impacts (~100 structures) for 8-foot raise.
Ashton Dam	• Same YCT impacts as Island Park. • Supply source has no special designations. • Some (7) federally-listed wildlife species. • Few wetlands impacts. • High recreation and infrastructure impacts.

Cost Estimates

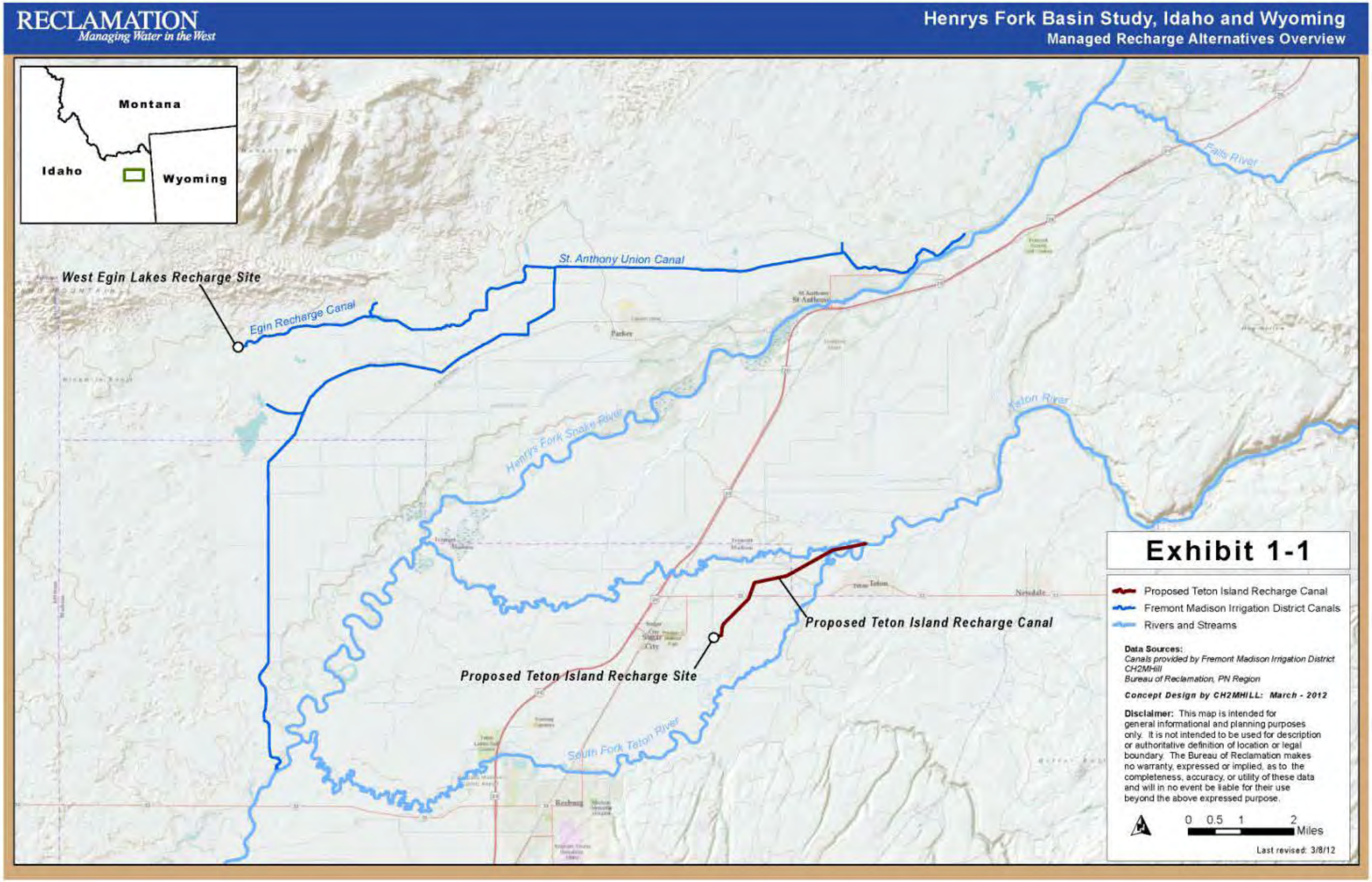
Alternative	Sub-Alternative	Total Estimated Construction Cost	Cost Per Acre-Foot
Island Park Dam	1-foot bladder raise	$850,000	$100
	1-foot bladder raise w/Crosscut Canal	$22,980,000	$2,900
	8-foot embankment raise	$29,330,000	$400
	8-foot embankment raise w/Crosscut Canal	$51,470,000	$700
Ashton Dam	Reconstruction	$17,140,000	$800
	Reconstruction w/Crosscut Canal	$39,280,000	$1,900

Managed Recharge Alternatives

Managed Recharge Alternatives Overview

- Alternatives Overview and Introduction of Sub-Alternatives
- Model Results
- Water Needs
- Environmental Impacts
- Cost Estimates

Locations of Managed Recharge Alternatives



Managed Recharge Sub-Alternatives

- Sub-alternatives were identified based on existing recharge at Egin Lakes and potential expansion.

- Costs and potential impacts were assessed for each sub-alternative.

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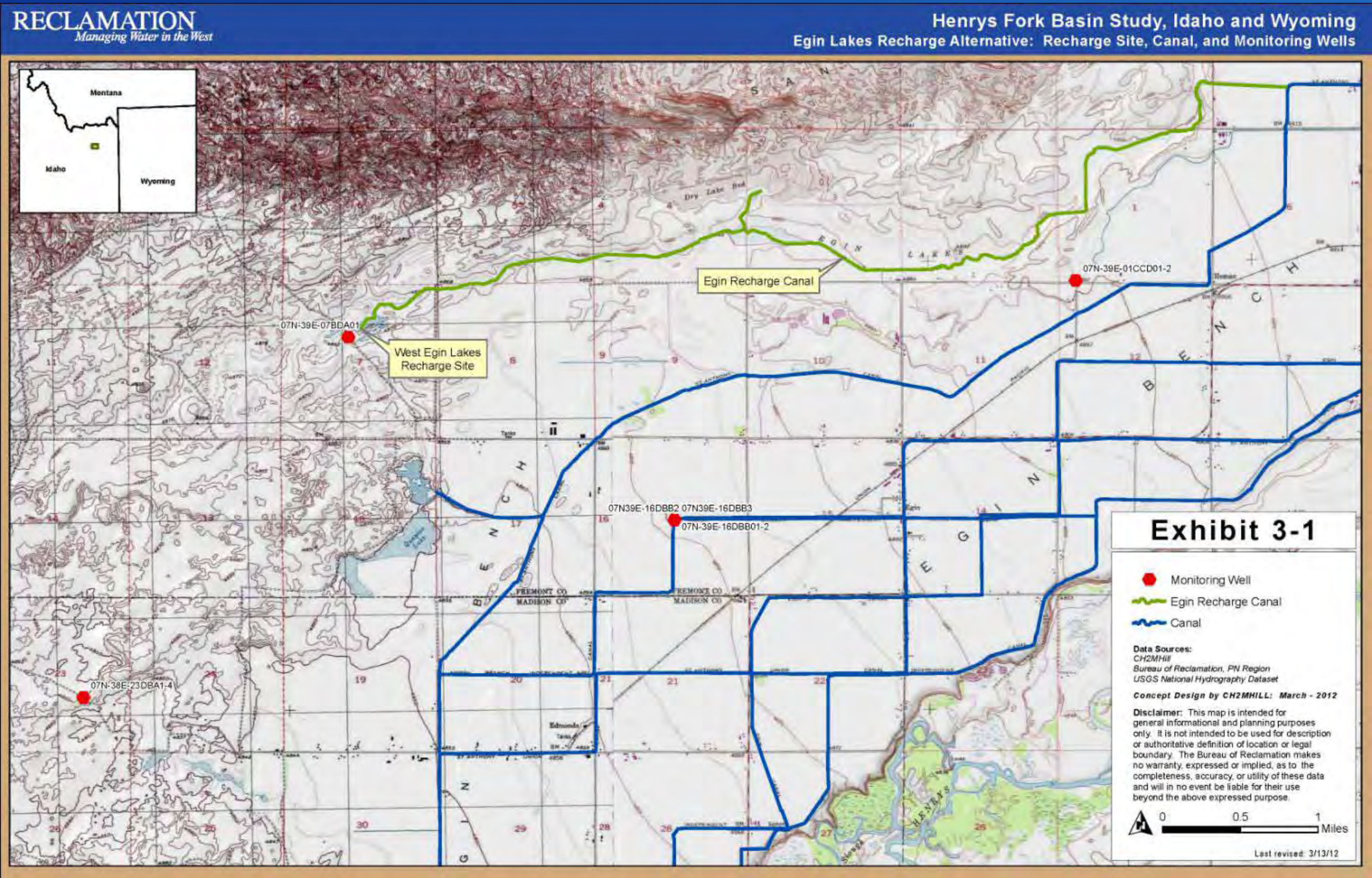
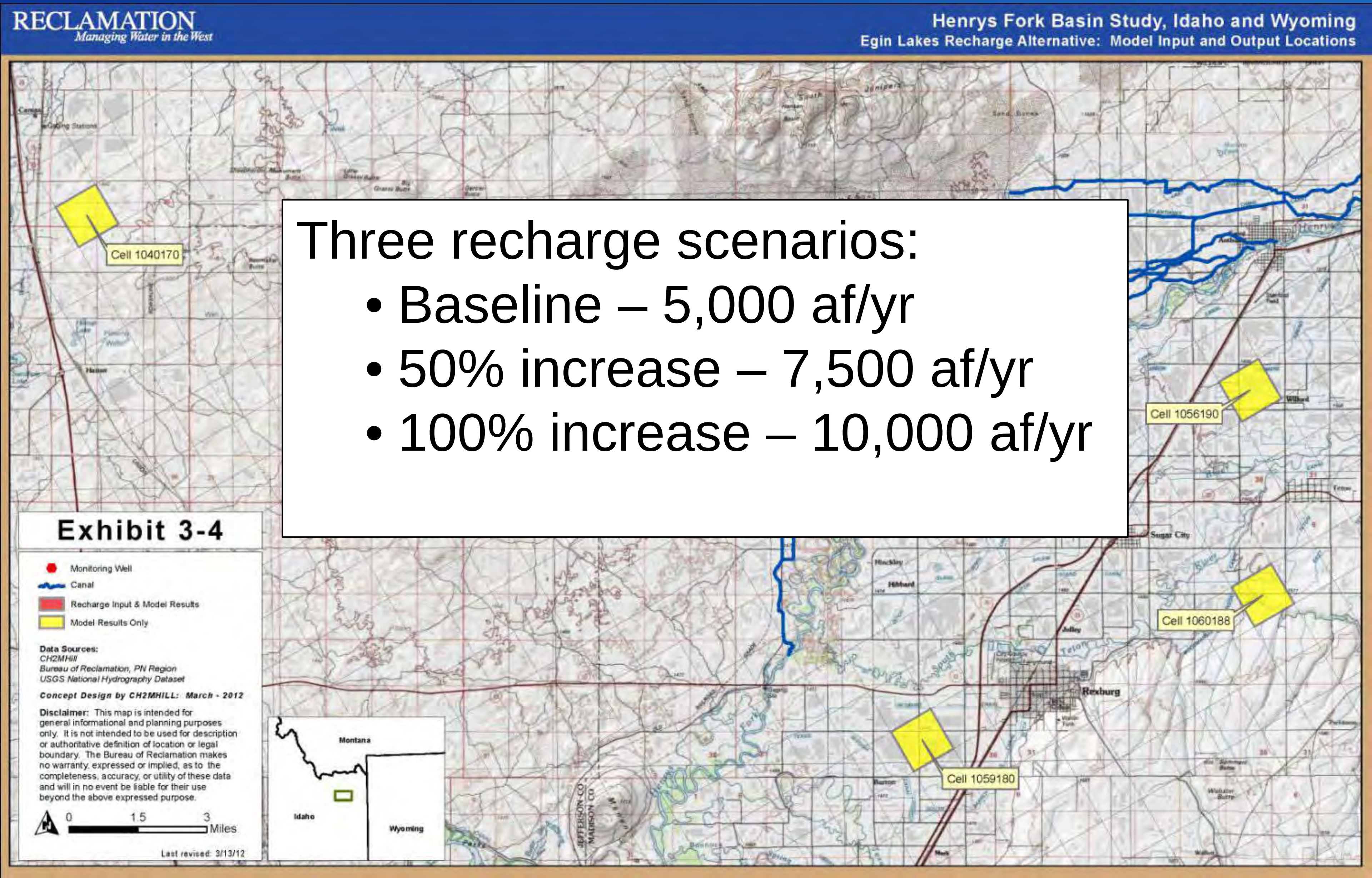
West Egin Lakes Recharge



West Egin Lakes

Recharge Modeling



Three recharge scenarios:

- Baseline – 5,000 af/yr
- 50% increase – 7,500 af/yr
- 100% increase – 10,000 af/yr

West Egin Lakes

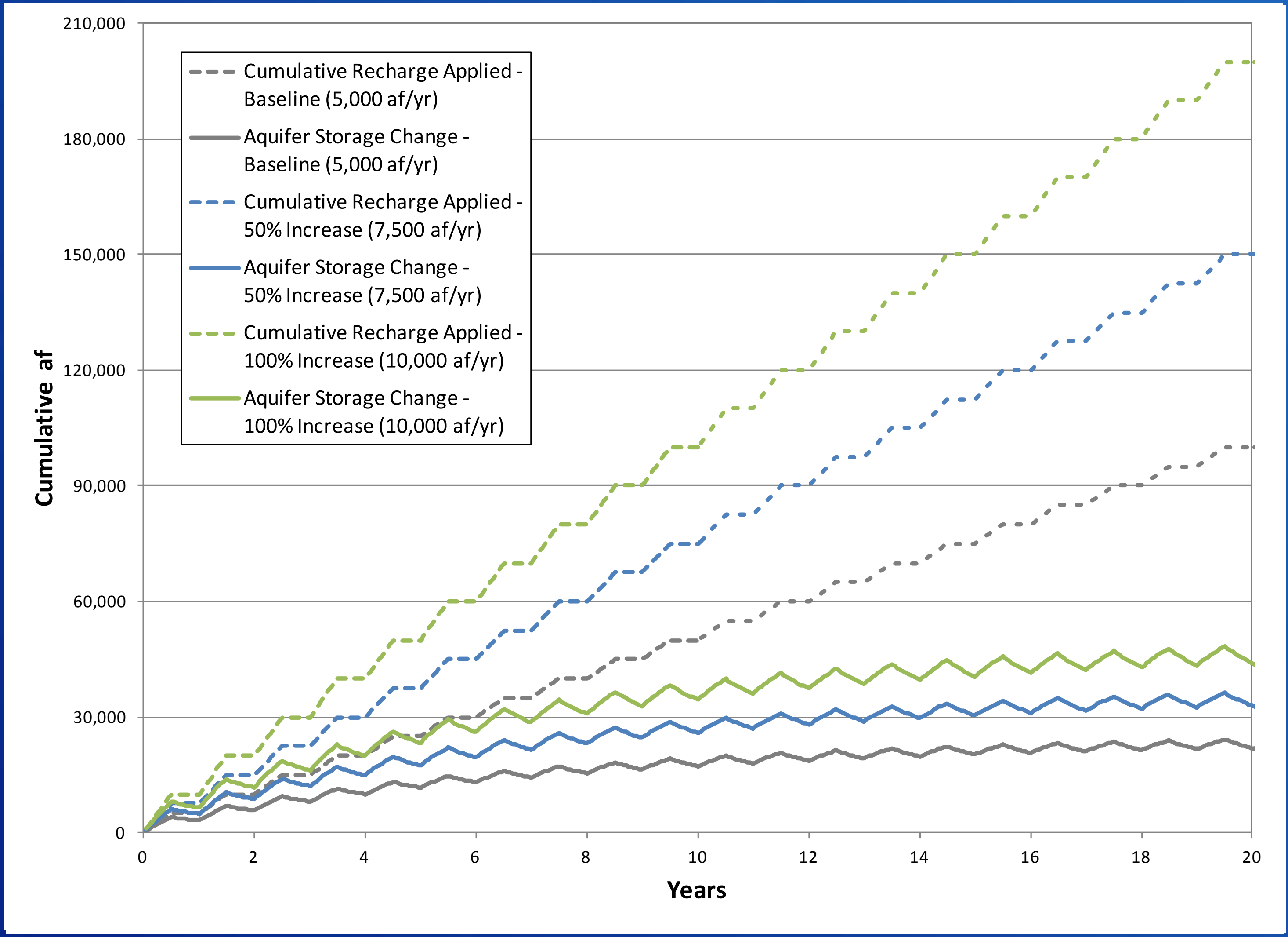
Model Results at end of 20-Year Period

- 50% Increase Sub-Alternative
  - 2,500 af incremental annual recharge
  - 0.01 – 0.09 feet groundwater level increases
  - 1.6 cfs incremental flow increase in river (Ashton to Rexburg)
  - 22% of applied recharge stored in ESPA

- 100% Increase Sub-Alternative
  - 5,000 af incremental annual recharge
  - 0.02 – 0.19 feet groundwater level increases
  - 3.2 cfs incremental flow increase in river
  - 22% of applied recharge stored in ESPA

West Egin Lakes

Model Results over Course of 20-Year Period



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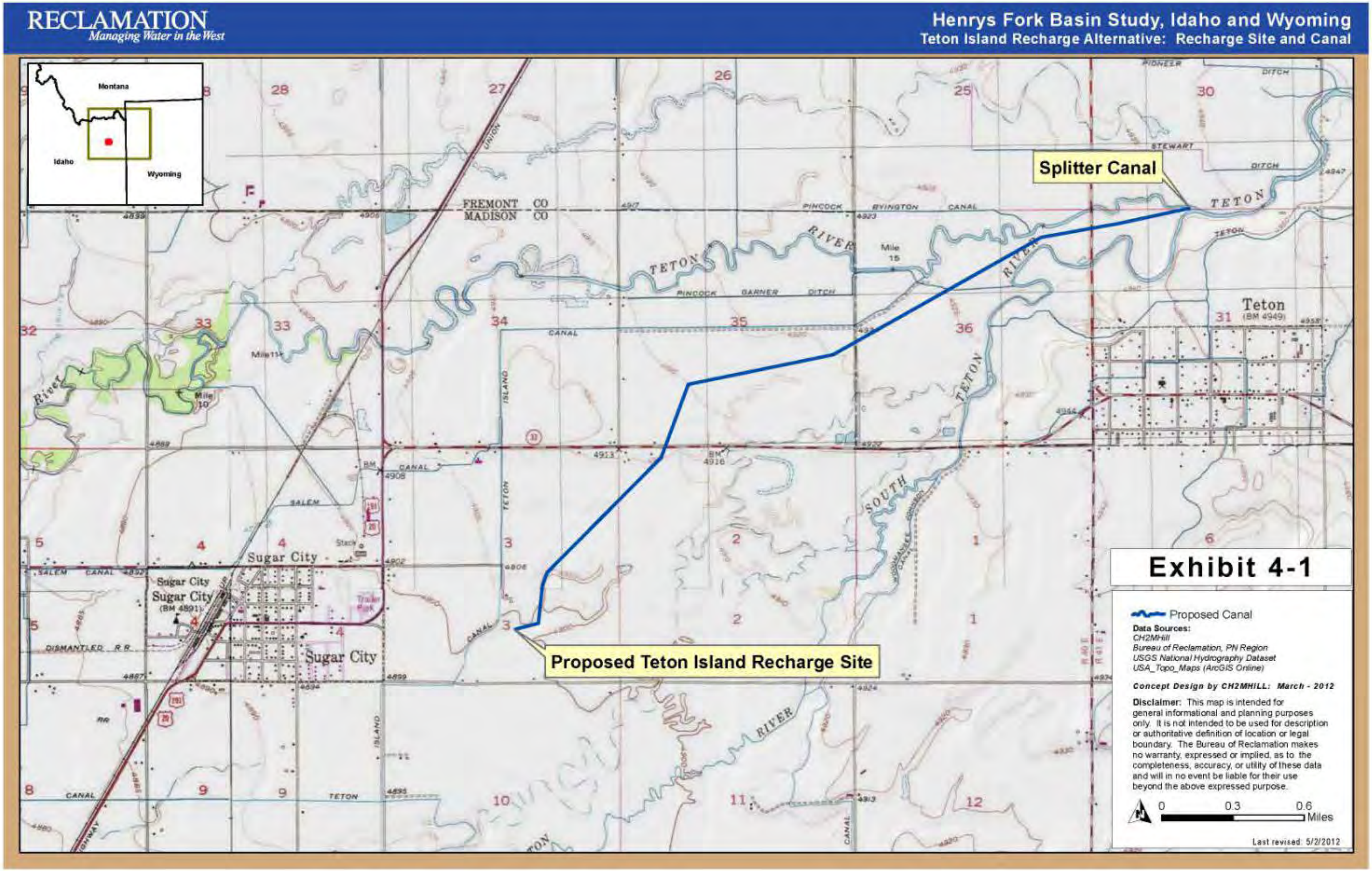
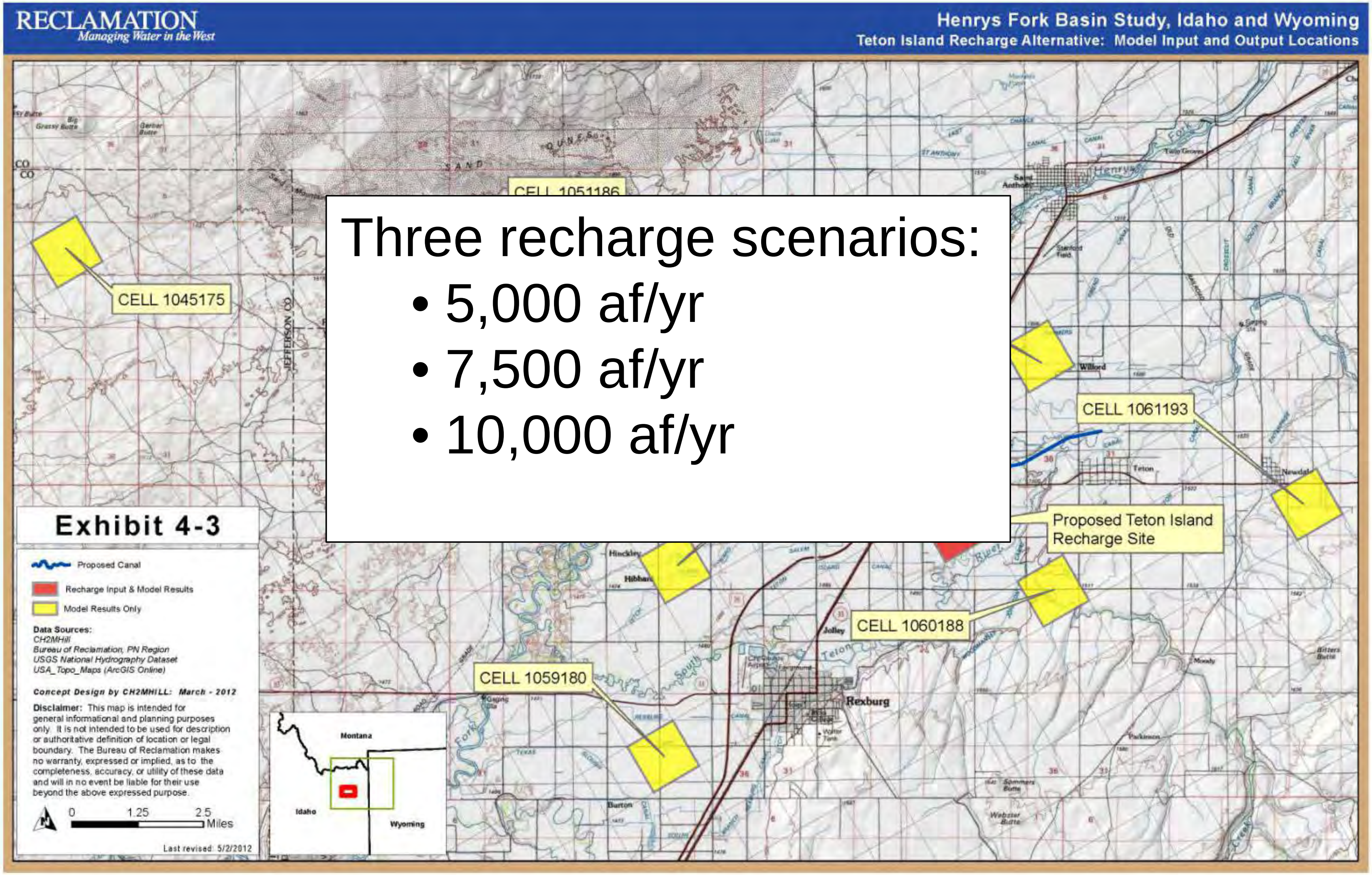
Teton Island Recharge



Teton Island

Recharge Modeling



Three recharge scenarios:

- 5,000 af/yr
- 7,500 af/yr
- 10,000 af/yr

Teton Island

Model Results at end of 20-Year Period

Parameter	5,000 af/yr	7,500 af/yr	10,000 af/yr
Groundwater level increase	0.02 – 0.30 ft	0.03 – 0.45 ft	0.03 – 0.60 ft
Incremental river flow increase (Ashton – Rexburg)	3.0 cfs	4.5 cfs	6.0 cfs
Applied recharge stored in ESPA	8%	8%	8%

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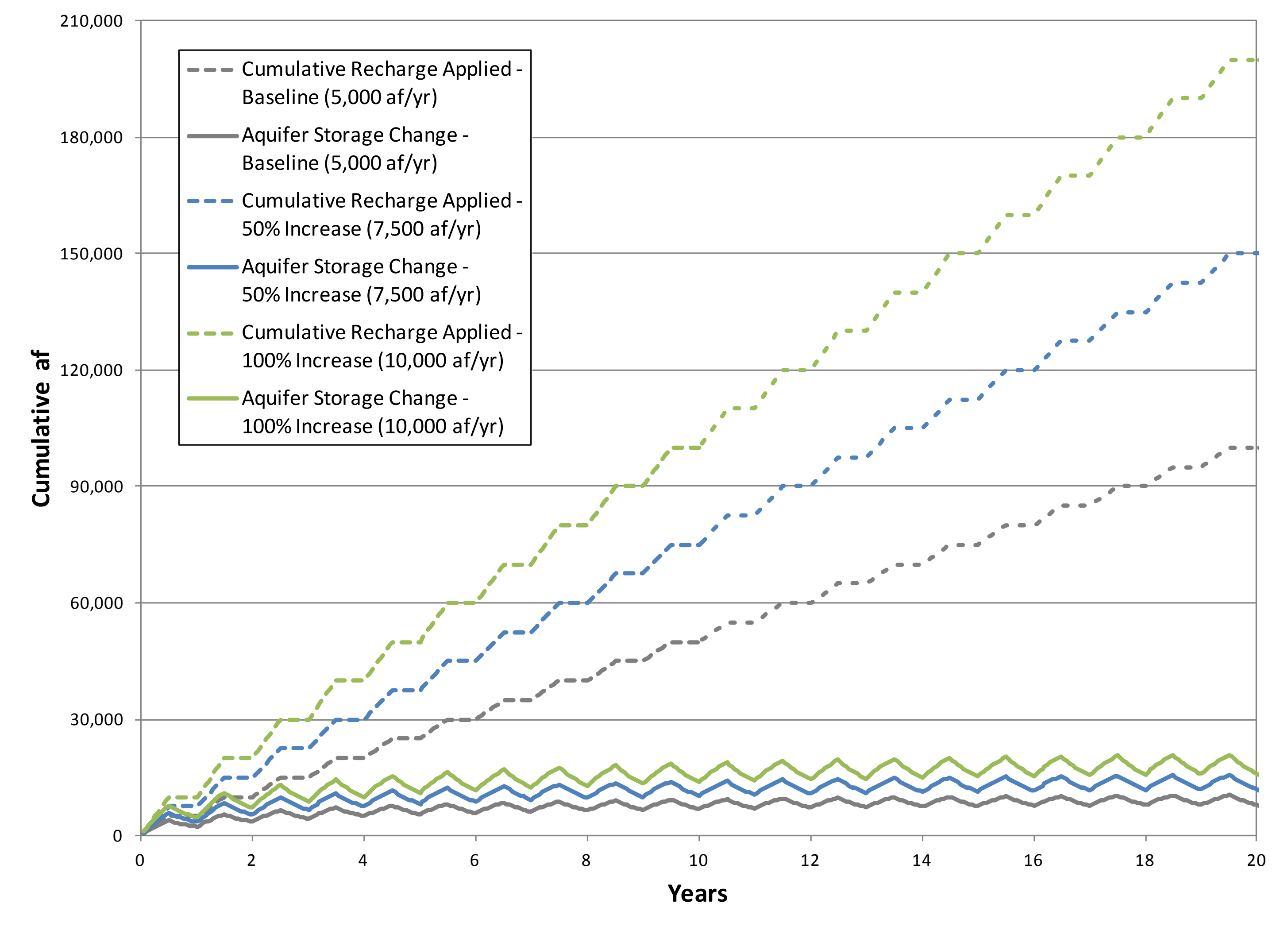
Teton Island

Model Results over Course of 20-Year Period



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Water Needs

- Stored water could be used for the following uses:
  - In-Basin
    - Agricultural demands
    - M&I demands
    - Environmental flows
  - Out-of-Basin

Recharge Site	Irrigated Regions Receiving Benefit	River Segments with Enhanced Environmental Flows
West Egin Lakes	Egin Bench	Henrys Fork
Teton Island	Lower Watershed	Teton South Fork Teton Henrys Fork

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Environmental Impacts

- The following factors were reviewed:
  - Change in connectivity
  - Presence of Yellowstone cutthroat trout (YCT)
  - River reach special designations
  - Wildlife habitat
  - Federally-listed species
  - Wetlands
  - Land ownership/management
  - Recreation/economic value
  - Infrastructure

Environmental Impacts, cont.

Exhibit 3-19

Land Management Implications and Impacts to Recreation/Economic Value and Infrastructure at the Recharge Site

	Land Management Data[a]					Recreation/Economic Value								Infrastructure[d]				
Recharge Site	Private	Federal	State	Conservation Easements[b]	Rating	Boating	Fishing	Yellowstone National Park	Guiding/ Outfitting	Scenic/ Natural Features[c]	Cultural/ Historic Resources[c]	Land Recreation[c]	Rating	Roads	Structures	Habitation	Additional Infrastructure Notes	Rating
Egin Lakes		•			[illegible]								Low	•			Improve road/driveway crossing capacity	Few

Notes:

[a]Land management data per the BLM Idaho Surface Management Agency (2010). For federal government lands, the data displays the managing agency which may or may not be the same as the agency that "owns" the land.

[b]Per feedback from Trout Unlimited, Friends of the Teton River, American Rivers, and the Henry's Fork Foundation.

[c]Per the Resource Evaluation (IWRB 1992)

[d]Preliminary impacts based on cursory review of aerial photography.

Legend

Land Management

[illegible]	Federal, Conservation Easement
State	State
Private	Private

Recreation/Economic Value

[illegible]	Significant Impacts to Recreation/ Economic Values
Moderate	Moderate Impacts to Recreation/ Economic Values
Low	Minimal Impacts to Recreation/ Economic Values

Infrastructure

[illegible]	Impacts to major Infrastructure/development
Moderate	Moderate impacts to human environment
Few	Few impacts to human environment

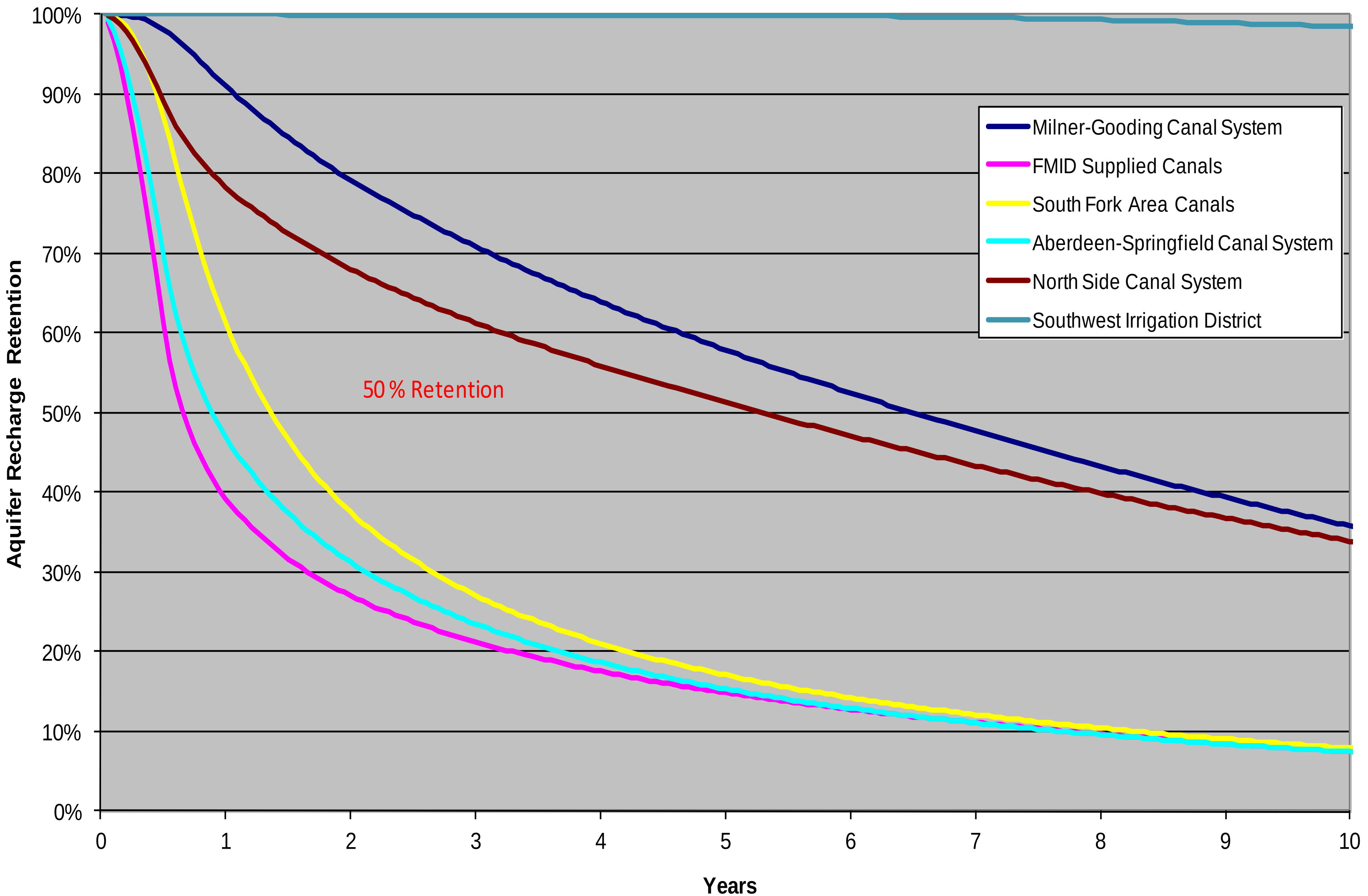
Environmental Impacts, cont.

Alternative	Environmental Considerations
West Egin Lakes	• No conservation population of YCT in Henrys Fork. • Supply source has no special designations. • Few impacts to wildlife habitat, federally-listed species, wetlands, and recreation. • Minimal infrastructure impacts (road crossings). • Site may be included in future wilderness study area.
Teton Island	• Conservation populations of YCT in Teton and South Fork. • Supply source has no special designations. • Few impacts to wildlife habitat, federally-listed species, wetlands, and recreation. • Minimal infrastructure impacts (road crossings).

Cost Estimates

Alternative	Sub-Alternative	Total Estimated Construction Cost	Cost Per Acre-Foot
West Egin Lakes	50% Increase (7,500 af/yr)	$10,060,000	$4,000
	100% Increase (10,000 af/yr)	$13,620,000	$2,700
Teton Island	5,000 af/yr	$4,550,000	$900
	7,500 af/yr	$5,690,000	$800
	10,000 af/yr	$7,470,000	$700

Comparison to other ESPA Recharge Sites



Agricultural Conservation Alternatives

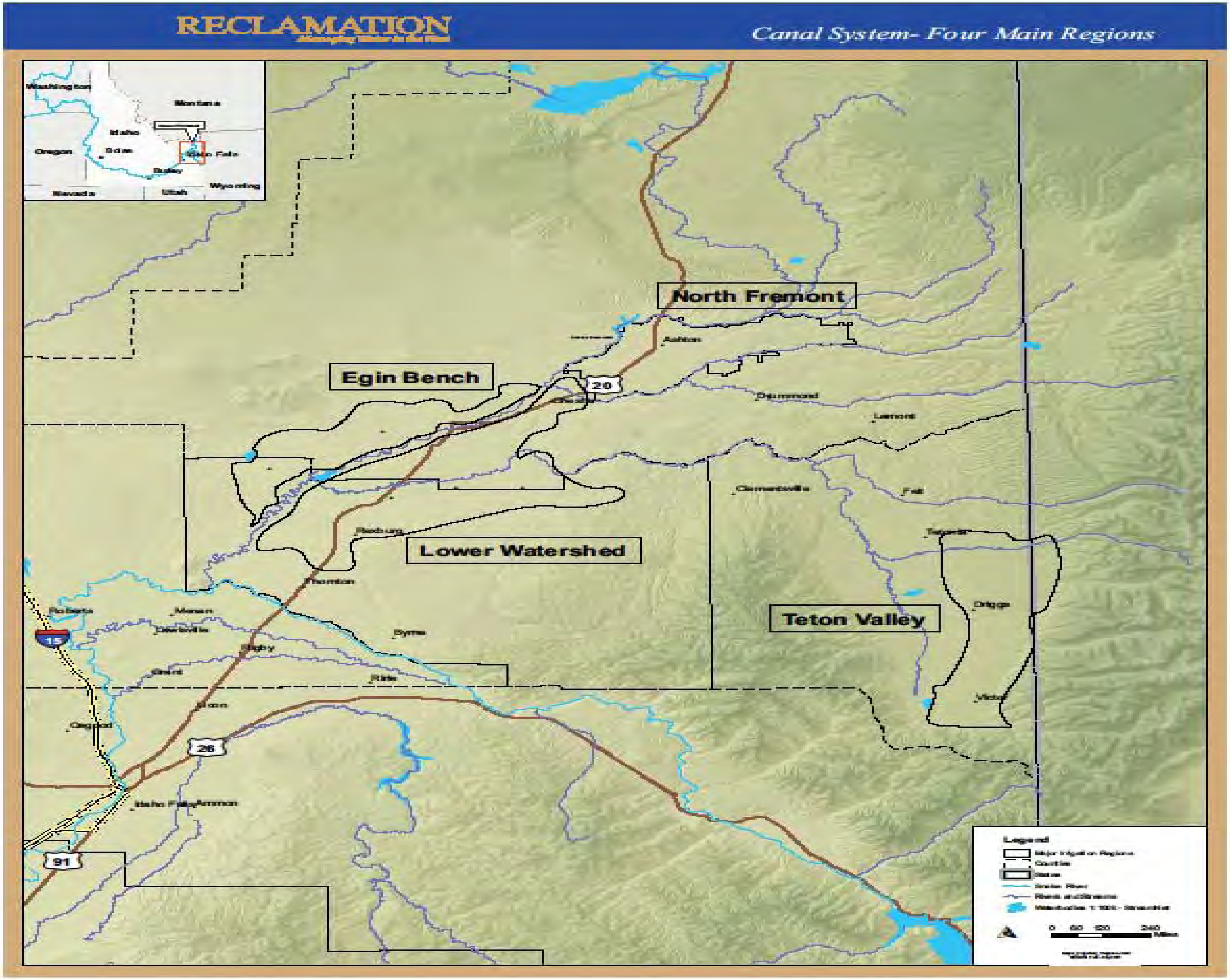
Conservation Alternatives

1. Canal Automation
2. Demand Reduction
3. Lining and Piping of Canals
4. Recharge Using Existing Canals
5. Conversion from Flood to Sprinkler (not done)

Methodology – Dr. Van Kirk's Model

"The USDA Study appears to be a carefully done study based on sound methods and valid data. Its water budget work and products will be useful…."

(Bryce Contor/RMEA)



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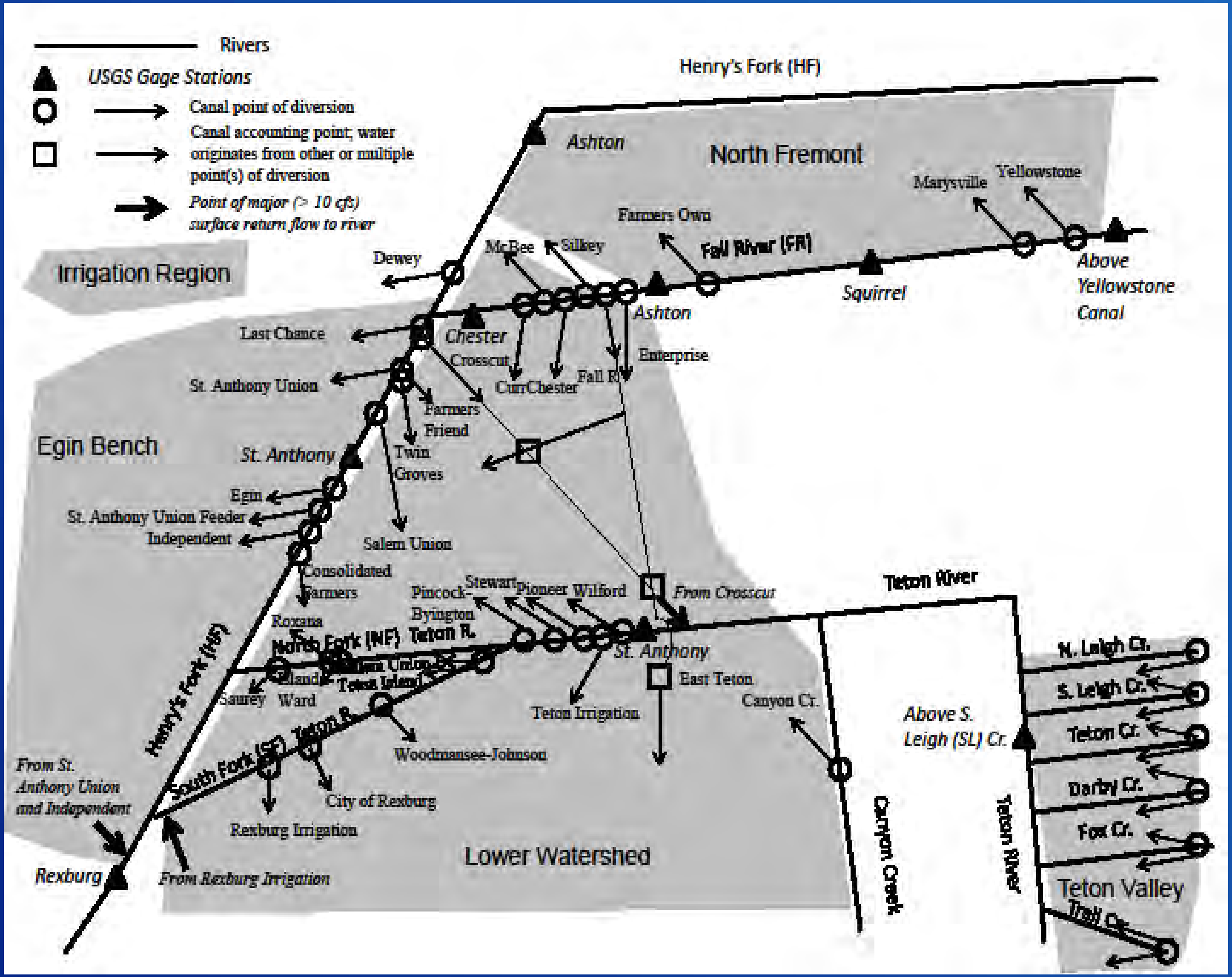

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Key Points

- Diversions are average daily diversions for 30 years.

- “Current” condition is not average over 30 years.

- Examples shown have all diversion points changed.

- Sample run once model is set up is 20 minutes.

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Automated Canals – Langemann Gates

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Automated Canals – Costs

Cost $ = $392/cfs x cfs capacity + $14,988

Canal - Diversion	Irrigated Region	Peak Flow CFS	Automated Canal Costs	Teton Valley @ S.Leigh	Teton Valley @ St. Anthony	Egin Bench @ Rexburg	Lower Watershed @ Rexburg	North Fremont @ Chester
Dewey	Egin Bench	49	34,208			$ 34,208		
Egin	Egin Bench	439	187,088			$ 187,088		
Independent	Egin Bench	522	219,624			$ 219,624		
Last Chance	Egin Bench	136	68,312			$ 68,312		
St. Anthony Union	Egin Bench	620	258,040			$ 258,040		
St. Anthony Union Feeder	Egin Bench	261	117,312			$ 117,312		
Canyon Creek	Lower Watershed	78	45,576				$ 45,576	
Chester	Lower Watershed	128	65,176				$ 65,176	

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Automated Canals – Results

[1] The period from May 15 to July 15

[2] The period from July 16 to May 14

			|---------	Acre Feet	---------|	
Alternative	Irrigated Region	Output USGS Gauging Station	Change in Annual Flow	Change in Peak Flow[1]	Change in non-Peak Flow[2]	Estimated Cost Millions
Canal Automation	Teton Valley	South Leigh	(195)	5,388	(5,583)	0.4
Canal Automation	North Fremont	Chester	6,009	1,376	4,633	0.2
Canal Automation	Lower Watershed	Rexburg	49,153	80,073	(30,920)	2.3
Canal Automation	Egin Bench	Rexburg	23,639	28,524	(4,885)	0.9

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Demand Reduction

- Demand was reduced by setting diversions to ET demand and scaling down the irrigated area served by 25 percent and 50 percent.

Demand Reduction – Costs

- WestWater Research – 2008 Presentation to ESPA CAMP - $ 1,816 per acre.

Irrigated Region	Location of Model Output (USGS Gage Station)	Acres Served	Estimated Cost for 25% Demand Reduction	Estimated Cost for 50% Demand Reduction
Teton Valley	South Leigh Creek	31,480	$14.3	$28.6
Teton Valley	St. Anthony (Teton River)	52,820	$24.0	$48.0
North Freemont	Chester	32,500	$14.8	$29.5
Lower Watershed	Rexburg	73,000	$33.1	$66.3
Egin Bench	Rexburg	30,500	$13.9	$27.7

Demand Reduction – Results

[1] The period from May 15 to July 15

[2] The period from July 16 to May 14

Alternative	Irrigated Region	Output USGS Gauging Station	Change in Annual Flow	Change in Peak Flow[1]	Change in non-Peak Flow[2]	Estimated Cost Million
			|---------- Acre Feet		----------|	
25% Demand Reduction	Teton Valley	South Leigh	7,613	11,188	(3,576)	14.3
50% Demand Reduction	Teton Valley	South Leigh	16,531	17,633	(1,102)	28.6
25% Demand Reduction	North Fremont	Chester	6,273	1,503	4,770	14.8
50% Demand Reduction	North Fremont	Chester	7,082	1,883	5,199	29.5
25% Demand Reduction	Lower Watershed	Rexburg	80,137	92,965	(12,828)	33.1
50% Demand Reduction	Lower Watershed	Rexburg	112,494	106,193	6,300	66.3
25% Demand Reduction	Egin Bench	Rexburg	51,116	35,592	15,523	13.8
50% Demand Reduction	Egin Bench	Rexburg	79,687	42,879	36,808	27.7

RECLAMATION

Pipelines and Lining

- ‘Pipeline’ simulated 100 percent decrease in canal seepage while model ‘Lining” simulated a 75 percent decrease. Diversions were set to ET demand.

- Thus, water previously lost to seepage was used for crop irrigation.

Pipelines and Lining Costs

- ➢ Repeated CH2M HILL cost estimating procedures for consistency with other alternatives.

Cost are millions of dollars					Cost of Installed Pipelines by Irrigated Region & Model Output Gauging Station				
Canal - Diversion	Irrigated Region	Peak Flow CFS	Canal Length (feet)	Pipe Install Costs	Teton Valley @ S.Leigh	Teton Valley @ St. Anthony	Egin Bench @ Rexburg	Lower Watershed @ Rexburg	North Fremont @ Chester
Dewey	Egin Bench	49	37,440	$ 17.2			$ 17.2		
Egin	Egin Bench	439	99,406	$ 114.9			$ 114.9		
Independent	Egin Bench	522	138,266	$ 184.0			$ 184.0		
Last Chance	Egin Bench	136	116,785	$ 64.7			$ 64.7		
St. Anthony Union	Egin Bench	620	124,753	$ 192.1			$ 192.1		
St. Anthony Union Feeder	Egin Bench	261	68,233	$ 53.4			$ 53.4		
Canyon Creek	Lower Watershed	78	92,331	$ 45.5				$ 45.5	
Chester	Lower Watershed	128	26,900	$ 14.6				$ 14.6	
Consolidated Farmers	Lower Watershed	612	45,005	$ 68.5				$ 68.5	

Pipelines & Lining – Results

[1] The period from May 15 to July 15

[2] The period from July 16 to May 14

			|---------- Acre Feet ----------|			
Alternative	Irrigated Region	Output USGS Gauging Station	Change in Annual Flow	Change in Peak Flow[1]	Change in non-Peak Flow[2]	Estimated Cost Millions
Lining Reduce Canal Seepage	Teton Valley	South Leigh	(19,909)	2,011	(21,920)	85.8
Pipeline Reduce Canal Seepage	Teton Valley	South Leigh	(28,512)	531	(29,043)	243.5
Lining Reduce Canal Seepage	North Fremont	Chester	5,716	1,800	3,916	97.6
Pipeline Reduce Canal Seepage	North Fremont	Chester	11,405	3,588	7,817	167.1
Lining Reduce Canal Seepage	Lower Watershed	Rexburg	(48,506)	(1,873)	(46,633)	633.7
Pipeline Reduce Canal Seepage	Lower Watershed	Rexburg	(56,315)	3,221	(59,537)	953.8
Lining Reduce Canal Seepage	Egin Bench	Rexburg	(36,741)	(2,695)	(34,046)	434.7
Pipeline Reduce Canal Seepage	Egin Bench	Rexburg	(41,764)	210	(41,974)	626.4

Recharge Using Existing Canals

- Diversions were increased 20 percent and 40 percent for the '40%DivInc' model run.

- Diversions were then limited by the amount of available water or canal capacity.

RECLAMATION

Recharge Using Existing Canal - Costs

- Recharge using existing canals consider recharge during the current irrigation season.

- Cost assumed to be zero.

RECLAMATION

Recharge Using Existing Canals – Results

[1] The period from May 15 to July 15

[2] The period from July 16 to May 14

Alternative	Irrigated Region	Output USGS Gauging Station	Change in Annual Flow	Change in Peak Flow[1]	Change in non-Peak Flow[2]	Estimated Cost Millions
			|---------- Acre Feet ----------|			
Recharge Using Existing Canals-20%	Teton Valley	South Leigh	(2,305)	(4,310)	2,006	-
Recharge Using Existing Canals-40%	Teton Valley	South Leigh	(3,985)	(8,013)	4,029	-
Recharge Using Existing Canals-20%	North Fremont	Chester	(8,102)	(2,964)	(5,138.1)	-
Recharge Using Existing Canals-40%	North Fremont	Chester	(15,066)	(5,342)	(9,723.8)	-
Recharge Using Existing Canals-20%	Lower Watershed	Rexburg	(30,286)	(33,224)	2,938.3	-
Recharge Using Existing Canals-40%	Lower Watershed	Rexburg	(55,402)	(62,513)	7,110.2	-
Recharge Using Existing Canals-20%	Egin Bench	Rexburg	(17,644)	(14,795)	(2,849.2)	-
Recharge Using Existing Canals-40%	Egin Bench	Rexburg	(30,395)	(26,888)	(3,506.6)	-

Impacts to Basin Needs

- Increase/decrease in annual flows

- Increase/decrease in peak and/or non-peak flows
  - “best/ideal” hydrograph?

Some Important Considerations

- Automated Canals
  - Management of diversions
- Demand Reduction
  - Cost per acre
  - Impacts to agricultural economy

Some Important Considerations, cont.

- Pipelines & Linings
  - High cost
  - Reduced flows (except North Fremont)

- Recharge with Existing Canals
  - Increase non-peak flows in Upper Teton
  - Recharge constraints

Teton Dam Alternative

Previous Studies

- Bureau of Reclamation. 1991. *Teton Dam Reappraisal Working Document*.
- HDR Engineering, Inc. 1995. *Teton Dam Reconnaissance Study*.

RECLAMATION

Draft Teton Dam Costs

Alternative	Total Storage Volume	Supplemental Water Volume	Total Construction Cost	Cost per Unit Storage (Dollar per acre-foot)	Cost per Unit Supplemental Water (Dollar per acre-foot)
Teton Dam Rebuild – rockfill embankment dam	288,000	55,000	$165,504,000	$575	$3,009
Teton Dam Rebuild – roller-compact concrete dam	288,000	55,000	$322,171,000	$1,119	$5,857

Teton Dam Considerations

- History
- Fish Passage, Reservoir Impact
- Rockfill vs Roller Compacted
- 288K acre feet – Reclamation
  50-100K acre feet – HDR
- Power facilities & additional irrigation
  costs included

RECLAMATION