

Midvale Conservation Program Level II Feasibility Study

Wind/Bighorn River
Basin Advisory Group
Wyoming State Water Plan Meeting

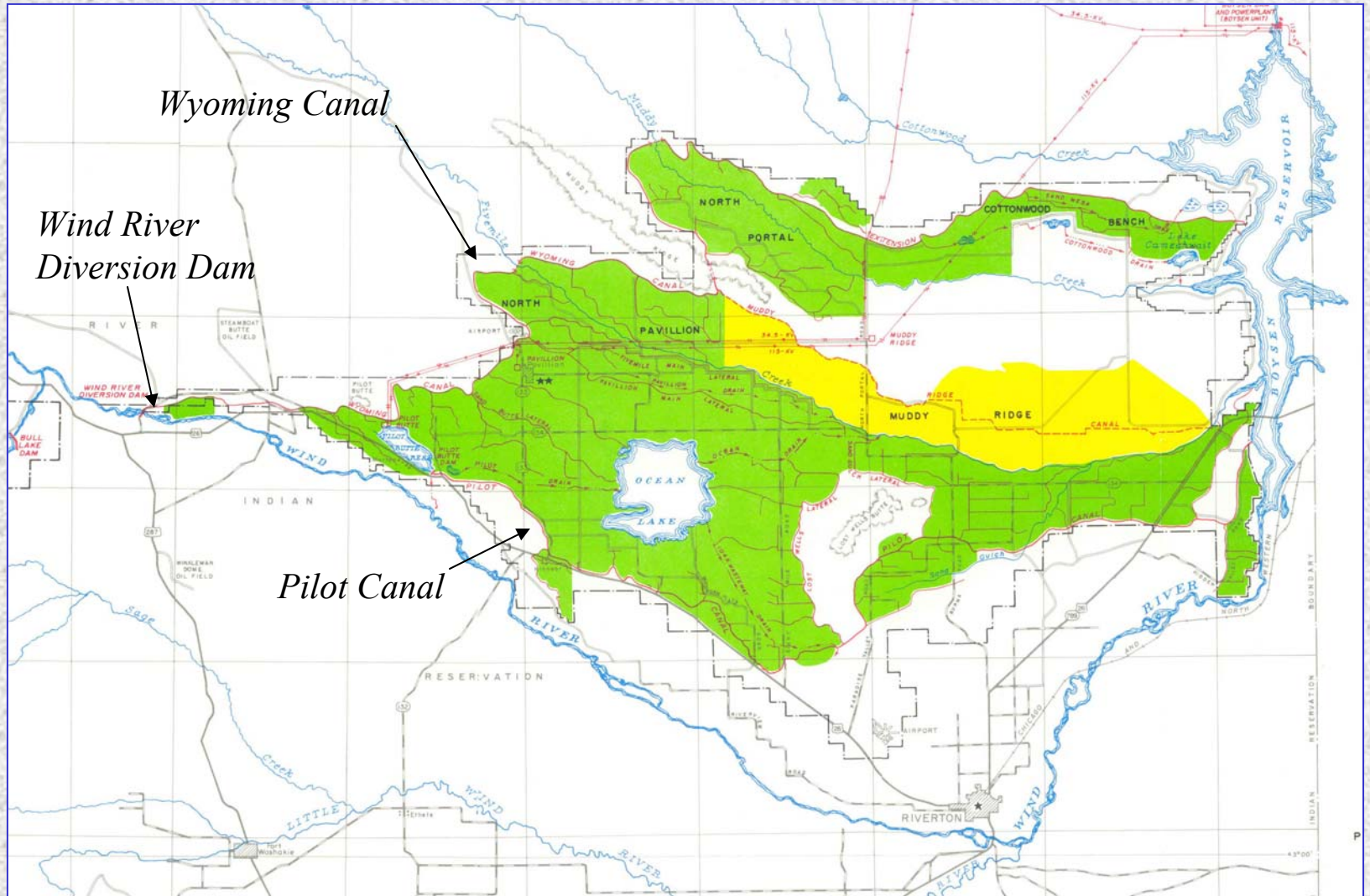
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ANDERSON CONSULTING ENGINEERS, INC.

Civil • Water Resources • Environmental

Riverton Unit



Project Issues and Understanding

1. District Master Plan

Goals:

- Systematic rehab/replacement of structures
- Increase water supply through conservation
- Improve management/delivery of water
- Reduce O&M costs
- Develop 20-year implementation plan

Ancillary Benefits:

- Identification of personnel requirements
- Identification of vehicle and equipment requirements
- Project partnering/funding
- Timely permitting requirements

Components:

- Rehab existing structures
- Lining canals/laterals
- Conversion of laterals to pipelines
- Incorporation of hydropower
- Installation of measurement structures
- Regulation storage reservoirs
- Automation of facilities
- Realignment/reconfiguration of existing facilities
- Improvements in measurement/recording
- On-farm improvements

Project Issues and Understanding

2. Conservation Potential (20-Year Plan)

• On-Farm Improvements	75,000 AF
• Reduction in Canal/Lateral Waste	40,000 AF
• Reduction in Seepage/Evaporation Losses	<u>25,000 AF</u>
	140,000AF

Perspective:

Average Yield:	300,000 AF
Potential Conservation:	<u>50,000 AF</u>
Firm Yield	350,000 AF

Equivalent Reservoir

Firm Yield:	50,000 AF
Required Storage Capacity:	100,000 AF
Assuming \$1,000/AF	<u>x 1,000</u>
Cost	\$100 million

3. Project Funding

- In-Kind Construction Services
- Materials provided by WWDC
- Partnering may provide other funding opportunities
- Sources for on-farm improvements critical
- PL-566 Funding Investigation

Project Goal / Objectives

Goal: Development of a 20-Year Plan of Improvements

Objectives:

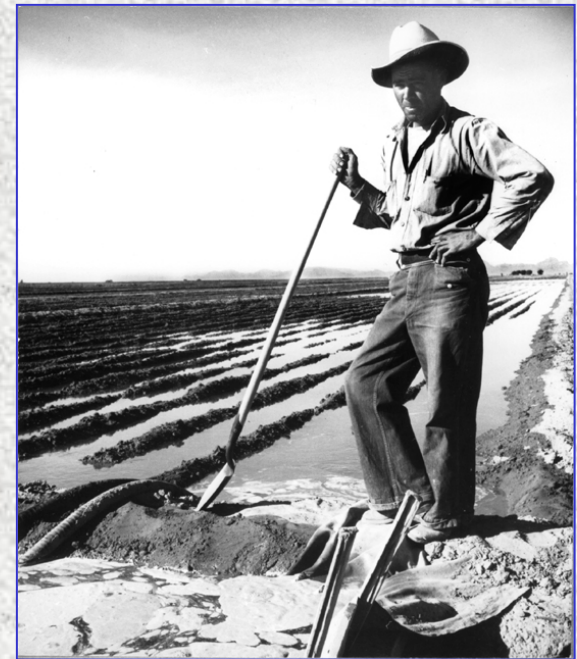
- Evaluate feasibility of gravity pressure pipeline
- Evaluate potential regulation storage
- Inventory existing structures/identify rehab needs
- Conduct seepage investigations
- Integrate potential hydropower benefits
- Conduct irrigation efficiency analysis/
Identify potential on-farm improvement
- Develop GIS database
- Prepare rehab plan
- Evaluate alternative funding sources
- Prepare conceptual designs and cost estimates
- Identify potential permitting requirements



P36.5 Lateral

Our Approach

- I. Consensus Building
- II. Structure Inventory & Assessment
- III. Seepage Loss Analysis
- IV. Potential for Gravity Pressurized Flow
- V. Irrigation Efficiency
- VI. On-Farm Improvements
- VII. Potential for Hydropower
- VIII. Regulation Storage Opportunity
- IX. Automation Opportunities
- X. Realignment of Existing Facilities



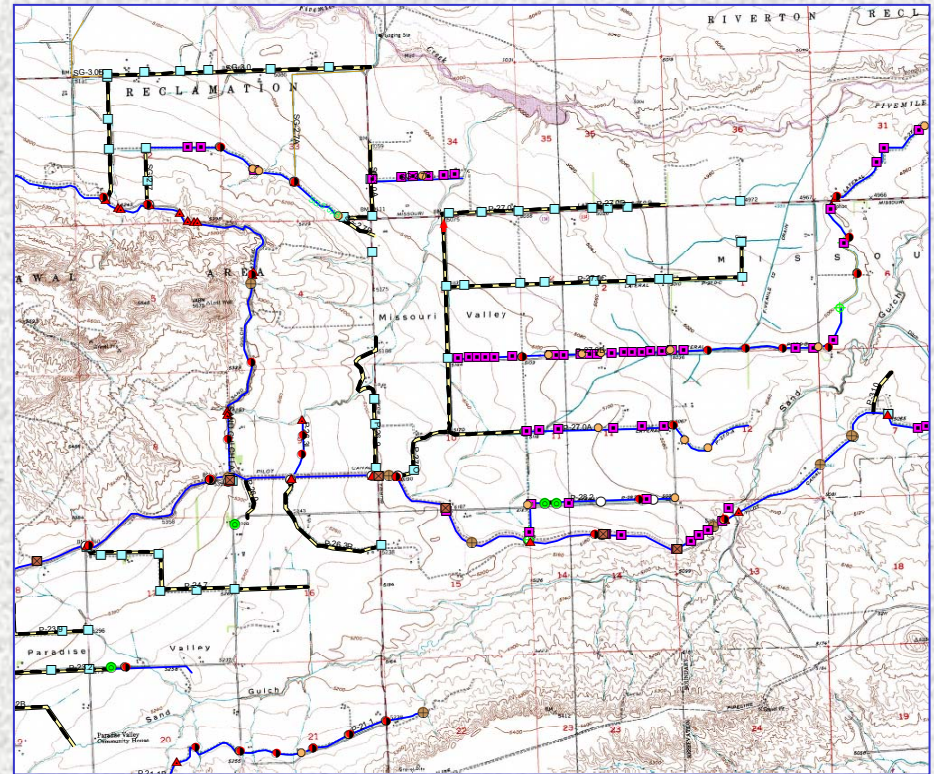
Consensus Building

1. Initiate with Scoping Meeting
2. Obtain consensus among MID / WWDC / Water Users / Consultant
3. Facilitate input through outreach program
4. Enhance process by:
 - a. Encouraging participation (advertising)
 - b. Listening / soliciting input (memos / minutes / comment sheets / “Tailgate Talks”)
 - c. Identifying / developing alternatives with input
 - d. Developing a database to disseminate information (spreadsheet / website)
 - e. Developing a contact list
 - f. Issuing status summaries
5. Exchange and Dissemination of Information (Website, FTP, etc)

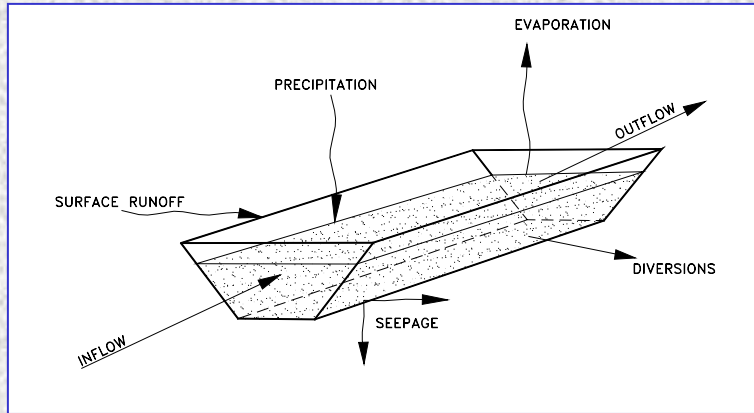


Ditch Inventory and Assessment

- Interview ditch riders/District representatives
- Location with GPS
- Structure measurement / survey
- Condition assessment / Life expectancy
- Photo-documentation
- Identification of seepage locations
- Assessment of past remediation
- All major structures:
 - Diversions / check structures
 - Headgates / chutes / drop structures
 - Siphons
 - Measurement Devices
 - Wasteway structures
- Document farmers turnout structures (GPS/Photo)
- Operational schematic / GIS



Seepage Evaluation



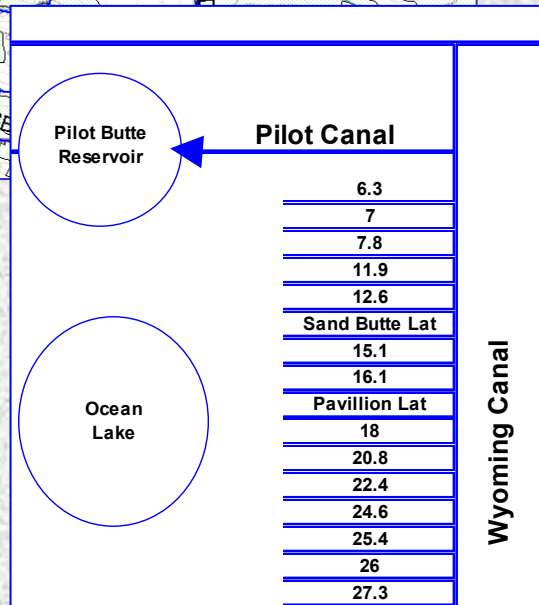
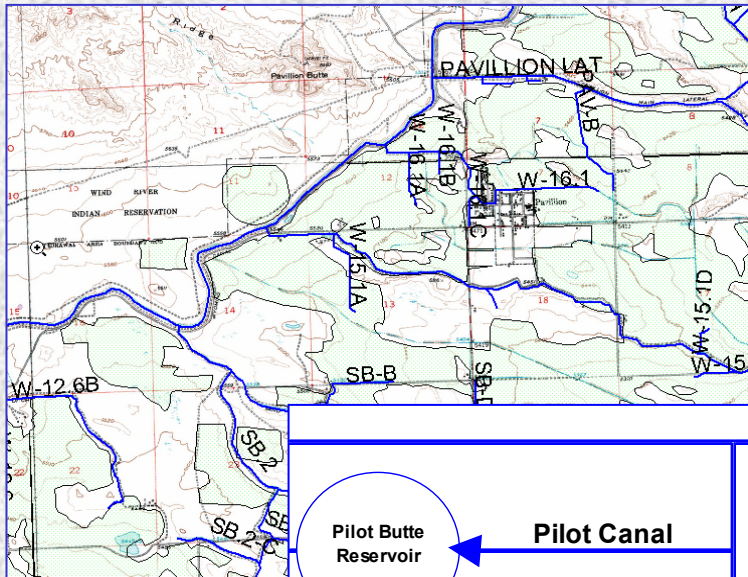
- Water Budget Approach
- Measurement of ditch flow upstream and downstream of suspected seepage
- Measurement of ditch turnouts
- Checkbook accounting
- USGS standard methods
- Typically 5% accurate

Lateral	Diverted	%Loss	% Waste
2.1	-	--	--
4.2	11.8	12.7%	31.4%
7.1	-	--	--
Lost Wells (Main)	69.4	10.5%	5.9%
Lost Wells A	6.0	--	--
Lost Wells D	17.5	3.4%	--
Lost Wells DB	2.3	8.7%	26.1%
Lost Wells E	11.8	4.2%	0.0%
Lost Wells EC	3.6	8.33	--
Lost Wells F	6.0	0.0%	50.0%
Lost Wells G	3.0	--	--
21.1	19.8	27.3%	6.1%
21.7	1.7	0.0%	0.0%
22.3	-	--	--
Sand Gulch (Main)	48.6	14.0%	0.0%
Sand Gulch 2.7	12.2	9.0%	0.0%
Sand Gulch 3.0	2.9	--	--
Sand Gulch 4.8	6.6	3.0%	39.4%
26.3L	4.8	--	--
26.9		9.62	??
27.0 A	4.0	17.5%	0.0%
27.0 B	25.0	-2.2%	6.0%
27.0 C	7.8	-26.9%	7.7%
27.0 D	-	--	--
28.2	6.3	-7.9%	0.0%
31.7	25.0	14.80	7.60
31.0	-	--	--
32.8	5.0	-4.0%	44.0%
34.0	4.3	9.3%	20.9%
34.9	14.2	7.0%	16.9%

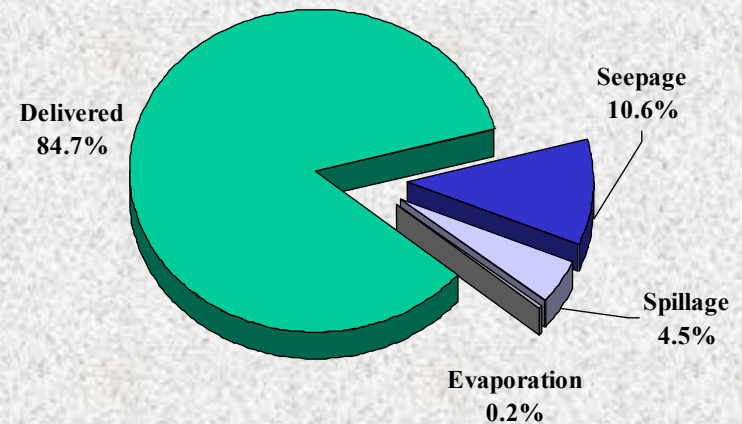
Potential for Gravity Pressurized Flow

- Target laterals unless hydropower benefits achieved
- Evaluate potential for hydropower at each location
- Considerations for site selection / design / implementation
 - Maximum discharge
 - Slope of lateral
 - On-farm application methods (existing / future)
 - Potential conservation (waste / seepage / evaporation)
 - Acres benefited
 - Size of pipe (type and cost)
 - Gravity pressurized vs. gravity flood

Irrigation Efficiency



- District irrigation use spreadsheet model
- GIS mapping: crops and irrigation
- District diagram: Midvale Irrigation District
- Seepage estimates
- Irrigation Efficiency
- Interactive evaluation of alternatives
- Determination of Potential Conservation



On-Farm Improvements / Application Efficiency

On-Farm Application Methods

Efficiency Range (%)

Flood Irrigation / Furrow	40 – 60
Gated Pipe	45 – 65
Gated Pipe / Surge Valves	50 – 70
Side Rolls	60 – 80
Center Pivot / Lateral Move	75 – 85
LEPA	80 – 90
Surface Drip System	85 - 95

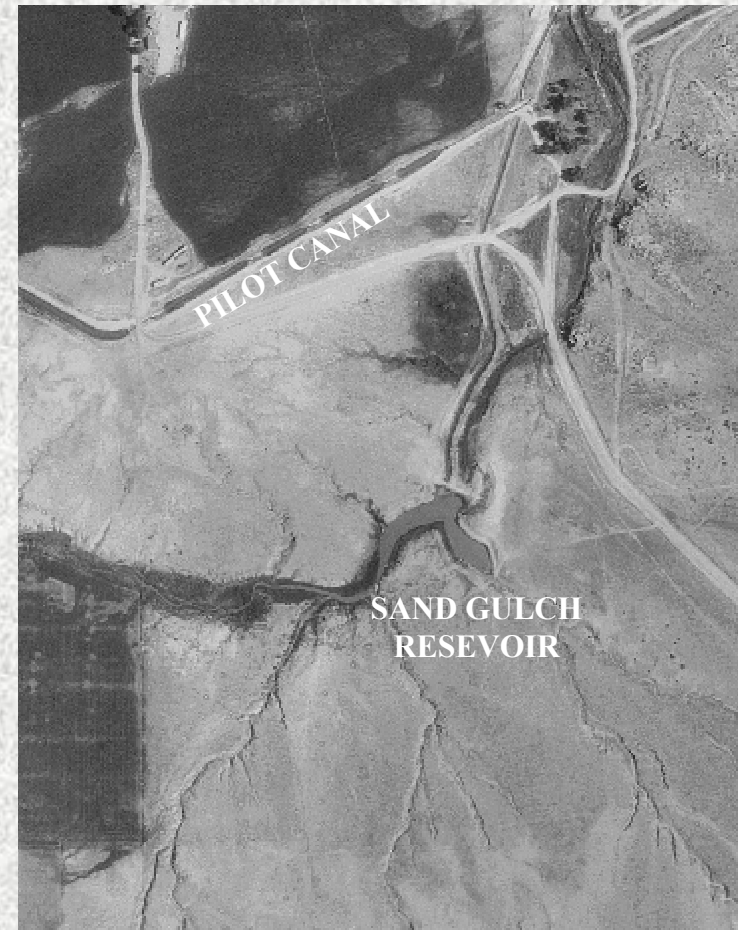
	Furrow	Gated Pipe	Gated Pipe/ Surge	Side Roll	Center Pivot / Lateral Move	LEPA	Drip System
CIR (inches)	20.5	20.5	20.5	20.5	20.5	20.5	20.5
Efficiency (%)	40	45	50	60	75	80	85
Farm Delivery (AF/AC)	4.3	3.8	3.4	2.8	2.3	2.1	2.0
Farm Delivery/1,000 AC (AF)	4300	3800	3400	2800	2300	2100	2000
Savings (AF)	----	500	900	1500	2000	2200	2300

Potential for Hydropower

- Identify technical and economic feasibility for small-scale hydropower generation at selected sites
- Existing utility and plant/transmission lines
- Evaluate power output
 - Head (ft)
 - Discharge/capacity (cfs)
- Marketing/Using Power
 - availability (seasonal)
 - generation capacity
 - power market in area (District vs. non-District)
- Potential permitting requirement
 - FERC
 - Section 404
 - T&E Species
 - Wetlands
 - Cultural resource inventory
- Assess Benefits/Costs
- 20-year plan may promote feasibility

Re-regulating Reservoir Feasibility

- Review operational waste records
- Locate reservoir to avoid pumping
 - adjacent to canal / lateral
 - near significant drop in canal / lateral
- Optimize storage / maximize reduction in operational waste
- Include operation / management information



Automation Opportunities

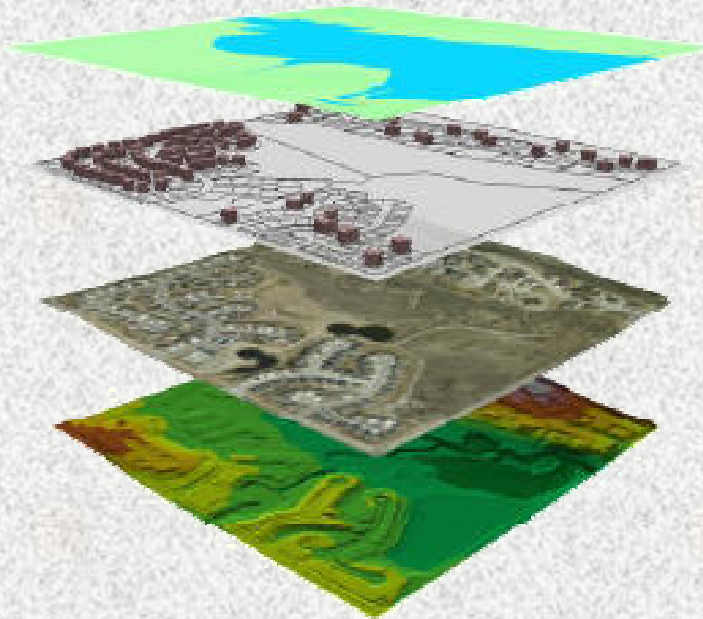
Benefits / Considerations:

- Improved operation and management of water deliveries
- Potential for conservation through reduction in waste
- Timely acquisitions of measurement data
- May include remote measurement of discharge and water level
- May include remote operation of slidegates
- Potential locations:
 - Bull Lake Dam
 - Wyoming Canal Diversion Dam/Measurement Structure
 - Pilot Butte Reservoir Diversion/Measurement Structure
 - Pilot Canal Measurement Structure
 - Lateral Headgates
 - Regulation Storage Reservoirs

Realignment of Existing Facilities

- **Several changes in last 70 – 80 years**
- **Existing alignment will be reviewed**
- **Considerations:**
 - **Site topography**
 - **Land ownership**
 - **Irrigated acreage/water delivery data**
 - **Location of turnouts/headgates**
- **Potential Benefits:**
 - **Pressurized flow for some service areas**
 - **Potential hydropower**
 - **Reduction in O&M**
 - **Conservation**

GIS Development



Dataset Themes: Ownership, Hydrography, Soils, etc.

Topographic Mapping

Ortho Photography

Digital Elevation Models: Base maps, Data Analysis

ACE APPROACH:

Comprehensive “Clearinghouse” of Project Information

Rehabilitation Plan

Two Phases: Phase I – Pilot Butte Reservoir / Ocean Lake / Pilot Canal
Phase II – Bull Lake / Wyoming Canal

Potential Alternatives:

- Rehabilitation of existing structures
 - Lining of canal / laterals
 - Conversion of laterals to pipelines
 - Incorporation of hydropower
- Benefits
- Installation of measurement structures
 - Installation of re-regulating reservoir
 - On-farm improvements
 - System Automation
 - Realignment / Reconfiguration of existing facilities

Evaluation Criteria:

- Potential conservation
- Constructability
- Economic feasibility / relative cost
- Potential hydropower benefits
- Ability to fund
- Ease of permitting
- Landowner Considerations

Project Funding

WWDC:

- Ditch facilities (diversions, ditches, pipelines, re-regulating reservoirs, turnout structures, etc)
- Potential to use 50% grant to purchase materials, MID responsible for engineering, permitting and construction

Farm Service Agency (USDA)

- Conservation Reserve Program
- Continuous Sign-up for High Priority Conservation Practices

Natural Resource Conservation Service (NRCS):

- Environmental Quality Incentive Program (EQIP)
- Wildlife Habitat Improvement Program (WHIP)
- PL 566

Office of State Lands and Investments

- Loans for on-farm improvements

Wyoming Department of Environmental Quality:

- Funds are available through Section 319 of the Clean Water Act

Project Status

1. Completed seepage/water balance study on Pilot Canal System.
2. Completed inventory of structures on Pilot Canal System.
3. Completed pertinent data and initiated development of a project GIS.
4. Continuing data collection efforts.
5. Initiating evaluation of irrigation efficiency and on-farm irrigation methods.
6. Initiated development of a rehabilitation plan for the Pilot Canal System