

Travers Reservoir Rehabilitation Project

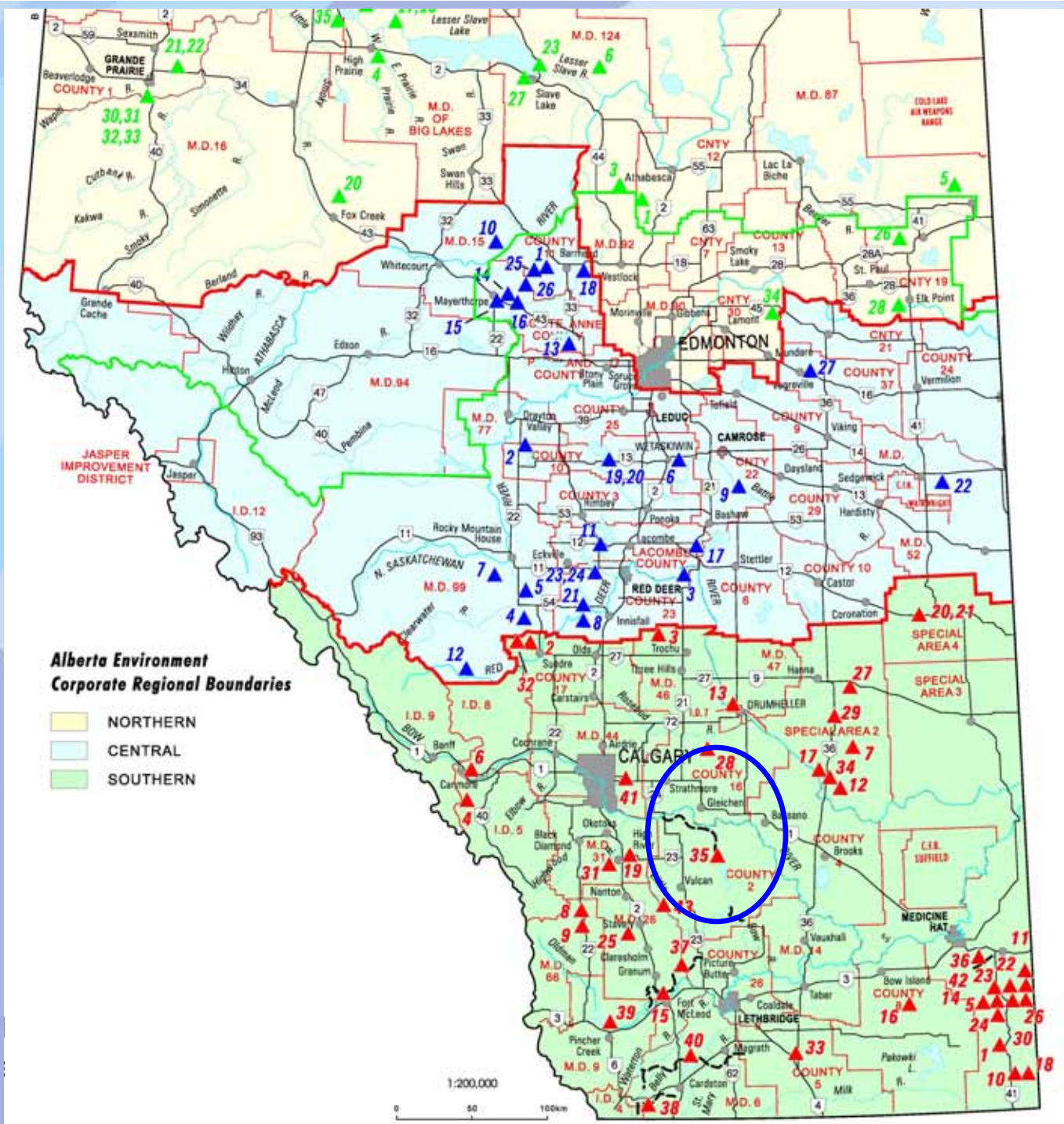
2010 Irrigation Technical Conference
Lethbridge, AB
June 2, 2010



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Location Plan

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CALGARY

Eastern Irrigation District Headworks

Bow River Irrigation District Headworks

A map showing a section of the Bow River. A blue line, representing a route, starts from the top right and moves towards the bottom left. The text "BOW RIVER" is written in large, bold, blue letters across the river. Below it, the word "BADGE" is partially visible.

LETHBRIDGE

**Government
of Alberta** ■

History of CBRH

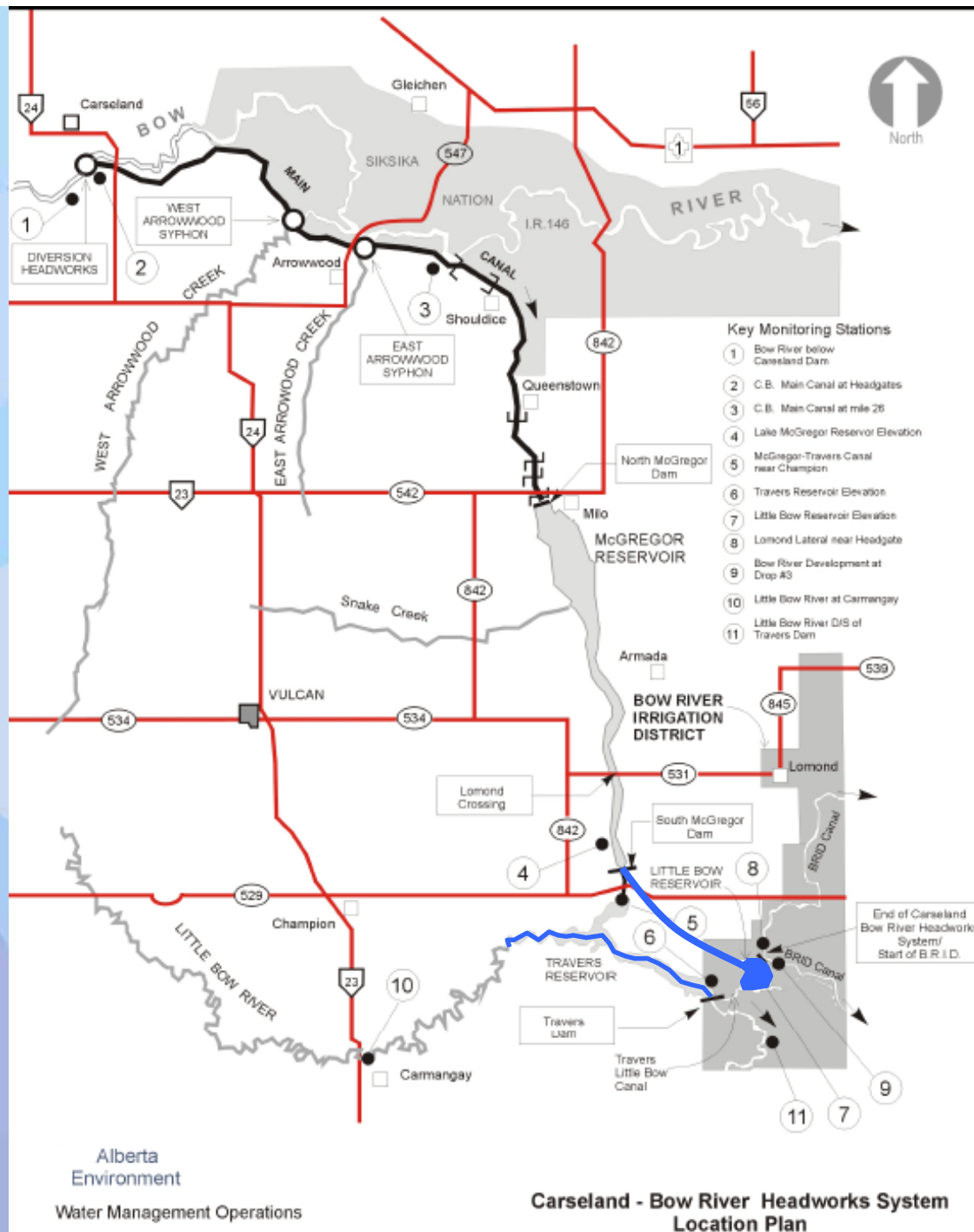
- CBRH system was built in the early 1900's
- Travers Dam was constructed in 1950's by the PFRA
- AENV took control of the headworks portion of the system In 1974. The BRID was formed and took over the remainder of the system

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System Map (Pre 1950 rehab)

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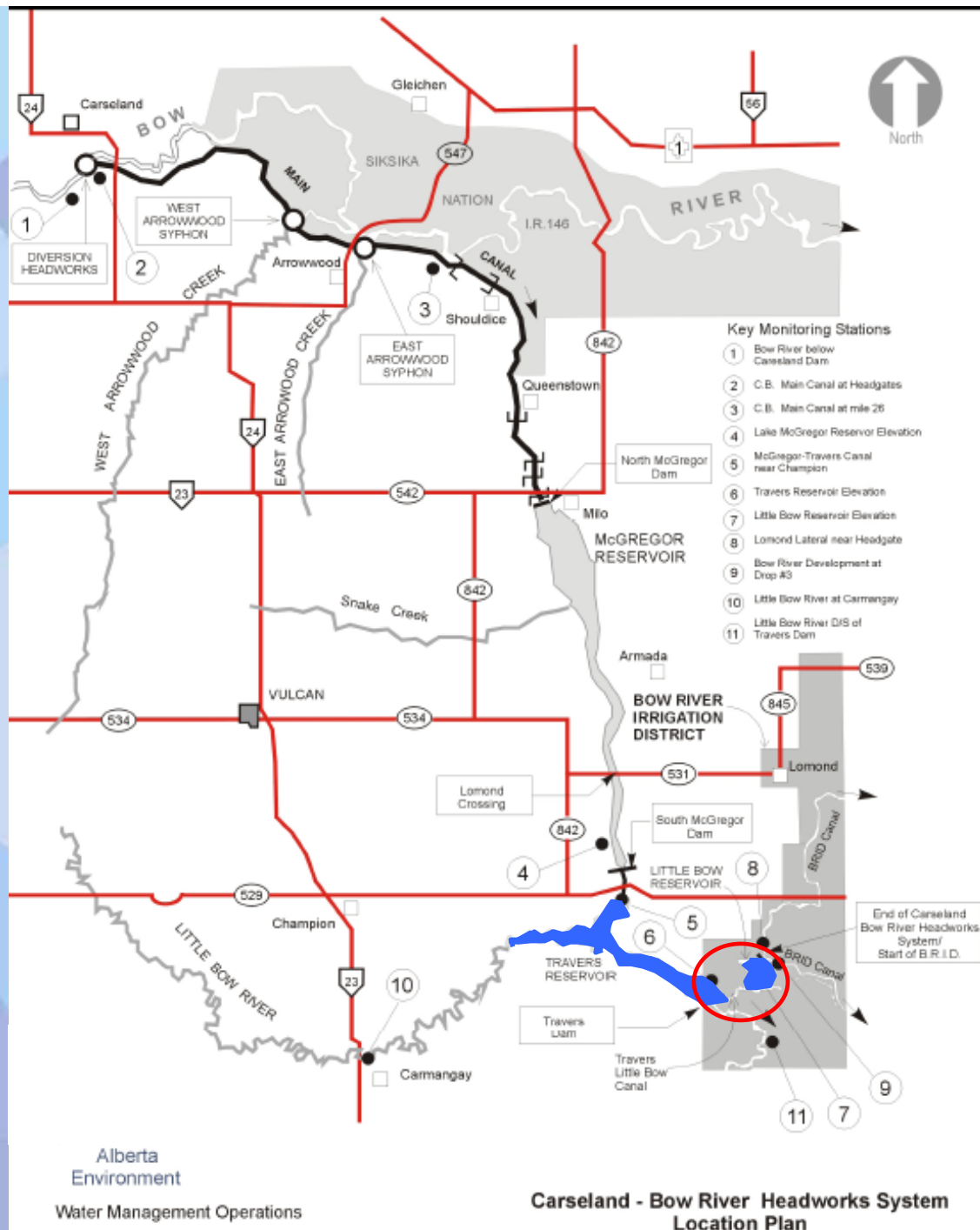


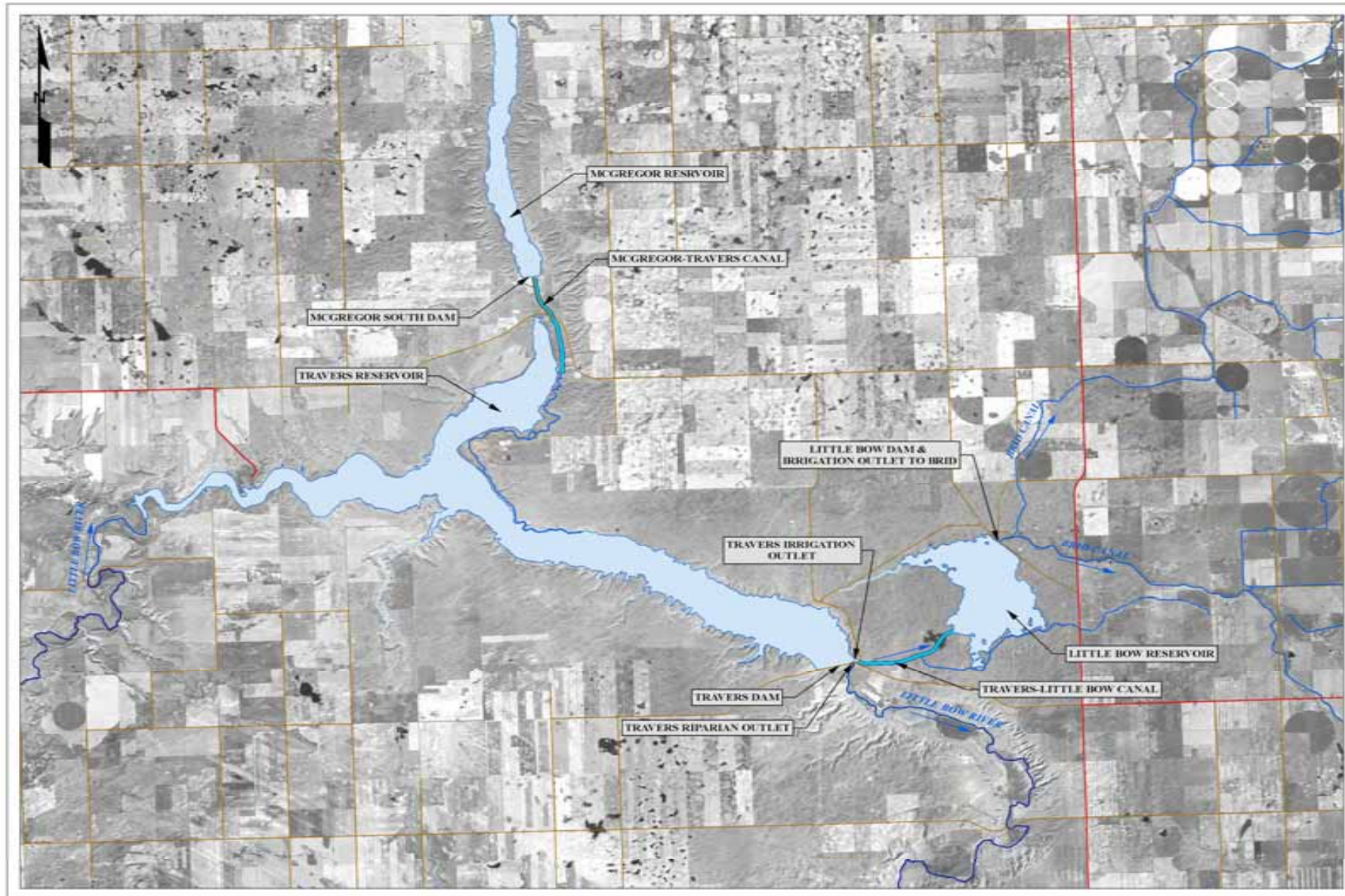
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System Map After Travers Construction (Post-1950's)

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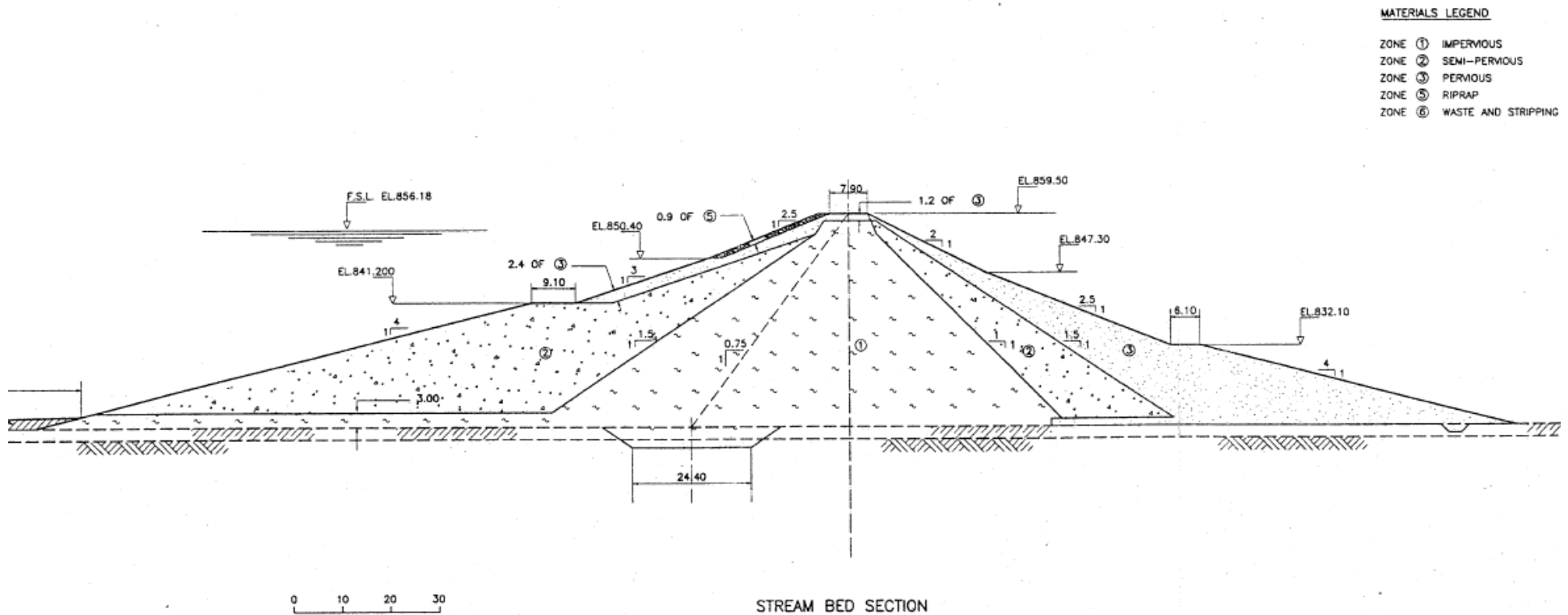




Travers Dam and Reservoir Characteristics

- Zoned earthfill dam on Little Bow River
- Maximum dam height of 44 m
- Dam length is 915 m
- Dam top width is 10.4 m

Travers Dam and Reservoir Characteristics



Travers Dam and Reservoir Characteristics



Travers Dam and Reservoir Characteristics

- Outlets:
 - Gated concrete chute service spillway
 - Gated riparian outlet pipe
 - Irrigation Outlet (gated concrete outlet)
- Reservoir Storage of 312,000 dam³
(253,000 ac-ft)
- Licensed Live Storage of 104,600 dam³
(84,800 ac-ft)

Travers Dam and Reservoir Characteristics



Travers Dam and Reservoir Issues

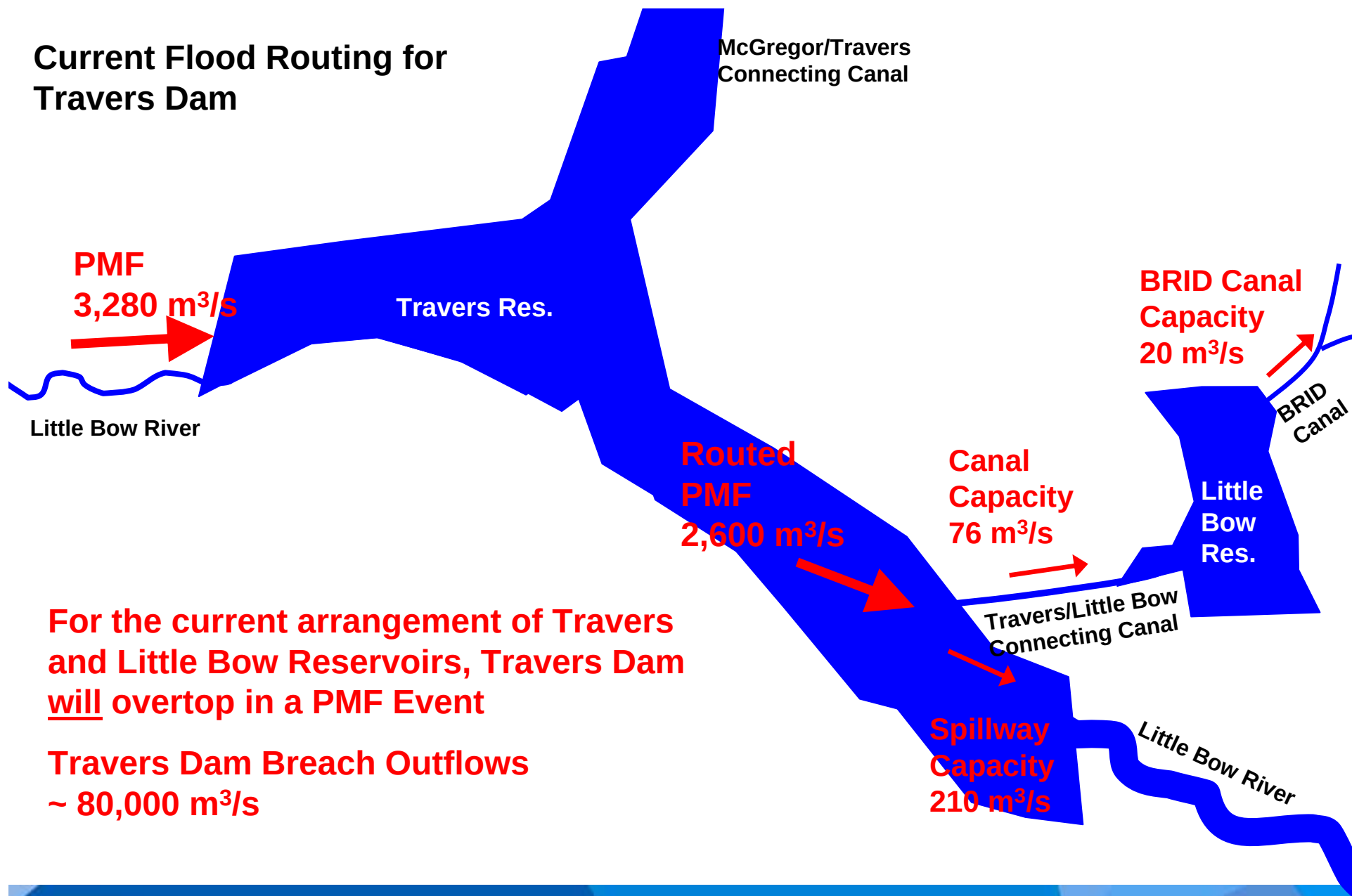
- Aging structures
- Inadequate spillway capacity
- Seepage through dam core
- Poor upstream riprap

Dam Classification

Table 3.1: Classification of Dams and Inflow Design Flood Selection according to the Canadian Dam Safety Guidelines (2007)

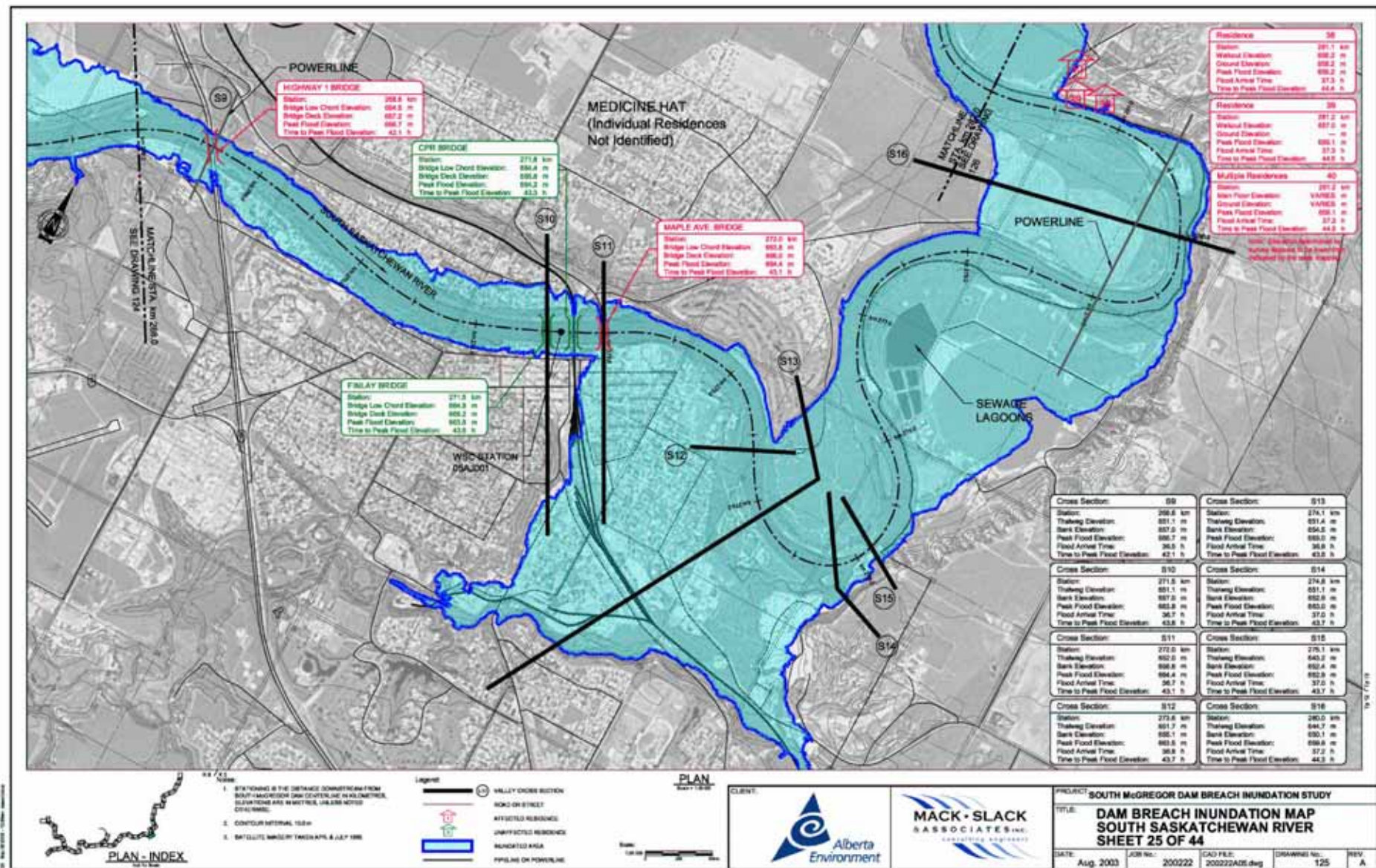
Dam Class	Population at risk	Incremental Loss of Life	Incremental Infrastructure and Economic Losses	Incremental Environmental and Cultural Losses	Inflow Design Flood – Return Period or Peak Flow
Significant	Temporary only	Unspecified	Recreational facilities and seasonal workplaces	Loss of marginal fish and wildlife habitat only. Compensation in kind highly possible	Between 1:100 year and 1:1,000 year Events
High	Permanent	10 or fewer	High economic losses affecting infrastructure, public, transportation and commercial facilities	Significant loss of important fish and wildlife habitat. Compensation in kind highly possible.	1/3 between the 1:1,000 year and PMF Events
Very High	Permanent	100 or fewer	Very high economic losses affecting important infrastructure or services	Significant loss of critical fish and wildlife habitat. Compensation in kind possible but impractical	2/3 between the 1:1,000 year and PMF Events
Extreme	Permanent	More than 100	Extreme losses affecting critical infrastructure or services	Major loss of critical fish and wildlife habitat. Compensation in kind impossible.	PMF

Current Flood Routing for Travers Dam

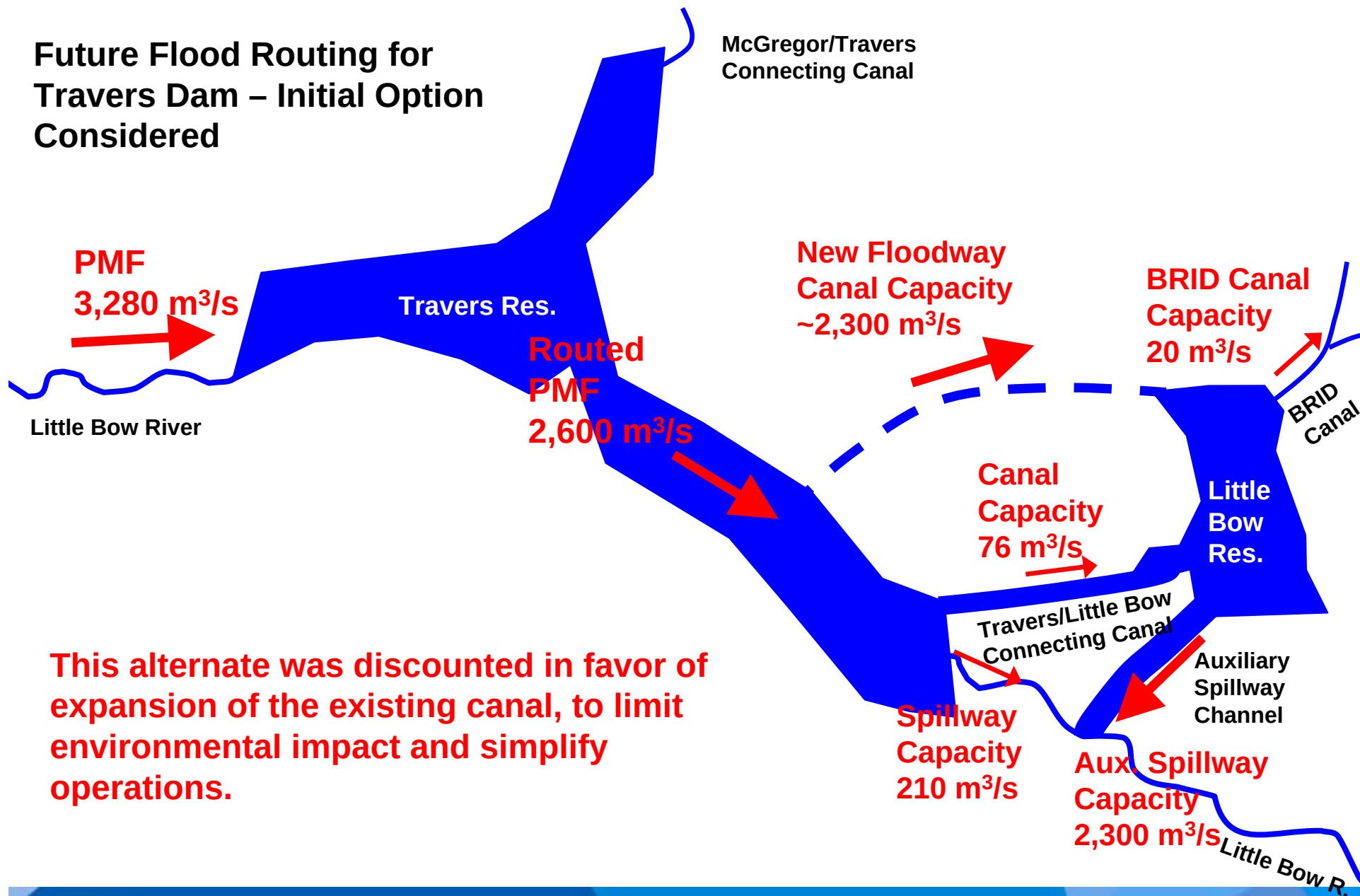


For the current arrangement of Travers and Little Bow Reservoirs, Travers Dam will overtop in a PMF Event

Travers Dam Breach Outflows
~ 80,000 m³/s

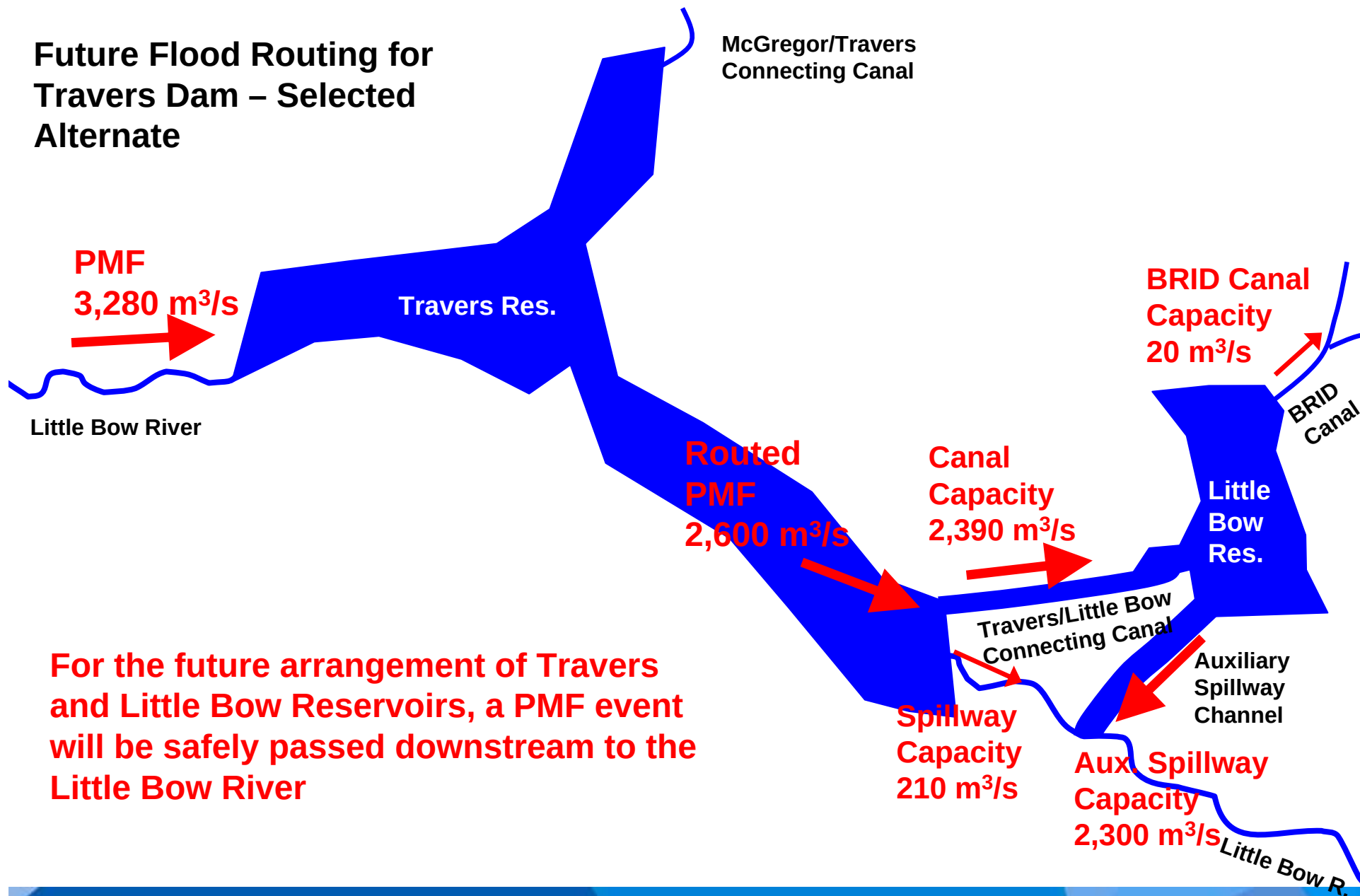


Future Flood Routing for Travers Dam – Initial Option Considered



This alternate was discounted in favor of expansion of the existing canal, to limit environmental impact and simplify operations.

Future Flood Routing for Travers Dam – Selected Alternate



For the future arrangement of Travers and Little Bow Reservoirs, a PMF event will be safely passed downstream to the Little Bow River

Planned Rehabilitation at Travers Dam

- Travers Dam Embankment
 - Flatten and raise downstream dam slope to enhance stability
 - Raise dam crest by 1.6 m for flood routing
 - Replace riprap on upstream dam face
 - Construct new seepage monitoring system at dam toe
- Existing Concrete Spillway
 - Replace gate system and provide new bridge over structure crest
 - Repair concrete slab floor

Planned Rehabilitation at Travers Dam

- Travers Dam Embankment
- Existing Concrete Spillway
- Riparian Outlet Conduit
- Irrigation Outlet
- New Auxiliary Earth Spillway South Channel
- Work on Little Bow Reservoir

Planned Rehabilitation (Cont'd)

- Riparian Outlet Conduit
 - Replace conduit and extend to dam toe
- Irrigation Outlet
 - Remove existing outlet system and road crossing
 - Widen and lower canal (by 1.8 m)
 - Construct a new roadway crossing 200m downstream of current crossing
- New Auxiliary Earth Spillway South Channel
 - Excavate new south channel
 - Construct new concrete weir at upstream end of channel
- Work on Little Bow Reservoir
 - Increase capacity of irrigation inlet canal
 - Raise Little Bow main dam and construct East dyke
 - Replace Little Bow outlet structure

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Travers Reservoir Damsite Area

LITTLE BOW
RESERVOIR

EXCAVATE NEW AUXILIARY
EARTH SPILLWAY SOUTH
CHANNEL (AVERAGE 4 METRES
DEEP BY 150 METRES WIDE
BY 1 KILOMETRE LONG)

CONSTRUCT NEW
CONCRETE WEIR
STRUCTURE

CONSTRUCT DIVIDER DYKE
BETWEEN IRRIGATION CANAL
AND SOUTH CHANNEL
(LOCATION TO BE DETERMINED)

ENLARGE
IRRIGATION
CANAL

REPLACE IRRIGATION OUTLET/
ROAD CROSSING STRUCTURE
(NEW STRUCTURE ABOUT 200
METRES DOWNSTREAM)

FLOW

REHABILITATE
CONCRETE
SPILLWAY

TRAVERS RESERVOIR

REHABILITATE RIPARIAN
OUTLET TO DISCHARGE
DIRECTLY INTO RIVER
(EXTEND CONDUIT TO DAM TOE)

LITTLE BOW RIVER

REHABILITATE TRAVERS
DAM (RAISE DAM 1.6
METRES, REPLACE UPSTREAM
ROCK RIPRAP AND FLATTEN
BACKSLOPE)

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amec

Note: Topographic features are exaggerated 2:3 times in the vertical direction.

Planned Rehabilitation – Travers Dam

- Main Embankment Stage 1
(on-going, completed by fall 2010)
- Concrete Structures and Earthworks
(summer 2010 – summer 2011)
- Main Embankment Stage 2
(summer 2012 – summer 2013)

Planned Rehabilitation – Travers Dam

- Main Embankment Stage 1 key work:
 - Construct lower earthfill berm (to Elev. 850.0 m) on Travers Dam to flatten slope
 - Borrow material from irrigation outlet canal enlargement
 - Relocate riparian outlet to Little Bow River
 - Construct toe drains and main embankment seepage collection and monitoring system

Stage 1 Work



Stage 1 Work



Stage 1 Work



Stage 1 Work



Stage 1 Work



Planned Rehabilitation – Travers Dam

- Concrete Structures and Earthworks Key Work
 - Service spillway:
 - Upstream wingwall repairs
 - Replace and raise existing bridge
 - Concrete chute slab replacement
 - Gate and hoist system replacement
 - Riparian outlet system gate and hoist upgrades
 - Auxiliary spillway:
 - South channel excavation
 - Structure construction
 - Enhancement dyke construction
 - Granular plug construction

NEW OPERATOR DECK, HOIST AND CONTROL SYSTEM

TOP OF NEW BRIDGE DECK EL. 861.250

REPLACE EXISTING BRIDGE DECK WITH NEW BRIDGE DECK

FOR EMERGENCY FLASH BOARDS 51 DIA. x 457 IRON PIPES Ø 1524 c/c EMBED 457 INTO TOP OF CHUTE WALL TO STA. 074.576 NOW PLUGGED WITH GROUT

CONCRETE PLUG OF LONGITUDINAL PIPE AT STA. 065.532, STA. 082.964, STA. 120.396, STA. 147.828, STA. 175.260, STA. 202.692, STA. 230.124, STA. 257.556 AND STA. 282.854

RAISE WALLS AND PIERS

ADD BREAST WALL

RAISE PIERS AND ABUTMENT WALLS

REPLACE GATES

6000

FLOW

RADIUS OF FLOOR CURVE FROM 038.100 TO 056.523 = 229.826

RADIUS OF FLOOR CURVE FROM STA. 31.913 TO STA. 056.388 = 205.740

FLOOR SLAB 457 THICK AT STA. 038.10 TO 382 AT STA. 065.53

REPLACE CHUTE FLOOR SLAB AND SUBSURFACE DRAINAGE SYSTEM. REFER TO DRAWINGS 344 TO 347 FOR DETAILS

SLOPE=0.12

EL. 852.587

SLOPE=0.12

FLOOR SLAB 305 THICK FROM STA. 065.532 TO STA. 282.854

FLOOR SLAB 400 THICK FROM 056.388 TO 275.844

EL. 853.440

TOP OF SLAB EL. 854.050

EL. 856.180

EL. 857.520

EL. 858.012

PFRA DESIGN LEVEL EL. 858.012

100 YEAR FLOOD EL. 857.520

10 YEAR FLOOD EL. 856.180

610 OF RIPRAP ON SIDES AND BOTTOM FOR 6096 SEE NOTE 5

TO EL. 850.392

REPLACE LEVEL MEASUREMENT SYSTEM

CUTOFF AND SPILLWAY AREA TO STA. 038.100 IS IMPERVIOUS MATERIAL

HARDESTY 2134x6096 RADIAL GATE

HARDESTY DOUBLE DRUM GATE HOIST MODEL 4A-D

EL. 859.536

T.O.D. EL. 859.536

EL. 858.100

EL. 857.523

EL. 856.388

EL. 853.440

EL. 852.587

EL. 850.392

EL. 849.651

EL. 847.444

EL. 845.100

EL. 843.100

EL. 841.100

EL. 839.100

EL. 837.100

EL. 835.100

EL. 833.100

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EL. 829.100

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EL. 803.100

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EL. 575.100

EL. 573.100

EL. 571.100

EL. 569.100

EL. 567.100

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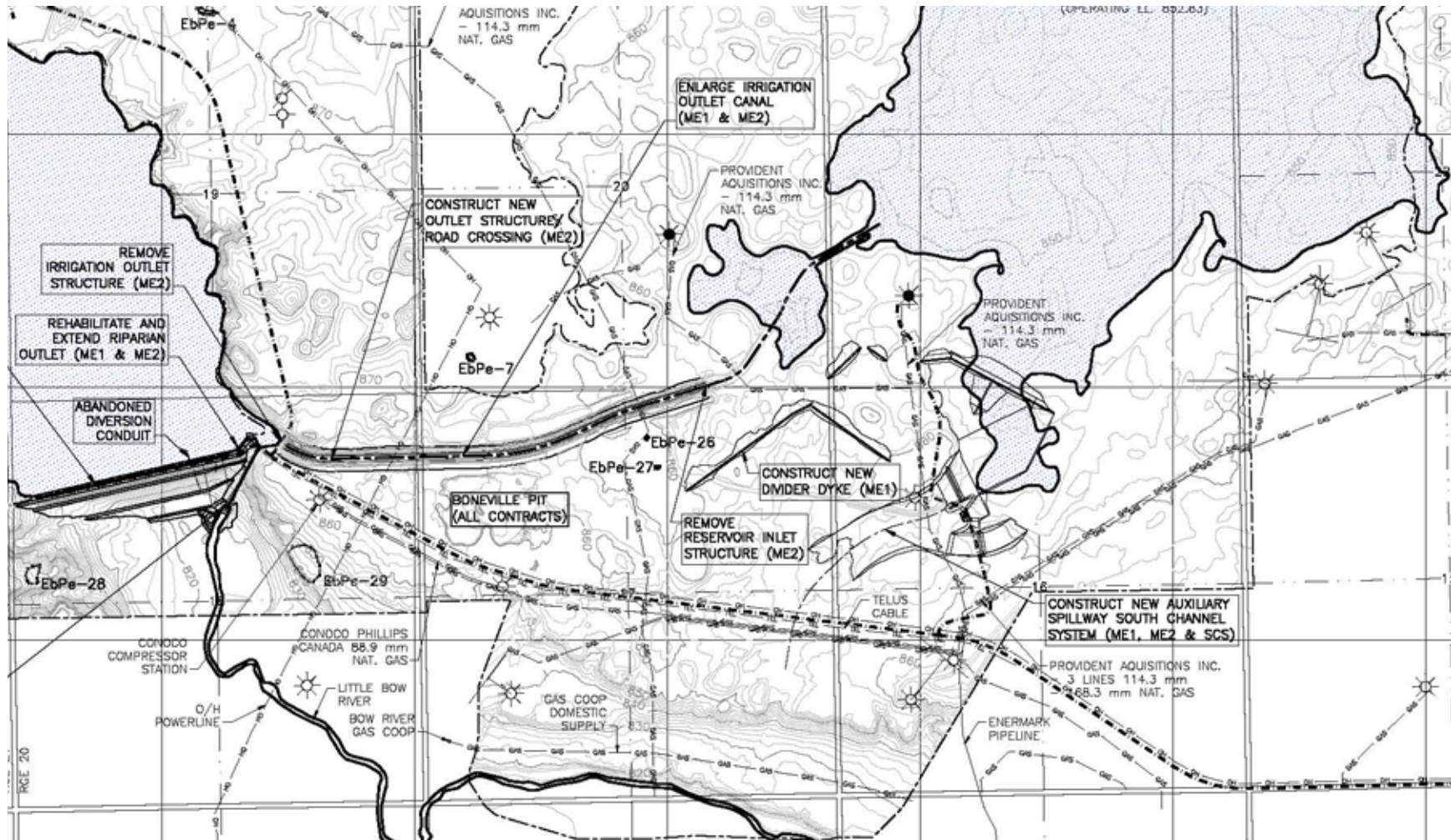
EL. 563.100

EL. 561.100

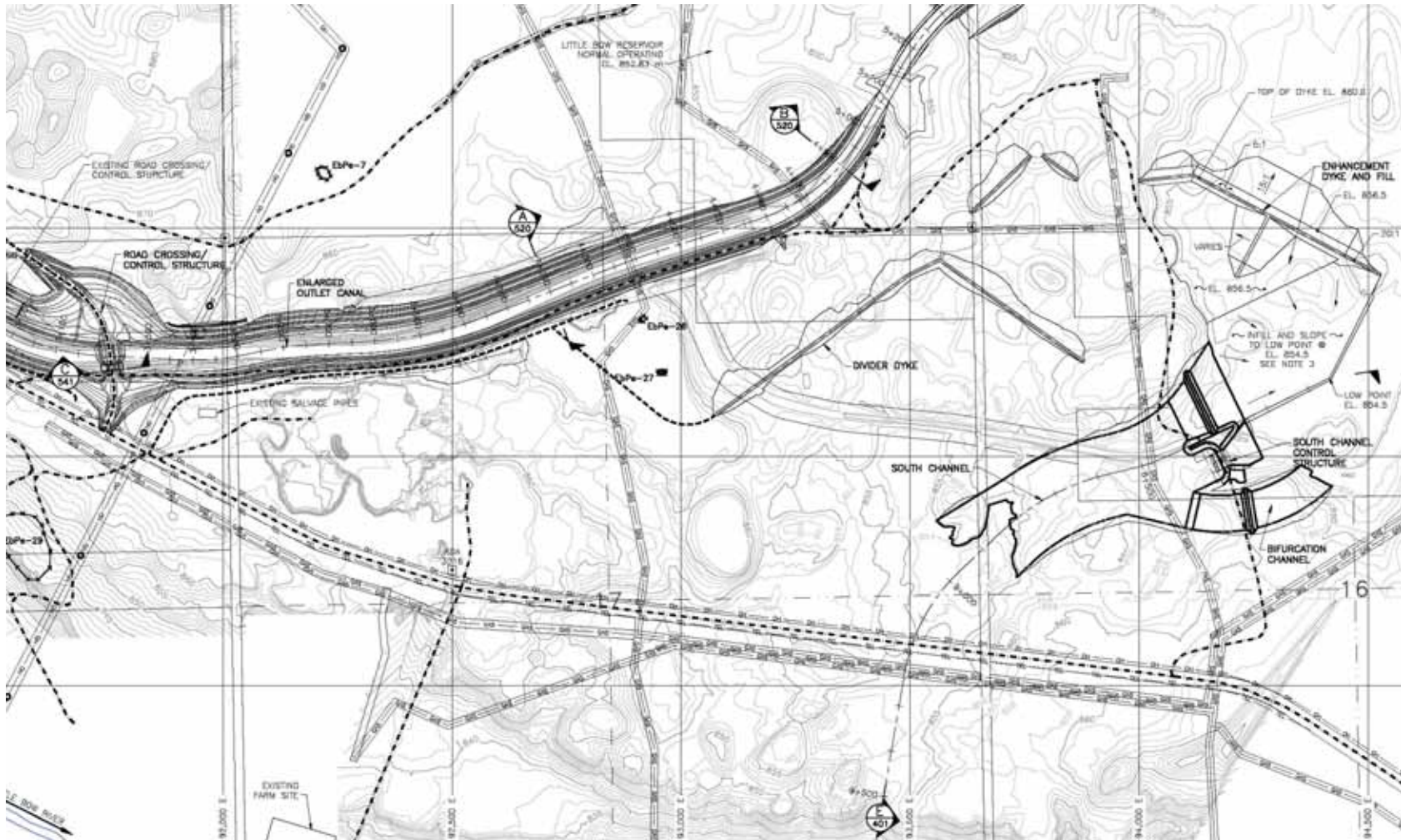
EL. 559.100

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Auxiliary Spillway Work



Auxiliary Spillway Work



Planned Rehabilitation – Travers Dam

- Main Embankment Stage 2 key work
 - Complete downstream embankment fill and raise dam
 - Upstream slope riprap replacement
 - Remove Irrigation Outlet control structure
 - Construct new roadway crossing of Irrigation Outlet



Thank You