RSM 2013- Reservoir Sediment Management Workshop

Development of databook
Workshop agenda planning
Attendance by NWK personnel from Regulatory, Planning, Operations, and Engineering

Development of databook (HNTB)
Workshop agenda planning (HNTB)
Attendance by two reservoir sedimentation experts

State Participation

- Attendance
- Presentations by Kansas Water Office
- Data from Kansas Biological Survey
- Free venue from University of Kansas Civil Engineering Department

Agencies in Attendance

FEDERAL

- USACE (KC):
  - River Engineering
  - Hydrologic Engineering Branch Chief
  - Planning
  - Water Control
  - Regulatory
  - Tuttle Creek Lake Manager
  - Perry Lake Manager
  - Water Quality
- Other USACE: ERDC, HEC, Omaha, Tulsa
- USGS

STATE

- Kansas Biological Survey
- Kansas Water Office
- University of Kansas
- Delaware River Watershed
- Kansas Department of Health and Environment
- Kansas Department of Agriculture-DWR
- Kansas Department of Wildlife, Parks, and Tourism

PRIVATE

- Rollin Hotchkiss
- George Annandale
- HNTB
- The Watershed Institute

Outcomes

- Compilation of brainstorming ideas, presentations, and meeting notes
- Selection of immediate “next steps” for targeting Section 204 funds
  - Operational change model to decrease trapping efficiency
  - Moveable inlet extension pipe for hydrosuction/ pressure flushing
  - Additional meetings/communication with stakeholders, including EPA

Tuttle Creek

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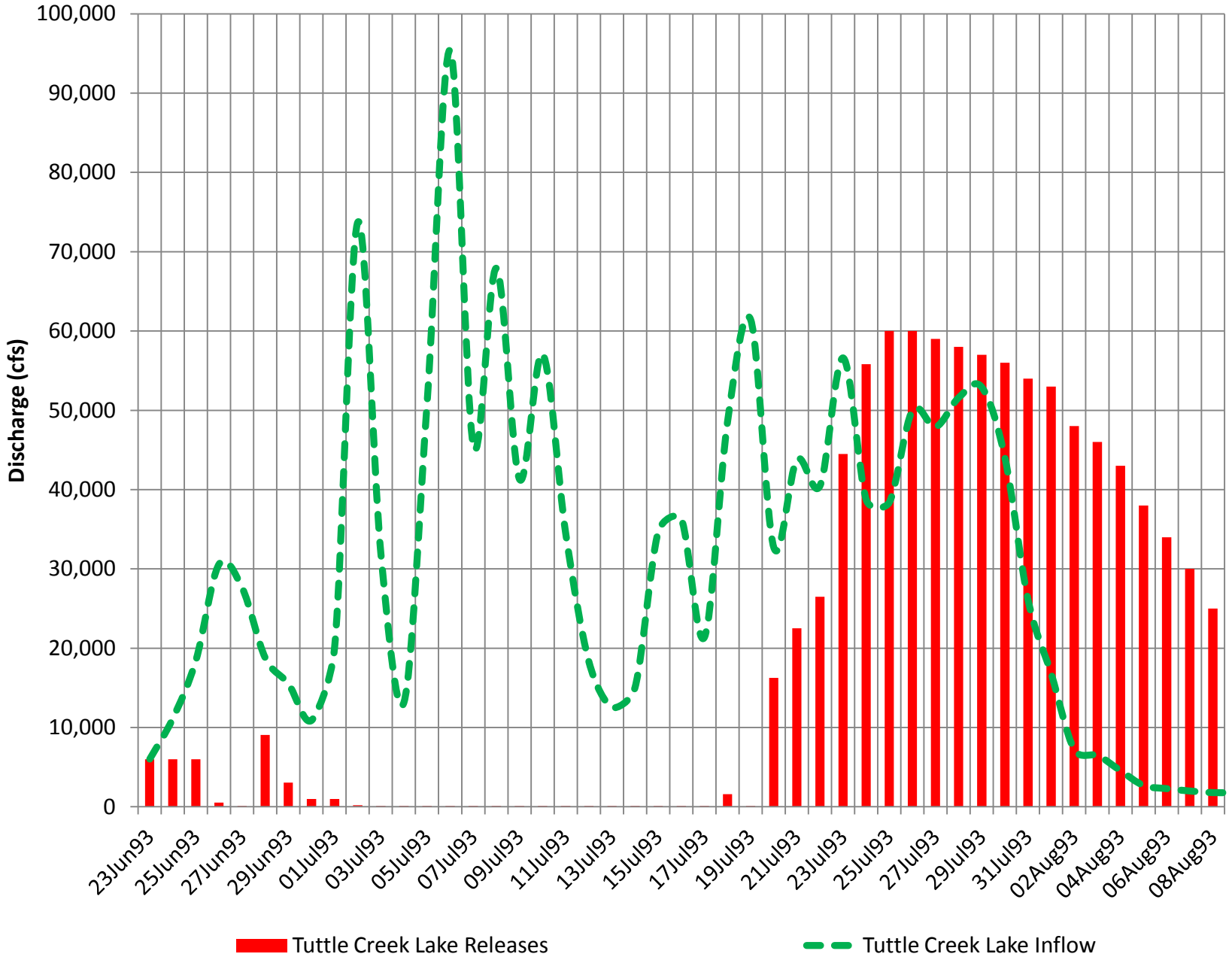
Tuttle Creek

Operational Changes within Existing Flexibilities

Low-hanging fruit: A course of action that can be undertaken quickly and easily as part of a wider range of changes or solutions to a problem (dictionary.com)


Discharge (cfs)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
23Jun93
25Jun93
27Jun93
29Jun93
01Jul93
03Jul93
05Jul93
07Jul93
09Jul93
11Jul93
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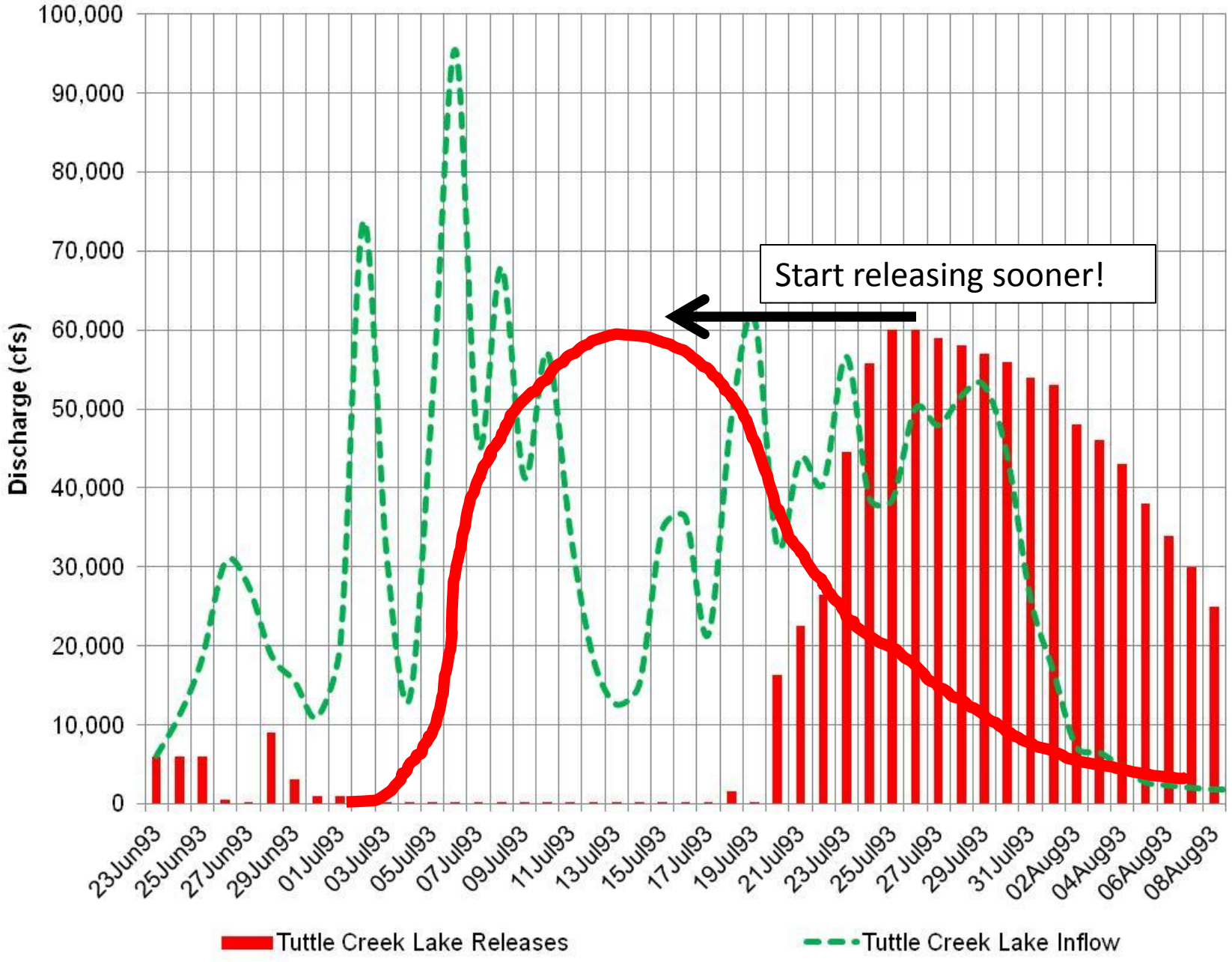
31Jul93
02Aug93
04Aug93
06Aug93
08Aug93
Tuttle Creek Lake Releases
Tuttle Creek Lake Inflow


Start releasing sooner!
Discharge (cfs)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
23Jun93
25Jun93
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Tuttle Creek Lake Releases
Tuttle Creek Lake Inflow

HEC-RAS Unsteady Flow and Sediment Model Under Development

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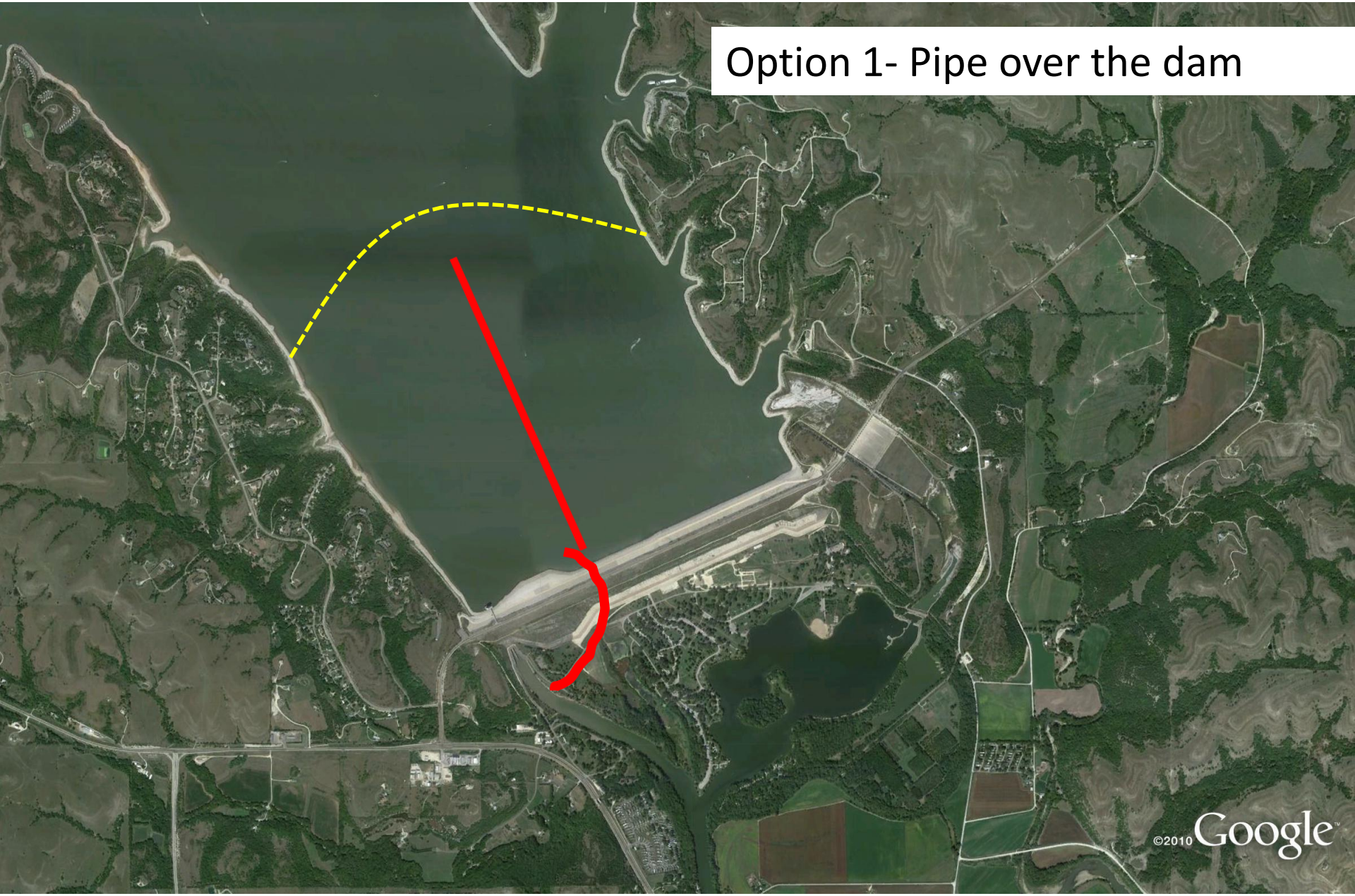
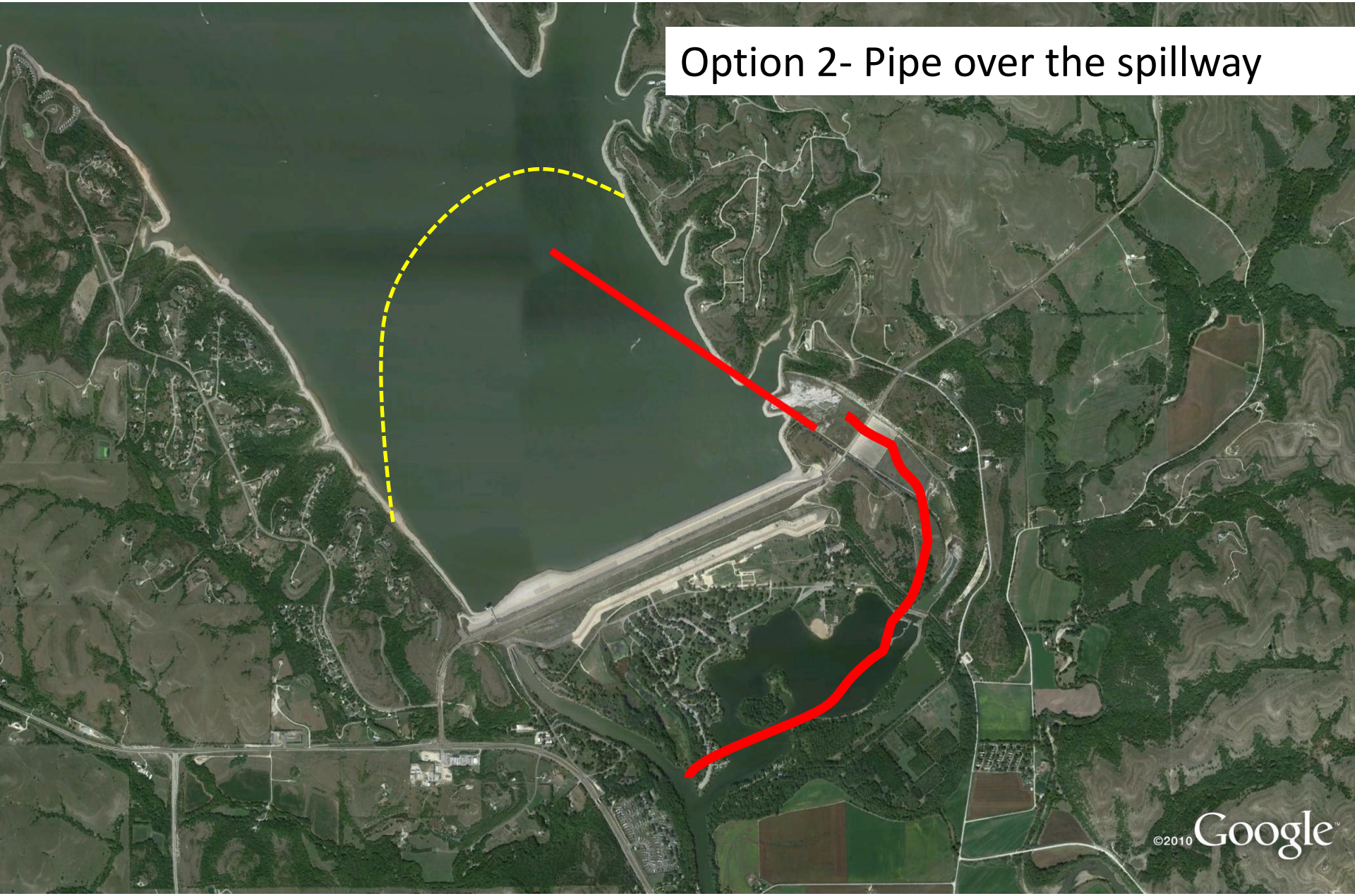
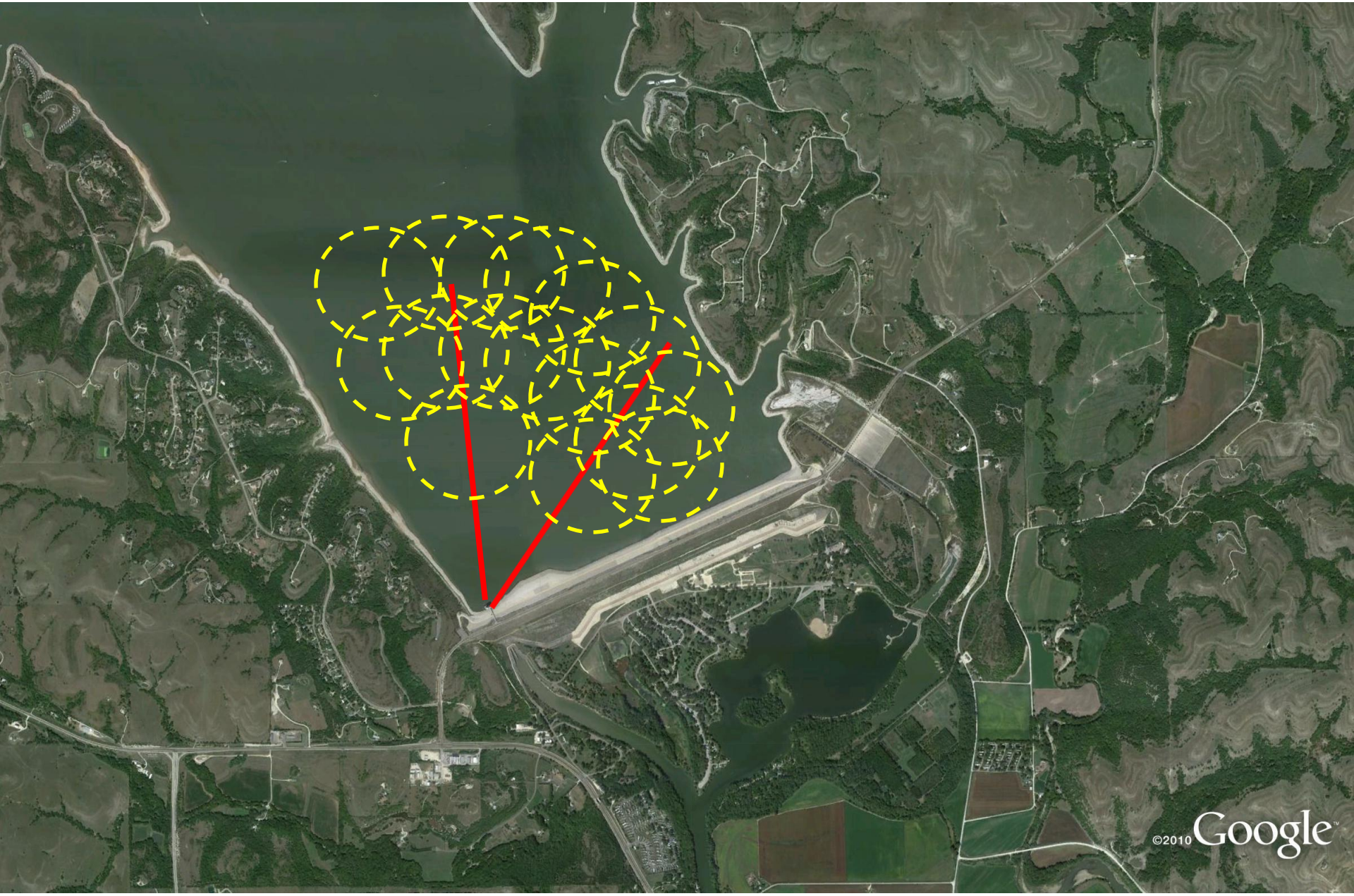
Tuttle Creek

Option 1- Pipe over the dam



Option 2- Pipe over the spillway

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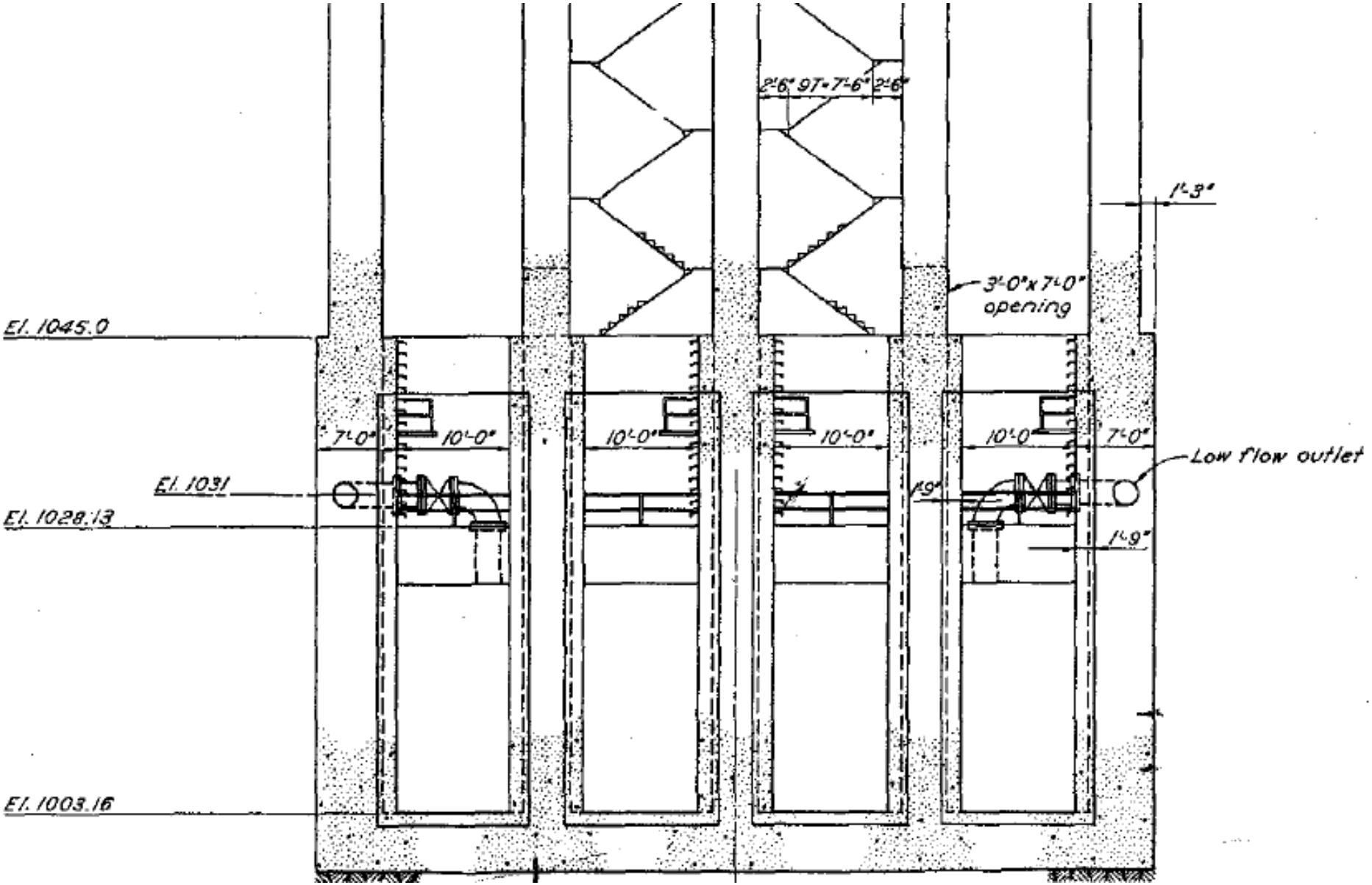
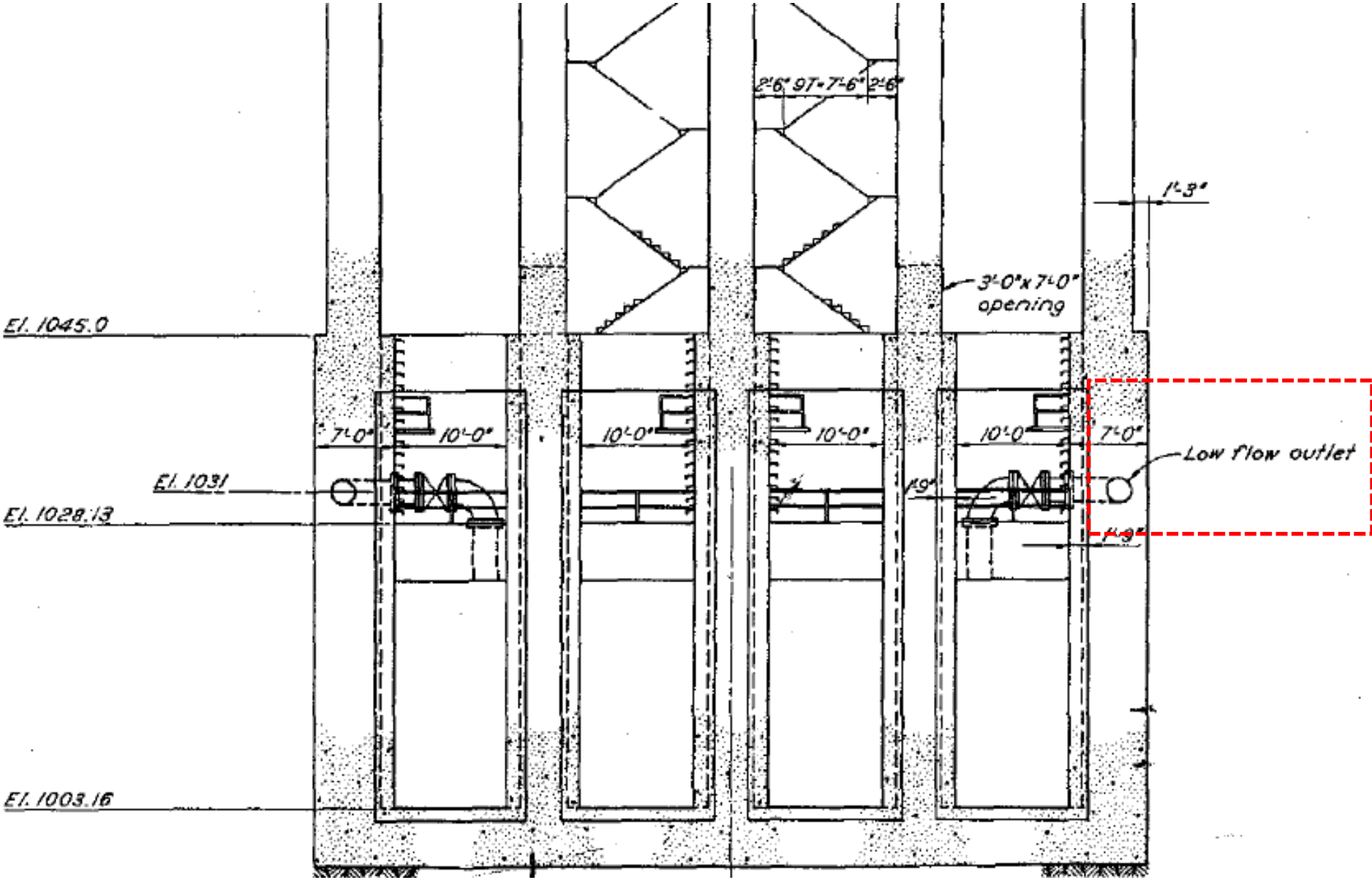

2'-6"
9T-7'-6"
2'-6"
1'-3"
3'-0" x 7'-0" opening
El. 1045.0
7'-0"
10'-0"
10'-0"
10'-0"
10'-0"
7'-0"
Low flow outlet
El. 1031
1'-9"
El. 1028.13
1'-9"
El. 1003.16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1'-9"
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Inlet Extension Pipe

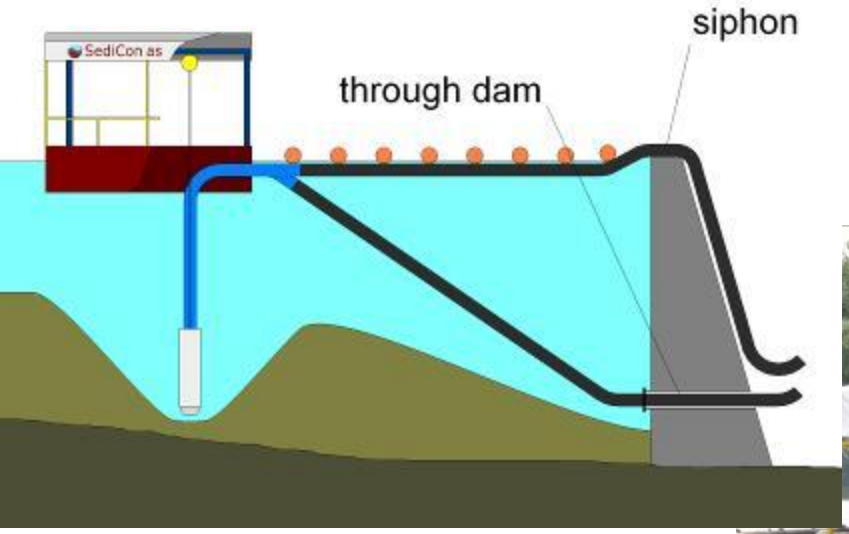

Image source: SediCon.no

Back of the Envelope…

Pipe		
No of Pipes	1	
Diameter	2	ft
Length	6000	ft
Pipe material	Plastic (PVS, ABS)	
C	130	
Pipe roughness	0.000005	
ε/D	0.0000025	
Water Temp	60	deg F
v	1.22E-05	ft²/s
Cd	0.61	
Head	71	
Flow	35.71	
Discharge	35.71	cfs
Velocity	11	fps
Re	1.87E+06	
friction factor, f	0.011	
hf, ft	64	RE
Specific Gravity of Sediment	2.6	
% Sediment by Weight	16%	
Sediment Flow Rate per Pipe	4.4	ac-ft/day
Total Sediment Outflow	1591	ac-ft/year
Sediment Input Rate	3500	ac-ft/year
New Trapping Efficiency	55%	
Dredge and Disposal Cost/cy	$5	
Annual Savings	$ 12,832,607	
Flow Usage	25,851	ac-ft
Mean Annual Runoff	1,211,816	ac-ft
% of MAR for Hydrosuction	2%	

1, 2 ft diameter would pass 14% of incoming sediment using 2% of annual inflow, assuming a 5 % solids concentration by weight, at a length of up to 6000 ft.

1, 2 ft diameter pipe would pass 45% of incoming sediment using 2% of annual inflow, assuming a 16 % solids concentration by weight, at a length of up to 6000 ft.

35% solids concentration would achieve near 100% sediment pass-through.

Inlet Extension Pipe: Next Steps

- ERDC analysis (DOTS request)
- Potential site-visit to Ferron, Utah

Summary

- RSM and Section 204 Funds
- Workshop with significant State and Federal involvement
- Promsing solutions
  - Operational changes
  - Inlet extension/ hydro-suction/ dredging with downstream disposal