Rough River Lake Dam - Remedial Construction

25 March 2014

US Army Corps of Engineers
BUILDING STRONG®

Rough River Lake Dam:

Constructed: 1955-1958
Type: Compacted Earth Fill
Top Elevation: 556 msl
(559 msl - top of wall)
Drainage Area: 454 mi^2
Storage: 334,400 acre / ft.
Highest Water Level:
527.4 on May 11, 2011

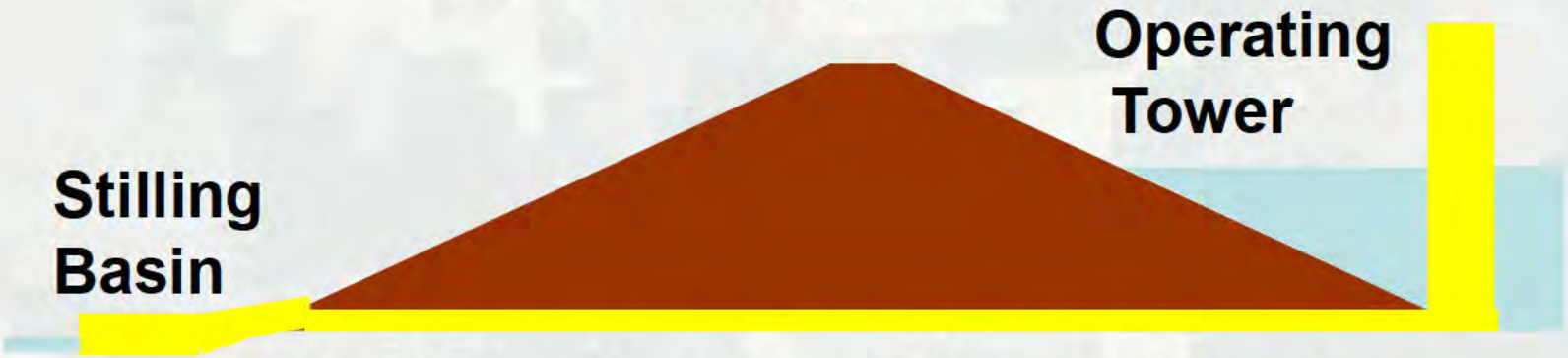
Flood Risk Management Benefits

Nolin River -	$103,449,000
Rough River -	$213,602,000
Green River -	$148,231,000
Barren River -	$170,608,000
Total -	$635,890,000

Lake Data:

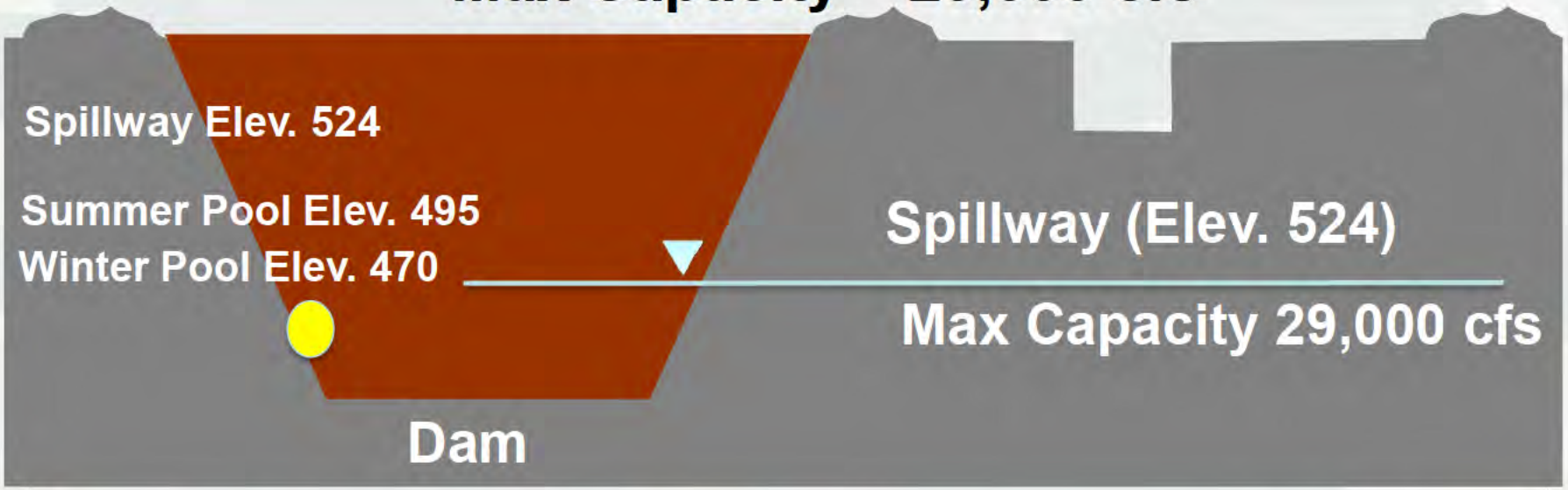
Seasonal Pool	Pool Elevation	Water Acres
Winter Pool	470 ms	2,180 acres
Summer Pool	495 msl	5,100 acres
Flood Pool	524 msl	10,260 acres
Probable Max Flood	553.9 msl	

Outlet Works (Controlled)



Conduit - Max Capacity – 5000 cfs

Emergency Spillway (Uncontrolled) – Max Capacity – 29,000 cfs



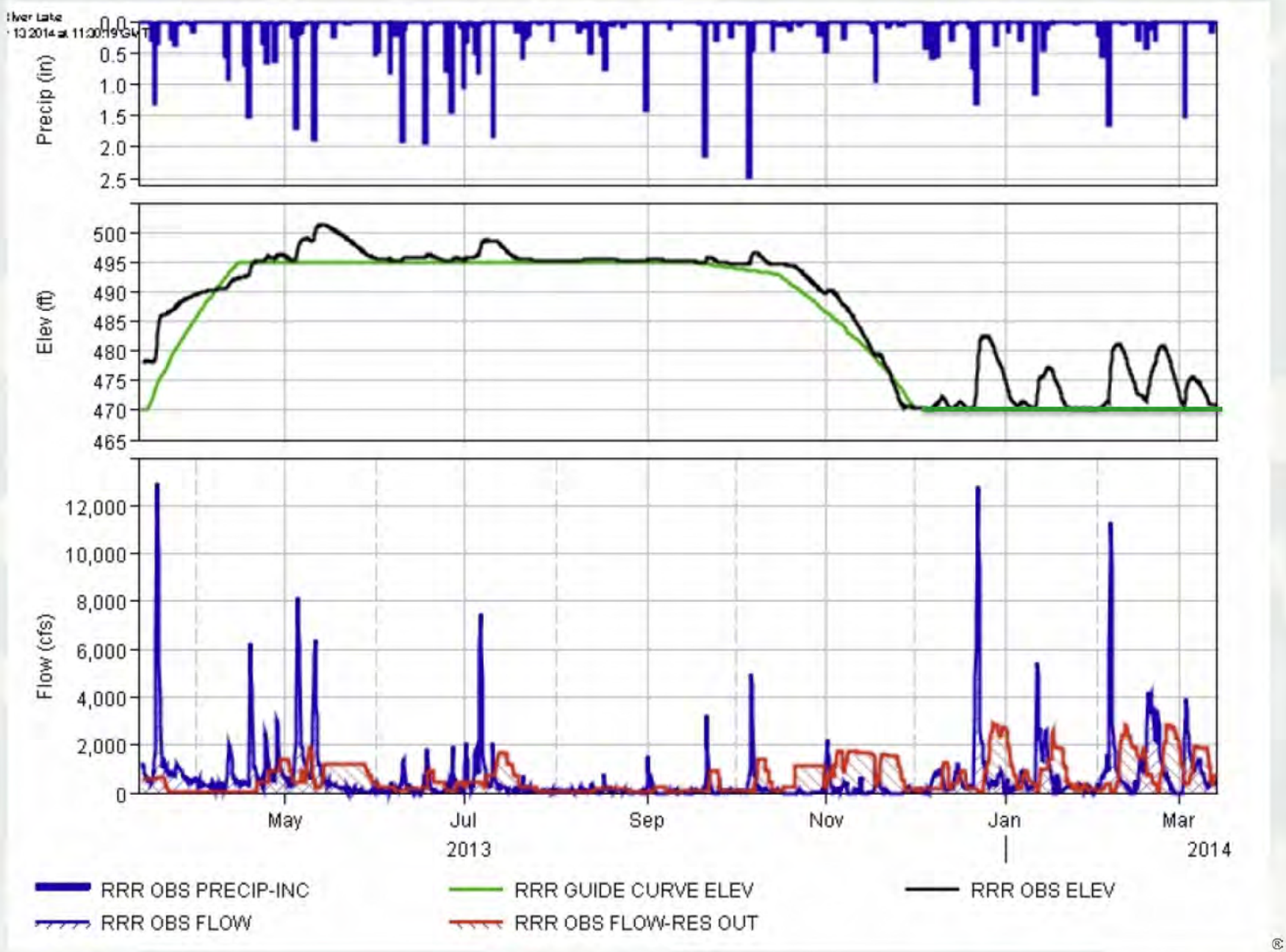
Louisville District Daily Lake Report
13 March 2014

		Lake Elevations							Flood Storages		
Basin	Project	Winter Pool Feet	Summer Pool Feet	Flood Pool Feet	Todays Pool Feet	Dev. from Pool Feet	24 Hour Change Feet	24 Hour Precip Inches	6 A.M. Outflow CFS	Inches Avail	Percent Util
Little Miami	Caesar Creek	846.0	849.0	883.0	837.5	-8.5	0.4	0.27	15	13.47	-14.68
	W. H. Harsha	729.0	733.0	795.0	730.2	1.2	1.1	0.21	219	10.96	1.20
Mill Creek	West Fork	675.0	675.0	702.0	676.2	1.2	0.9	0.27	9	6.06	2.41
Mad River	C. J. Brown	1009.0	1012.0	1023.0	1009.2	0.2	0.1	0.30	133	7.43	1.08
Whitewater	Brookville	740.0	748.0	775.0	740.7	0.7	0.4	0.00	737	10.45	1.57
Licking	Cave Run	724.0	730.0	765.0	733.7	9.7	-0.2	0.30	2642	8.17	17.93
Kentucky	Carr Creek	1017.0	1028.0	1055.0	1017.9	0.8	0.1	0.36	106	9.71	1.61
	Buckhorn	757.0	782.0	840.0	760.8	3.8	3.7	0.30	214	7.33	1.09
Salt River	Taylorsville	545.0	547.0	592.0	545.1	0.1	0.0	0.25	415	11.20	0.14
Green River	Green River	668.0	675.0	713.0	668.6	0.6	0.2	0.30	804	14.50	0.87
	Nolin	490.0	515.0	560.0	493.2	3.2	-0.1	0.11	1412	14.29	1.79
	Barren River	525.0	552.0	590.0	536.8	11.8	-0.6	0.00	3939	13.66	8.59
	Rough River	470.0	495.0	524.0	470.8	0.8	-0.2	0.02	727	12.51	0.56
Up. Wabash	J. E. Roush	737.0	749.0	798.0	742.7	5.7	-0.6	0.32	4096	3.86	2.28
	Salamonie	730.0	755.0	793.0	740.9	10.9	5.2	1.76	26	7.87	5.53
	Mississinewa	712.0	737.0	779.0	727.1	15.1	4.9	0.27	377	7.40	7.48
Mid. Wabash	Cecil Harden	640.0	662.0	690.0	653.9	8.3	2.7	0.01	203	8.41	11.66
	Cagles Mill	636.0	639.5	704.0	639.0	3.0	2.6	0.11	213	12.50	2.18
	Monroe	538.0	538.0	556.0	538.3	0.3	0.1	0.04	880	10.85	1.37
	Patoka	532.0	536.0	548.0	535.2	3.2	0.0	0.36	419	14.11	17.46

(ALWAYS WEAR YOUR LIFE JACKETS WHEN ON OR NEAR THE WATER)

Comments:

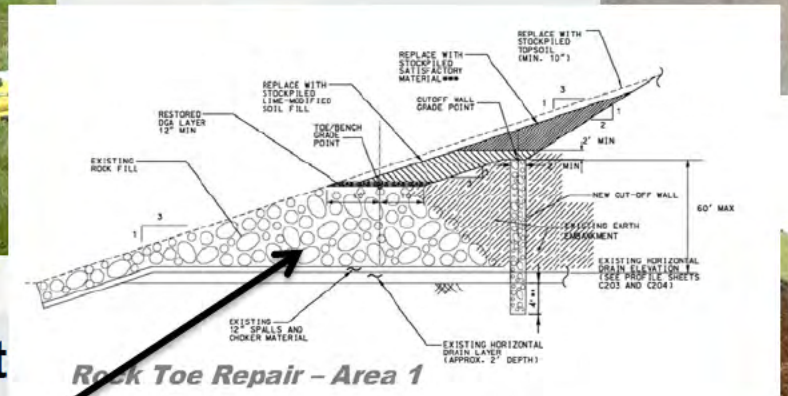
Highest Pool Elevations of Record


Precip (in)
0.0
0.5
1.0
1.5
2.0
2.5
Elev (ft)
500
495
490
485
480
475
470
465
Flow (cfs)
12,000
10,000
8,000
6,000
4,000
2,000
0
May
Jul
2013
Sep
Nov
Jan
Mar
2014
RRR OBS PRECIP-INC
RRR OBS FLOW
RRR GUIDE CURVE ELEV
RRR OBS FLOW-RES OUT
RRR OBS ELEV

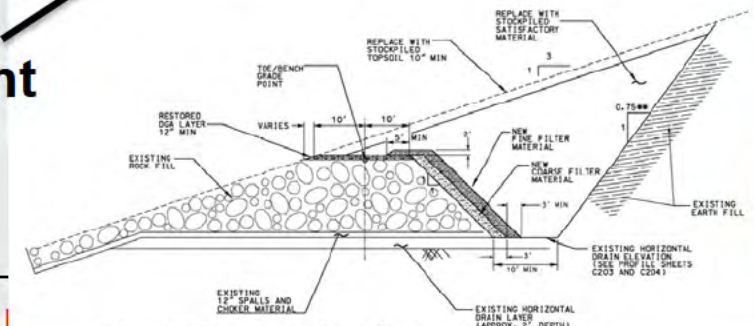
Didn't you just "fix" Rough River Dam?
2005-2007 Remedial Construction

2003 sinkhole near downstream rock toe

Rock fill zone that had void space accept embankment material



Rock Toe Repair – Area 1



Rock Toe Repair – Area 2

Didn't you just "fix" Rough River Dam?
2005-2007 Remedial Construction

Heavy erosion at stilling basin

Extended the stilling basin and added baffle blocks

Didn't you just "fix" Rough River Dam?
2005-2007 Remedial Construction

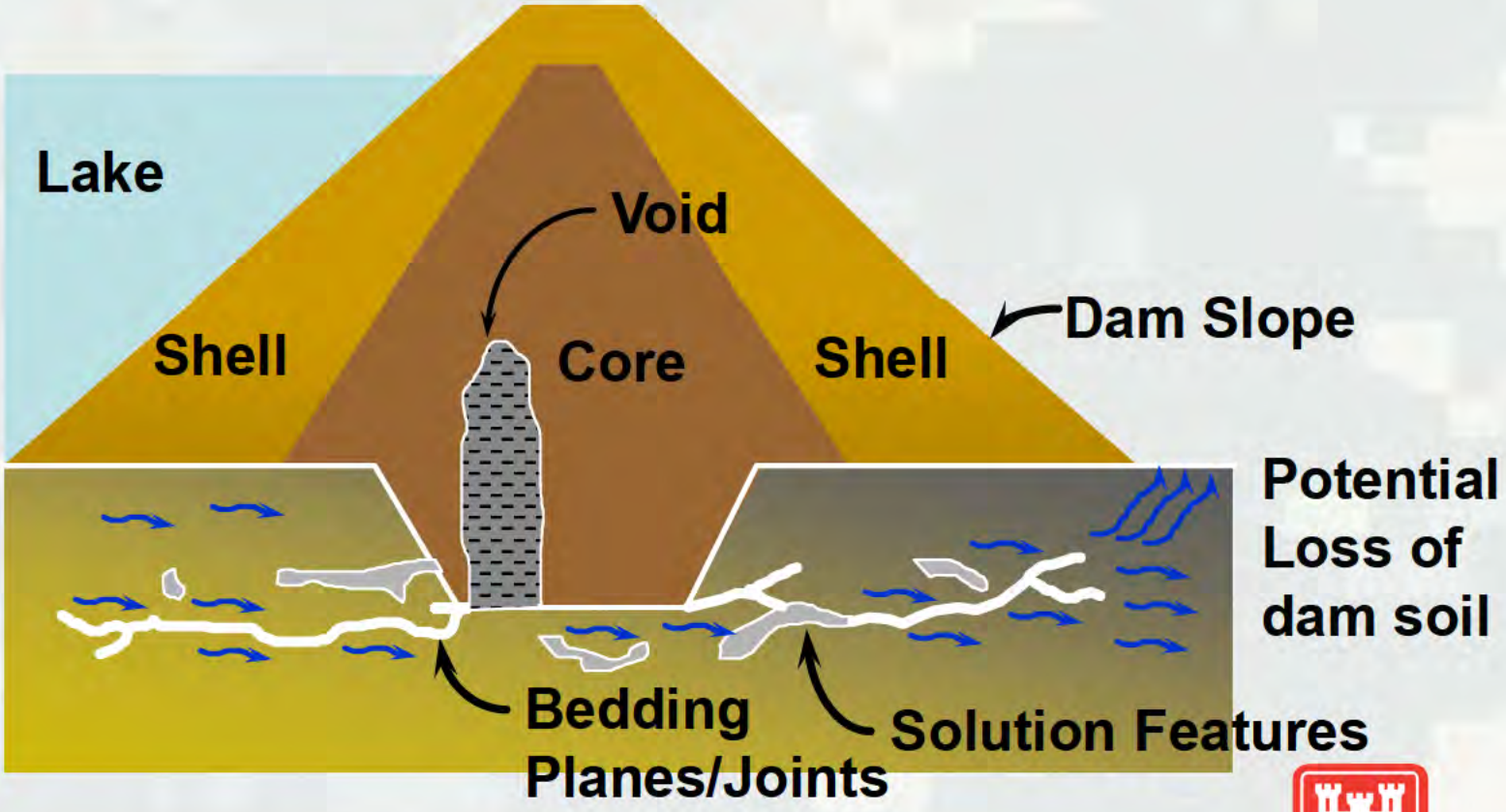
Raised the dam 5 ft. to contain Probable Maximum Flood

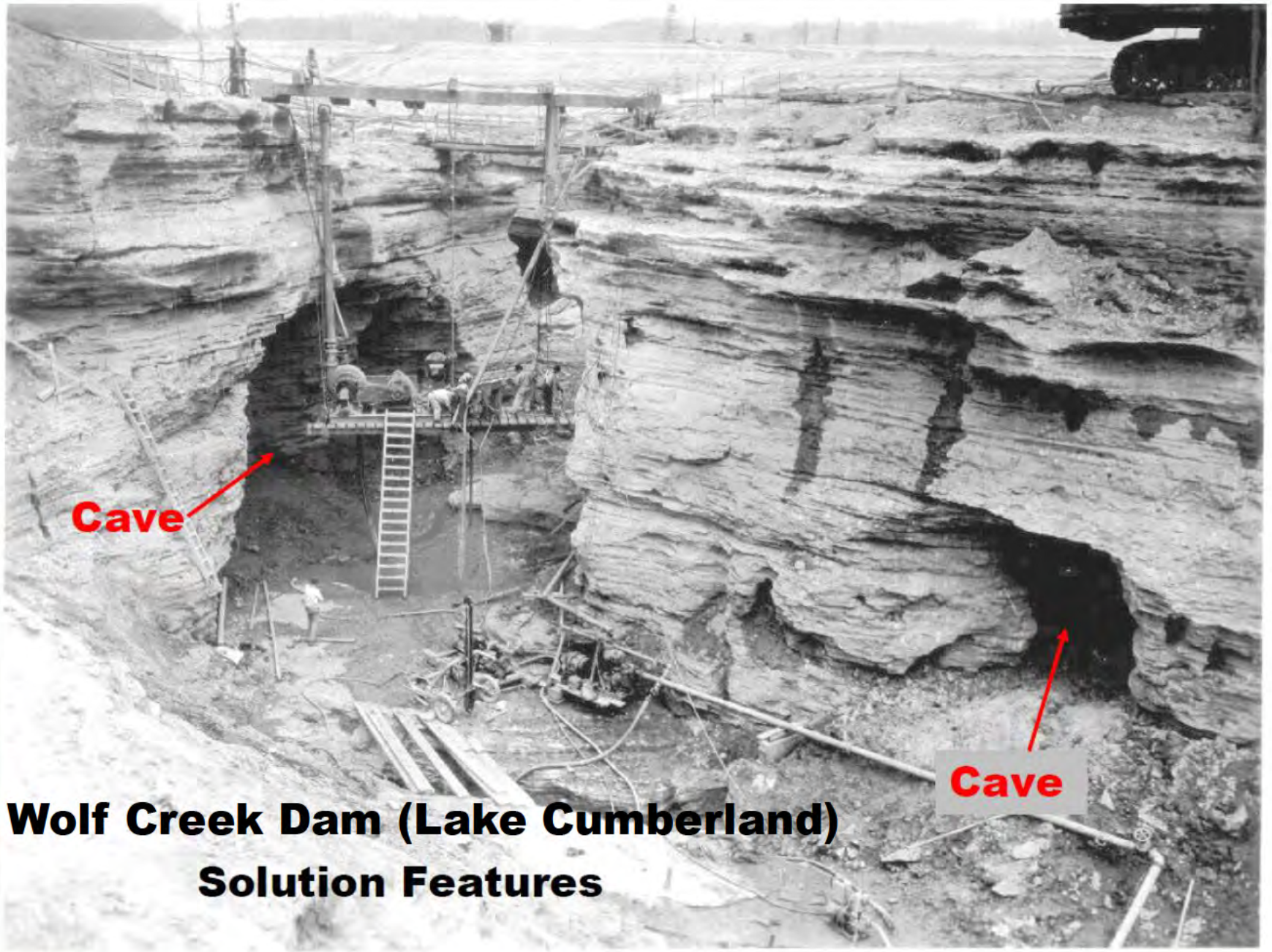
Raised the road 2 ft. and added "parapet" wall for 3 additional ft.

Rough River – Risk Informed Dam Safety Program

- 2005 – Screening of all USACE dams across the country
- 2008 – Established Interim Risk Reduction Measures Plan
  - ► Enhanced surveillance and monitoring
  - ► Additional Explorations and instrumentation
  - ► Automation of instruments for more frequent readings
  - ► Emergency Action Plan Exercises with State and County Emergency Management Agencies
- 2008-2012 – Establish baseline risk and determine need for remediation
  - ► Complete study process to make the case that major remedial construction is prudent for Rough River Lake Dam.

Karst Foundations
Internal erosion of dam embankment soil by groundwater flow through joints / solution features





Wolf Creek Dam (Lake Cumberland)

Solution Features

1950-1960 Vintage Life

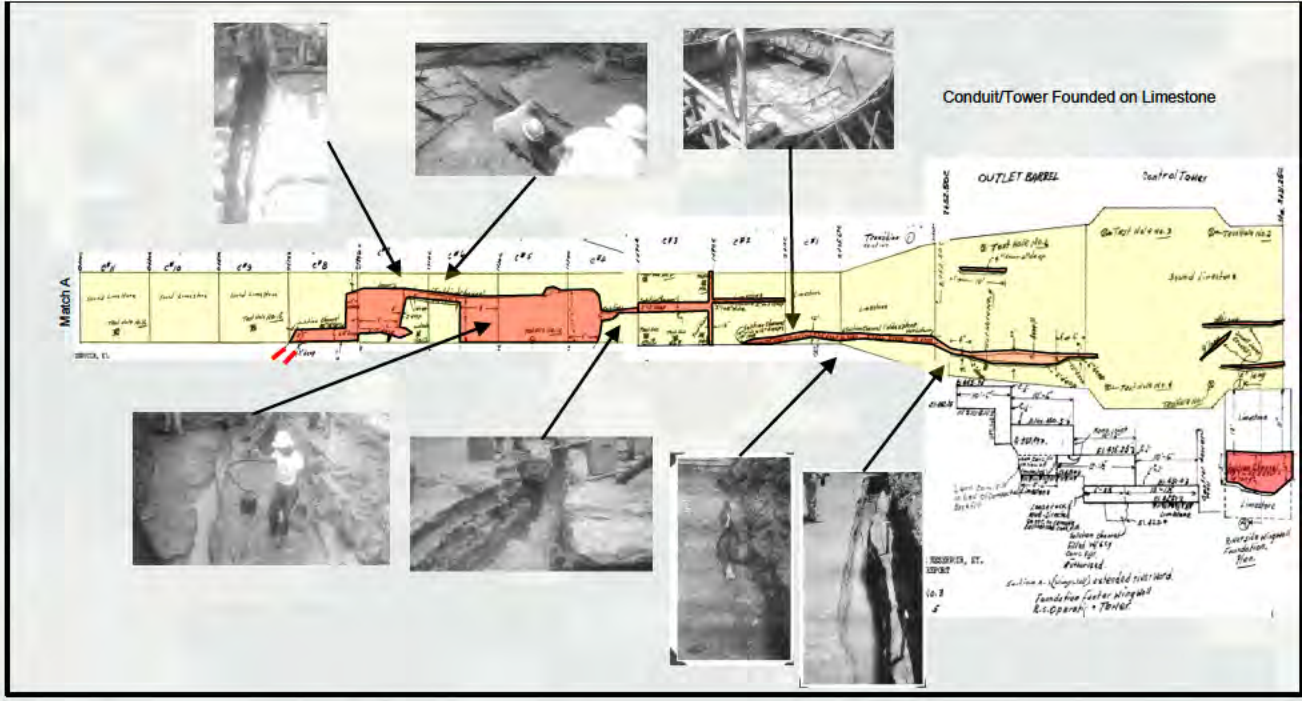
Surgery

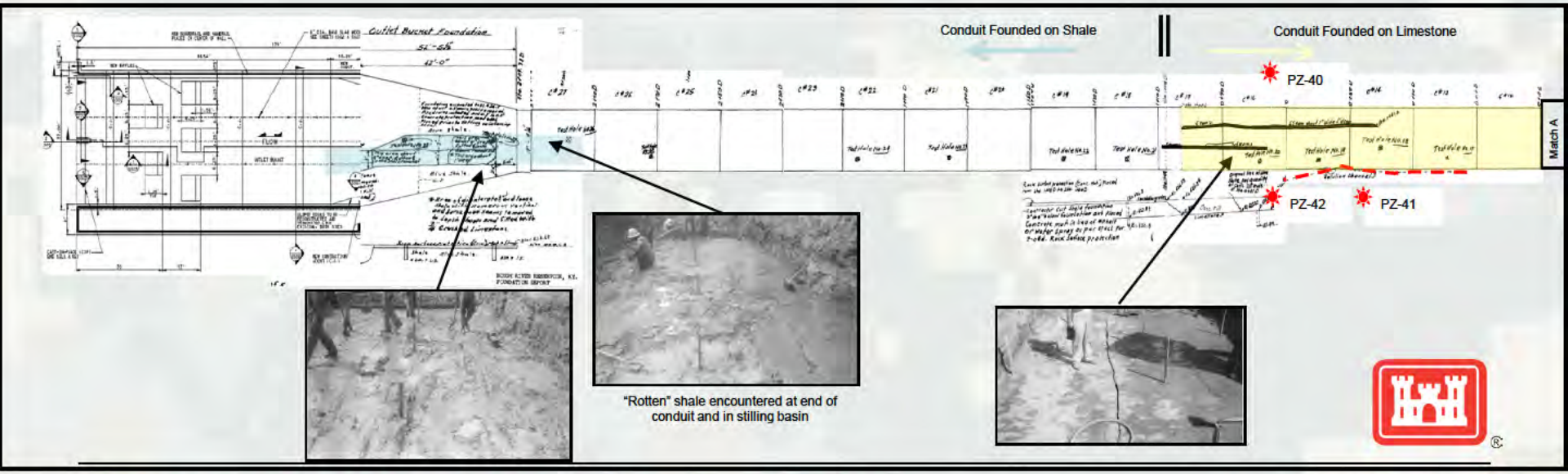
Dentistry

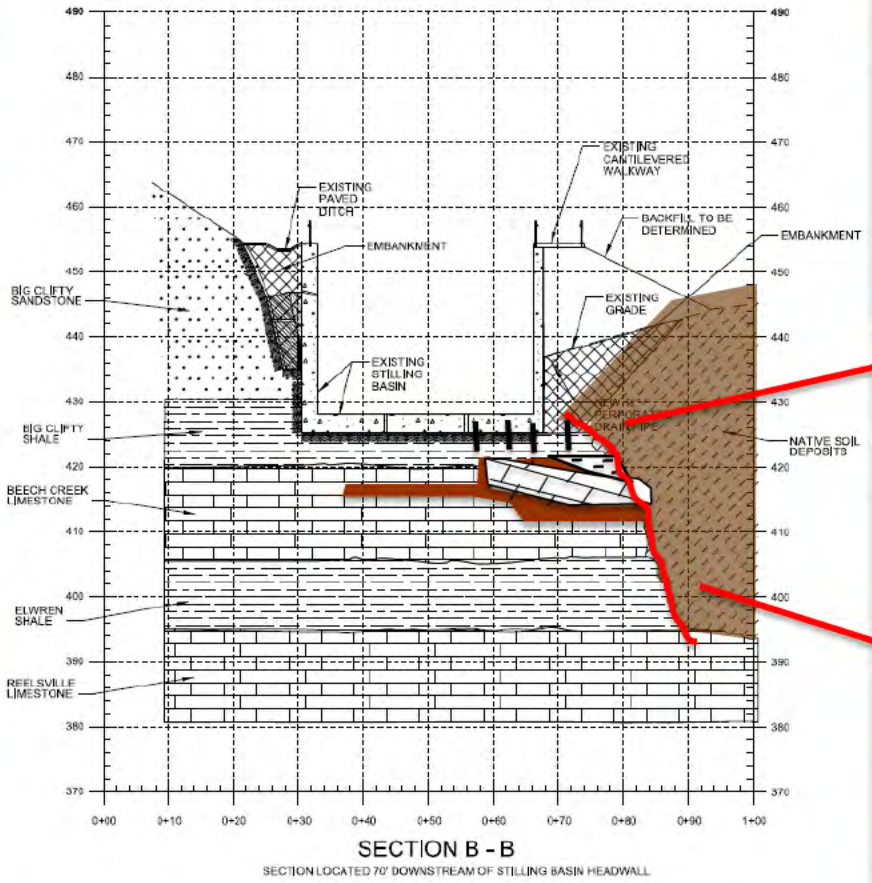
Technology

1950-1960 Vintage
Dam Engineering

Karst solution features found during original construction of the tower and conduit

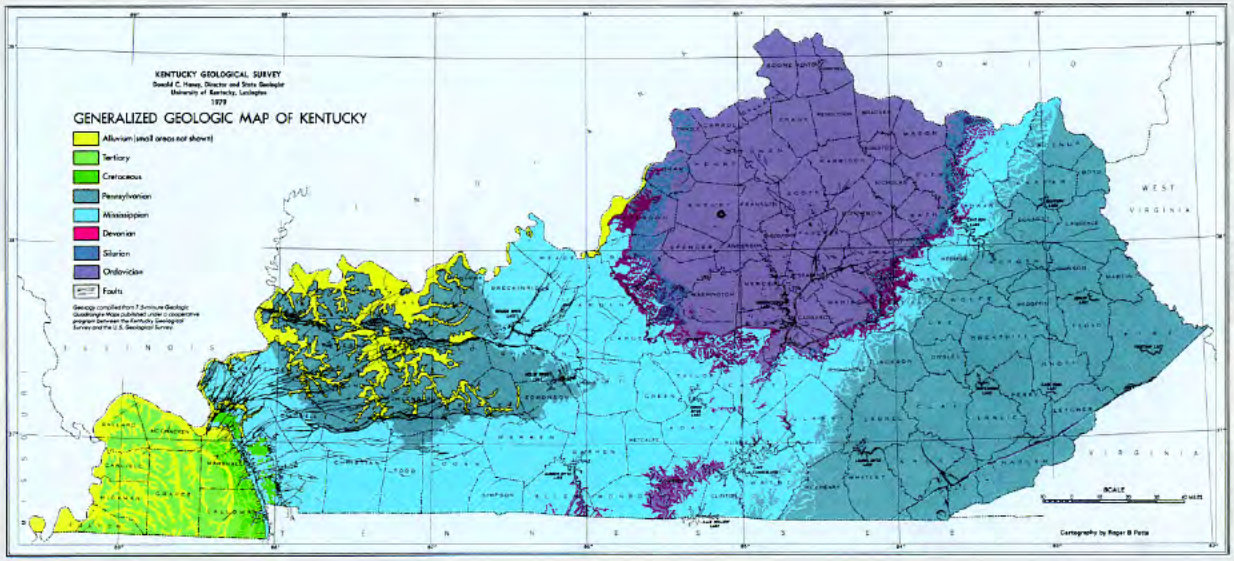


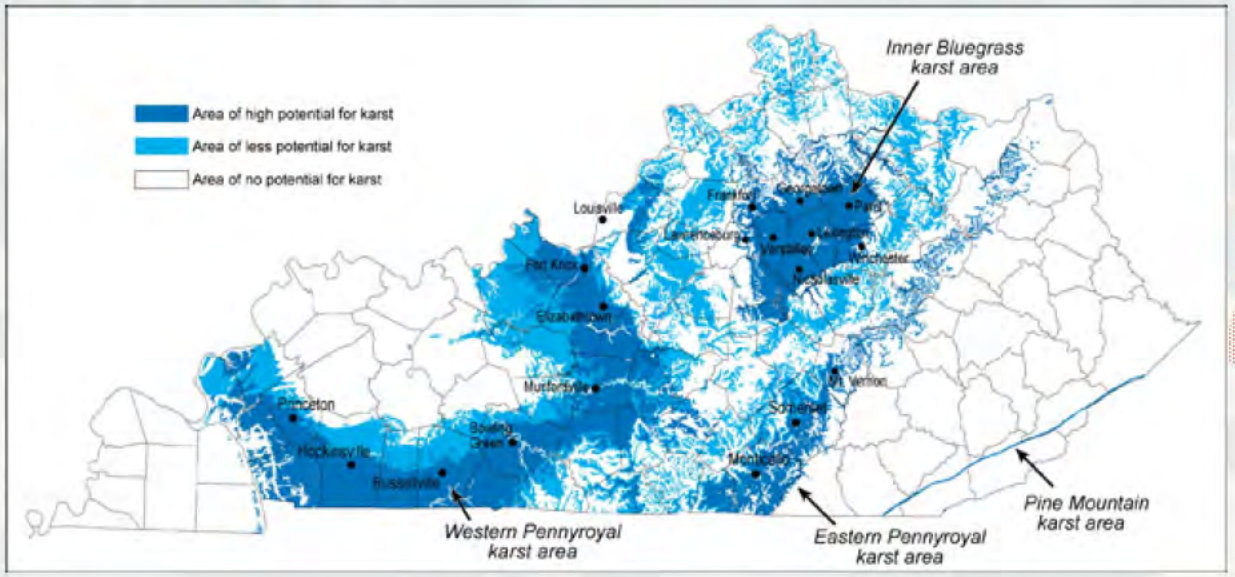


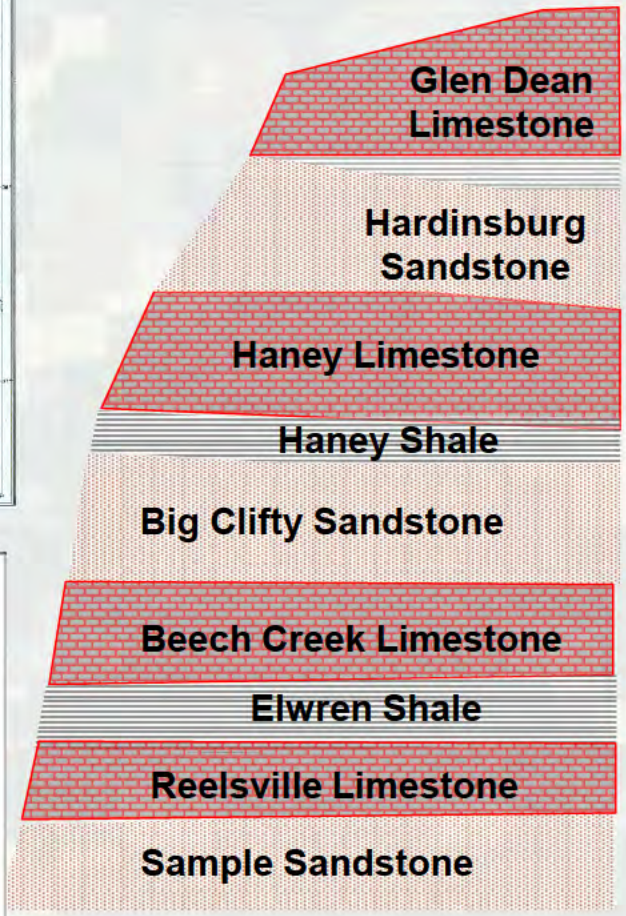


SECTION B - B

SECTION LOCATED 70' DOWNSTREAM OF STILLING BASIN HEADWALL

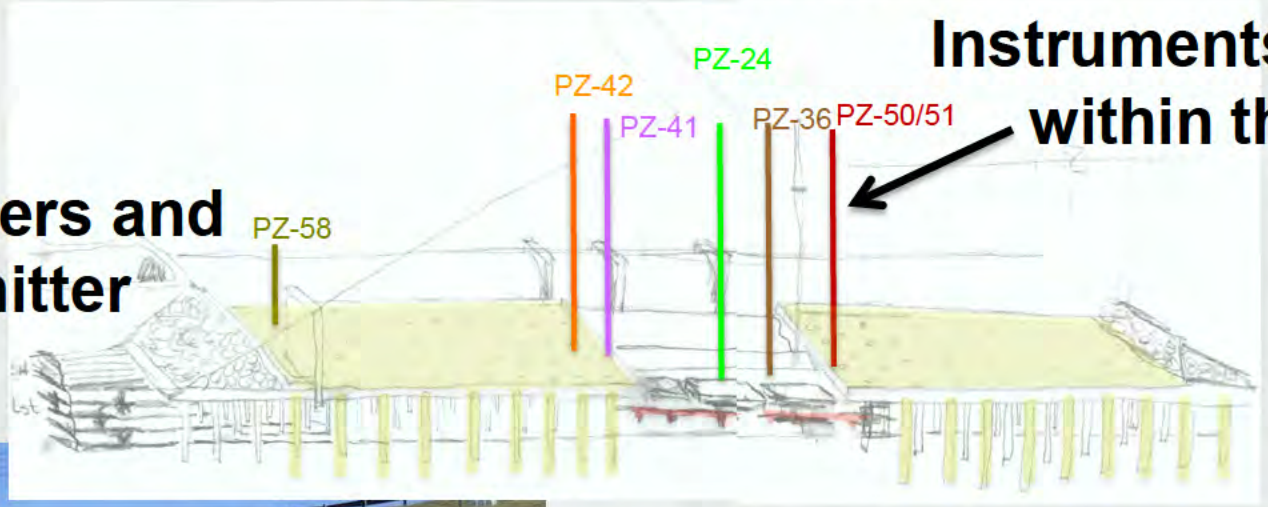






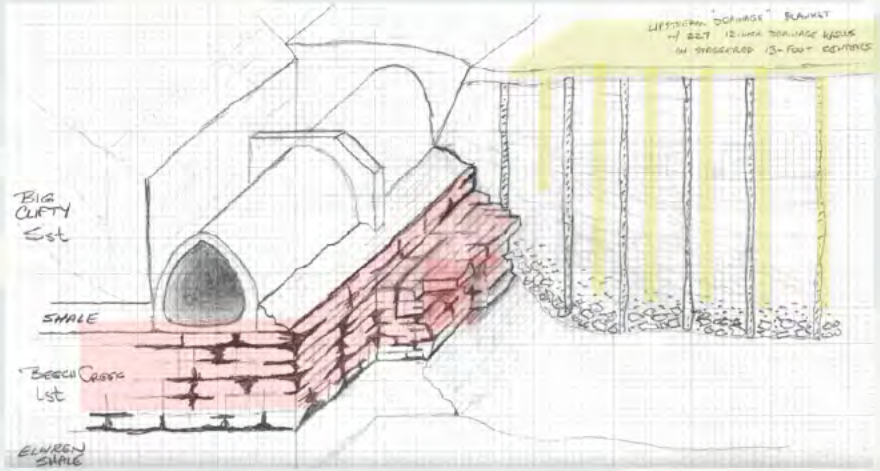
Rough River Dam, KY

Enhanced Real Time Instrumentation Monitoring



Instruments installed within the dam

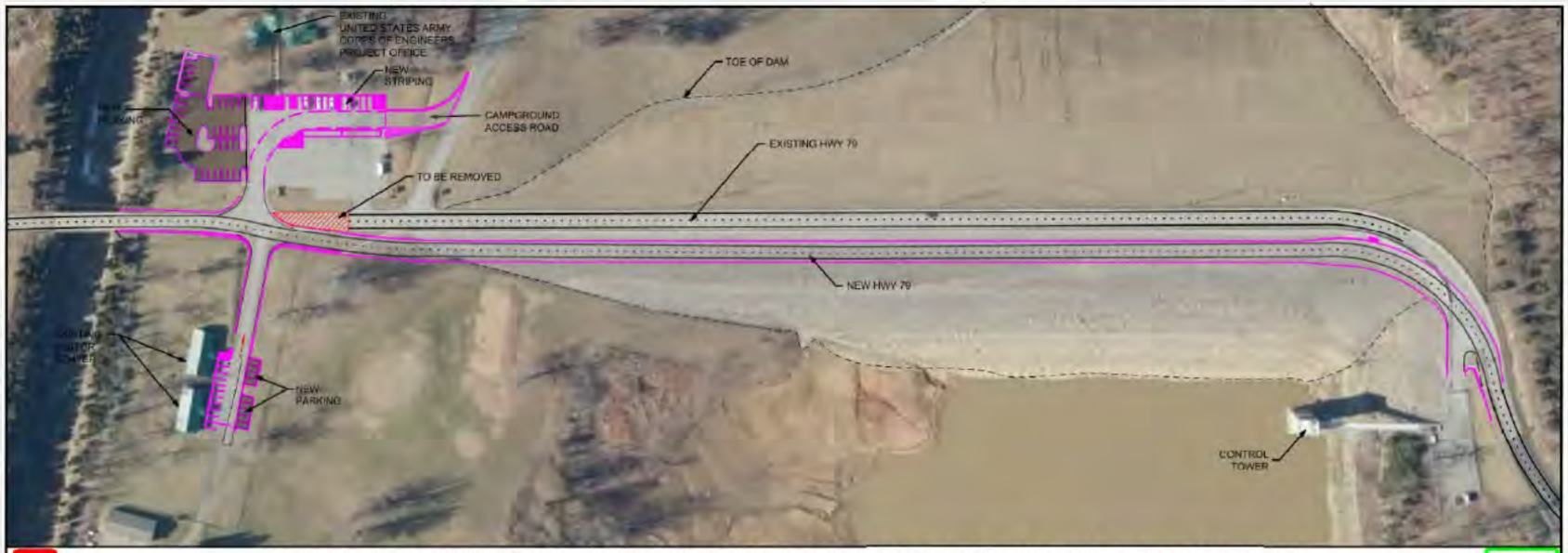
Data Loggers and Transmitter



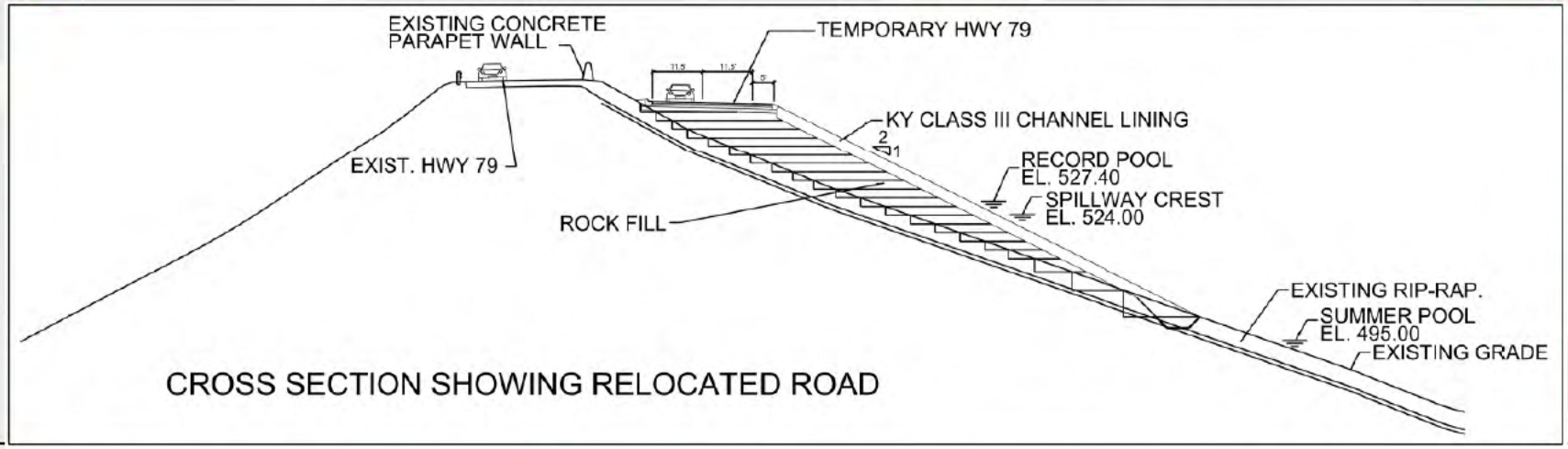
Rough River – Construction Timeline

- 2012 to Present – Develop Plans and Specifications (Phase 1a complete, Phase 1b and Phase 2 ongoing)
- 2014 – Phase 1a contract to relocate KY State Hwy 79 to the upstream slope (awarded)
- 2015 – Initiate Grouting (Phase 1b) and determine if a cut-off wall is needed
- 2016-2019 – Install cut off wall (Phase 2)

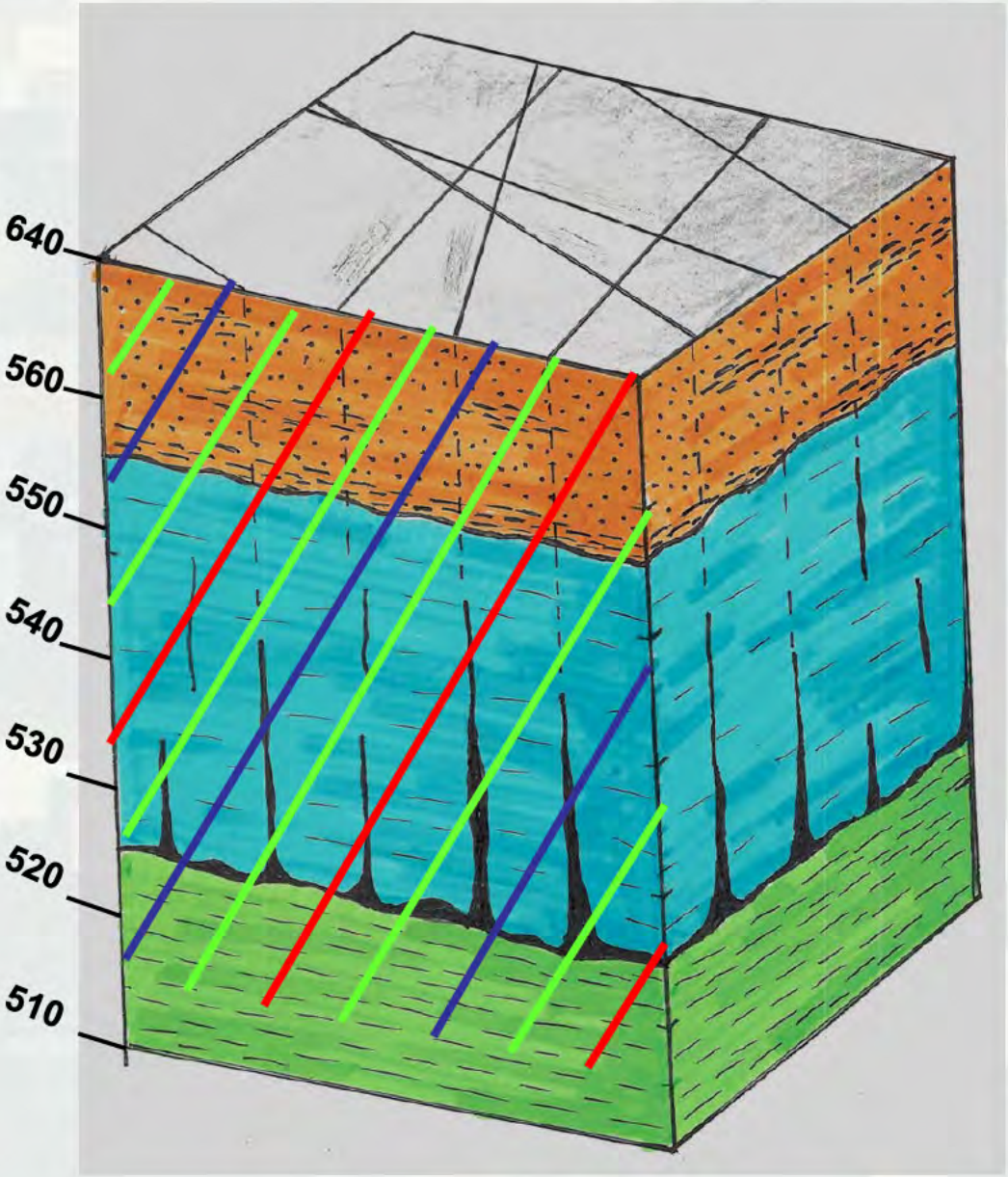
Phase 1a - Temporary Road Relocation to Obtain Existing Roadway Alignment for Use as Work Platform



TEMPORARY RELOCATION OF HWY 79 DURING CONSTRUCTION - ROUGH RIVER LAKE DAM



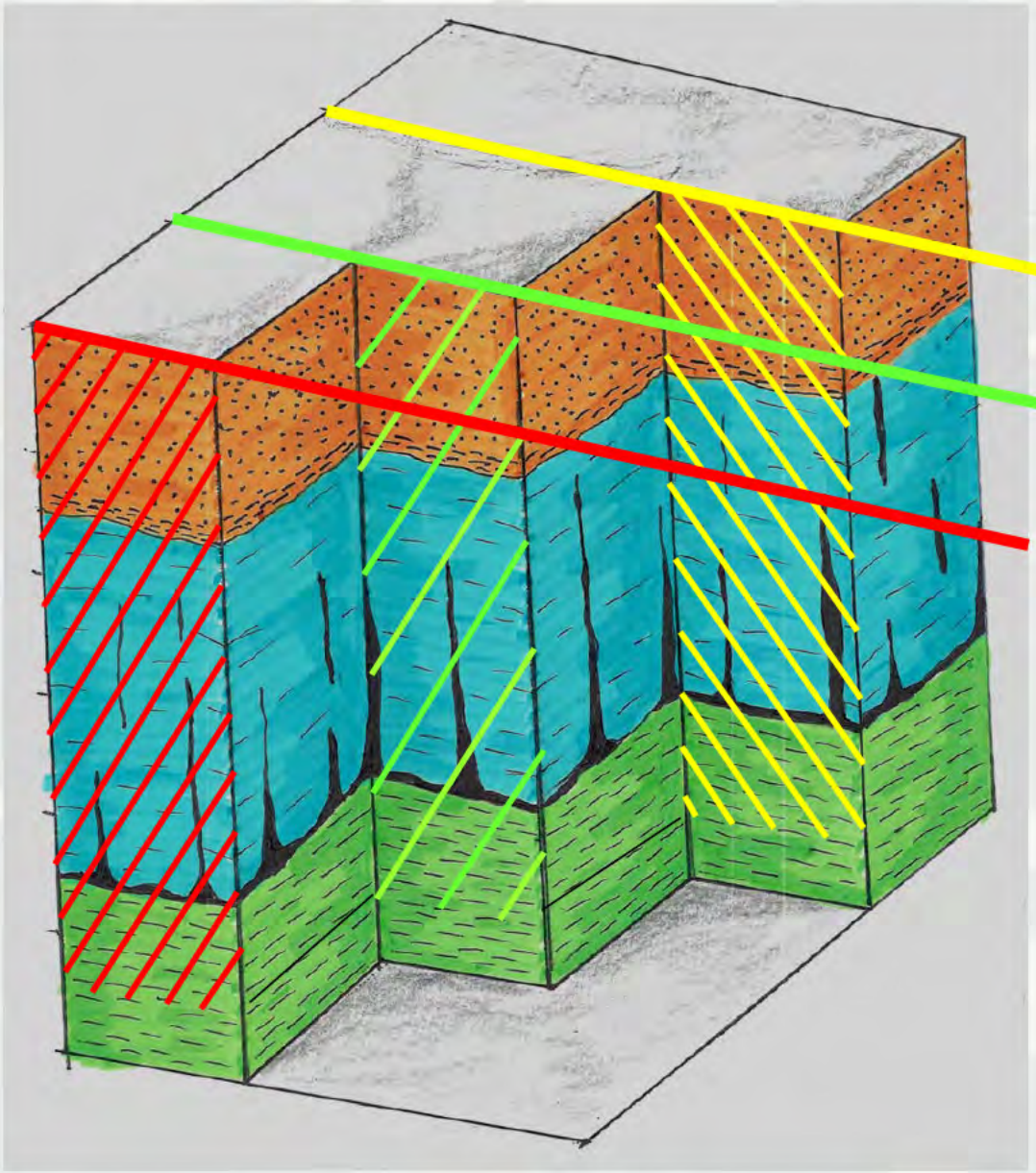
CROSS SECTION SHOWING RELOCATED ROAD



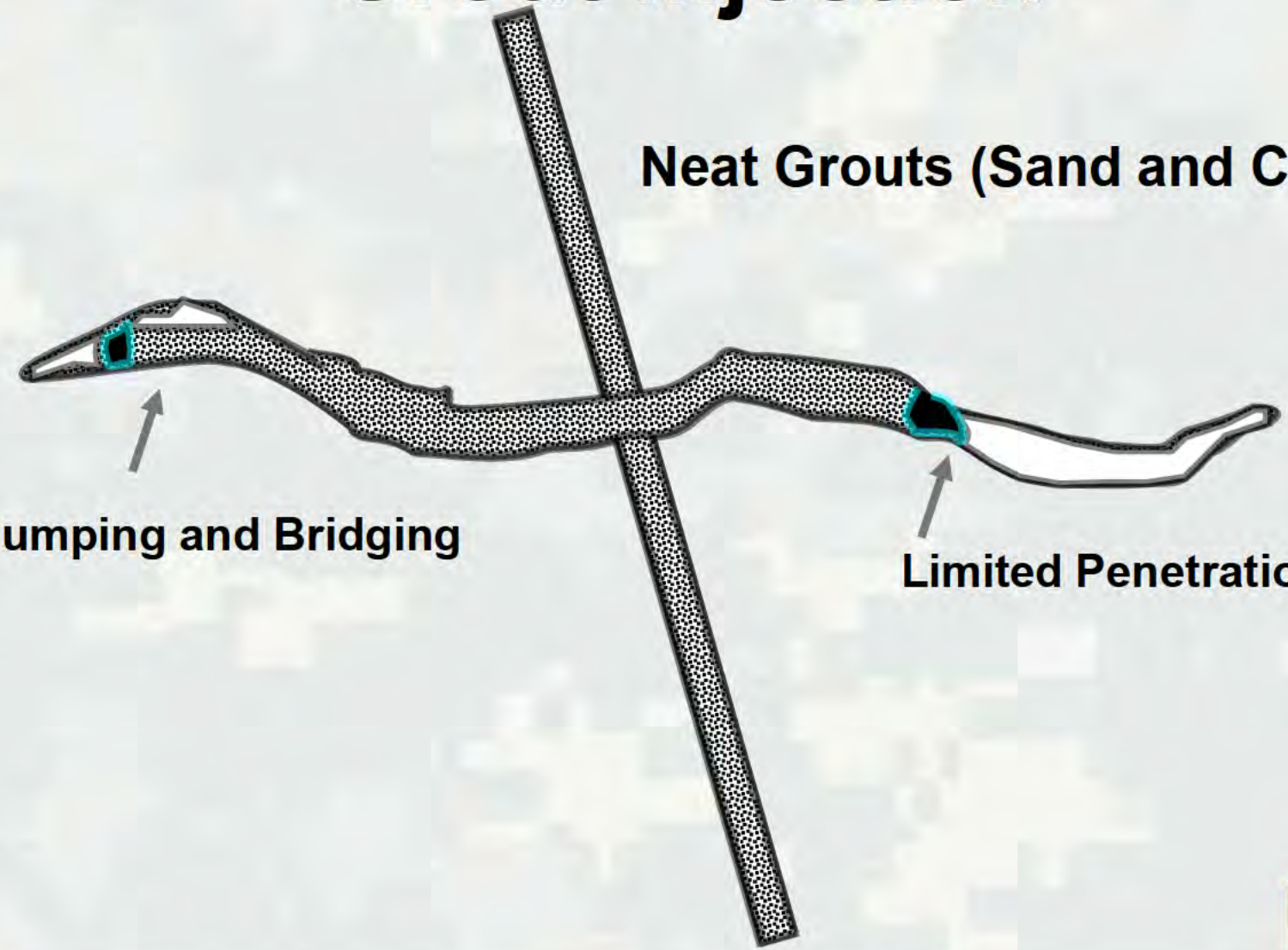
PRIMARIES
20’ Centers

SECONDARIES
10’ Centers

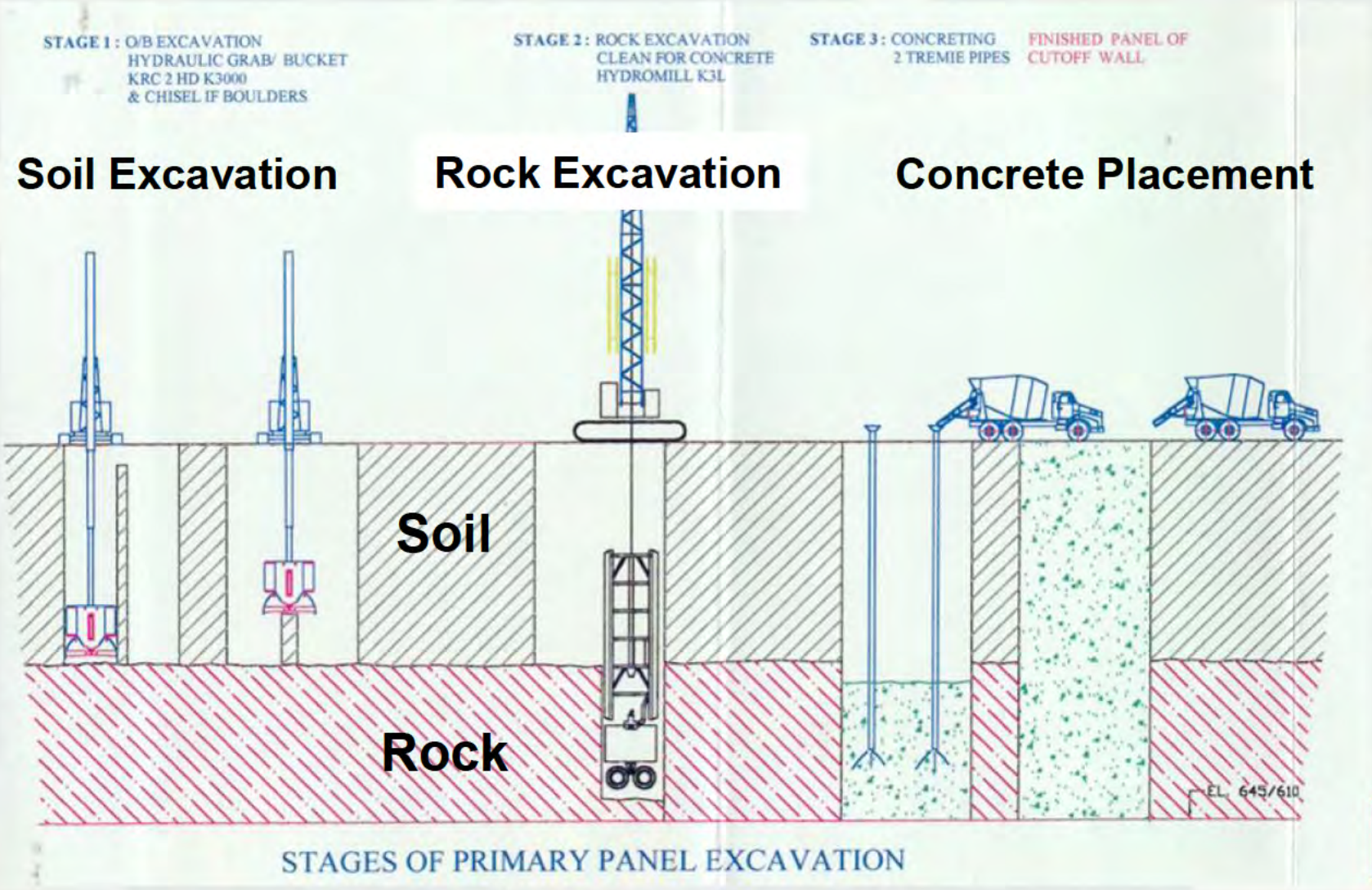
TERTIARIES
5’ Centers


B-Line
C-Line
A-Line

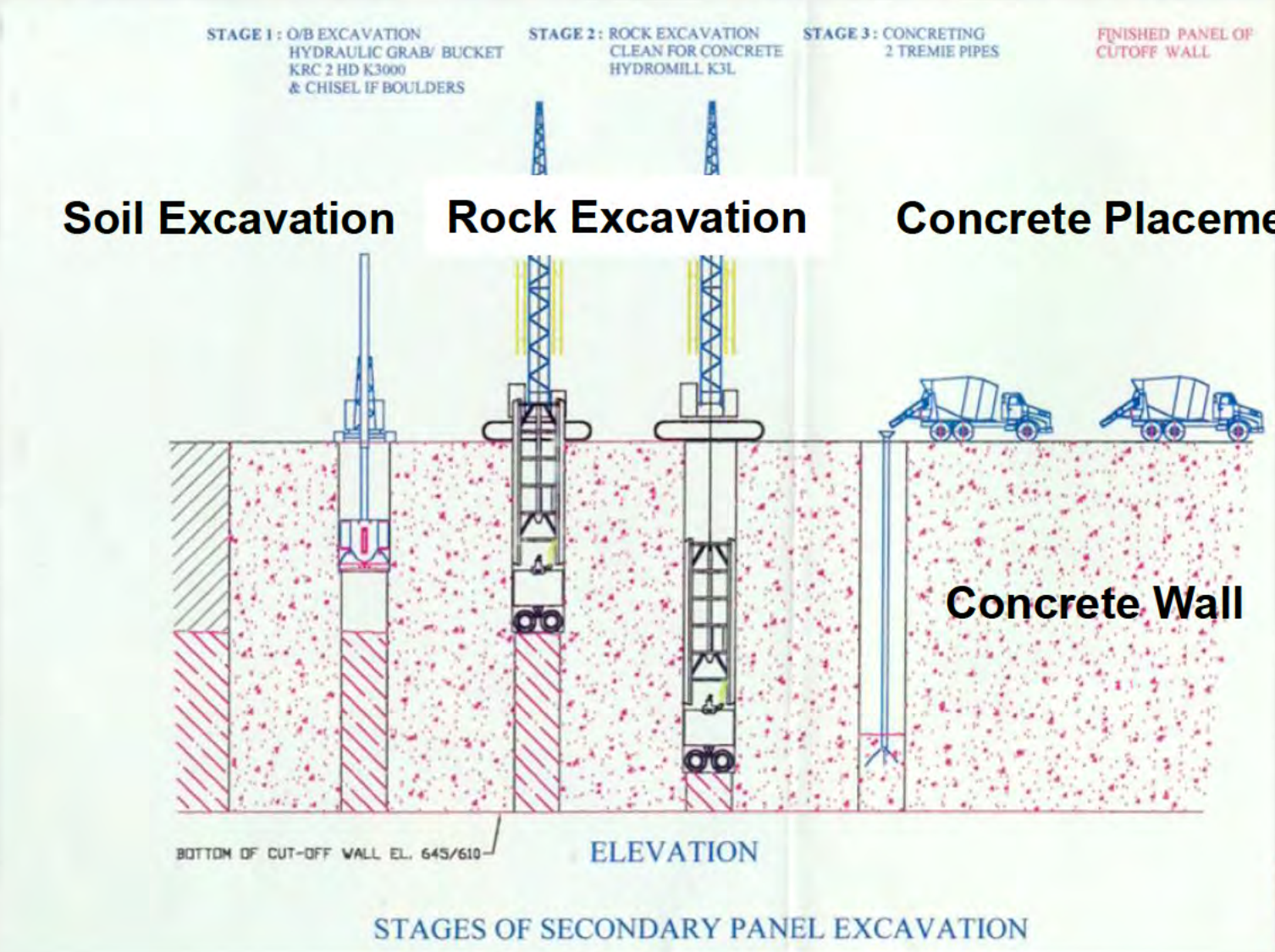
Grout Injection



Cut-off Wall - Primary Panel Placement

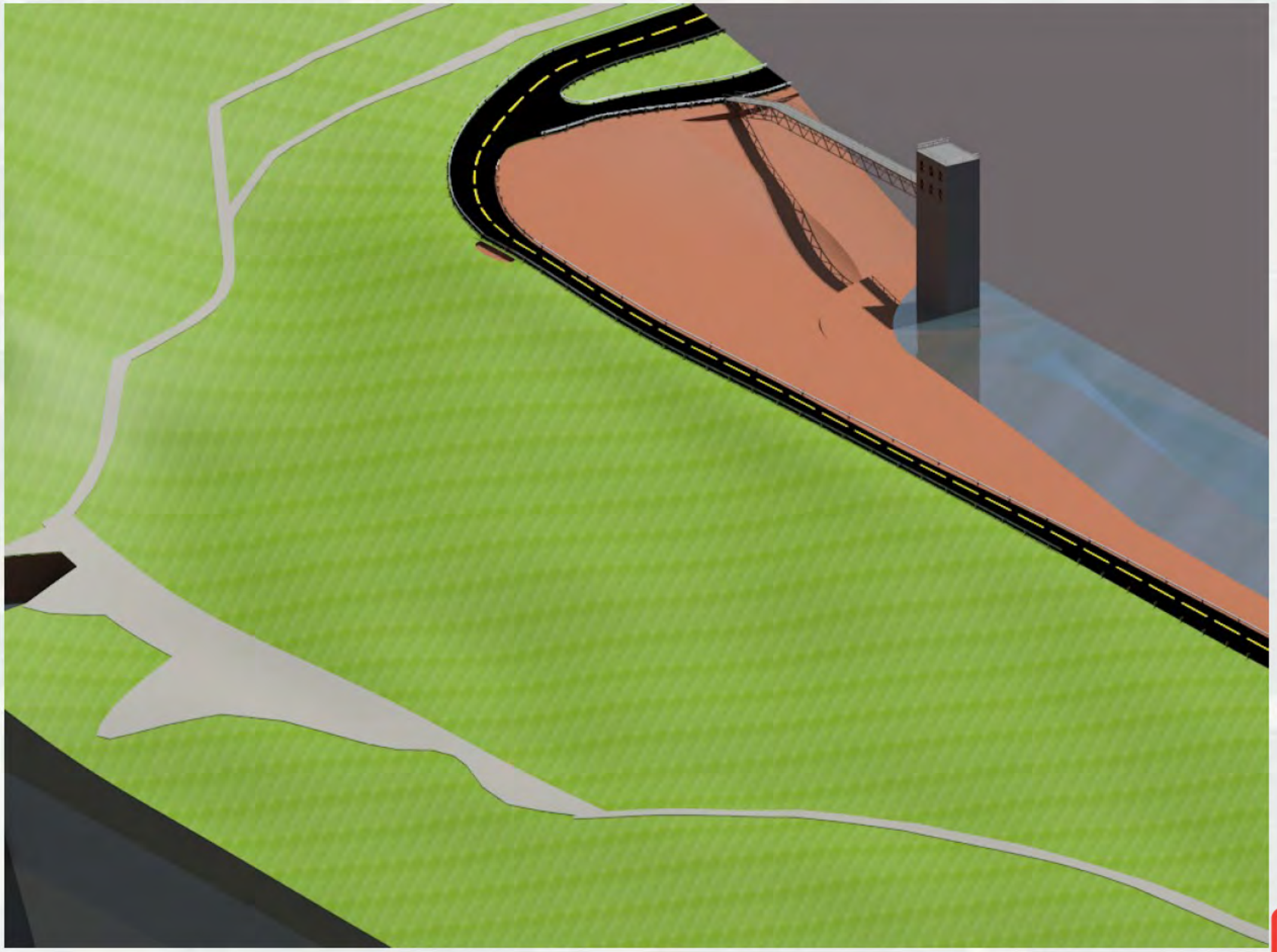


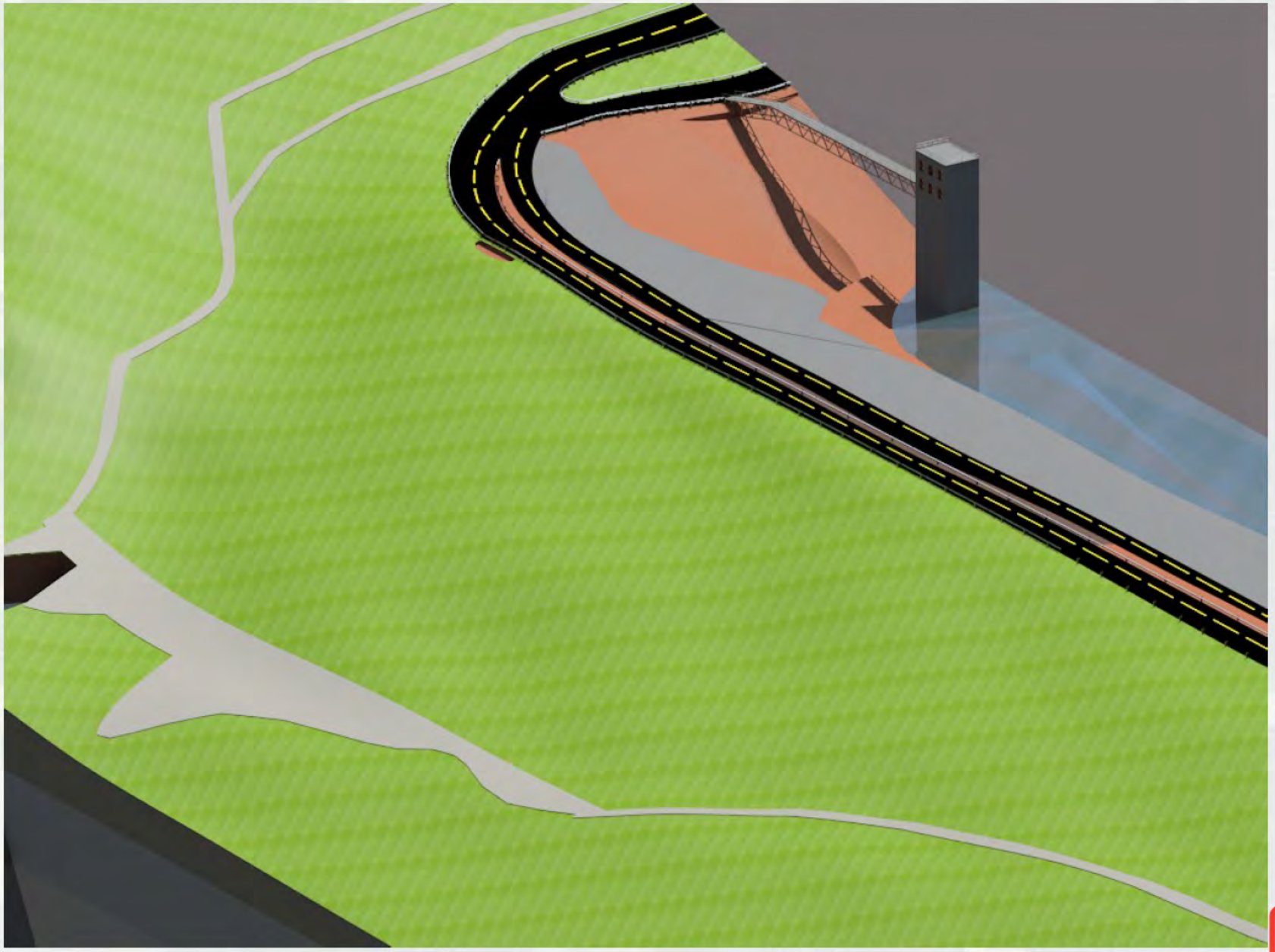
Cut-off Wall - Closure Panel Placement

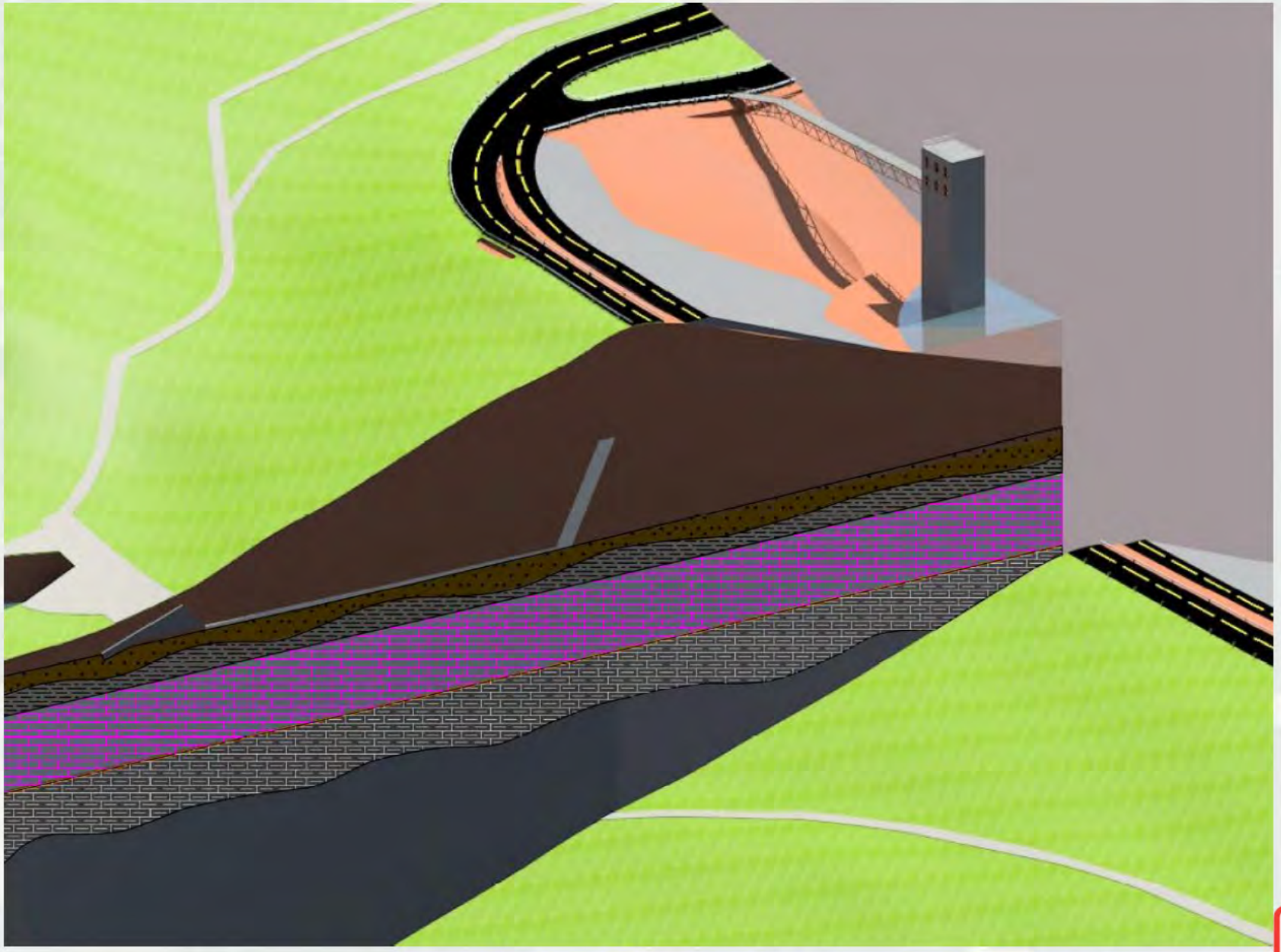


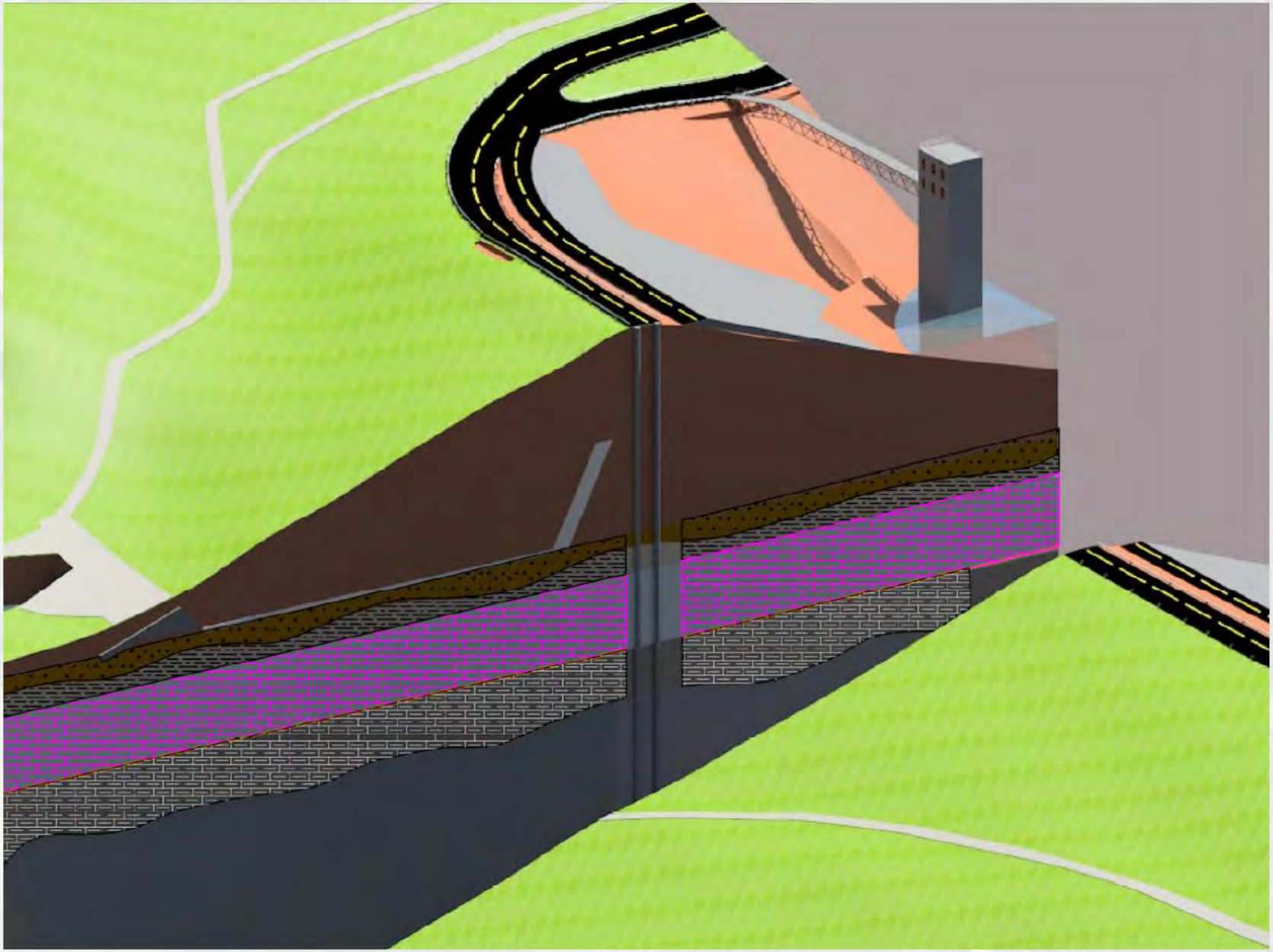
Mississinewa Cutoff Wall Construction

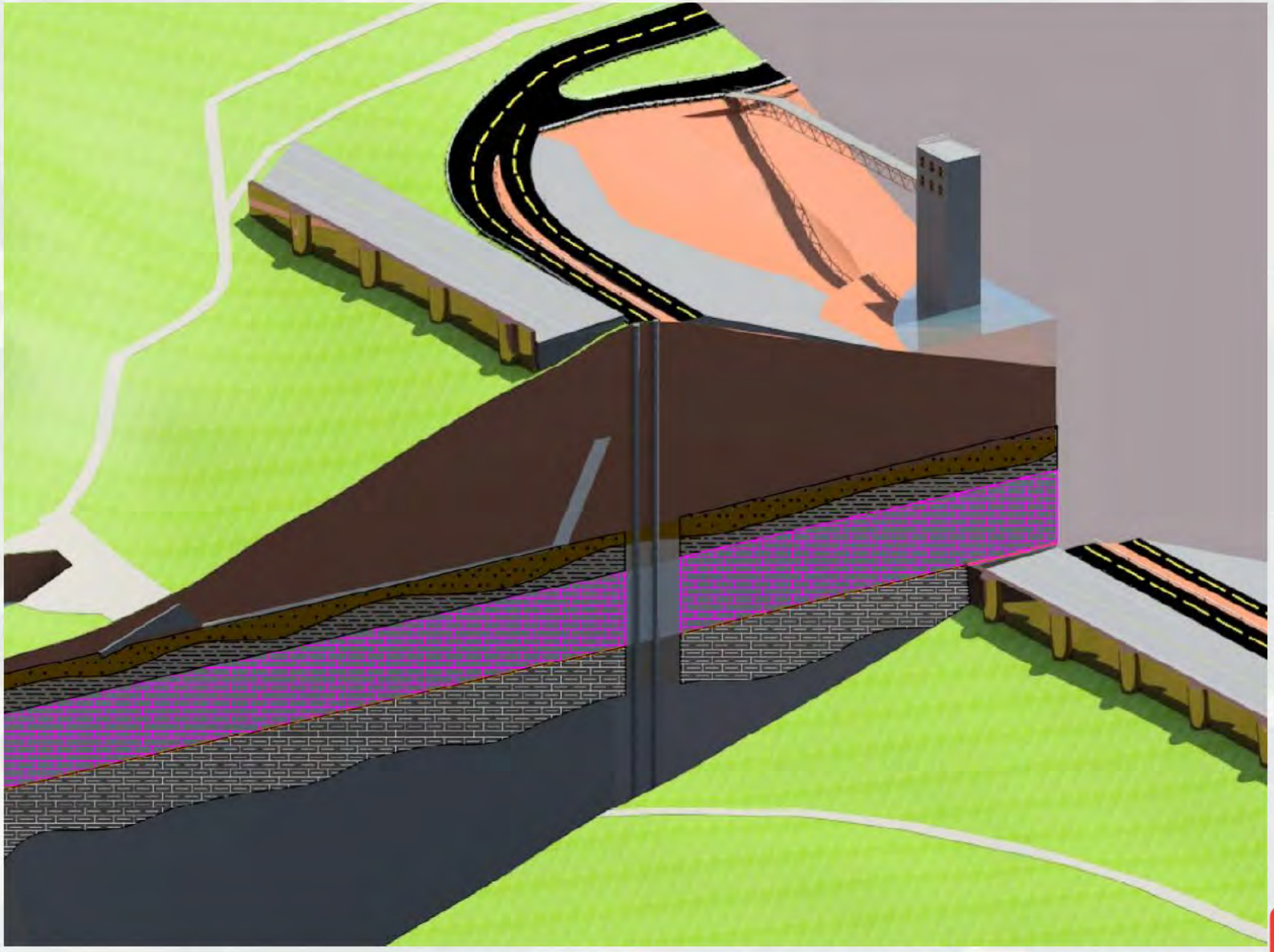
Wolf Creek Cutoff Wall Construction

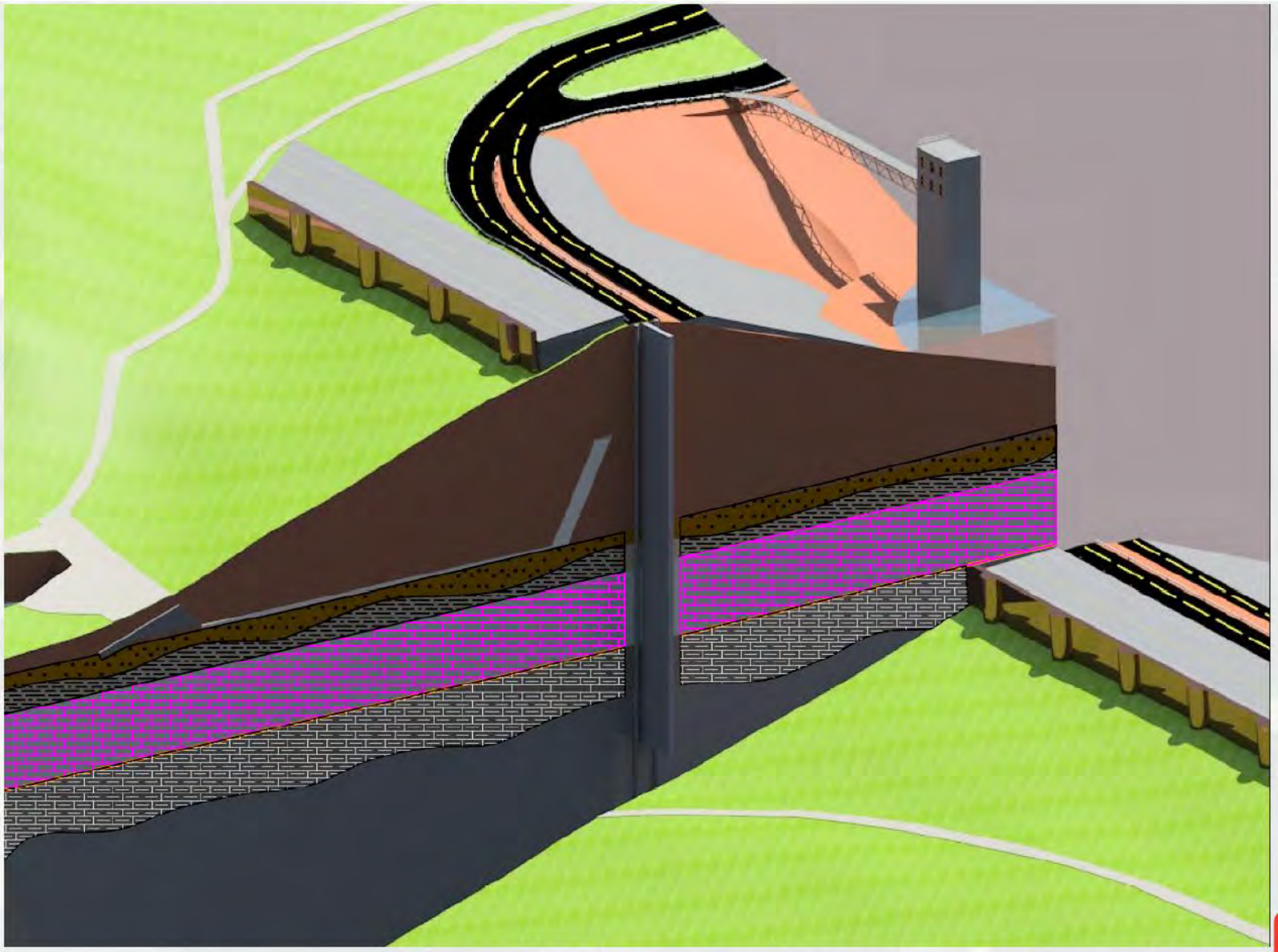


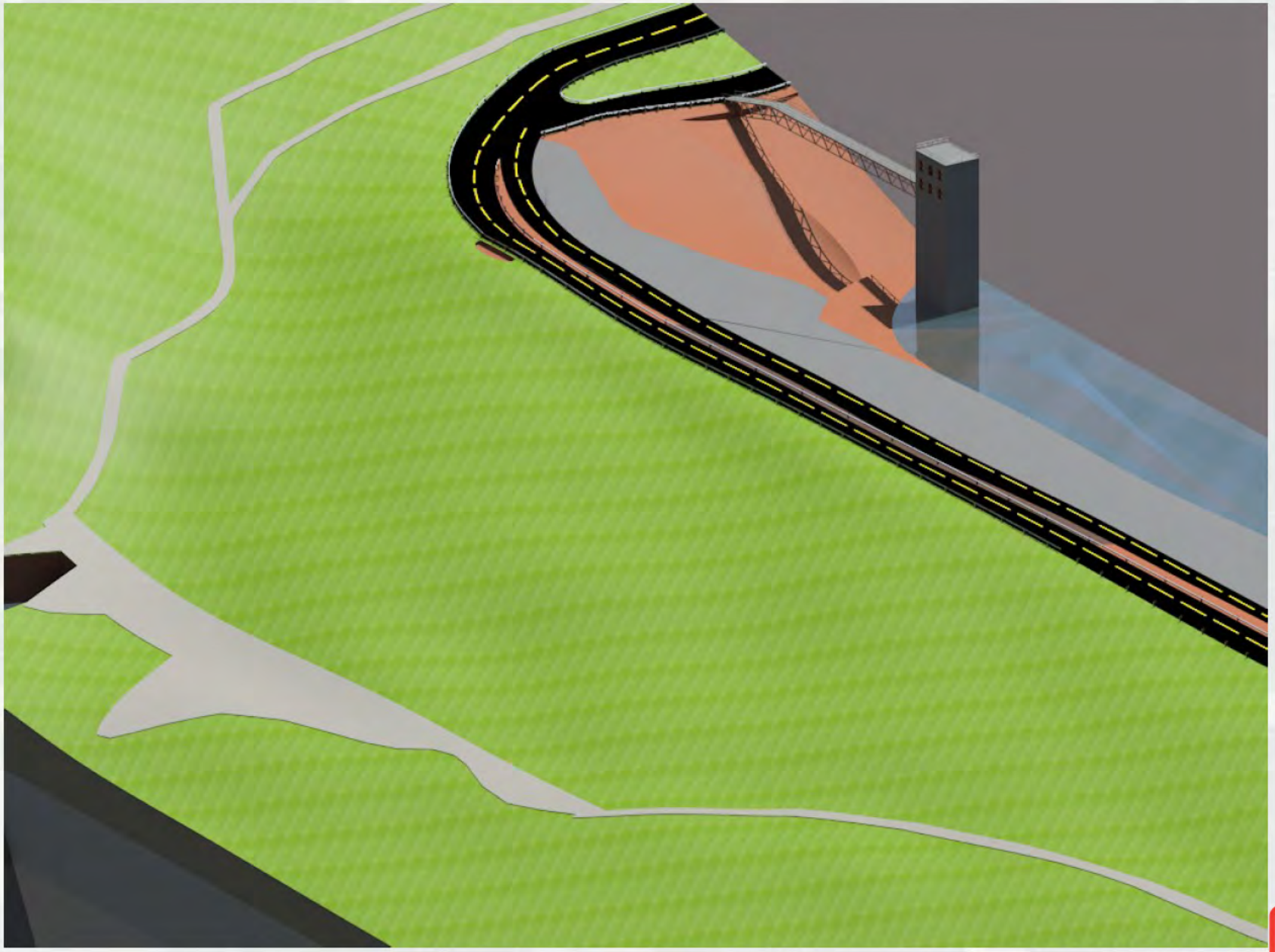






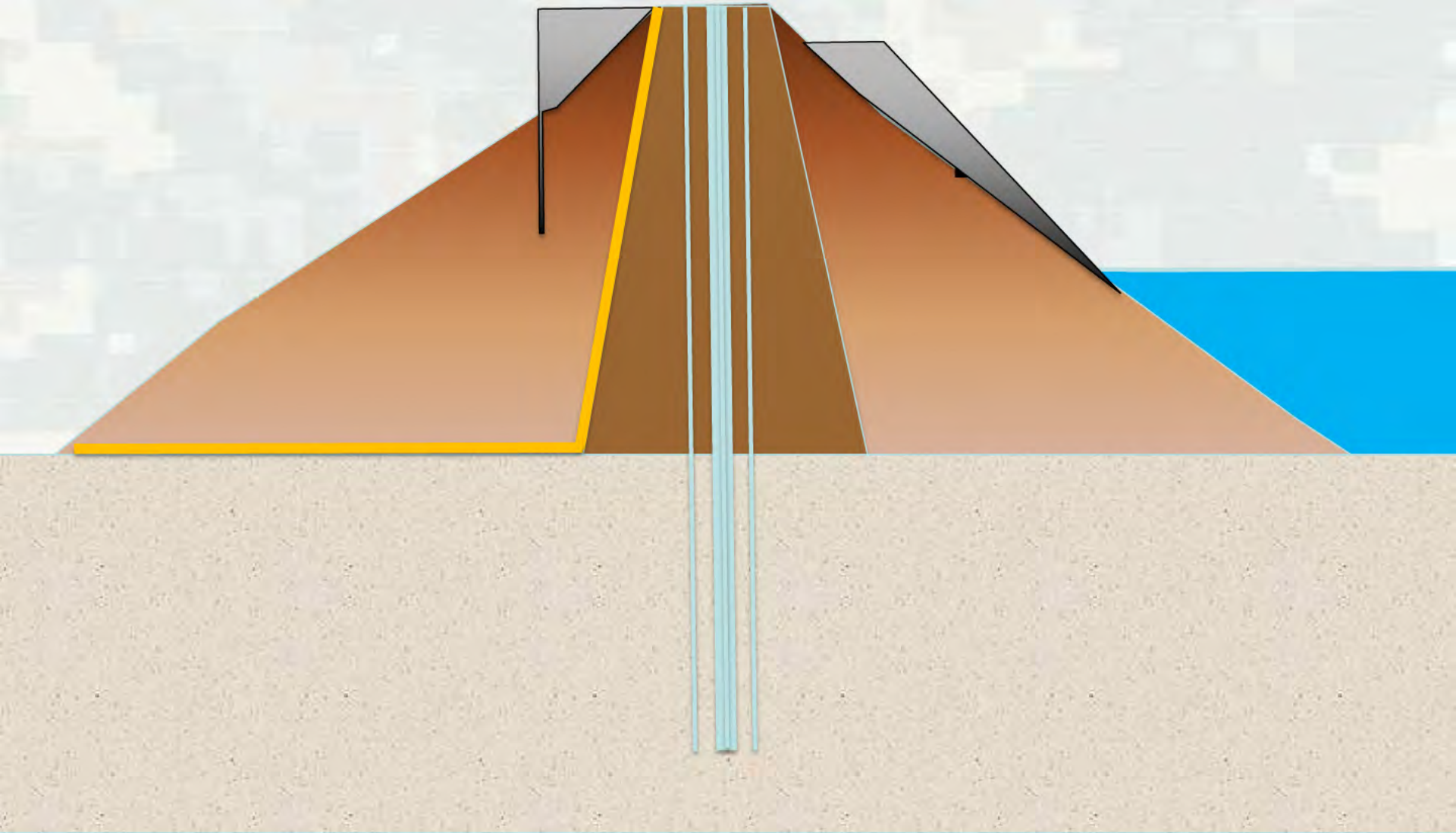






Questions?

Rough River Lake Dam
Remediation Construction 2014-2019



Stilling Basin Training Wall Repair November 2012