Case Study: Dream Mountain AML Passive Treatment System

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BioMost, Inc.
Mining & Reclamation Services

Overview

- Location / Landowner / Watershed Group
- Background
- PTS Design Phase 1
- PTS Design Phase 2
- System Performance

Location / Landowner / Watershed Group

- Northern Wv
- Dream Mountain Ranch
- Friends of the Cheat

Preston County
(Albright, Wv)

DREAM
MOUNTAIN RANCH

Hunting Ranch
& Event Venue

Friends of the Cheat

Project Owner

Background

Muddy Creek

- Viable Trout Fishery Upstream of Dream Mountain

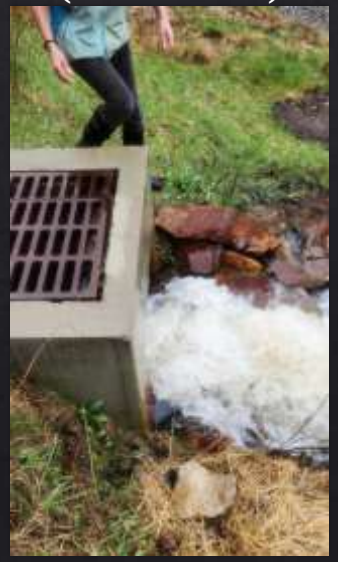
Dream Mountain Site

- 1995 – WV AML
  - Treatment System outside game fencing
- 2009 – WVU
  - Steel Slag Bed & Mixing Basin
- 2012 – WVU
  - (Two) 1-Ac Treatment Wetlands
- 2019 – BioMost Inc (Phase 1)
  - Online Spring 2021
- 2022 – BioMost Inc (Phase 2)
  - Online April, 2024

Water Quality (Influent)

		Flow (gpm)	pH	Acid (mg/L)	Diss. Fe (mg/L)	Diss. Mn (mg/L)	Diss. Al (mg/L)
Site #1 (sources combined)	Avg	124	2.9	423	20	2	31
	Design	251	2.8	625	26	3	41

(4/3/2024)



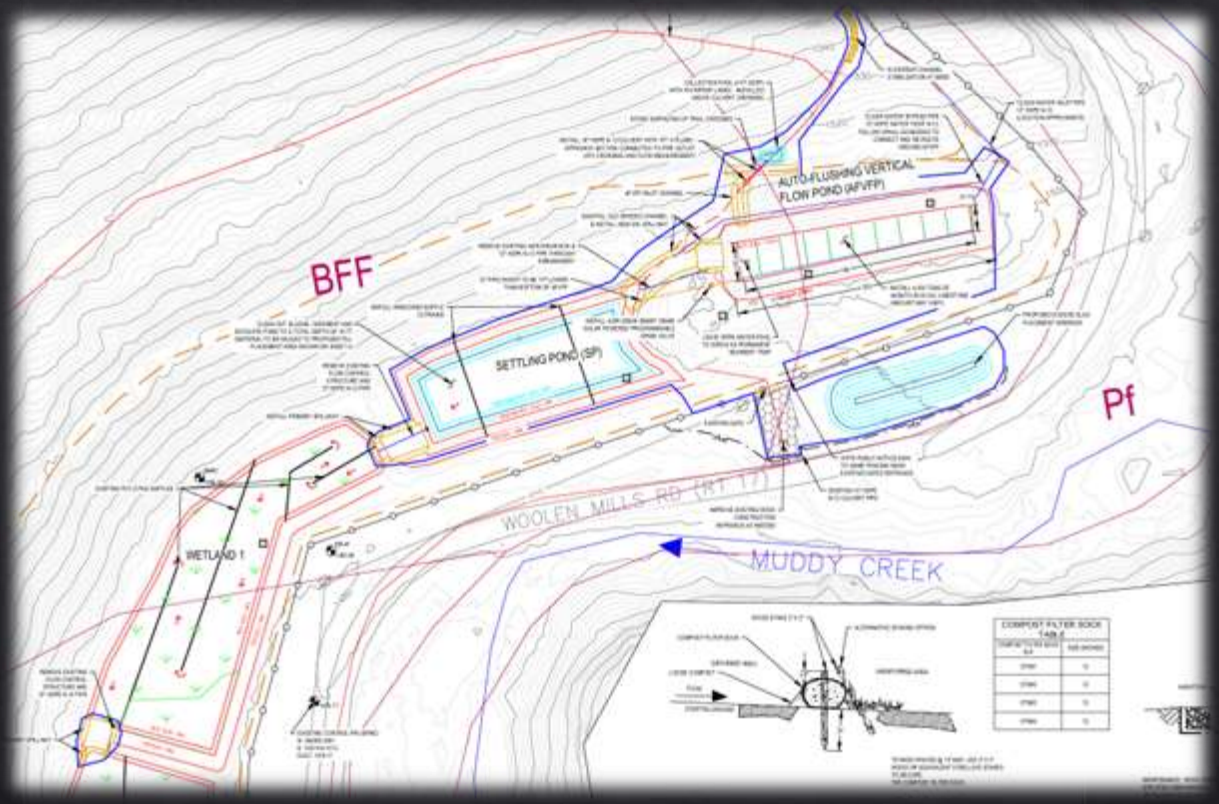
861 GPM (Measurable)
Estimated at >1,000 GPM

Construction: $232,800

PTS Design Phase 1

Construction Items

- Stabilize Inlet Channel (Erosion)
  - Collection Pool
- Install 1-FT H Flume
- Slag Bed converted to AFVFP
  - 4,750 Tons Hi-Cal LS
  - Re-route Clean Water Diversion to SP
- Mixing Basin / SP Clean Out Sludge & Over – Excavate for Increased Storage
  - 10 FT Total Depth
- Install Rock Lined Spillways
  - Remove Ex Flow Control Structures



PTS Design Phase 1

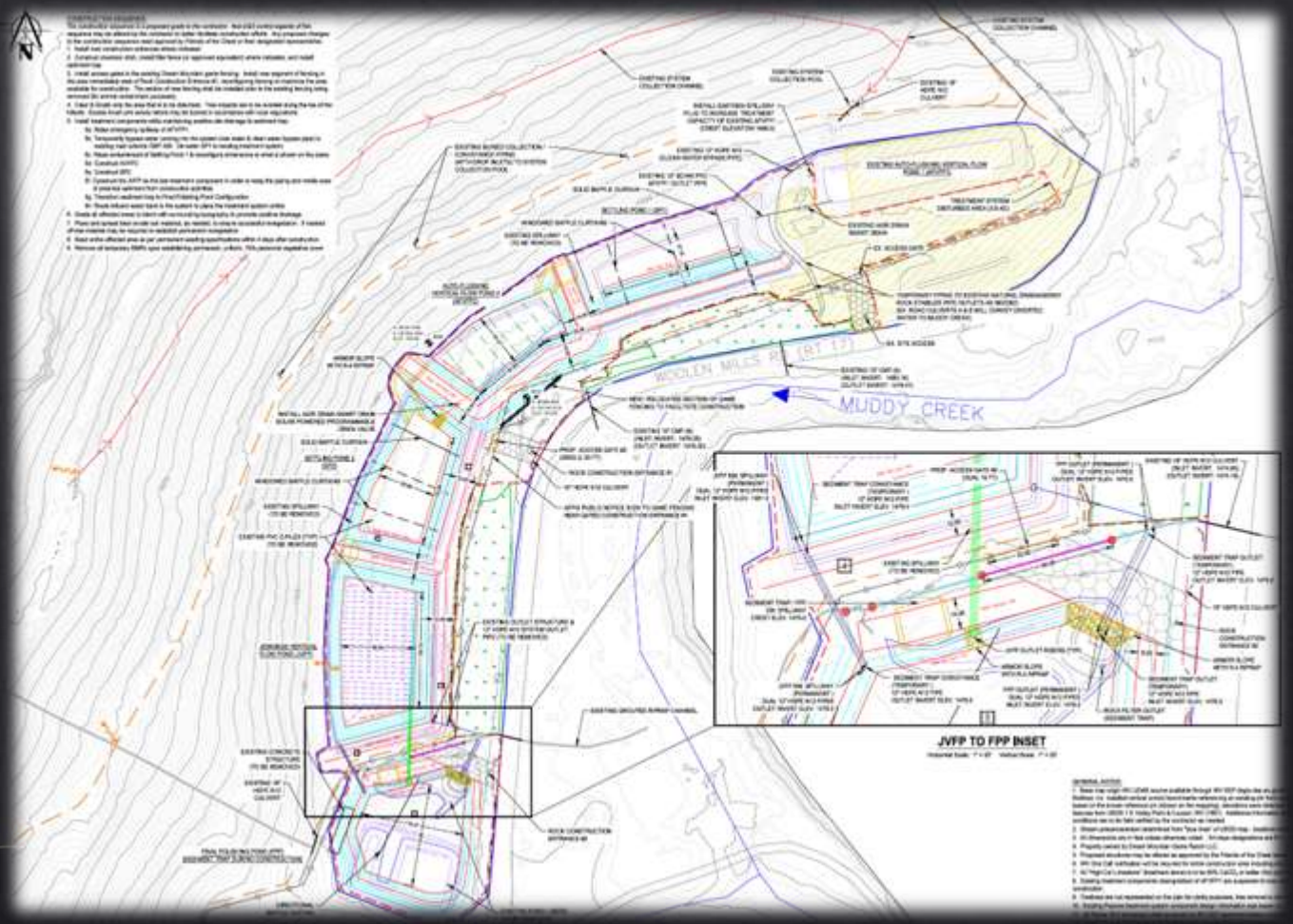
- Metered Expectations

Construction: $982,700

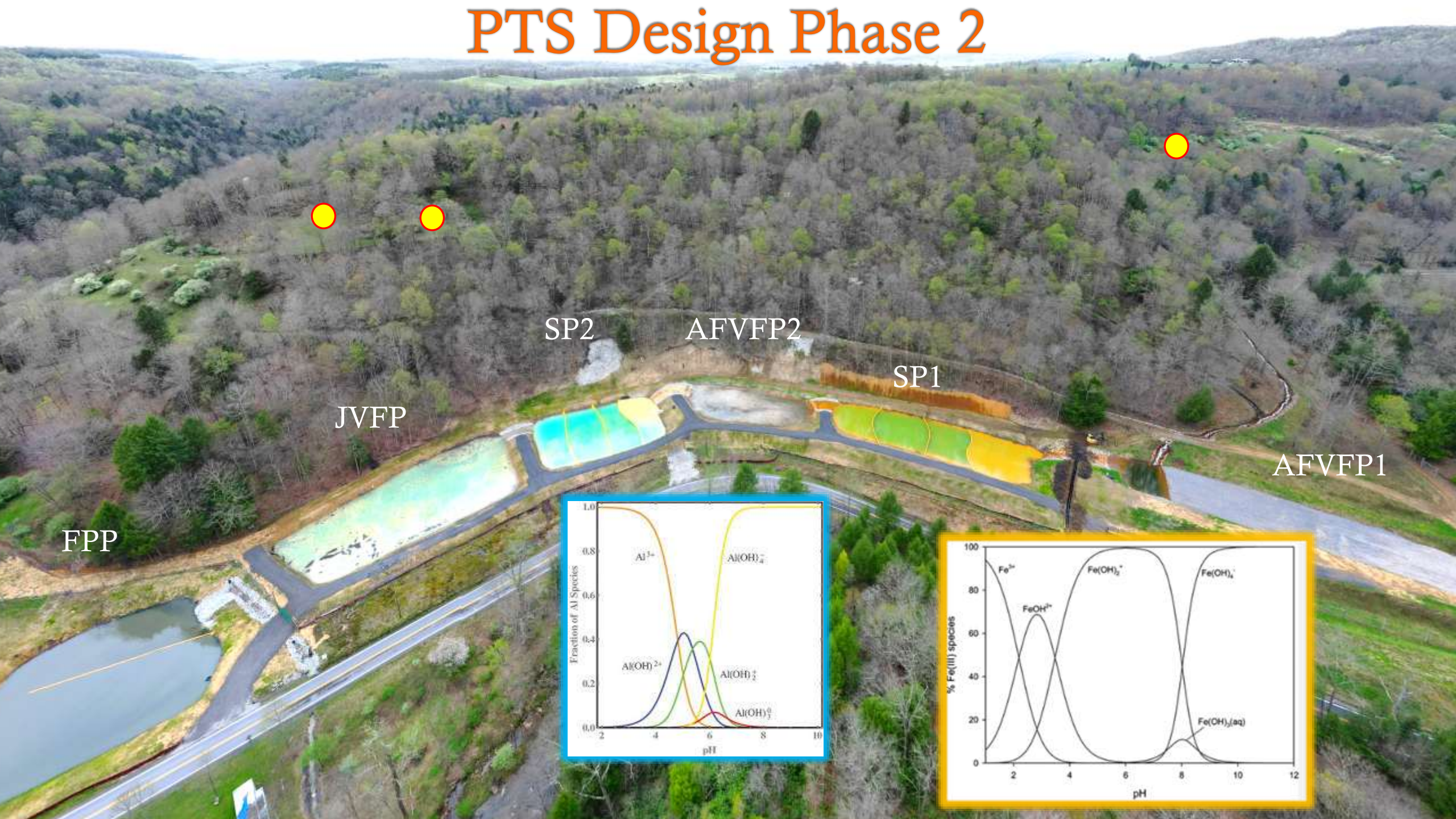
PTS Design Phase 2

Design / Construction Features

- AFVFP1 – Increase ‘Active’ Stone Ratio
  - Em Spillway Raised 1.5FT
- SP1
  - Rise Embankment (Avoid Wetlands)
  - 3 Baffle Configuration
- AFVFP2 – 2,500 Tons LS
- SP2
  - 3 Baffle Configuration
- JVFP – 3,000 Ton LS
- Final Polishing Pond – Directional Baffle



PTS Design Phase 2



Raise Spillway

Smart Drain

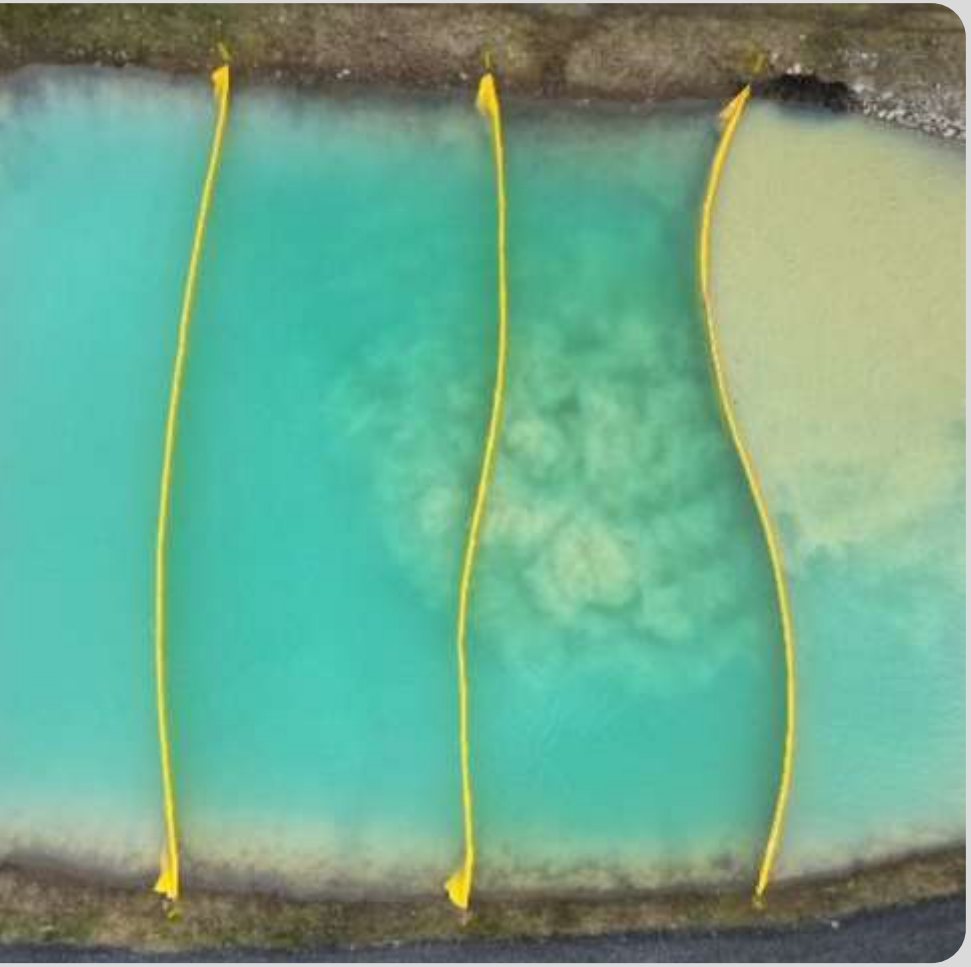
AFVFP 1 – 4,750 Tons Hi-Cal (AASHTO #2)

Settling Pond 1

- 3 Baffle Configuration
  - Solid – Windowed – Windowed
- Sorptive Mass / Co-precipitation

AFVFP 2 – 2,500 Tons Hi-Cal (AASHTO #3)

- Agri Drain Smart Drain
  - Daily Flush
  - Modified BOLTS
    - Fully Drain Before AFVFP1 Opens
- DR17 HDPE Underdrain Piping
  - Fernco Connections
  - Saddle Tees



Settling Pond 2

- 3 Baffle Configuration
  - Solid – Windowed – Windowed
- Sorptive Mass / Co-Precipitaiton

JVFP – 3,000 Ton Hi-Cal LS

Media Mix

- Volumetric Mix
- 3 Parts Hi-Cal LS
- 2 Parts Woodchips
- 1 Part Spent Mushroom Compost

Multi-Cell Underdrain

- Maximum Control of Media Usage / Flow Distribution

Odor Control

- Restrict Flow Thru Media
- Pass Water Thru Dual Secondary Outlet Pipes
- Blend Treated Waters in FPP

Final Polishing Pond

- Mix JVFP Riser Effluent & JVFP Overflow
- Directional Baffle Curtain
- Dual Outlet Pipes Discharge to Ex. Channel
  - Ex. Culvert Under Public Road
  - Ex. Channel to Muddy Creek

“ Thank you again for working with us on this difficult project -- we appreciate you all. Just yesterday Garrett and I saw some young of the year fish hanging around the Final Polishing Pond culvert outlet, which seemed unbelievable a year ago. ” – Madison Ball FOC (8/2/2024)

Site Challenges

- Working Inside the Game Fence
- Site Conditions & Landslide Issues
- Highway Erosion
- Clean Water Diversion & Water Handling
- Collection Channels – Long Term Maintenance Issue
  - Sediment for AFVFP1 / Fouling
    - Trench or Regular Stone Face Washing

System Performance

- Sampling Events (4 full & 2 Partial):
  - 4/2/2024 – Limited Field Data Only
  - 4/9/2024 (Presented at IMWA – Field Tour)
  - 7/2/2024
  - 10/16/2024
  - 2/13/2025
  - 4/10/2026

4/2/2024 Field Data

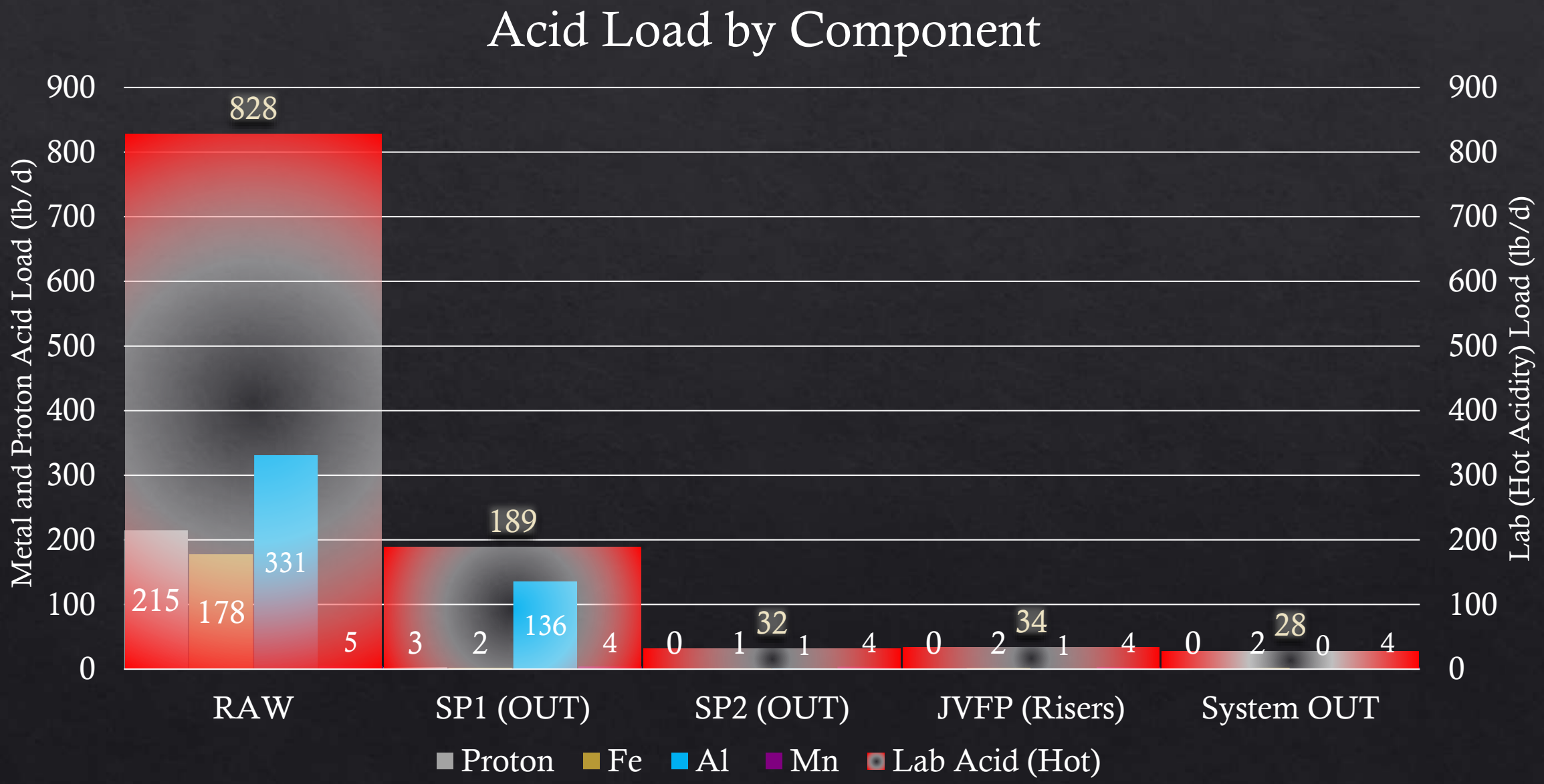
Location	Flow (gpm)	pH
Raw	583	2.9
SP1 Out		4.6
SP2 Out		6.3
JVFP Out		6.9
System Out	[583]	7.0

4/9/2024 Results

Location	Flow (gpm)	pH	Alk (mg/L)	Acid (mg/L)	Cond. (µS/cm)	Diss. Fe (mg/L)	Diss. Al (mg/L)	Diss. Mn (mg/L)	SO_4 (mg/L)
Raw	179	2.7	0	385	1620	30.8	27.7	1.3	573
SP1 Out		4.5	0	88	960	0.4	11.4	1.0	518
SP2 Out		5.9	0	15	933	0.1	0.1	1.0	463
JVFP Out	189	6.8	153	*16**	1030	0.3	<0.1	0.9	397
System Out	[189]	6.6	89	*13**	991	0.4	<0.1	0.9	470

*Lab was not reporting negative acidity values in accordance with the Standard Method for Hot Acidity SM2310B(4a)

4/9/2024 Results



7/2/2024 Results

Location	Flow (gpm)	pH	Alk (mg/L)	Acid (mg/L)	Cond. (µS/cm)	Diss. Fe (mg/L)	Diss. Al (mg/L)	Diss. Mn (mg/L)	SO_4 (mg/L)
Raw	40	2.8	0	461	2030	30.9	46.5	2.4	912
SP1 Out	(not sampled)								
SP2 Out	(not sampled)								
JVFP Out	(not sampled)								
System Out	[40]	7.3	105	*10**	1437	<0.1	<0.1	1.0	707

*Lab was not reporting negative acidity values in accordance with the Standard Method for Hot Acidity SM2310B(4a)

7/2/2024 Results

Acid Load (lb/d) In – Out

System Influent

- 221 lb/day Acid

System Effluent

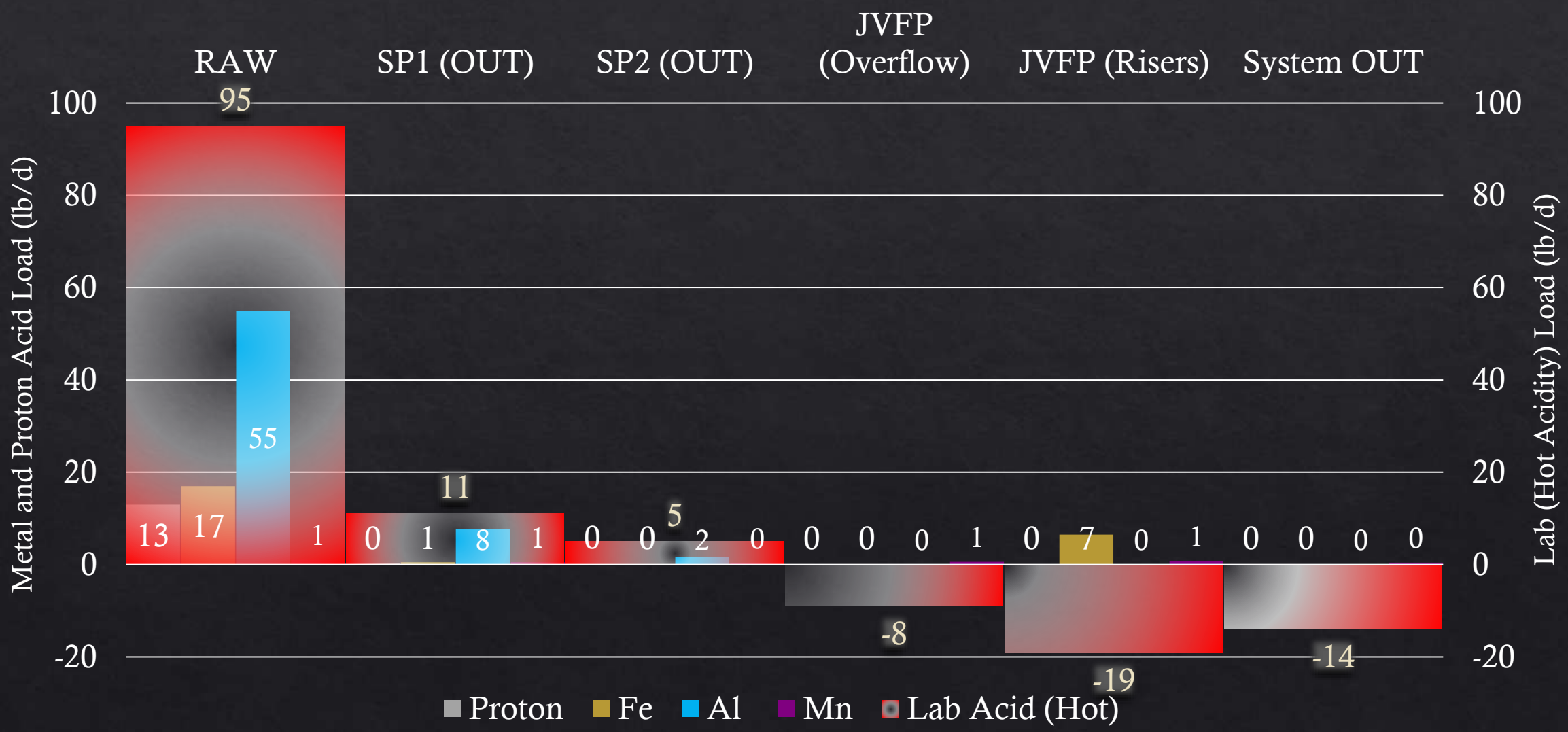
- >220 lb/day Acid Removed
- Appx -50 lb/day Acid

10/16/2024 Results

Location	Flow (gpm)	pH	Alk (mg/L)	Acid (mg/L)	Cond. (µS/cm)	Diss. Fe (mg/L)	Diss. Al (mg/L)	Diss. Mn (mg/L)	SO_4 (mg/L)
Raw	15.2	2.8	0	520	1880	34.2	54.4	2.9	975
SP1 Out		4.5	0	61	1480	1.0	7.6	1.5	870
SP2 Out		4.8	0	28	1390	0.2	1.7	1.0	786
JVFP Overflow		7.1	73	*-50*	1320	0.1	<0.1	1.9	681
JVFP Effluent	1.7	7.0	988	*-937*	1580	13.3	<0.1	2.0	43
System Out	[15.2]	7.7	99	*-78*	1320	<0.05	<0.1	1.2	657

10/16/2024 Results

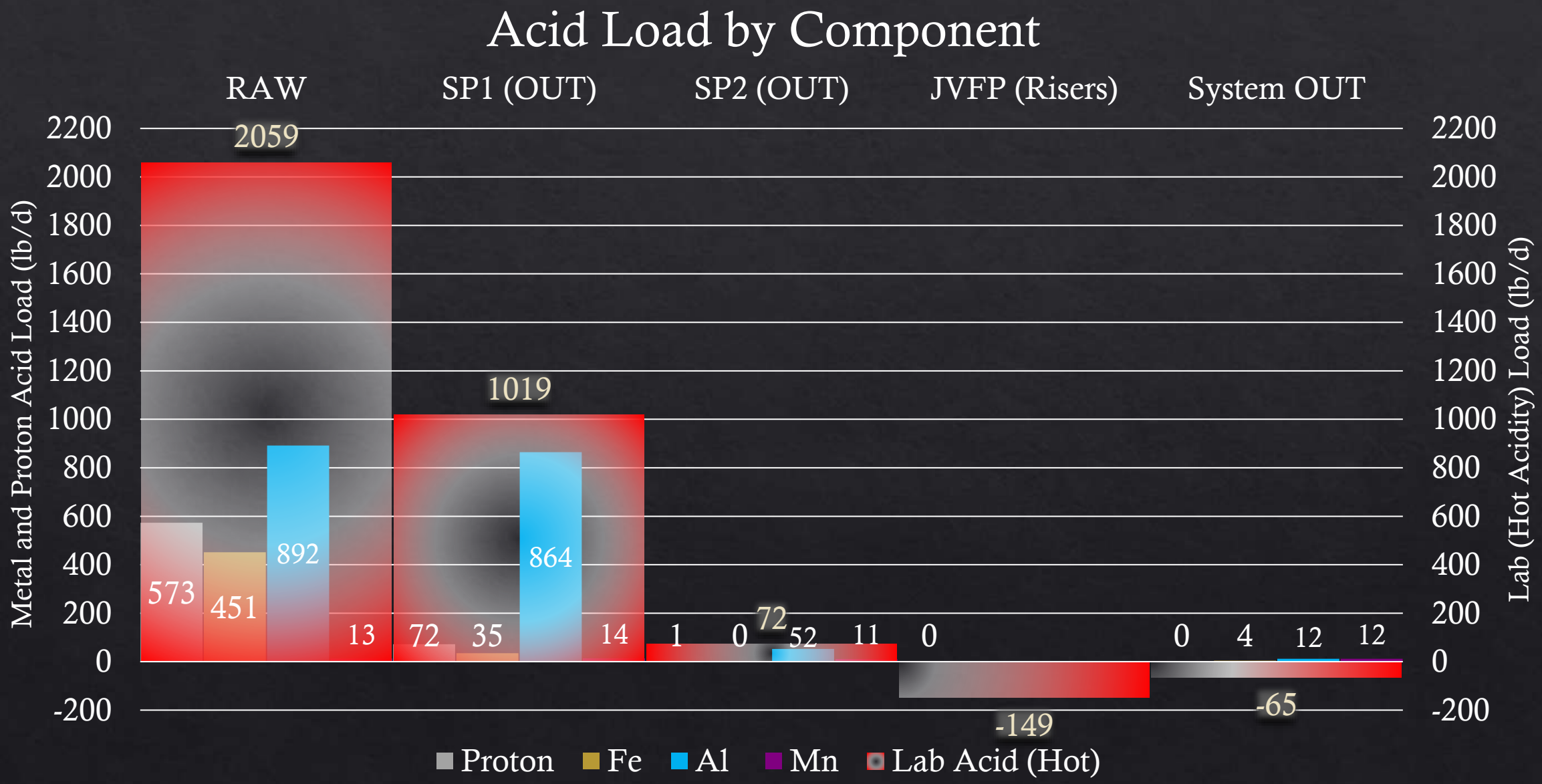
Acid Load by Component



2/13/2025 Results

Location	Flow (gpm)	pH	Alk (mg/L)	Acid (mg/L)	Cond. (µS/cm)	Diss. Fe (mg/L)	Diss. Al (mg/L)	Diss. Mn (mg/L)	SO_4 (mg/L)
Raw	601	2.8	0	285	1173	23.2	22.2	1.1	484
SP1 Out		3.7	0	141	1057	1.8	21.5	1.2	582
SP2 Out		5.7	7	10	1048	<0.1	1.3	0.8	533
JVFP Out	56	6.7	220 (field)	*(not sampled)*					
System Out	[601]	6.4	26	-9	1001	0.2	0.3	0.9	473

2/13/2025 Results

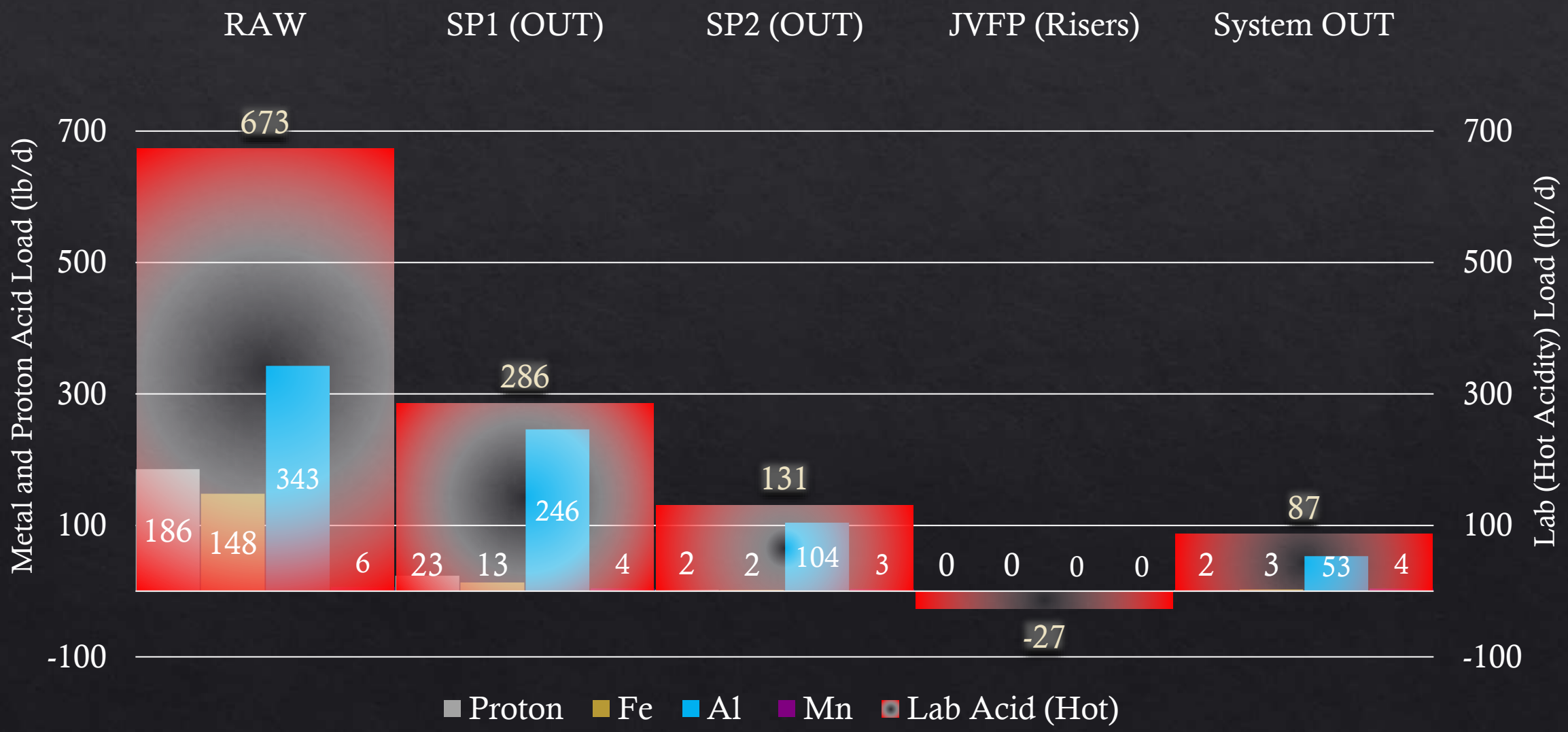


4/10/2026 Results

Location	Flow (gpm)	pH	Alk (mg/L)	Acid (mg/L)	Cond. (µS/cm)	Diss. Fe (mg/L)	Diss. Al (mg/L)	Diss. Mn (mg/L)	SO_4 (mg/L)
Raw	195	2.8	0	287	1584	23.5	26.3	1.5	645
SP1 Out		3.7	0	122	1061	2.1	18.9	1.0	563
SP2 Out		4.7	0	56	976	0.3	8.0	0.8	516
JVFP Out	10	7.0	412	-226	1159	0.02	<0.08	1.2	160
System Out	[195]	4.9	1.7	37	909	0.4	4.1	0.9	474

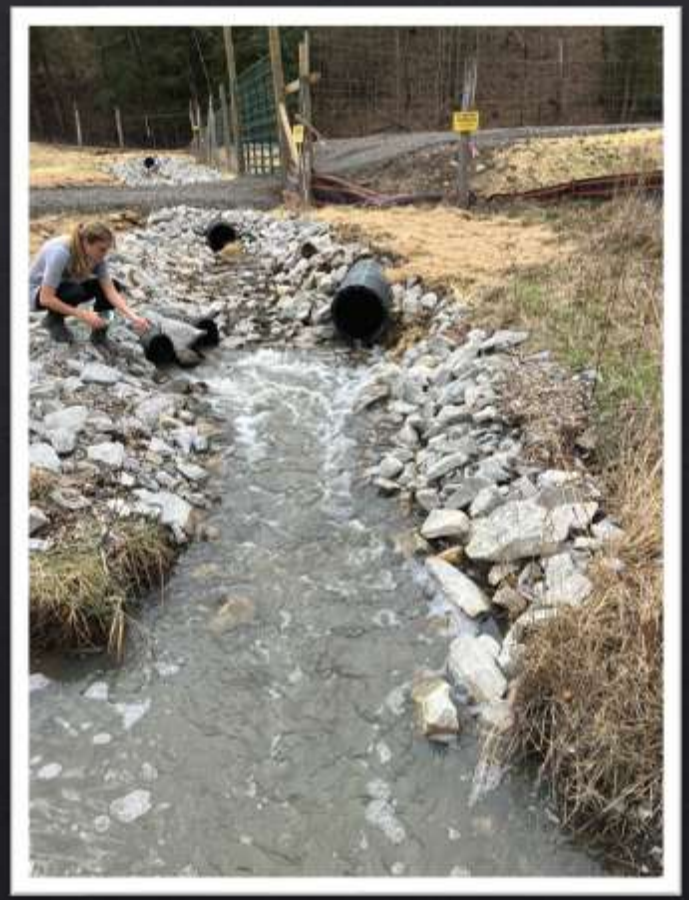
4/10/2026 Results

Acid Load by Component



Acid Load Removal Summary

- 4/9/2024: **>800 lb/day (~1,000 lb/day)** — 120%
  - 179 gpm
  - (Full JVFP Use)
- 7/2/2024: **>221 lb/day (~270 lb/day)** — 123%
  - 40 gpm
  - Partial JVFP
- 10/16/2024: **109 lb/day** — 115%
  - 15 gpm
  - Partial JVFP (11%)
- 2/13/2025: **2,124 lb/day** — 103%
  - 601 gpm
  - Partial JVFP (9%)
- 4/10/2026: **586 lb/day** — 87%
  - 195 gpm
  - Partial JVFP (5%)



Treatment Goal 80% Acid Load Removal

Design vs Actual Raw Loading

Max Design (Treatment)

- 251 gpm
- 1,886 lb/day Acid Load
  - 78 lb/d Fe Load
  - 124 lb/day Al Load

Actual Known Max (2/13/2025)

- 601 gpm
  - But Documented to Pass ~1,000 GPM
- 2,059 lb/day Acid Load
  - 450 lb/day Fe Load
  - 891 lb/day Al Load

Design Life 15 – 25 Years

Acknowledgements

- Dream Mountain Ranch
- Friends of the Cheat
- Blue & Gold Development LLC
  - Contractor (Phase 1)
- Solid Rock Excavating Inc.
  - Contractor (Phase 2)

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