Chevron Environmental Management Company

P.O. Box 469
Questa, NM 87564
Cell (505) 690-5408
amarti@chevron.com

July 31, 2025

Mr. Erik Munroe
Coal Program Manager
Mining and Minerals Division
1220 South St. Francis Drive
Santa Fe, NM 87505

Delivered via email to:
erik.munroe@emnrd.nm.gov

Re: McKinley Mine Permit No. 2016-02
VMU 1 Bond Release Application

Dear Mr. Munroe:

Enclosed is an application for bond release for Vegetation Management Unit 1. This application includes 48 acres of area eligible for Phase I bond release, and 837 acres of land eligible for Phase II and III bond release (which includes the 48 acres of land eligible for Phase I bond release). The application includes information in support of Phase III bond release that would reduce the current bond by $1,846,525.

CMI will proceed with the next steps on this application after further direction from MMD. Hard copies of this application will follow the submittal of this electronic copy.

If you have any questions regarding this submittal, please contact me at (505) 690-5408, Kyle Kutter at (314) 984-8800, or Frank Rivera at (505) 870-0941.

Sincerely,

Armando Martinez
McKinley Mine – Operations Lead
CEMREC

Frank Rivera, P.E.
Senior Lead Consultant
WSP USA, Inc

Encl

REPORT

Chevron Mining Inc.
McKinley Mine

Permit No. 2016-02
VMU 1 Bond Release Application

Submitted to:

Mining and Mineral Division

1220 South St. Francis Drive,

Santa Fe, NM 87505

Submitted by:

Chevron Mining Inc.

6101 Bollinger Canyon Road,

San Ramon, CA 94583-2324

Prepared by:

WSP USA Inc.

701 Emerson Road, Suite 250,

Creve Coeur, MO 63141

July 31, 2025

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Chevron Mining Inc. - McKinley Mine
Permit No. 2016-02
Application for VMU 1 - Bond Release
July 31, 2025

1.0 INTRODUCTION

This document constitutes Chevron Mining Inc.'s (CMI) application for bond release of the permanent-program performance bond for Vegetation Management Unit 1 (VMU 1) which includes 837 acres of land eligible for Phase II and III bond release, and 48 acres of land eligible for Phase I bond release (included in the Phase II and III acreage). Phase I bond release is requested for reclaimed road and rail corridors, and access that will remain for the postmining land use. Phase II bond release is being sought for the overall area since vegetation has been established and the contribution of suspended solids to streamflow or runoff outside the permit is not in excess of the 19.8 NMAC requirements. Phase III bond release is being sought since the entire reclaimed area has met vegetation standards in accordance with the permit and the regulations and all remaining reclamation obligations have been completed. The application has been formatted to follow the requirements of 19.8.14.1412 New Mexico Administrative Code (NMAC).

2.0 19.8.14.1412 A (2) (A) APPLICANT AND PERMITTEE

Chevron Mining Inc.
6101 Bollinger Canyon Road
San Ramon, CA 94583-2324
Telephone: (925) 790-6958

McKinley Mine is covered by the New Mexico Mining and Minerals Division (MMD) Permit # 2016-02.

3.0 19.8.14.1412 A. (2) (B) LEGAL DESCRIPTION

The Phase I, Phase II and Phase III bond release is being requested for the permanent-program lands in an area referred to as VMU 1, which is located in the sections listed below. The list also identifies land ownership to further define in those sections what lands are affected by this bond release, which includes in whole or in part the following: leased allotments, Chevron-owned land, and a federal surface lease. The specific boundaries of the bond release application lands within this legal description are detailed in Exhibit F: VMU 1 Bond Release – Land Inventory - Surface & Coal. This bond release application is intended to cover all the permanent program disturbance within these sections.

3.1 Bond Release Area Legal Description

The VMU 1 area exists entirely within T16N R20W and T17N R20W, New Mexico Principal Meridian, McKinley County, New Mexico. The following list breaks down the location of the lands included in the bond release by section number and includes BIA allotment numbers and identifies federal and private lands.

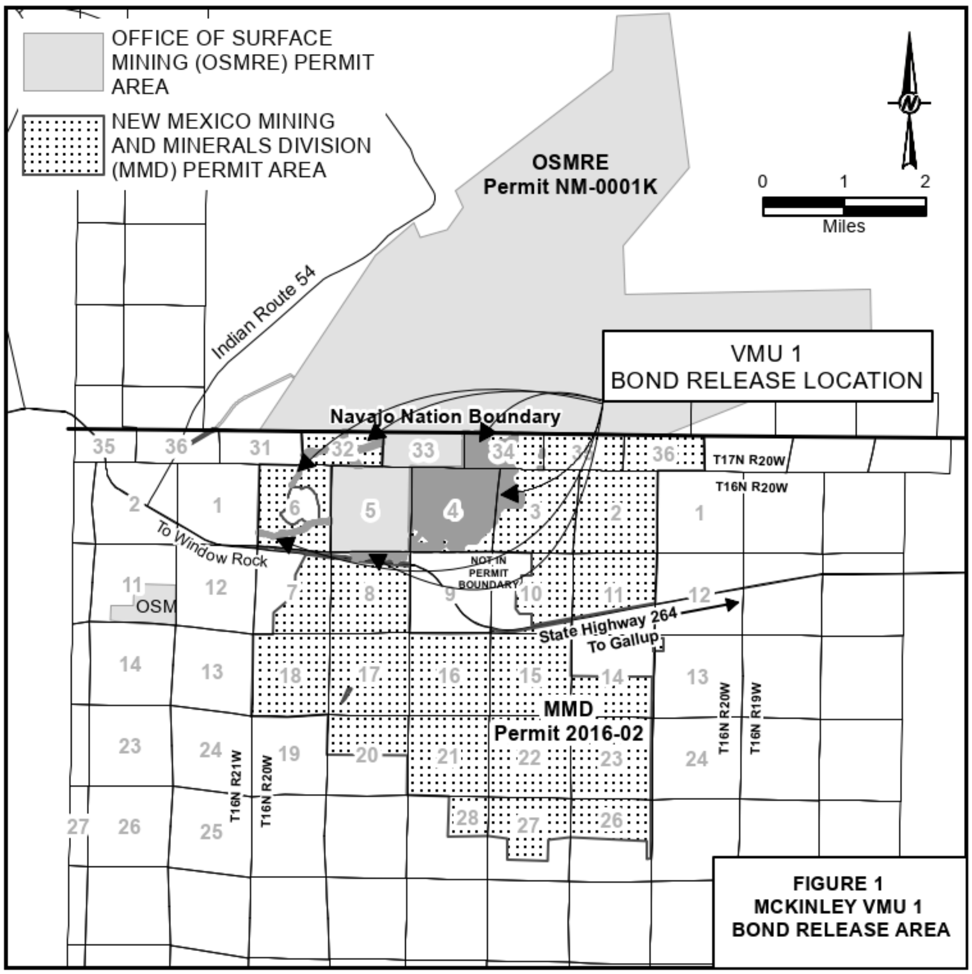
- T16N R20W:
  - Section 4 BIA Allotments 1616, 1617, 1618 & 1619
  - Section 6, BLM Federal Lease NM 057349
  - Section 3, Chevron-Owned Surface
  - Section 8 BIA Allotments 1613 & 1614
- T17N R20W:
  - Section 32 BIA Allotments 1622 & 1623

- Section 34 BIA Allotments 1620 & 1621

4.0 19.8.14.1412 A. (2) (C) LOCATION

The areas for which bond release is being requested are located at the CMI McKinley Mine. The McKinley Mine is located approximately 23 miles northwest of Gallup, NM, and 3 miles east of Window Rock, AZ, on NM State Highway 264. The areas in this Phase I, II and III bond release application are located within the Window Rock and Tse Bonita School USGS quadrangle maps, which are shown on the accompanying map Exhibit B: VMU 1 Bond Release – USGS Quadrangle. Figure 1 shows the general location for the bond release area and the permit boundaries.

Figure 1: McKinley Mine VMU 1 - Bond Release Area



5.0 19.8.14.1412 A. (2) (D) SUMMARY

5.1 Summary

Phase I bond for much of the area was released in 2011, which covered backfilling and grading, graded spoil suitability, topsoil replacement and construction of hydrologic structures and drainage control. 48 acres of road and railroad corridors and access areas that still require Phase I bond release are included with this bond release application. Phase II and Phase III bond release for 837 acres is being sought for the portion of bond associated with completion of reclamation requirements that results in the reduction of settleable solids and the development of vegetation to meet the requirement as established in the regulations and the applicable permit. Exhibit C: VMU 1 Bond Release – Postmining Topography shows the reconstructed topography and drainage control.

Seeding of the majority of reclaimed lands occurred between 1999 and 2014 as shown on Exhibit D: VMU 1 Bond Release – Seeding Map. This map shows the year of seeding or reseeding for each disturbed area. Approximately 824 acres (98.4%) of the 837 acres in VMU 1 have been seeded for 10 years or more.

In support of the post mining land use of grazing and wildlife habitat, the permit specifies that access roads and existing fences will remain for the use of the landowners. Roads are generally a two-track road with no surfacing material or roadside ditches as was typical before mining, and current land owner roads in the general area. An aerial photograph is provided in Exhibit E: VMU 1 Bond Release – Aerial, which shows the access roads to remain. In addition, the postmining road system may also be found on Exhibit 5.6-3 in Permit No. 2016-02.

The original calculation of the reclamation bond for Permit 2016-02 may be found in Appendix 2.9-A in Volume I. Calculations for the requested bond release for this application are provided below under 5.4 Bonding Information, with additional detail provided in Section 13.5 Phase II and Phase III Performance Bond Reduction as well as in Appendix 1 - Performance Bond Calculations.

5.2 Sediment Control

The National Pollutant Discharge Elimination System (NPDES) permit classifies all outfalls at McKinley mine as Appendix C outfalls, which fall under the criteria for Western Alkaline Coal Mining Subpart H regulations under 40 CFR 434.81. The Appendix C outfall classification means that the primary sediment control for the watersheds at each outfall are Best Management Practices (BMPs), which includes landforms, hydrologic conveyance and erosion-control structures, revegetation, etc.; no sediment ponds are necessary to control sediment in any of the watersheds. Compliance is verified through collection of water monitoring data from outfall discharges and field inspections of the BMPs.

5.3 Revegetation

Reports documenting the results of revegetation-success sampling are submitted in the Annual Reports. VMU 1 vegetation sampling occurred from 2019 through 2024. The results of these reports are summarized in Section 13.1 the Revegetation section of the Phase III Bond Release Requirements. The results from 2023 and 2024 demonstrate that vegetation has been successfully established.

5.4 Bond Information

The bond reduction associated with the Area VMU 1 bond release is $1,846,525. Please see Section 13.5 Performance Bond Reduction section for more detailed bonding information as well as Appendix 1 – Performance Bond Calculations.

5.5 Disturbed Acreage to be Released

The acres included in this bond release application and corresponding percentage of the permitted area are presented below:

- Acreage to be released (VMU 1): 837.0 ac.
- Acres permitted: 12,958.2 ac.
- Percentage of acres permitted being released: 6.5 %

6.0 19.8.14.1412 A. (2) (E) SURFACE AND MINERAL RIGHTS

See the table in Appendix 2 for information on surface and mineral owners, which includes bond release acreages. Surface and mineral information is depicted on Exhibit F: VMU 1 Bond Release – Land Inventory - Surface & Coal.

7.0 19.8.14.1412 A. (2) (F) NOTIFICATION LETTERS

A copy of the proposed draft notification letter is provided in Appendix 3. The notification letter will be sent once MMD advises CMI to proceed with the public notice process. CMI will coordinate with MMD to ensure all appropriate interests are notified by either CMI or MMD.

Notification letters regarding this bond release application will be sent to adjoining landowners, allottees, local government agencies, planning agencies, sewage and water-treatment authorities, and water companies in the vicinity of the proposed release areas.

MMD will provide notification letters and invitations for inspections to land owners and allotees within the proposed release areas, to the surface and mineral owners listed on the table in Appendix 2 (e.g., BIA, BLM, NM State Land Office, etc.) and other government agencies.

CMI requested addresses from the BIA for allottees within and adjoining the proposed bond release area who will be sent a notification letter. A copy of the information received from BIA with allottee addresses by allotment is contained in Appendix 4.

Appendix 5 contains a full list of all other interests (with addresses) that will be notified of this bond release application.

8.0 19.8.14.1412 A. (2) (G) OTHER MAPS AND INFORMATION

The following exhibits are provided as part of this bond release application:

- Exhibit A: VMU 1 Bond Release – Bond Release Location
- Exhibit B: VMU 1 Bond Release – USGS Quadrangle
- Exhibit C: VMU 1 Bond Release – Postmining Topography
- Exhibit D: VMU 1 Bond Release – Seeding Map
- Exhibit E: VMU 1 Bond Release – Aerial
- Exhibit F: VMU 1 Bond Release – Land Inventory - Surface & Coal

9.0 19.8.14.1412 A. (2) (H) CERTIFICATION

A notarized certification is enclosed that states that all applicable reclamation activities have been accomplished in accordance with the requirements of SMCRA, the Act, the regulatory program, and the approved reclamation plan. The certification may be found in Appendix 6.

10.0 19.8.14.1412 A. (3) PUBLIC ADVERTISEMENT

A draft public notice is contained in Appendix 7 that addresses the requirements of this section. The advertisement shall be placed in the newspapers (Navajo Times and The Gallup Independent) once MMD advises CMI to proceed with the public notice. A copy of the full application will be placed in the McKinley County courthouse prior to sending out notification letters and publication of the advertisement.

11.0 PHASE I BOND RELEASE REQUIREMENTS

Phase I bond for much of the VMU 1 area was released in 2011, which covered backfilling and grading, graded spoil suitability, topsoil replacement and construction of hydrologic structures and drainage control.

48 acres of road and railroad corridors that still require Phase I bond release are included with this bond release application. The majority of grading of the 48 acres occurred between 1986 and 2014. The location of these areas is shown with a lavender highlight on Exhibit A and the other exhibits.

Records from the annual reports show that graded spoil was sampled and passed in the 1986 to 1987 period on grids that included road corridors in the east half of Section 32, T17N, R20W. The majority of topdressing activities for these road and railroad corridors occurred between 1986 and 2014.

The railroad corridor was constructed in the 1970s. It was reclaimed in accordance with MMD Permit No. 2016-02, as detailed in Permit Section 5.9 and Appendix 5.8-A (these materials are contained in Appendix 8 of this application). The plan contained five elements to meet the performance standards included:

1. Removal of the railroad tracks, anchoring materials, railroad ties, and 8 inches of ballast.

2. Earthwork conducted in such a manner that fill material was placed in cut areas with the goal to approximate pre-railroad topography. The lower bank fill below some of the rail sections was not going to be cut out since those zones were expected to be stable.

3. Culvert removal and establishing pre-mining drainages.

4. Neutral material placement as a planting medium, and use of in-situ rock materials as rock mulch.

5. Seeding and mulching of disturbed areas.

All five elements were completed during reclamation of the railroad corridor. The corridor was reclaimed, resulting in a long and narrow strip of reclamation between 75 and 150 feet (ft) wide blended into the surrounding contours. The proposed postmining contours may be found in Exhibit 5.8-A2 in Appendix 5.8-A. of the Mine Permit. The exhibit shows that the reclaimed area was graded to 3:1 slope, where possible, and steeper in some locations, where required, as dictated by the existing pre-mining topography. Final seeding was completed in 2014. Further details regarding the Railroad Corridor Reclamation Plan can be found in Appendix 8 in this application.

12.0 PHASE II BOND RELEASE REQUIREMENTS

12.1 Successful Establishment of Vegetation

Vegetation establishment and success for the majority of VMU 1 was measured in 2019 through 2024. The demonstration that VMU 1 met Phase II requirements, however, will be based on the same 2023 and 2024 data used to demonstrate Phase III requirements were met. The results of these reports are summarized in Section 13.1 which is the Revegetation section of the Phase III Bond Release Requirements. The results demonstrate that vegetation has been successfully established.

12.2 Sediment Control

Various demonstrations have been completed at McKinley Mine showing that surface water from reclaimed land does not contribute suspended solids to streamflow or runoff outside the permit area in excess of the requirements in 19.8.14.1412 C. (2). Key information, to that end, includes both modeling analysis and water monitoring data.

<u>Modeling Information</u>

As documented in the MMD Permit 2016-02 Section 6.3.3, on November 16, 2009, MMD approved a sediment-yield comparison study between premine and postmine lands. The study showed that reclaimed lands would have significantly less sediment yield than premining lands, that is 0.369 tons per acre for reclaimed lands verses 0.892 tons per acre for premined lands. Because of the large area included in the study, MMD considered it to be a representative study of the rest of the mine on MMD-jurisdictional lands. Subsequently, MMD advised CMI that sediment ponds in the study area and in fully reclaimed watersheds (seeded and mulched) were no longer necessary.

Monitoring Information

A comprehensive analysis of water-quality data for large, medium, and small watersheds is contained in Appendix B of the 1992 Annual Mining and Reclamation Report submitted to MMD. The findings from this report combine 1992 data with sampling data from as far back as 1982 to show that runoff from disturbed large, medium and small watersheds has better water quality than that of paired undisturbed watersheds; the results are summarized in Table 1. This data was also used as additional support for the McKinley Mine's demonstration under the 20-41 (e) Windows program (now referenced as 19.9.20.2009 (e) NMAC) for a waiver from additional sediment control, which includes a requirement that the runoff from the regraded (i.e., reclaimed) area be as good as or better quality than the waters entering the permit area (i.e., undisturbed areas) in order to qualify for the window.

Table 1: Summary of Modeling Results

Watershed	Parameter	Undisturbed Average	Disturbed Average
Large	TSS	92604	45184
Medium	TSS	25847	25738
Small	TSS	20963	15267

Conclusion

The modeling information coupled with monitoring data demonstrate that the requirement in 19.8.14.1412 C. (2) was met. This information parallels the mine's NPDES permit that makes the same findings using both modeling information and monitoring data.

12.3 Prime Farmland

There are no areas designated as Prime Farmland within the Permit No. 2016-02 permitted area.

12.4 Silt Dams

There are no permanent impoundments located within the VMU 1 bond release area. All sedimentation ponds in this area have been reclaimed.

12.5 Phase II Performance Bond Reduction

Please see Section 13.5 - Performance Bond Reduction for bonding and bond reduction information.

13.0 PHASE III BOND RELEASE REQUIREMENTS

13.1 Revegetation

The vegetation success for most of the VMU 1 bond release area is demonstrated through the results of vegetation sampling conducted in VMU 1 in 2023 and 2024. The VMU 1 vegetation sampling reports are summarized here and demonstrate that vegetation success standards have been met in the Permit No. 2016-02 (the Permit), and those recommended in the MMD Coal Mine Program Vegetation Standards (MMD 1999). The 2023 and 2024 Vegetation Monitoring Reports for VMU-1 are contained in Appendix 9.

The Permit requires that the following parameters be met for vegetation success: ground cover, productivity, diversity, and woody stem stocking (Table 2). The ground cover requirement for live perennial/biennial cover on the reclamation is 15%. The productivity requirement is 350 air-dry lbs/ac perennial/biennial annual production (i.e., forage production). The woody stem stocking success standard is 150 live woody stems/ac. In accordance with NMAC 19.8.20.2065 B. (5), sampling results are compared against 90% of these cover, production and wood stem stocking standards.

Table 2: Revegetation Success Standards for the Mining Minerals Diversion Permit Area

Vegetative Parameter	Success Standard	MMD Guidance
Ground Cover	15% live perennial/biennial canopy cover	in 2 of the last 4 years
Productivity	350 air-dry pounds per acre perennial/biennial annual production	in 2 of the last 4 years
Diversity	A minimum of 2 shrub or subshrub taxa contributing at least 1% relative cover each.	in 1 of the 2 sampling years of the responsibility period (of the last four years)
	A minimum of 2 perennial warm-season grass taxa contributing at least 1% relative cover each.	
	A minimum of 1 perennial cool-season grass taxa contributing at least 1% relative cover.	
	A minimum of 3 perennial/biennial forb taxa combining to contribute at least 1% relative cover.	
Woody Stem Stocking	150 live woody stems per acre	in 1 of the 2 sampling years of the responsibility period

Note: Diversity criteria assessed for individual perennial/biennial species relative cover as agreed upon by MMD and CMI in June 2019.

The MMD Coal Mine Program Vegetation Standards also state that for Phase III bond release applications, it must be demonstrated that the total annual production and total live cover of biennials and perennials equal or exceeds the approved standards for at least two of the last four years of the responsibility period. Shrub density and revegetation diversity must equal or exceed the approved standards during at least one of the two sampling years of the responsibility period (MMD 1999). 2023 and 2024 vegetation success data meet these requirements.

VMU 1 Summary

Vegetation success sampling has been ongoing in VMU 1 for the past six years. Table 3 shows the results by parameter for the six years of sampling. As the table shows, it was data collected in 2023 and 2024 that demonstrate that VMU 1 fully meets the vegetation-success standards required for two years and is eligible for Phase II and III bond release.

Table 4 provides a numerical summary on hypothesis testing results for cover, forage production and woody plant density for the six years of sampling. Unshaded cells indicate where a parameter met hypothesis testing.

Table 5 shows the results for various diversity parameters for the six-year sampling period. The table shows various species or numbers of species matched against the standards and whether that standard was met. Cells that are not shaded show where the standards were met.

Table 6 contains a statistical summary for forage production. The table shows the effect of variance on means that were greater than the success standard. Unshaded cells show results that passed hypothesis testing.

Table 3: VMU-1 Revegetation Success at McKinley Mine from 2019 to 2024, Mining and Minerals Division Permit Area

Vegetative Parameter[1]	Success Standard	MMD Guidance	M-VMU-1 2019	2020	2021	2022	2023	2024
Ground Cover	15% live perennial/biennial cover	in 2 of the last 4 years	✓	✓	✗	✓	✓	✓
Productivity	350 air-dry pounds per acre perennial/biennial annual production	in 2 of the last 4 years	✓	✗	✗	✗	✓	✓
Diversity	A minimum of 2 shrub or subshrub taxa contributing at least 1% relative cover each.	in 1 of the 2 sampling years of the responsibility period	✓	✓	✓	✓	✓	✓
	A minimum of 2 perennial warm-season grass taxa contributing at least 1% relative cover each.		✗	✓	✗	✓	✓	✓
	A minimum of 1 perennial cool-season grass contributing at least 1% relative cover.		✓	✓	✓	✓	✓	✓
	A minimum of 3 perennial/biennial forb taxa combining to contribute at least 1% relative cover.		✓	✗	✓	✓	✗	✓
Woody Stem Stocking	150 live woody stems per acre	in 1 of the 2 sampling years of the responsibility period	✓	✓	✓	✓	✓	✓
			M-VMU-1 2019	**2020**	**2021**	**2022**	**2023**	**2024**
			☑ (blue)	✗	✗	✗	☑ (blue)	✓

Notes:

[1] Parameter and corresponding standard explained in Table 2 of the Vegetation Success Monitoring Reports (Appendix H)

KEY

- ✓ All success standards met for the year
- ✗ Success standards not met for the year
- ☑ (blue) Success standards for ground cover and productivity met

Table 4: VMU-1 Statistical Analysis Results for Cover, Production, and Woody Plant Density, 2019 to 2024

Vegetation Metric	Success Standard	Results 2019	2020	2021	2022	2023	2024
Perennial/Biennial Cover	≥ 15%	29.6	42.9	25	22.5	33.3	52.5
Annual Forage Production	≥ 350 lb/ac	719	511	520	451	784	897
Woody Plant Density	≥ 150 stems/ac	1,821	2,577	1,592	2,752	2,941	2,779

Note: Shaded cells indicate where hypothesis testing was not met.

Table 5: VMU-1 Results for Diversity, 2019 to 2024

Diversity Component	Standard (% relative cover)	2019 Result	2019 Species	2020 Result	2020 Species	2021 Result	2021 Species	2022 Result	2022 Species	2023 Result	2023 Species	2024 Result	2024 Species
Shrubs and Subshrubs			**(6 spp.)**		**(9 spp.)**		**(7 spp.)**		**(7 spp.)**		**(6 spp.)**		**(6 spp.)**
Species 1	≥ 1.0%	11.96%	Four-wing saltbush	12.71%	Four-wing saltbush	13.33%	Rubber rabbitbrush	13.55%	Four-wing saltbush	15.34%	Fourwing saltbush	17.26%	Fourwing saltbush
Species 2	≥ 1.0%	3.36%	Broom snakeweed	3.93%	Gardner's saltbush	5.84%	Mormon tea	6.21%	Shadscale saltbush	2.32%	Shadscale saltbush	3.66%	Hairy false goldenaster
Perennial Warm-Season Grasses			**(4 spp.)**		**(3 spp.)**		**(2 spp.)**		**(3 spp.)**		**(5 spp.)**		**(3 spp.)**
Species 1	≥ 1.0%	12.58%	James' galleta	16.23%	James' galleta	23.04%	James' galleta	23.34%	James' galleta	27.92%	James' galleta	17.25%	James' galleta
Species 2	≥ 1.0%	0.84%	Alkali sacaton	1.14%	Alkali sacaton	0.94%	Blue grama	4.19%	Blue grama	5.85%	Alkali sacaton	11.27%	Alkali sacaton
Perennial Cool-Season Grasses			**(9 spp.)**		**(10 spp.)**		**(7 spp.)**		**(11 spp.)**		**(10 spp.)**		**(7 spp.)**
Species 1	≥ 1.0%	21.38%	Western wheatgrass	16.43%	Thickspike wheatgrass	21.15%	Russian wildrye	10.39%	Indian ricegrass	12.01%	Russian wildrye	11.37%	Indian Ricegrass
Perennial/Biennial Forbs	≥ 1.0% combined	**2.64%**	**(15 spp.)**	**0.30%**	**(3 spp.)**	**5.25%**	**(6 spp.)**	**9.04%**	**(11 spp.)**	**0.30%**	**(7 spp.)**	**2.34%**	**(9 spp.)**
Species 1		0.63%	Fendler's globemallow	0.15%	Purple aster	4.90%	Rattlesnake weed	5.55%	Chenopod	0.26%	Hoary tansyaster	1.76%	Sweetclover
Species 2		0.46%	Manyflowered ipomopsis	0.14%	Rose heath	0.14%	Palmer's penstemon	1.81%	Trailing fleabane	0.01%	Yellow salsify	0.29%	Upright prairie coneflower
Species 3		0.42%	Flixweed	0.01%	Palmer's penstemon	0.09%	Upright prairie coneflower	0.62%	Purple aster	0.01%	Sweetclover	0.29%	Palmer's penstemon

Notes:
-- = not applicable
Indicates an unmet parameter

Note: Parameter and corresponding standards explained in Table 2 of the Vegetation Success Monitoring Reports (Appendix 9).

Table 6: Summary of VMU-1 Production Results

Annual Total Production (lbs/ac)	2019	2020	2021	2022	2023	2024
Mean	719	511	520	451	784	897
Standard Deviation	666	498	979	443	603	813
90% Confidence Interval	173	130	255	115	157	212

Reference: MMD, 1999. Coal Mine Reclamation Program Vegetation Standards, New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division.

13.2 Postmining Land Use (19.8.20.2064 NMAC)

The information in this section provides a demonstration that VMU 1 meets the requirements of 19.8.20.2064 Revegetation: Grazing, which states: When the approved postmining land use is range or pasture land, the operator shall demonstrate to the director, that the reclaimed land has the capability of supporting livestock grazing at rates approximately equal to that for similar non-mined lands for at least two of the last four full years of liability required under Subsection B of 19.8.20.2065 NMAC.

To that end, a livestock carrying-capacity analysis is provided herein on the forage production data for vegetation sampling conducted from 2019 through 2024 in VMU 1 based on those years a given VMU was sampled. The analysis also shows what would be the carrying capacity for total production as additional support information.

Carrying capacities were calculated for the mean forage production values, and for the available mean total production values. The calculations were based on an average of 30 days per month with a 50% utilization of the vegetation production values. Carrying capacity is in terms of the animal-unit-month (AUM), which is the amount of dry forage required by one animal unit for one month based on a forage allowance of twenty-six (26) pounds per day for a 1,000-pound cow either dry or with calf up to 6 months of age, or four (4) sheep or goats (MMD 2000).

The non-mined carrying capacity figure selected to compare against the reclaimed carrying capacity is the average baseline premining figure of 0.07 AUM/Acre. (Dames and Moore 1974; Settlement Agreement 1988). Use of a value of 0.07 AUM/Acre was also formally referenced in MMD's approvals of CMI bond release applications in 2010 and 2012 (MMD 2010; MMD 2012).

Table 7 summarizes the carrying capacities calculated from production data collected from 2019 through 2024 for the years VMU-1 was sampled. The calculations show that all production data exceeded the 0.07 AUM/Ac premining value. The calculations also show that data collected during this intensive drought episode still exceeded the 0.07 AUM/Ac premining value. Subsequently, this analysis demonstrates that the standard in 19.8.20.2064 was met in not only two of the last four years of liability but in all the sampling episodes.

Table 7: Summary of VMU-1 Carrying Capacities from Production Data (2019 through 2024)

Categories Measured	Production lb/ac	AUM/ac
Premining Baseline Condition (Avg Value)	127	0.07
19 VMU 1 Mean Total Production	853	0.55
19 VMU 1 Mean Forage Production	719	0.46
20 VMU 1 Mean Total Production	515	0.33
20 VMU 1 Mean Forage Production	511	0.46
21 VMU 1 Mean Total Production	601	0.39
21 VMU 1 Mean Forage Production	520	0.33
22 VMU 1 Mean Total Production	683	0.44
22 VMU 1 Mean Forage Production	451	0.28
23 VMU 1 Mean Forage Production	784	0.5
24 VMU 1 Mean Forage Production	897	0.58

References

- Dames and Moore, 1974. Environmental Assessment-McKinley Mine, McKinley County, New Mexico,
- MMD, 1999. Coal Mine Reclamation Program Vegetation Standards, New Mexico Energy, Minerals and Natural Resources Department Mining and Minerals Division.
- MMD, 2010. Director's Order with Findings of Fact and Conclusions of Law for McKinley Mine (Permit 2006-02) Area 4 and Area 9 Reclamation Liability-Release Application. Finding of Fact No. 21.
- MMD, 2012. Director's Order with Findings of Fact and Conclusions of Law for McKinley Mine Sections 7, 8 and 18 South Mine Access Area Reclamation Liability Release Application. Finding of Fact No. 22.
- Settlement Agreement, 1988. B.8 Report. MMD Permit No. 2016-02, Volume 10, Tab 09.

13.3 Surface and Groundwater

The report, titled "VMU 1, Bond Release Application, Groundwater and Surface Water Evaluation" included in Appendix 10 documents the status of groundwater and surface water and demonstrates that the operation has complied with the probabable hydrologic consequences determination.

13.4 Ponds and Small Depressions

There are no permanent impoundments or small depressions located within the VMU 1 bond release area. All sedimentation ponds in this area have been reclaimed.

13.5 Performance Bond Reduction

The bond reduction associated with the VMU 1 bond release and the amount of bond that would remain is shown below. The bond reduction was computed by subtracting out the revegetation costs associated with the VMU 1 acreage from the existing bond. A reduction in bond for the Phase I and II acreage was not necessary.

Tables are provided in Appendix 1 Performance Bond Calculation showing the rationale and calculations for the bond to be released, and the bond that would be retained for the remaining lands under reclamation liability in MMD jurisdiction. It was necessary to reallocate the current bond funds to the remaining cost centers to bring the bond up to date; these calculations (in 2015 dollars i.e., the last escalation) are provided in Table 1 in the appendix. Table 2 in the appendix escalates the bond calculations in Table 1 to 2022 dollars. Table 3 in the appendix shows what the bond would be in 2022 dollars after release of VMU 1 under liability. Table 4 in the appendix shows the new total bond amount after reduction of the bond certificates for currently approved Phase III bond releases (9S and 9N), and VMU 1. Calculations were done in 2022 dollars for consistency with a pending bond release updates.

The following summarizes the current and remaining bond fund, proposed VMU 1 bond release amount, and new total bond figure.

- Current Bond Certificates Amount: $ 24,645,642
- Remaining Bond Fund after 9S and 9N PIII Release: $ 19,134,482
- MMD VMU 1 direct & indirect costs to be released: $ 1,846,525
- New Bond Fund Amount: $ 17,287,957

Appendix 1: Performance Bond Calculations

Table 1: Remaining bond after TCP, A9&10, and A11& 12 (Escalated to 2015 dollars, and Funds Reallocated)

Item #	Cost Category		Quantity	Rate		TOTAL
1	Grading - Worst Case Pits					$0
2	Grading - Spoils					$0
3	Acid & Toxic Material Management					$0
4	Topsoil Replacement	South Facilities (Ac)	234.1	$1,135	$265,704	$265,700
5	Revegetation	Total Disturbance (Ac)	4982.3	$822	$4,095,451	$4,095,451
6	Road Removal	Sourth Facilities (Ac)	7	$4,335	$30,345	$30,345
7	Sedimentation Pond Removal	Sourth Faciliites Ponds	2	$7,000	$14,000	$14,000
8	Earthmoving Support (For South Facilities)		$418,800	100%	$418,800	$418,800
9	Facility Removal		$1,053,000	100%	$1,053,000	$1,053,000
10	Hydrologic Structures					$0
	SUBTOTAL - Direct Costs					$5,877,296
11	Contractor Mobilization/Demobilization (1% of Subtotal)					$59,000
12	Supplemental Contingencies (3% of Subtotal)					$176,000
13	Engineering Design Fees (2.5% of Subtotal)					$147,000
14	Contractor's Profit and Overhead (15% of Subtotal)					$882,000
15	Project Management Fee (2.5% of Subtotal)					$147,000
	TOTAL Without Gross Receipts Tax					$7,288,296
	Gross Receipts Tax (2022 rate: 6.75%)				6.75%	$492,000
	TOTAL With Gross Receipts Tax (In 2000 Dollars)					$7,780,296
	Inflation rate Qtr-1 2000 to Qtr-4 2015	1.62046			Total Escalated to 2015 Dollars	$12,607,692
	Inflation Factors: Qtr-1 2000 & Qtr-4 2015	500.48	811.01			
	Supplemental Fund For Permit Modifications/Revisions/Misc					$10,887,226
	Total bond (After A11/12 PI Approval and Reduction)					**$23,494,918**
					Current Bond Fund:	$24,645,642

Date: 073125

Table 2: Bond Escalated to 2022 Dollars

Item #	Cost Category		Quantity	Rate		TOTAL
1	Grading - Worst Case Pits					$0
2	Grading - Spoils					$0
3	Acid & Toxic Material Management					$0
4	Topsoil Replacement	South Facilities (Ac)	234.1	$1,135	$265,703.50	$265,700
5	Revegetation	Total Disturbance (Ac)	4982.3	$822	$4,095,451	$4,095,451
6	Road Removal	South Facilities (Ac)	7	$4,335	$30,345	$30,345
7	Sedimentation Pond Removal	Sourth Faciliites Ponds	2	$7,000	$14,000	$14,000
8	Earthmoving Support (For South Facilities)		$418,800	100%	$418,800	$418,800
9	Facility Removal		$1,053,000	100%	$1,053,000	$1,053,000
10	Hydrologic Structures					$0
	SUBTOTAL - Direct Costs					$5,877,296
11	Contractor Mobilization/Demobilization (1% of Subtotal)					$59,000
12	Supplemental Contingencies (3% of Subtotal)					$176,000
13	Engineering Design Fees (2.5% of Subtotal)					$147,000
14	Contractor's Profit and Overhead (15% of Subtotal)					$882,000
15	Project Management Fee (2.5% of Subtotal)					$147,000
	TOTAL Without Gross Receipts Tax					$7,288,296
	Gross Receipts Tax (2022 rate: 6.75%)				6.75%	$492,000
	TOTAL With Gross Receipts Tax (In 2000 Dollars)					$7,780,296
	Inflation rate Qtr 4 2000 to Qtr-2 2022	2.02689			Total Escalated to 2022 Dollars	$15,769,804
	Inflation Factors: Qtr-4 2000 & Qtr-2 2022:	500.48	1014.42			
	Supplemental Fund For Permit Modifications/Revisions/Misc					$7,725,114
	Total bond (After A11/12 PI Approval and Reduction)					**$23,494,918**
					Current Bond Fund	$24,645,642
	Note: Inflation factors from USCOE Civil Works Construction Cost System (Composite Index Weighted Average) 9/30/21					

Table 3: Bond After A10 PII and PIII in 2022 dollars

k	Cost Category			Quanity	Rate		TOTAL
		Area 10 Revegetation Reduction (ac.)		837.0	$822.00	$688,014	
1	Grading - Worst Case Pits			Input	Reduction subtracted from total		$0
2	Grading - Spoils				disturbance revegetation costs		$0
3	Acid & Toxic Material Management						$0
4	Topsoil Replacement	South Facilities (Ac)		234.1	$1,135	$265,703.50	$265,700
5	Revegetation	Total Disturbance (Ac)		4982.3	$822	$4,095,451	$3,407,437
6	Road Removal	Sourth Facilities (Ac)		7	$4,335	$30,345	$30,345
7	Sedimentation Pond Removal	Sourth Faciliites Ponds		2	$7,000	$14,000	$14,000
8	Earthmoving Support (For South facilities)			$418,800	100%	$418,800	$418,800
9	Facility Removal			$1,053,000	100%	$1,053,000	$1,053,000
10	Hydrologic Structures			$266,600	0%	$0	$0
	SUBTOTAL - Direct Costs						$5,189,282
11	Contractor Mobilization/Demobilization (1% of Subtotal)						$52,000
12	Supplemental Contingencies (3% of Subtotal)						$156,000
13	Engineering Design Fees (2.5% of Subtotal)						$130,000
14	Contractor's Profit and Overhead (15% of Subtotal)						$778,000
15	Project Management Fee (2.5% of Subtotal)						$130,000
	TOTAL Without Gross Receipts Tax						$6,435,282
	Gross Receipts Tax (2022 rate: 6.75%)					6.75%	$434,000
	TOTAL With Gross Receipts Tax (In 2000 Dollars)						$6,869,282
		Inflation rate Qtr 4 2000 to Qtr-2 2022	2.02689			Total inflated to 2022 Dollars	$13,923,279
		Inflation Factors: Qtr-4 2000 & Qtr-2 2022	500.48	1014.42			
	Supplemental Fund For Permit Modifications/Revisions/Misc						$7,725,114
	Total bond						**$21,648,393**
						Current Bond Fund Certificates	$24,645,642
						Reduction Specific to A10	$1,846,525

Table 4: New Bond Amount

Bond After 9S and 9N Release	**$19,134,482**
VMU 1 Phase III Bond Reduction	$1,846,525
New Bond Amount	$17,287,957

Appendix 2: Surface and Mineral Rights Owners of Lands

Chevron Mining Inc - McKinley Mine
Permit 2016-02
VMU 1 Bond Release Application
Surface and Mineral Rights Owners of Lands

VMU	Township and Range	Section	Phase I Acres	Phase II Acres	Phase III Acres	Surface Ownership	Allotment Numbers	Right of Entry	Mineral Rights Ownership	Right to Mine
1	T16N, R20W	3		58.5	58.5	Chevron USA, Inc.	N/A	Deed	PNRC	Lease
		4		184.2	184.2	BIA	1616	Lease	BLM	Lease
		4		103.5	103.5	BIA	1617	Lease	BLM	Lease
		4		119.7	119.7	BIA	1618	Lease	BLM	Lease
		4		176.9	176.9	BIA	1619	Lease	BLM	Lease
		6	14.6	14.6	14.6	BLM	N/A	See Note	BLM	Lease
		8		9.6	9.6	BIA	1613	Lease	BLM	Lease
		8		9.4	9.4	BIA	1614	Lease	BLM	Lease
		8		3.1	3.1	BIA	1614	Lease	BLM	Lease
1	T17N, R20W	32	24.3	24.3	24.3	BIA	1622	Lease	BLM	Lease
		32	8.1	8.1	8.1	BIA	1623	Lease	BLM	Lease
		34	0.9	0.9	0.9	BIA	1620	Lease	BLM	Lease
		34		122.5	122.5	BIA	1620	Lease	BLM	Lease
		34		1.1	1.1	BIA	1621	Lease	BLM	Lease
		Total	**47.9**	**836.5**	**836.5**					

Note: BIA is the Bureau of Indian Affairs, BLM is the Burearu of Land Management, and PNRC is the Peabody Natural Resources Company
Section 6, T16N, R20W: Surface and Mineral Rights under Federal Coal Lease No. NM 057349

Land Owner	**Address**
BIA	USDI, Bureau of Indian Affairs, P.O. Box 1060, Gallup, NM 87305
BLM	USDI, Bureau of Land Management, Farmington Field Office, 6251 College Blvd., Suite A, Farmington, NM 87402
Westbrook	Paula Westbrook Heirs, c/o Bruce Williams, 25 Roaad 5787, NBU 2010, Farmington, NM 87401
PNRC	Peabody Natural Resources Company, 701 Market St., Suite 718, St. Louis, MO 63101-1830
Chevron USA, Inc.	Chevron Mining Inc. 6101 Bollinger Canyon Road, San Ramon, CA 94583-2324
NTUA	NTUA, P.O. Box 170, Fort Defiance, AZ 86504

Appendix 3: Draft Notification Letter

Draft Notification Letter (VMU 1)

Date: July 31, 2025
Mr. John Doe
1000 John Doe Lane
City, NM Zip Code

Re: McKinley Mine VMU 1 Bond Release Application
Permit No. 2016-02

Dear Mr. Doe:

Chevron Mining Inc. (formerly The Pittsburg & Midway Coal Mining Co.) has filed an application for bond release of the permanent-program performance bond for VMU 1 which includes 837 acres of land eligible for Phase II and Phase III bond release, and 48 acres of land that qualifies for Phase I bond release (which lies within the Phase II and III area). Phase II bond release is being sought since vegetation has been established to regulatory standards and the contribution of suspended solids to streamflow or runoff outside the permit is not in excess of the 19.8 NMAC requirements. Phase III bond release is being sought since reclaimed land has met vegetation standards in accordance with the permit and the regulations and all remaining reclamation obligations have been completed. The Phase I bond release area includes a road for the postmining land use, reclaimed road, and reclaimed railroad corridors and reclaimed ancillary areas that qualify for Phase I release.

The application was filed with the New Mexico Mining and Minerals Division (MMD) of the Energy, Minerals & Resources Department in Santa Fe, New Mexico. This application concerns property that may be under your control or ownership or that may be of interest to you.

Chevron Mining Inc.'s headquarters is located at 6001 Bollinger Canyon Road, San Ramon, CA 94583. The current permit number for the McKinley Mine regulated by MMD is 2016-02, which has been administratively extended by MMD.

The McKinley Mine is located approximately 23 miles northwest of Gallup, NM and 3 miles east of Window Rock, AZ on NM State Highway 264. The VMU 1 bond release application is located within the Hunters Point, Samson Lake and Tse Bonita School USGS quadrangle maps.

The lands for which bond release is sought are shown on the accompanying map Figure 1: McKinley Mine VMU 1 - Bond Release Area, and are located within the following areas:

T16N, R20W New Mexico Principal Meridian, McKinley County, New Mexico:
Section Numbers: 3, 4, 6, and 8

T17N, R20W New Mexico Principal Meridian, McKinley County, New Mexico:
Section Numbers: 32 and 34

VMU 1 Surface Ownership

VMU	Township and Range	Section	Phase I Acres	Phase II Acres	Phase III Acres	Surface Ownership	Allotment Numbers
1	T16N, R20W	3		58.5	58.5	Chevron USA, Inc.	N/A
		4		184.2	184.2	BIA	1616
		4		103.5	103.5	BIA	1617
		4		119.7	119.7	BIA	1618
		4		176.9	176.9	BIA	1619
		6	14.6	14.6	14.6	BLM	N/A
		8		9.6	9.6	BIA	1613
		8		9.4	9.4	BIA	1614
		8		3.1	3.1	BIA	1614
1	T17N, R20W	32	24.3	24.3	24.3	BIA	1622
		32	8.1	8.1	8.1	BIA	1623
		34	0.9	0.9	0.9	BIA	1620
		34		122.5	122.5	BIA	1620
		34		1.1	1.1	BIA	1621
		Total	**47.9**	**836.5**	**836.5**		

Bonding Information

The following summarizes the current and remaining bond fund, proposed bond release and remaining bond:

Current Bond Type: Surety Bond

- Current Bond Certificates Amount: $ 24,645,642
- Remaining Bond Fund after 9S and 9N PIII Release: $ 19,134,482
- MMD VMU 1 direct & indirect costs to be released: $ 1,846,525
- New Bond Fund Amount: $ 17,287,957

Disturbed Acreage to be released:

- Total acreage to be released: 837.0 ac.
- Acres permitted: 12,958.2 ac.
- Percentage of acres permitted being released: 6.5%

Phase I bond for much of the area was released in 2011, which covered backfilling and grading, graded spoil suitability, topsoil replacement and construction of hydrologic structures and drainage control. 48 acres of road and railroad corridors and ancillary areas that were not part of the 2011 Phase I bond release are now eligible for Phase I bond release and included with this bond release application. Phase II and Phase III bond release is being sought for the portion of bond associated with completion of reclamation requirements that results in the reduction of settleable solids and the development of vegetation on reclaimed land to meet the requirement as established in the regulations and the applicable permit. Disturbance and mining in VMU 1 occurred between 1986 and 2009. Seeding of the majority of the reclaimed lands occurred between 1999 and 2014. Assessment of VMU 1 for vegetation performance was conducted in 2020, 2021, 2022, 2023 and 2024.

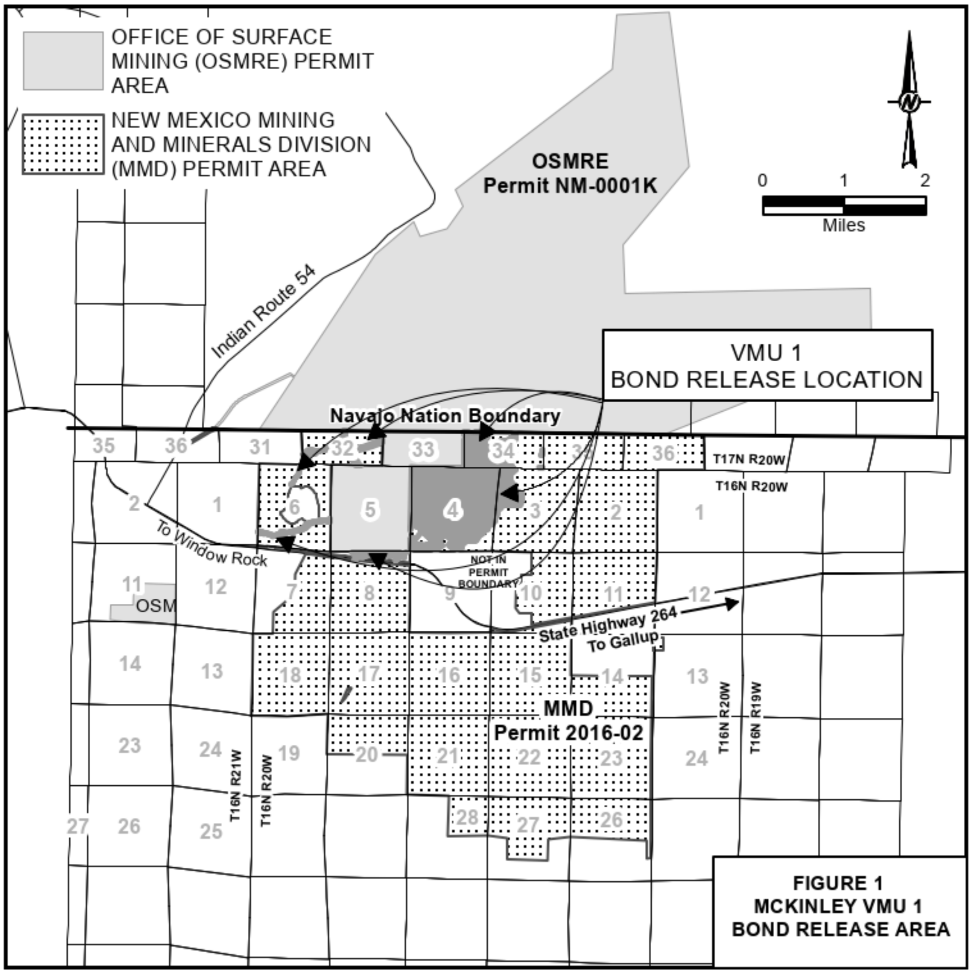
A copy of the detailed bond-release application is available for public inspection at the following locations:

- County Clerk, McKinley County Courthouse, 201 W Hill Ave, Gallup, New Mexico, 87301.

- New Mexico Mining and Minerals Division, 1220 South St. Francis Drive, Santa Fe, NM 87505 (Contact Name: Erik Munroe by phone at 505-670-9997 or by email at erik.munroe@emnrd.nm.gov to make arrangements to review the bond release application).
- Within 30 days of the final publication of a notice for this bond-release application in the Gallup Independent or Navajo Times newspaper, written comments, objections, or requests for a public hearing and informal conference on this bond-release application shall be submitted to:
  - Mike Tompson, Director, Mining and Minerals Division, 1220 South St. Francis Drive, Santa Fe, NM 87505.

An inspection of the lands to be released will be conducted at the McKinley Mine at 9 AM on September 23, 2025. Parties interested in participating in the inspection may contact Mr. Erik Munroe of the Mining and Minerals Division at 505-670-9997.

Figure 1: McKinley Mine VMU 1 Bond Release Area



Appendix 4: BIA Allottee Names and Addresses

NAVAJO NATION
PO BOX 1910
WINDOW ROCK, AZ 86515

MARTHA B VAN WINKLE
PO BOX 2538
WINDOW ROCK, AZ 86515

MATILDA B ARVISO
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TOHATCHI, NM 87325

RENA B BEGAY
PO BOX 735
NAVAJO, NM 87328-0735

DOROTHY MORRIS
PO BOX 148
JOSEPH CITY, AZ 86032-0148

ERNIE ARVISO
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GALLUP, NM 87305-1576

SADIE BEGAY
PO BOX 1026
ST MICHAELS, AZ 86511-1026

PATRICIA A PAYNE
710 S DON LYN CT
PEORIA, IL 61604-5915

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TUCSON, AZ 85706-2333

CLIFFORD BIGTHUMB
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HOMER BIGTHUMB
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GILBERT BEGAY
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FORT DEFIANCE, AZ 86504-0838

EMILY BENNETT
PO BOX 465
FORT DEFIANCE, AZ 86504-0465

LAVINA BEGAY
PO BOX 667
NAVAJO, NM 87328-0667

EMMETT BIGTHUMB
PO BOX 1451
CORTEZ, CO 81321-1451

MELVINA E BIGTHUMB
PO BOX 3235
WINDOW ROCK, AZ 86515-3235

VERNA ARVISO
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ROBERT D BRADLEY
PO BOX 701
FENCE LAKE, NM 87315-0701

CYNTHIA BIGTHUMB
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WINDOW ROCK, AZ 86515-1357

ERWIN N BIGTHUMB
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SAINT MICHAELS, AZ 86511-0338

OMER BIGTHUMB
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ST MICHAEL, AZ 86511

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MARICOPA, AZ 85138-1610

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ERIK T BEGAY
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TUCSON, AZ 85711-7208

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NELSON D BEGAY
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AMOS BEGAY
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GANADO, AZ 86505-1026

MAE ALBERT WALLACE
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SAINT MICHAELS, AZ 86511-1175

MARGURITE CHEE
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WINDOW ROCK, AZ 86515-1090

TOM C YAZZIE
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WINDOW ROCK, AZ 86515-2313

LOUIS BEGAY
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ROSE MARIE WALLACE
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SHERRY M YAZZIE
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JOHNNY WALLACE
164 ROAD 2755
AZTEC, NM 87410-9708

FRANK J WILLIE
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OVERLAND PARKS, KS 66204

JULIA ANN CHEE
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ALBERT WALLACE
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SAINT MICHAELS, AZ 86511-1175

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MESA, AZ 85210-2341

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WESLEY JOHN
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AMBROSE WALLACE
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RUBY M WALLACE
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CHAPTER
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C/O EUPHEMIA Y CLENDON
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GANADO, AZ 86505

EUPHEMIA Y. CLENDON
HC 58 BOX 70 UNIT 185
GANADO, AZ 86505-9708

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LEUPPX, AZ 86035-5261

RAMSEY LEE
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DERRICK HARR CHEE
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GAYLEN A BLACKGOAT
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DELFINO M JOHNS
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DARREN HARRI CHEE
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LEUPPX, AZ 86035-5261

ORLANDA L CHEE
PO BOX 5261
LEUPPX, AZ 86035-5261

UTAHNA V BELONE
EASTERN NAVAJO AGENCY
PO BOX 328
CROWNPOINT, NM 87313

ERIC H CHEE
PO BOX 5261
LEUPPX, AZ 86035-5261

DAVID BROWN
PO BOX 742
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APT 112
APOPKA, FL 32703

NAVAJO NATION
PO BOX 1910
WINDOW ROCK, AZ 86515

HANABAH DAWES
PO BOX 41
MEXICAN SPRINGS, NM 87320

MARIE F R NESWOOD
PO BOX 1
ST MICHAELS, AZ 86511

LILLAINE C GATEWOOD
PO BOX 911
FORT DEFIANCE, AZ 86504-0911

DAISY M JOE
PO BOX 575
MENTMORE, NM 87319

ROSE M WAUNEKA
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GALLUP, NM 87301

PAULINE CLAW
5088 HCR-5 BOX 310
GALLUP, NM 87305

BETTY SCOTT
701 S FIFTH ST APT 2
GALLUP, NM 87301-6406

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ARLENE B SOCE
HC33 BOX 310 #5067
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FARMINGTON, NM 87401

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WINDOW ROCK, AZ 86515-1215

LUCY M JIM
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SHIPROCK, NM 87420-2183

ROSE M KLADE
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SAINT MICHAELS, AZ 86511-0363

AGNES MCDONALD
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NEWCOMB, NM 87455-7541

ALTA M BEGAY
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SAINT MICHAELS, AZ 86511-0626

HOWARD BEGAY
PO BOX 220
CHAMBERS, AZ 86502-0220

ERNEST J BEGAY
PO BOX 626
SAINT MICHAELS, AZ 86511-0626

TOMMY KEE
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FALLON, NV 89406-9163

Appendix 5: Other Interests

Bureau of Indian Affairs
PO Box 1060
Gallup, NM 87301

Bureau of Land Management
6251 College Blvd. Suite A
Farmington, NM 87402

Continental Divide Electric
Corp.
PO Box 786
Gallup, NM 87301

El Paso Natural Gas Co.
Gallup District Office
PO Box 103
Rehoboth, NM 87322

KHAC Radio
PO Box 9090
Window Rock, AZ 86515

McKinley County Manager
207 West Hill St
Gallup, NM 87301

Navajo Communications
Company Inc.
PO Drawer 6000
Window Rock, AZ 86515

Navajo Land Development
PO Box 2249
Window Rock, AZ 86515

Navajo Nation Minerals Dept.
PO Box 1910
Window Rock, AZ 86515

Navajo Partnership for
Housing, Inc.
PO Box 1370
St. Michaels, AZ 86511

Navajo Tribal Utility Authority
PO Box 170
Fort Defiance, AZ 86504

New Mexico State Land
Office
PO Box 1148
Santa Fe, NM 87504-1148

Peabody Natural Resource
Company
701 Market St.
St. Louis, MO 63101

Public Service Co. of NM
Alvandado Square
Albuquerque, NM 87158

Santa Fe Railroad
Trainmaster Office
811 Roundhouse Rd.
Gallup, NM 87301

District Technical Support
Engineer
NM State Highway Dept.
PO Box 2159
Milan, NM 87201

Tse Bonita Valley Water
Users Association
HCR-5, Box 34
Gallup, NM 87301

Bureau of Reclamation
Four Corners Construction
Office
1235 La Plata Highway
Farmington, NM 87401-8754

Appendix 6: Certification of Application

McKinley Mine

Vegetation Management Unit 1

Certification of Application

Chevron Mining Inc. (CMI) certifies that all applicable reclamation activities have been accomplished on the lands contained in this Chevron Mining Inc – McKinley Mine, Permit 2016-02 Vegetation Monitoring Unit 1 Bond Release Application in accordance with the requirements of SMCRA, the Act, the regulatory program, and the approved permit and reclamation plan.

______________________ 7/30/25

Armando Martinez – CEMC — Date

McKinley Mine – Operations Lead

State of New Mexico)
) SS
County of McKinley)

Subscribed and sworn to before me, in my presence, this 30 day of July, 2025.

Knyssa Etsitty a Notary Public in and for the State of New Mexico.

KNYSSA ETSITTY
Notary Public
State of New Mexico
Comm. # 2005563
My Comm. Exp. Feb 24, 2029

____

Notary Public

My Commission expires Feb 24, 2029

Appendix 7: Public Notice

Public Notice
Chevron Mining Inc. (formerly The Pittsburg & Midway Coal Mining Co.) has filed an application for bond release of the permanent-program performance bond for VMU 1 which includes 837 acres of land eligible for Phase II and Phase III bond release and 48 acres that qualify for Phase I bond release (which lies within the Phase II and III area). Phase II bond release is being sought since vegetation has been established and the contribution of suspended solids to streamflow or runoff outside the permit is not in excess of the 19.8 NMAC requirements. Phase III bond release is being sought since the reclaimed area has met vegetation standards in accordance with the permit and the regulations and all remaining reclamation obligations have been completed. The Phase I bond release area includes a road, reclaimed road and railroad corridors and reclaimed ancillary areas, that qualify for Phase I release.

The application was filed with the New Mexico Mining and Minerals Division (MMD) of the Energy, Minerals & Resources Department in Santa Fe, New Mexico.

Chevron Mining Inc.'s headquarters is located at 6001 Bollinger Canyon Road, San Ramon, CA 94583. The current permit number for the McKinley Mine regulated by MMD is 2016-02, which expired on March 7, 2021 but has been administratively extended by MMD.

The McKinley Mine is located approximately 23 miles northwest of Gallup, NM and 3 miles east of Window Rock, AZ on NM State Highway 264. The areas in the bond release application are located within the Samson Lake USGS quadrangle map.

The land for which bond release is sought is shown on the accompanying map Figure 1 McKinley Mine VMU 1 Bond Release Area, and is located within the following areas:

T16N, R20W New Mexico Principal Meridian, McKinley County, New Mexico:
Section Numbers: 3, 4, 6, and 8

T17N, R20W New Mexico Principal Meridian, McKinley County, New Mexico:
Section Numbers: 32 and 34

VMU 1 Surface Ownership

VMU	Township and Range	Section	Phase I Acres	Phase II Acres	Phase III Acres	Surface Ownership	Allotment Numbers
1	T16N, R20W	3		58.5	58.5	Chevron USA, Inc.	N/A
		4		184.2	184.2	BIA	1616
		4		103.5	103.5	BIA	1617
		4		119.7	119.7	BIA	1618
		4		176.9	176.9	BIA	1619
		6	14.6	14.6	14.6	BLM	N/A
		8		9.6	9.6	BIA	1613
		8		9.4	9.4	BIA	1614
		8		3.1	3.1	BIA	1614
1	T17N, R20W	32	24.3	24.3	24.3	BIA	1622
		32	8.1	8.1	8.1	BIA	1623
		34	0.9	0.9	0.9	BIA	1620
		34		122.5	122.5	BIA	1620
		34		1.1	1.1	BIA	1621
		Total	**47.9**	**836.5**	**836.5**		

Bonding Information

The following summarizes the current and remaining bond fund, proposed bond release and remaining bond:

Current Bond Type: Surety Bond

- Current Bond Certificates Amount: $ 24,645,642
- Remaining Bond Fund after 9S and 9N PIII Release: $ 19,134,482
- MMD VMU 1 direct & indirect costs to be released: $ 1,846,525
- New Bond Fund Amount: $ 17,287,957

Disturbed Acreage to be released:

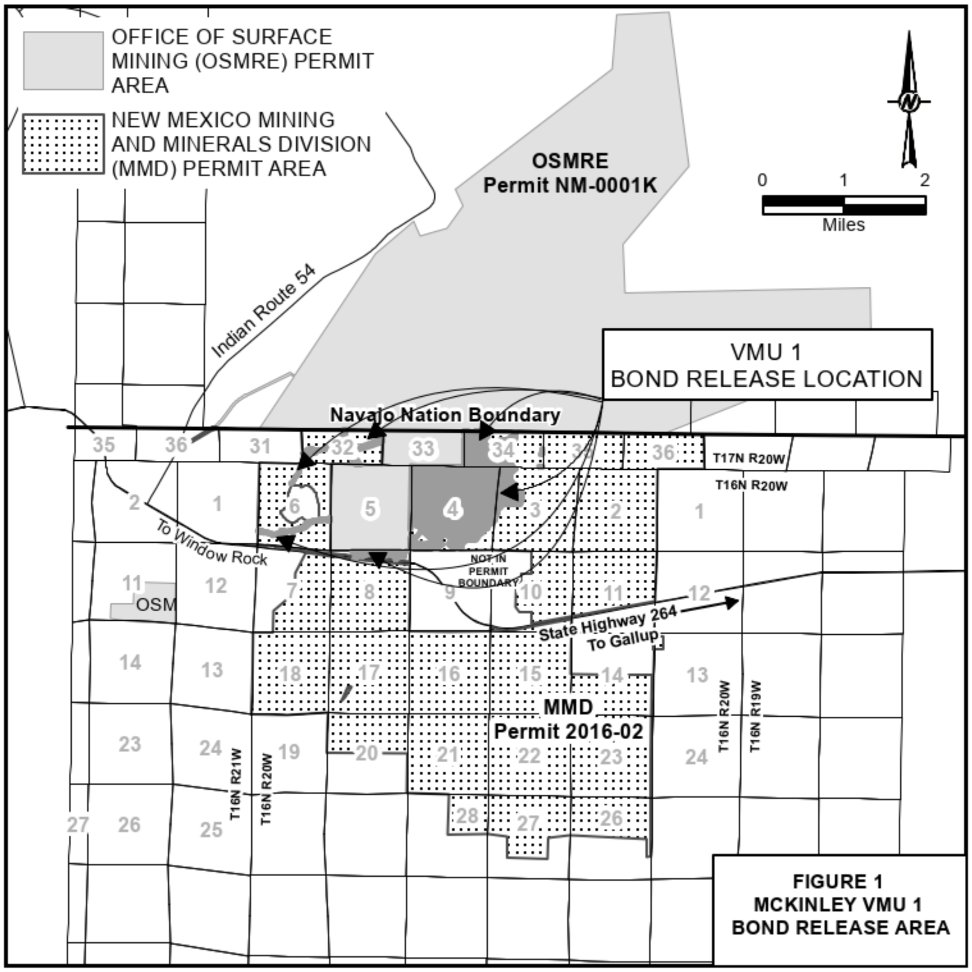
- Total acreage to be released: 837.0 ac.
- Acres permitted: 12,958.2 ac.
- Percentage of acres permitted being released: 6.5%

Disturbance and mining in VMU 1 occurred between 1986 and 2009. Phase I bond for much of the area was released in 2011, which covered backfilling and grading, graded spoil suitability, topsoil replacement and construction of hydrologic structures and drainage control. 48 acres of road and railroad corridors and ancillary areas that were excluded from the 2011 Phase I bond release are now eligible for Phase I bond release and included with this bond release application. Seeding of the majority of the reclaimed lands occurred between 1999 and 2014. Assessment of VMU 1 for vegetation performance was conducted in 2020, 2021, 2022, 2023, and 2024.

A copy of the detailed bond-release application is available for public inspection at the following locations:

- County Clerk, McKinley County Courthouse, 201 W Hill Ave, Gallup, New Mexico, 87301.
- New Mexico Mining and Minerals Division, 1220 South St. Francis Drive, Santa Fe, NM 87505 (Contact Name: Erik Munroe by phone at 505-670-9997 or by email at erik.munroe@emnrd.nm.gov to make arrangements to review the bond release application).
- Within 30 days of the final publication of a notice for this bond-release application in the Gallup Independent or Navajo Times newspaper, written comments, objections, or requests for a public hearing and informal conference on this bond-release application shall be submitted to:
  - Mike Tompson, Director, Mining and Minerals Division, 1220 South St. Francis Drive, Santa Fe, NM 87505.

Figure 1: McKinley Mine VMU 1 Bond Release Area



Appendix 8: Railroad Corridor Reclamation Plan

5.9 Railroad Reclamation Plan

5.9.1 Railroad Reclamation Overview

CMI has reviewed requirements for reclaiming railroad sections. Within the permitted area, CMI has approximately 3.8 miles of railroad (RR) tracks that exist in Sections 5, 8, 17 and 20 in T16N R20W. The track section is primarily a single track however there are sections that convert to two track lanes. The railroad tracks are owned by Burlington Northern Rail Road Company. The portions of the RR within the permitted area are located on (i) allotments administered by Bureau of Indian Affairs land, which is leased to Chevron Mining Inc., (CMI), and (ii) land owned by CMI.

As part of the surface coal mine operations within the permit area, the RR is subject to performance standards indentified in the Coal Surface Mining Act (Section 69-25-19 NMSA 1978).

CMI has found 5 work elements to meet these performance standards for RR track reclamation and they are listed below:

Removal of railroad tracks – this work includes removal of metal tracks and anchoring materials, wood treated ties, and 8" of ballast material.

Earthwork – this work includes removal of dirt fill areas and balancing them with nearby fill areas to get back to approximate pre-railroad track topography. Stable cut slopes would not be graded or backfilled. Rock mulched may also be used to stabilize slopes.

Culvert removal – this work includes removal of culverts that were placed in drainage areas, and reconstruction of stable drainages in these zones.

Neutral dressing – this work includes using existing or placed neutral dressing material suitable as a planting medium. In areas where rock out crop exists rock mulch may be used.

Seeding and Mulching – this work includes seeding and mulching disturbed areas with the permanent seed mixture and then mulching following our standard practices..

The details for the site specific plans are documented in appendix 5.8A.

Section 6
Railroad Reclamation Plan

January 13, 2011

In response to MMD's McKinley Permit Renewal 2010-02-Technical Comments, specifically the comments regarding the revision of Section 4.4.3 Railroad, CMI reviewed the current conditions of sections 6, 17, and 18 and developed the following reclamation plan for the removal of the railroad portion running through these sections.

COAL OUTCROP AREAS

There are no visible coal outcrop zones in the disturbed and undisturbed areas adjacent to the railroad spur in section 6.

CULVERTS

The culverts have been inventoried on exhibit 5.8 A-1A. Upon removal of the rail road tracks and the fill material, the culverts will be removed and drainages will be constructed to replace the culverts.

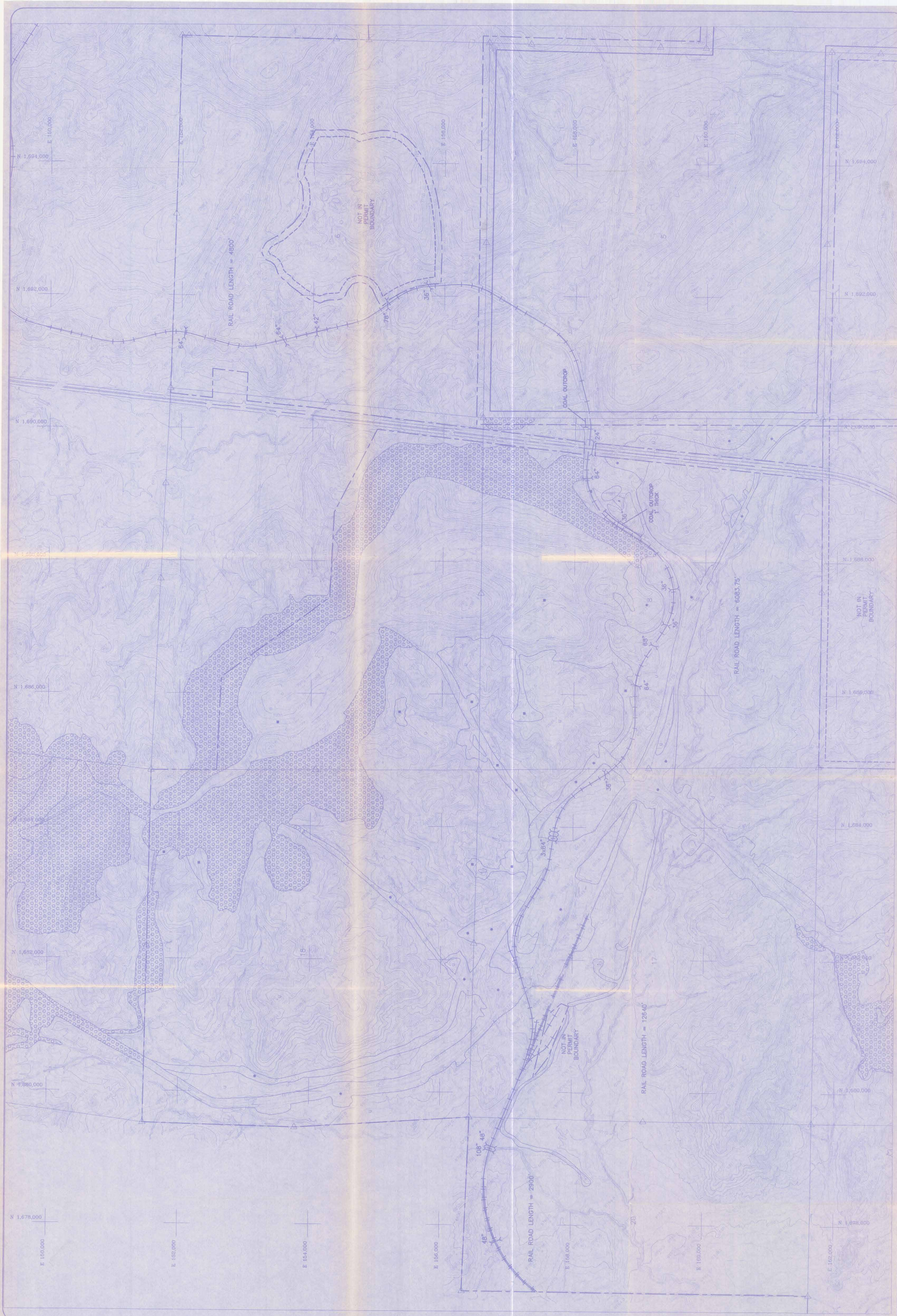
EARTHWORK

There are several fill zones along the railroad spur in section 6 that will need to be removed. The fill material will be placed back in the cut zones. The cut and fill zones will be balanced within close proximity of each other. The lower bank fill below some of the rail section will not be cut out. These zones are stable and will not cause any long term stability issues. There is plenty of lush vegetation and rocky outcrop to stabilize the lands in these segments.

The approximate contours have been developed and are denoted on exhibit 5.8 A-2A.

SEED and MULCH

Upon completion of earthwork, the area will be seeded and mulched with the approved MMD permanent seed mix.



REVISION	DATE	APP'D
UPDATED TITLEBLOCK TO INCLUDE SECTION 8.	02/10/11	M.S./L.R.

LEGEND

- OSM Permit Boundary
- MMD Permit Boundary
- Not In Permit Boundary
- Released Lands
- Prior To December 12, 1973 ●
- December 13, 1973 To February 15, 1979 ▲
- February 18, 1979 To March 7, 1986 ■
- March 7, 1986 To March 7, 1991 ●
- Undisturbed U
- Existing Rail Road
- Existing Culvert With Size Notation 84"

N

Chevron Mining Inc.

McKINLEY MINE

PERMIT COPY

EXHIBIT 5.8A-1

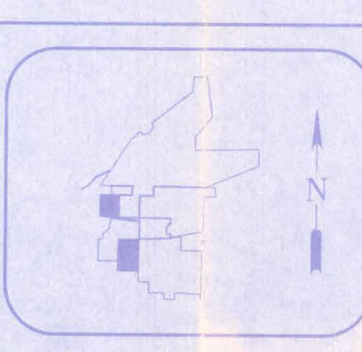
SECTION 6, 8, 17 & 20 RAIL ROAD RECLAMATION EXISTING INFRASTRUCTURE

Last Revision Date: 02/10/11
Drawn By: B.P.M.
Date Drawn: 12/30/10
Checked By:
Approved By:
Drawing Location: B1-06
Scale: 1"=400'
Drawing No.0/10-558

REVISION	DATE	APP'D
MERGED SECTION 8 INFORMATION ONTO MAP.	02/10/11	M.S./L.R.

LEGEND

OSM Permit Boundary	———
MMD Permit Boundary	—-—
Not In Permit Boundary	- - - -
Postmining Contour	~~~



Chevron

Chevron Mining Inc.

McKINLEY MINE PERMIT COPY

EXHIBIT 5.8A-2

SECTION 6, 8, 17 & 20 RAIL ROAD RECLAMATION
APPROXIMATE POSTMINING CONTOURS

Last Revision Date: 02/10/11
Drawn By: B.P.M.
Date Drawn: 12/30/10

Checked By: [signature] 2/10/11
Approved By: [signature] 2/10/11

Drawing Location: B1-G6
Scale: 1"=400'
Drawing No.0710-560

Appendix 9: Complete 2019 through 2024 Vegetation Monitoring Reports for VMU #1

REPORT

Vegetation Management Unit 1
Vegetation Success Monitoring, 2023

McKinley Mine, New Mexico - Mining and Minerals Division Permit Area

Submitted to:

Chevron Environmental Management Company

Chevron Mining Inc. - McKinley Mine
24 Miles NW HWY 264
Mentmore, NM 87319

Submitted by:

WSP USA Inc.

2440 Louisiana Boulevard NE, Suite 400
Albuquerque, New Mexico 87110

+1 505 881-5357

31406184.000

February 28, 2024

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Mining was completed in New Mexico Mining and Minerals Division (MMD) jurisdictional lands at the McKinley Mine in 2007; most of the land is reclaimed, with only the facilities remaining. The lands mined and reclaimed included prelaw, initial-program, and permanent-program lands. Liability release has been completed on all prelaw and initial-program lands, and full bond release on a limited amount of permanent-program land.

Chevron Mining Inc. (CMI) is assessing the vegetation in the remaining permanent program reclaimed areas in anticipation of future bond and liability releases. CMI understands the importance of returning the mined lands to productive traditional uses in a timely manner. To qualify for release, the lands must be in a condition that is as good as or better than the pre-mine conditions, stable, and capable of supporting the designated postmining land use of grazing and wildlife. To make that demonstration for bond and liability release, the reclaimed land must meet the revegetation success standards contained in Permit No. 2016-02. The extended period of responsibility before an application for bond and liability release can be submitted for a given area in the permit is at least ten years. WSP USA Inc. (WSP) was retained to monitor and assess the success of the vegetation relative to these requirements.

1.1 Vegetation Management Unit 1

This report presents results from 2023 quantitative vegetation monitoring conducted in Vegetation Management Unit 1 (M-VMU-1), comprising about 839 acres within Area 10 (Figure 1). The elevation in this area ranges from about 6,700 to 7,000 feet above mean sea level.

Permanent program reclamation in Area 10 started on lands disturbed after 1986 and reclamation generally was completed by 2013. Thus, reclamation age in the majority of M-VMU-1 ranges from approximately 9 to 30 years old. The configuration of the VMUs within the MMD Permit Area, shown on Figure 1, were developed in consultation with MMD. This section provides a general description of the reclamation activities that were implemented. Additional details of the reclamation for specific areas can be obtained through review of McKinley's annual reports.

1.2 Reclamation and Revegetation Procedures

Reclamation methods applied in Area 10 included grading of the spoils to achieve a stable configuration, positive drainage, and approximate original contour. Graded spoil monitoring was then conducted to verify that the upper 42 inches of spoil was suitable for plant growth. A minimum of 6 inches of topdressing (topsoil or topsoil substitute) were then applied over suitable spoils.

After topdressing placement, the surface was scarified in preparation for planting. Seeding was done using various implements that drilled and/or broadcast the seed. After the seeding, mulch consisting of either hay or straw was applied at a rate of about 2 tons/acre. The mulch was anchored 3 to 4 inches into the soil with a tractor-drawn straight coulter disc. The seeding was generally performed in the fall, which coincided with logical units for seeding that had been top-dressed over the spring and summer. Seed mixes used at McKinley have varied over time but included both warm- and cool-season grasses, introduced and native forbs, and shrubs. The early seed mixes tended to emphasize the use of alfalfa and cool-season grasses. Over time the seed mixes shifted to include more warm-season grasses and a broader variety of native forbs.

1.3 Prevailing Climate Conditions

The amount and distribution of precipitation are important determinants for vegetation establishment and performance at the McKinley Mine. Once vegetation is established, the precipitation dynamics affect the amount of vegetation cover and biomass on a year-to-year basis with grasses and forbs showing the most immediate response. Precipitation has been monitored at the site since 2015, with the Rain 10 gauge capturing precipitation in M-VMU-1.

Table 1 contains a summary of precipitation recorded at all the rain gauges for the South Mine. Total annual precipitation for many of the rain gauges is unavailable as they are taken offline due to freezing conditions from December through March. Growing season precipitation was available for most gauges and provides context to evaluate vegetation performance in M-VMU-1. The departure of growing season precipitation (April through September) between the Rain 10 gauge and the Window Rock (1937-1999) long-term seasonal mean is illustrated in Figure 2. Growing season precipitation in M-VMU-1 was below the long-term seasonal mean from 2016 to 2021 with a severe drought in 2020 when the site only received 20% of the normal growing season precipitation for the region. In 2022, M-VMU-1 growing season precipitation was about 45% above the long-term average. In 2023, growing season precipitation measured at the Rain 10 gauge was 59% of the long-term average. Winter precipitation measured at the South Tipple and North Bluff stations indicates a relatively wet season in 2023. Over the past nine years, growing season precipitation measured at the Rain 10 gauge was on average 20% below regional norms.

1.4 Objectives

The intent of this report is to document the vegetation community attributes in M-VMU-1 and compare them to the Permit's vegetation success criteria. Section 2 describes the vegetation monitoring methods that were used in 2023. Section 3 presents the results of the investigation with respect to ground cover, annual production, shrub density, and composition and diversity. Section 4 is a summary of the results for M-VMU-1 with emphasis on vegetation success.

2.0 VEGETATION MONITORING METHODS

Vegetation attributes on M-VMU-1 in Area 10 were quantified using the methods described in Section 6.5 of the Permit. Fieldwork was conducted at the end of the growing season, but prior to the first killing frost, and was completed between September 19 to 24, 2023.

2.1 Sampling Design

A systematic random sampling procedure employing a transect/quadrat system was used to select sample sites within the reclaimed area. The proposed transect locations were reviewed with MMD in advance of sampling. A 50-square foot grid was imposed over the VMU to delineate vegetation sample plots, and random points created in a geographic information system were used to select plots for vegetation sampling. The locations of randomly selected vegetation plots are shown on Figure 3. In the field, if the transect location was determined to be unsuitable, the next alternative location was assessed for suitability. Unsuitable transects were those that fell on or would intersect roads, drainage ways, wildlife rock piles, or prairie dog colonies. However, this did not occur in 2023 at M-MVU-1

Transects originated from the southeastern corner of the vegetation plot. Each transect was 30 meters (m) long in a dog leg pattern (Figure 4). Four 1-m^2 quadrats were located at pre-determined intervals along the transect for quantitative vegetation measurements. Each quadrat is considered an individual sample where measurements were made of production, total canopy, species canopy and basal cover, surface litter, surface rock fragments, and bare soil as discussed below.

2.2 Vegetation and Ground Cover

Relative and total canopy cover, basal cover, surface litter, rock fragments, and bare soil were estimated for each quadrat. Canopy cover, excluding annuals, is the ground cover metric used in standards assessments. Canopy cover estimates include the foliage and foliage interspaces of all individual plants rooted in the quadrat. Canopy cover is defined as the percentage of quadrat area included in the vertical projection of the canopy. The canopy cover estimates made on a species basis may exceed 100% in individual quadrats where the vegetation has multi-layered canopies. In contrast, the sum of the total canopy cover, surface litter, rock fragments, and bare soil does not exceed 100%.

Basal cover is defined as the proportion of the ground occupied by the crowns of grasses and rooting stems of forbs and shrubs. Basal cover estimates were also made for surface litter, rock fragments, and bare soil. Like the total cover estimates, the basal cover estimates do not exceed 100%. Percent area cards were used to increase the accuracy and consistency of the cover estimates. Plant frequency was determined on a species-basis by counting the number of individual plants rooted in each quadrat.

2.3 Annual Forage and Biomass Production

Production was determined by clipping and weighing all annual (current year's growth) above-ground biomass within the vertical confines of a 1-m^2 quadrat. Grasses and forbs were clipped to within 5 centimeters (cm) of the soil surface, and the current year's growth was segregated from the previous year's growth (e.g., gray, weathered grass leaves and dried culms). For this sampling event, plants that were less than 5 cm tall or considered volumetrically insignificant were not collected. Production from shrubs was determined by clipping the current year's growth.

The plant biomass samples of every species collected were placed individually in labeled paper bags. The plant tissue samples were air-dried (> 90 days) until no weight changes were observed with repeated measurements on representative samples. The average tare weight of the empty paper bags was determined to correct the total sample weight to air-dry vegetation weights. The net weight of the air-dried vegetation was converted to a pounds per acre (lbs/ac) basis.

2.4 Shrub Density

Shrub density, or the number of plants per square meter, was determined using the frequency count data from the quadrats and the belt transect method (Bonham 1989). The shrub density calculation used to evaluate the performance standard uses belt transect shrub density data collected from a 1-meter wide; 30-meter-long belt transect situated along the perimeter of the dog-legged transect (Figure 4). Shrubs rooted in the belt transect were counted on a species basis. Shrub density was also calculated from the quadrat data by dividing the total number of individual plants counted by the number of quadrats sampled. The density per square meter was converted to density per acre, but this information is not used to evaluate revegetation success.

2.5 Statistical Analysis and Sample Adequacy

The procedures for financial assurance release as described in Coal Mine Reclamation Program (CMRP) Vegetation Standards (MMD 1999) and the Permit guided this statistical analysis. Statistical tests were performed using both Microsoft® Excel and R statistical software (version 4.4.2). The normality of each dataset was first assessed using the Shapiro-Wilk test to determine the appropriate hypothesis test method (i.e., parametric versus nonparametric). Data were considered normal when the test statistic was significant (p-value > 0.10) for alpha (α) = 0.10. Thus, the null hypothesis that the population is normally distributed was accepted if the p-value > 0.10. In cases where the data were not normally distributed, a log transformation was applied to see if it normalized the data.

All hypothesis testing used to demonstrate the vegetation success standards were met was conducted using a reverse null approach. Because vegetation performance at McKinley is compared to technical standards, the one-sample, one-sided t-test (CMRP Method 3) is used for normally distributed data to evaluate the mean and the one-sample, one-sided sign test (CMRP Method 5) to analyze the median of data that are not normal (MMD 1999; McDonald and Howlin 2013). The one-sided hypothesis tests using the reverse null approach were designed as follows:

Perennial/Biennial Canopy Cover

H_0: Reclaim < 90% of the Technical Standard (15%)

H_a: Reclaim ≥ 90% of the Technical Standard (15%)

Annual Forage Production

H_0: Reclaim < 90% of the Technical Standard (350 lbs/ac)

H_a: Reclaim ≥ 90% of the Technical Standard (350 lbs/ac)

Shrub Density

H_0: Reclaim < 90% of the Technical Standard (150 stems per acre [stems/ac])

H_a: Reclaim ≥ 90% of the Technical Standard (150 stems/ac)

where H_0 is the null hypothesis, that the parameter mean of the reclaimed area is less than 90% of the technical standard, and H_a is the alternative hypothesis, that the parameter mean of the reclaimed area is greater than or equal to 90% of the technical standard. All hypothesis tests were performed with a 90% level of confidence.

Under the reverse null test, the revegetation success standard is met when H_0 is rejected, and H_a is accepted. The decision criteria at 90% confidence under the reverse null hypothesis are as follows:

One-sample, one-sided t-test – Method 3 (CMRP)

If $t^* < t_{(1-\alpha;\, n-1)}$, conclude failure to meet the performance standard

If $t^* \geq t_{(1-\alpha;\, n-1)}$, conclude that the performance standard was met

One-sample, one-sided sign test – Method 5 (CMRP)

If P > 0.10, conclude failure to meet the performance standard

If P ≤ 0.10, conclude that the performance standard was met

Statistical hypothesis testing was performed on perennial/biennial cover, annual forage production and shrub density using the one-sample, one-sided t-test and the one-sample, one-sided sign test. The hypotheses testing used the reverse null hypothesis bond release testing procedure as described in CMRP Vegetation Standards (MMD 1999).

Statistical adequacy is not required for vegetation success demonstrations at McKinley under the reverse null approach but is presented on the basis of the canopy cover, production, and shrub density data. The number of samples required to characterize a particular vegetation attribute depends on the uniformity of the vegetation and the desired degree of certainty required for the analysis.

The number of samples necessary to meet sample adequacy (N_{min}) was calculated assuming the data were normally distributed using Snedecor and Cochran (1967).

$$N_{min} = \frac{t^2 s^2}{(\overline{x}D)^2}$$

Where N_{min} equals minimum number of samples required, t is the two-tailed t-distribution value based on a 90% level of confidence with n-1 degrees of freedom, s is the standard deviation of the sample data, $\overline{x}$ is the mean, and D is the desired level of accuracy, which is 10 percent of the mean.

It is often impractical to achieve sample adequacy in vegetation monitoring studies based on Snedecor and Cochran's equation and a minimum sample number approach is taken. MMD recognizes the practical limitations of achieving statistical adequacy and has provided minimum sample sizes for various quantitative methods (MMD 1999). With normally distributed data where sample adequacy cannot be met because of operational constraints or for other reasons, 40 samples are often considered adequate. The 40 -sample recommendation is based on an estimate of the number of samples needed for a t-test under a normal distribution (Sokal and Rohlf 1981). Schulz et al. (1961) demonstrated that 30 to 40 samples provide a robust estimate for most cover and density measurements with increased numbers of samples only slightly improving the precision of the estimate.

CMI collected 40 samples based on the guidance discussed above. The 40 samples came from ten transects each having four quadrats as described in Section 2.1. Each quadrat is considered a unique sampling unit. Sample adequacy was calculated to determine the number of samples that would have been required for adequacy by the Snedecor and Cochran equation. Further analysis for sample adequacy of cover, production and density attributes was also demonstrated using a graphical stabilization of the mean method (Clark 2001).

The emphasis on statistical adequacy assumes that parametric tests of normally distributed data will be conducted to demonstrate compliance with the vegetation success standards. It is important to note that normally distributed data and sample adequacy are not required for reverse-null hypothesis testing. Nonparametric hypothesis tests are used to analyze data that are not normally distributed. When sample adequacy is not achieved, it is appropriate to use the reverse null approach for hypothesis testing. The reverse null is also generally recommended to evaluate reclamation success whether N_{min} is met or not (MMD 1999). This is because the reverse null is more defensible (compared to the classic approach) where the rejection of the null hypothesis definitively concludes that the reclamation mean is greater the technical standard (McDonald and Howlin 2013).

3.0 RESULTS

The vegetation community in M-VMU-1 is well established and dominated by perennial plants. A representative photograph of the vegetation and topography in M-VMU-1 is shown in Figure 5. The vegetation cover levels from 2019-2023 suggest that the site can meet the vegetation success standards for the Permit Area.

Vegetation success standards consist of four vegetative parameters: ground cover (i.e., perennial and biennial canopy cover), productivity, diversity, and woody stem stocking (Table 2). The ground cover requirement for live perennial/biennial cover on the reclamation is 15%. The productivity requirement is 350 air-dry lbs/ac perennial/biennial annual production. The woody stem stocking success standard is 150 live woody stems/ac.

Diversity is evaluated against numerical guidelines for different growth forms and photosynthetic pathways of the vegetation. In summary, the diversity guideline required by MMD would be met if at least two shrub or subshrub species have individual relative cover values of at least 1%; at least two perennial warm-season grass species have individual relative cover levels of at least 1%; at least one perennial cool-season grass species has an individual relative cover level of at least 1%; and at least three perennial or biennial forb species have a combined relative cover of at least 1%. MMD (1999) allows biennial forbs to be counted toward standards because they are technically monocarpic (single flowering) perennials that annually produce a significant number of seed and therefore as a species, they persist in the reclaimed plant community. Relative cover is the total percent cover of a perennial/biennial species divided by the total perennial/biennial cover of the sampling unit.

Diversity is also demonstrated by evidence of colonization or recruitment of native (not seeded) plants from adjacent undisturbed native areas. Table 3 summarizes the attributes of plants recorded in the quadrats in addition to those encountered or observed but not recorded in the formal quantitative monitoring of M-VMU-1. Recruitment of these native plant species is indicative of ecological succession and the capacity of the site to support a self-sustaining ecosystem.

For Phase III bond release applications, it must be demonstrated that the total annual production and total live cover of biennials and perennials equal or exceeds the approved standards for at least two of the last four years of the responsibility period. Shrub density and revegetation diversity must equal or exceed the approved standards during at least one of the two sampling years of the responsibility period (MMD 1999).

The field data for canopy and basal cover, density, production, and shrub density by the belt transect are included in Appendix A. Photographs of the quadrats are included in Appendix B. Appendix C provides the statistical analysis equations, summary data and statistical outputs for perennial/biennial canopy cover, annual forage production, and shrub density by the belt transect method.

3.1 Ground Cover

Perennial/biennial canopy cover was calculated by summing the perennial/biennial species cover estimates after excluding the annual forbs and grasses. Any recorded noxious weeds are excluded from perennial/biennial cover. Average total ground cover in 2023 in M-VMU-1 was 41.3% comprised of 31.3% total vegetation cover, 5.5% rock, and 4.5% litter on a canopy cover basis (Table 3). Consistent with the variability observed in semi-arid rangelands, total vegetation canopy cover in the individual quadrats varied, ranging from 3.4 to 80.0% (Table A-1). On a basal area basis, average ground cover was 22.7% with 9.7% vegetation, 5.7% rock, and 7.3% litter.

The mean perennial/biennial canopy cover in 2023 was 33.3 (± 6.0% 90% confidence interval [90% CI]), higher than all previous years except for 2020. The calculated minimum sample size needed to meet N_{min} was 134 samples (Table 4).

Applying the Shapiro -Wilks test to the 2023 perennial/biennial canopy cover indicated that the canopy cover data for M-VMU-1 were not normally distributed (Figure C-1). A log transformation of the canopy cover data resulted in a normal distribution (Figure C-4). As a result, hypothesis testing was conducted with the log transformed data the one-sample, one-sided t-test (MMD 1999). The calculated t*-statistic for M-VMU-1 log transformed perennial biennial cover was 6.67 where the log transformation was applied to the following data: 33.3% cover with a standard deviation of 22.9%, the technical standard of 15%, and a sample size of 40. The one-tail t (0.1, 39) value was 1.304, so under the reverse null hypothesis ($t^* \geq t\ (1\text{-}\alpha;\ n\text{-}1)$), we conclude that the performance standard is met for perennial/biennial cover (i.e., ground cover) by the quadrat method (Table C-2).

Because N_{min} was not met and called for an unreasonable number of samples, the perennial/biennial canopy cover data were evaluated using a stabilization of the mean approach (Clark 2001). Figure 6 illustrates the stabilization of the estimated mean for perennial/biennial canopy cover based on grouping four sample increments associated with a single transect. The samples were analyzed in four sample increments to allow an estimation of variability. The corresponding variability around the mean is expressed by the 90% CIs for each successive analytical increment. The analysis suggests that the mean remained relatively stable after about 28 samples with the 90% CI showing very little change after that, suggesting that 40 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of perennial cover.

3.2 Production

Productivity for vegetation success is assessed for above-ground annual forage production, excluding annuals and noxious weeds in air dry pounds per acre (lbs/ac). Perennial grass forage species contributed the most with 597 lbs/ac (76% of total forage production) in 2023. James' galleta (*Pleuraphis jamesii*) accounted for 36% of the grass forage production with 212 lbs/ac. The mean perennial forage biomass also includes five perennial forb species and six shrub species totalling 784 (± 157) lbs/acre in 2023, exceeding the vegetation success standard of 350 lbs/ac (Table 3 and Table 4).

The 2023 annual forage production data for M-VMU-1 were not normally distributed (Figure C-2). A log transformation of the data resulted in a normal distribution (Figure C-5), so hypothesis testing was conducted with the log transformed data the one-sample, one-sided t-test (MMD 1999). The annual forage production standard in M-VMU-1 was met in 2019 at 719 lbs/ac, but from 2020 to 2022 it was not met despite averaging well above the performance standard, likely in part due to high variance in the data. This suggests that the prolonged drought may have impacted biomass production, possibly compounded by the inherent variation in semi-arid landscapes where the distribution of vegetation is patchy or discontinuous.

The calculated t*-statistic for M-VMU-1 log transformed annual forage production was 5.02 where the log transformation was applied to the following data: 784 lbs/acre with a standard deviation of 602.6, the technical standard of 350 lbs per acre, and a sample size of 40. The one-tail t (0.1, 39) value was 1.304. Therefore, under the reverse null hypothesis ($t^* \geq t\ (1\text{-}\alpha;\ n\text{-}1)$), we conclude that the performance standard is met for annual forage production (Tables C-1 and C-3).

The calculated minimum sample size needed to meet N_{min} at the 90% confidence level for annual forage production was estimated to be 168 samples (Table 4). Because N_{min} was not met and called for an unreasonable number of samples, the data were evaluated using a stabilization of the mean (Clark 2001). Figure 7 illustrates the stabilization of the mean and 90% CI for perennial foliar cover. The analysis suggests that the mean remained relatively stable after about 28 samples with the 90% CI showing very little change after that, suggesting that 40 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of perennial cover.

3.3 Shrub Density

Shrub density ranged from an average of 2,941 (± 969) stems/ac based on the belt transect method to 7,082 (±4,651) stems/ac with the quadrat method (Table 4). In M-VMU-1, 14 shrub species were encountered in the belt transects (Table A-5) compared to six species in quadrats (Table 3). Four-wing saltbush *(Atriplex canescens)* was the most common shrub encountered under both measurement methods with shadscale saltbush (*Atriplex confertifolia*) and Mexican cliffrose *(Purshia mexicana)* and Mormon tea *(Ephedra viridis)* also occurring frequently in both methods.

The shrub density data by the belt transect method were normally distributed (Figure C-3) and the calculated minimum sample size needed to meet N_{min} at the 90% confidence level was estimated to be 135 samples (Table 4). Hypotheses testing was conducted using the one-sample, one-sided t-test (MMD 1999) on the raw shrub density data. The calculated t*-statistic for M-VMU-1 shrub density was 4.76 with an average of 2,941 stems/ac with a standard deviation of 1,864, the technical standard of 150 stems/ac, and a sample size of 10. The one-tail t (0.1, 9) value was 1.383, so under the reverse null hypothesis ($t^* \geq t_{(1-\alpha;\ n-1)}$), we conclude that the performance standard is met for shrub density (i.e., woody stem stocking) by the belt transect method (Table C-4).

Because N_{min} was not met for the M-VMU-1 Shrub density and called for an unreasonable number of samples, the shrub density belt transect data were evaluated using a stabilization of the mean (Clark 2001). Figure 8 illustrates the stabilization of the mean and 90% CI for perennial foliar cover. The analysis suggests that the mean remained relatively stable after about 7 samples with the 90% CI showing very little change after that, suggesting that 10 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of shrub density.

3.4 Composition and Diversity

Diversity is assessed through comparing the relative cover of various life-forms, based on their duration to the perennial/biennial cover of the vegetation management unit. In this context, relative cover is the average percent cover of a perennial/biennial species divided by the mean perennial/biennial cover of the sampling unit. Relative canopy cover of individual species contributing to perennial cover are listed in Table 3.

Collectively, 15 perennial grasses comprised the canopy cover in M-VMU-1 with a combined relative canopy cover of about 80%. The warm season grass James galleta comprised the highest cover of all grasses followed by the cool season grasses Russian wildrye (*Psathyrostachys juncea*) and bluebunch wheatgrass (*Pseudoroegneria spicata*) (Table 3). Seven shrubs combined to total 21% relative cover, with four-wing saltbush comprising the highest cover. Seven perennial/biennial forbs contributed 0.3% relative canopy cover.

Table 5 provides the diversity results for M-VMU-1 for 2019 through 2023 and is summarized below.

- The diversity standard for shrubs was achieved by three species that exceed the 1% relative cover standard including four-wing saltbush (15.34%) and shadscale saltbush (2.32%), and Mexican cliffrose (1.20%).
- The diversity standard for warm-season grasses was met by four species that exceed 1% relative cover including James' galleta (27.92%) and alkali sacaton (*Sporobolus airoides*, 5.85%).
- The diversity standard for cool-season grasses is achieved by eight species that exceed 1% relative cover including Russian wildrye (12.01%), bluebunch wheatgrass (9.04%), and Indian ricegrass (*Achnatherum hymenoides,* 7.31%).

- The diversity standard for forbs requires a minimum of three non-annual forb taxa combining to contribute at least 1% relative cover. The combined relative cover of seven non-annual forbs was 0.30% and included Hoary tansyaster (*Machaeranthera canescens*, 0.26%), yellow salsify (*Tragopogon dubius*, 0.01%), and sweetclover (*Melilotus officinalis*, 0.008%). Based on 2023 sampling, the combined relative cover for all seven non-annual forbs was less than 1%, failing to meet the forb diversity standard. The forb diversity standard, however, was met in 2019, 2021 and 2022.

The recruitment of native plants and establishment of seeded species within M-VMU-1 is indicative of ecological succession and the capacity of the site to support a diverse and self-sustaining ecosystem. Over the past four years, 81 unique species have been identified on M-VMU-1. In 2023 vegetation surveys, 43 different plant species were present within the reclamation areas of M-VMU-1 (Tables A-5 & 3). Species observed include 16 grasses, 13 forbs, and 14 shrubs, trees, and cacti. Of the 13 forbs, six are annuals and the remaining seven have variable durations or are purely perennial. Of the 16 grasses, ten are cool-season perennials, five are warm-season perennials and one is a cool-season annuals. Cacti and trees are rare on the reclamation, while shrubs and subshrubs are more common, and only shrubs and subshrubs were captured in 2023.

During the 2023 monitoring program, noxious weeds (NMDA 2020) were infrequently encountered on M-VMU-1 and one noxious weed, cheatgrass (*Bromus tectorum*), was recorded in one quadrat. Noxious weeds previously observed on M-VMU-1 include cheatgrass, musk thistle (*Carduus nutans*), saltcedar (*Tamarix ramosissima*), and Siberian elm (*Ulmus pumila*). The contribution of these species to the vegetation community is insignificant with densities much lower than native rangeland beyond the permit boundary. CMI continues to monitor for noxious weeds and actively controls them through husbandry practices that include annual services for weed control. Further, competition from desirable seeded and native species is expected to inhibit any substantial increase of noxious weeds in the reclamation.

4.0 SUMMARY

McKinley Mine's vegetation success standards for the post-mining land uses of grazing and wildlife are based on canopy cover, production, shrub density, and plant diversity (Table 2). The vegetation monitoring results for the past four years indicate that the vegetation community in M-VMU-1 is progressing having met the shrub density standard in every year and the perennial/biennial canopy cover standard for four out of the past five years (Table 4). In 2023, mean annual forage production was well above the standard and passed hypothesis testing: this has not been the case in the past three years when means were higher than the standard but failed the hypothesis testing. In various years, M-VMU-1 has met the warm-season grass and forb diversity standards (Table 5), but only in 2022 were all diversity standards met, likely a result of the above average precipitation received that year. A summary of the findings from the past five years are:

1) This year's lower than average and late onset of growing season precipitation appears to not have had strongly impacted grass and shrub diversity, but the expression of perennial forbs was affected. Variation in the precipitation patterns and amount over the past five years continue to affect herbaceous forbs on the reclamation.

2) In all years, average annual forage production was above the numeric performance standards; however, statistical hypothesis testing from 2020-2022 did not demonstrate that the standard was met due to highly variable data inherent in semi-arid patchy plant distributions.

3) Similarly, average perennial/biennial cover has been above the technical standard since 2019, though statistical hypothesis testing in 2022 did not demonstrate that the standards were met due to high variability; it was met in 2019 through 2021.

4) The diversity data for M-VMU-1 illustrates precipitation affects species expression when precipitation is adequate like in 2022 and allowed for the full expression of all plant functional groups while dry conditions impacted forbs in 2020 and 2023 and warm-season grasses in 2019 and 2021.

Overall, vegetation performance in M-VMU-1 is encouraging considering below-average precipitation in 5 of the past 6 years including a two-year drought in 2017 and 2018, and the exceptional drought in 2020. Though the presence of feral horses has diminished on the South Mine, their continued presence may negatively affect cover and production, especially in years when forage was scarce in previous years. The performance of vegetation under these conditions suggests that the reclaimed plant communities are resilient and capable of sustaining themselves under adverse conditions that are characteristic of this region. In many respects the reclamation in M-VMU-1 shows that it is capable of meeting and sustaining the post-mining land use. Considering seasonal patterns of forb emergence, quantitative sampling in the spring of 2024 is planned for early to capture forbs for the diversity standard assessment to complement the fall sampling and provide a more complete picture of the contribution of forbs to the reclaimed plant community.

5.0 REFERENCES

Bonham, C.D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons. New York, NY.

Clark, D.L. 2001. Stabilization of the mean as a demonstration of sample adequacy. American Society for Surface Mining and Reclamation Annual Meeting. Albuquerque, NM. June 3-7, 2001. ASSMR, Lexington, KY.

Mining and Minerals Division (MMD). 1999. Coal Mine Reclamation Program Vegetation Standards. Santa Fe, NM. April 30.

McDonald, L., and S. Howlin. 2013. Evaluation and comparison of hypothesis testing techniques for bond release application. University of Wyoming, Laramie, WY.

New Mexico Department of Agriculture (NMDA). 2020. New Mexico Noxious Weed List Update. New Mexico State University, Las Cruces, NM. June 2020.

Sokal, R.R. and F.J. Rohlf. 1981. Biometry (2nd edit.). W. H. Freeman and Co., San Francisco.

Schulz, A. M., R. P. Gibbens, and L. F. DeBano. 1961. Artificial populations for teaching and testing range techniques. J. Range Management. 14:236-242.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods applied to experiments in agriculture and biology. 6th ed. Ames, Iowa: Iowa State University Press.

TABLES

Table 1: South Mine Seasonal and Annual Precipitation, 2015-2023

Year	Station	Precipitation (inches)													
		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total	Growing Season Total
2015	South Tipple	2.05	1.59	0.11	0.52	1.64	1.11	2.37	1.62	0.30	1.36	1.31	0.76	14.74	7.56
	Rain 9	NA	NA	NA	0.50	1.38	1.22	2.88	1.25	0.22	1.13	0.99	NA	NA	7.45
	Rain 10	NA	NA	NA	0.42	1.32	1.11	2.59	1.39	0.30	1.10	0.78	NA	NA	7.13
	Rain 11	NA	NA	NA	0.48	1.88	1.02	2.80	1.69	0.26	0.97	1.08	NA	NA	8.13
2016	South Tipple	0.62	0.22	0.05	1.31	0.80	0.07	1.37	1.74	1.75	0.40	1.57	1.84	11.74	7.04
	Rain 9	NA	NA	NA	0.22	0.62	0.45	1.24	0.50	1.05	1.05	0.00	NA	NA	4.08
	Rain 10	NA	NA	NA	0.13	0.55	0.20	2.75	0.38	0.99	0.14	0.02	NA	NA	5.00
	Rain 11	NA	NA	NA	0.28	0.77	0.64	1.61	0.42	1.09	0.09	0.04	NA	NA	4.81
2017	South Tipple	1.25	1.64	0.48	0.35	0.77	0.42	2.48	0.90	1.34	0.15	0.09	0.02	9.89	6.26
	Rain 9	NA	NA	NA	1.20	1.02	0.01	0.82	1.40	1.64	0.37	0.91	NA	NA	6.09
	Rain 10	NA	NA	NA	1.00	0.67	0.08	0.94	1.63	1.36	0.34	0.81	NA	NA	5.68
	Rain 11	NA	NA	NA	1.23	1.16	0.05	0.86	2.00	1.85	0.34	0.49	NA	NA	7.15
2018	South Tipple	0.35	0.79	0.54	0.09	0.29	0.51	2.61	1.34	1.10	1.65	0.19	0.29	9.75	5.94
	Rain 9	NA	NA	NA	0.07	0.27	0.25	2.16	0.74	0.67	1.31	0.00	NA	NA	4.16
	Rain 10	NA	NA	NA	0.08	0.20	0.27	3.05	1.15	0.92	1.51	0.00	NA	NA	5.67
	Rain 11	NA	NA	NA	0.09	0.29	0.26	1.92	1.00	0.89	1.45	0.00	NA	NA	4.45
2019	South Tipple	1.30	1.81	1.23	0.44	1.77	0.33	0.22	0.05	1.59	0.09	1.14	0.85	10.82	4.40
	Rain 9	NA	NA	NA	0.16	1.36	0.24	0.46	0.37	1.84	0.05	0.07	NA	NA	4.43
	Rain 10	NA	NA	NA	0.20	1.49	0.37	0.19	0.27	1.34	0.03	0.05	NA	NA	3.86
	Rain 11	NA	NA	NA	0.20	1.50	0.19	0.44	0.20	1.72	0.06	0.08	NA	NA	4.25
2020	South Tipple	0.98	1.44	1.35	0.17	0.01	0.04	1.13	0.24	0.15	0.26	0.40	0.27	6.44	1.74
	Rain 9	NA	NA	NA	0.16	0.02	0.11	0.60	0.06	0.14	0.08	0.45	NA	NA	1.09
	Rain 10	NA	NA	NA	0.11	0.02	0.13	0.79	0.14	0.14	0.16	0.09	NA	NA	1.33
	Rain 11	NA	NA	NA	0.22	0.00	0.05	0.63	0.69	0.20	0.30	0.41	NA	NA	1.79
2021	South Tipple	1.11	0.34	0.40	0.07	0.08	0.37	5.45	1.24	2.12	1.77	0.55	2.26	15.76	9.33
	No Bluff	1.13	0.21	0.46	0.04	0.04	0.20	2.17	1.31	1.13	0.86	0.20	0.92	8.67	4.89
	Rain 9	NA	NA	NA	0.00	0.10	0.27	1.81	1.22	1.11	0.78	0.00	NA	NA	4.51
	Rain 10	NA	NA	NA	0.01	0.06	0.24	2.48	1.80	0.96	0.80	0.00	NA	NA	5.55
	Rain 11	NA	NA	NA	0.00	0.07	0.18	2.10	1.31	1.43	0.98	0.00	NA	NA	5.09
2022	South Tipple	0.36	0.74	1.25	0.00	0.01	0.66	3.68	5.36	1.51	2.92	0.59	0.74	17.82	11.22
	No Bluff	NA	NA	0.59	0.03	0.00	1.24	3.13	4.66	1.27	1.40	0.48	0.58	NA	10.33
	Rain 9	NA	NA	NA	0.00	0.00	0.51	2.38	4.05	1.02	1.77	0.41	NA	NA	7.96
	Rain 10	NA	NA	NA	0.00	0.00	0.69	3.57	4.27	1.02	1.83	0.33	NA	NA	9.55
	Rain 11	NA	NA	NA	0.00	0.00	0.56	3.30	4.62	1.09	1.97	0.51	NA	NA	9.57
2023	South Tipple	1.68	0.37	1.90	0.08	0.57	0.29	0.07	0.92	0.02	0.02	0.30	NA	NA	1.95
	No Bluff	1.21	0.50	1.64	0.05	0.55	0.13	0.03	3.16	0.33	0.57	0.42	NA	NA	4.25
	Rain 9	NA	NA	NA	0.01	0.93	0.26	0.23	2.21	0.98	0.18	0.00	NA	NA	4.62
	Rain 10	NA	NA	NA	0.03	0.53	0.13	0.06	2.61	0.51	0.03	0.00	NA	NA	3.87
	Rain 11	NA	NA	NA	0.00	0.77	0.23	0.36	2.44	0.71	0.09	0.00	NA	NA	4.51
Window Rock		0.72	0.68	0.88	0.61	0.49	0.47	1.75	2.05	1.23	1.14	0.83	0.95	11.80	6.60

Notes:

Long-term averages are from Window Rock, Arizona Station (029410), 1937 to 1999 (Western Regional Climate Center, 2020).

Growing season total precipitation is between April and September

NA=rain gauges taken offline due to freezing conditions, data unavailable.

data incomplete due to rain gauge malfunction

Table 2: Revegetation Success Standards for the Mining and Minerals Division Permit Area

Vegetative Parameter	Success Standard
Ground Cover	15% live perennial/biennial canopy cover
Productivity	350 air-dry pounds per acre perennial/biennial annual production
Diversity	A minimum of 2 shrub or subshrub taxa contributing at least 1% relative cover each.
	A minimum of 2 perennial warm-season grass taxa contributing at least 1% relative cover each.
	A minimum of 1 perennial cool-season grass taxa contributing at least 1% relative cover.
	A minimum of 3 perennial/biennial forb taxa combining to contribute at least 1% relative cover.
Woody Stem Stocking	150 live woody stems per acre

Indicates an unmet parameter

Table 3: Vegetation Cover, Density, and Production by Species, M-VMU-1, 2023

Common Name	Scientific Name	Code	Mean Vegetation Cover (%)			Mean Density $(\#/m^2)$	Mean Annual Production (lbs/ac)
			Canopy	Basal	Relative Canopy[a]		
Warm-Season Grasses (5)							
Perennials (5)							
Sideoats grama	*Bouteloua curtipendula*	BOCU	0.58	0.14	1.72	0.58	11
Blue grama	*Bouteloua gracilis*	BOGR2	0.34	0.22	1.03	0.28	6
James' galleta	*Pleuraphis jamesii*	PLJA	9.31	3.28	27.92	3.78	212
Alkali sacaton	*Sporobolus airoides*	SPAI	1.95	0.35	5.85	0.70	59
Sand dropseed	*Sporobolus cryptandrus*	SPCR	<0.01	<0.01	<0.01	0.13	<1
Cool-Season Grasses (11)							
Annuals (1)							
Cheatgrass	*Bromus tectorum*	BRTE	<0.01	<0.01	--	0.08	--
Perennials (10)							
Indian ricegrass	*Achnatherum hymenoides*	ACHY	2.44	0.78	7.31	0.58	35
Bottlebrush squirreltail	*Elymus elymoides*	ELEL5	0.05	0.02	0.15	0.13	2
Thickspike wheatgrass	*Elymus lanceolatus*	ELLA3	1.35	0.17	4.05	3.75	24
Slender wheatgrass	*Elymus trachycaulus*	ELTR7	0.51	0.18	1.54	0.30	12
Needle and thread	*Hesperostipa comata*	HECO26	1.16	0.36	3.47	0.50	13
Western wheatgrass	*Pascopyrum smithii*	PASM	0.75	0.23	2.26	1.85	21
Russian wildrye	*Psathyrostachys juncea*	PSJU3	4.00	1.91	12.01	2.03	101
Bluebunch wheatgrass	*Pseudoroegneria spicata*	PSSP6	3.02	1.10	9.04	2.05	73
Intermediate wheatgrass	*Thinopyrum intermedium*	THIN6	0.24	0.08	0.72	0.35	11
Tall wheatgrass	*Thinopyrum ponticum*	THPO7	0.52	0.10	1.57	0.13	19
Forbs (13)							
Annuals (6)							
Burningbush	*Bassia scoparia*	BASC5	<0.01	<0.01	--	0.03	--
Ribseed sandmat	*Chamaesyce glyptosperma*	CHGL13	0.05	<0.01	--	0.58	--
Threadstem sandmat	*Chamaesyce revoluta*	CHRE4	<0.01	<0.01	--	0.20	--
Fetid marigold	*Dyssodia papposa*	DYPA	<0.01	<0.01	--	0.18	--
Shortstem lupine	*Lupinus brevicaulis*	LUBR2	0.36	<0.01	--	0.10	--
Prickly Russian thistle	*Salsola tragus*	SATR12	0.07	<0.01	--	0.45	--
Perennials/Biennials (7)							
Rose heath	*Chaetopappa ericoides*	CHER2	<0.01	<0.01	<0.01	0.05	<1
Hoary tansyaster	*Machaeranthera canescens*	MACA2	0.09	<0.01	0.26	0.05	3
Sweetclover	*Melilotus officinalis*	MEOF	<0.01	<0.01	<0.01	0.05	--
Upright prairie coneflower	*Ratibida columnifera*	RACO3	<0.01	<0.01	<0.01	0.03	<1
Cutleaf vipergrass	*Scorzonera laciniata*	SCLA6	<0.01	<0.01	<0.01	0.05	<1
Scarlet globemallow	*Sphaeralcea coccinea*	SPCO	<0.01	<0.01	<0.01	0.03	<1
Yellow salsify	*Tragopogon dubius*	TRDU	<0.01	<0.01	0.01	0.03	--
Shrubs, Trees and Cacti (6)							
Fourwing saltbush	*Atriplex canescens*	ATCA2	5.11	0.56	15.34	1.08	132
Shadscale saltbush	*Atriplex confertifolia*	ATCO	0.78	0.05	2.32	0.08	21
Mat saltbush	*Atriplex corrugata*	ATCO4	0.30	0.05	0.90	0.13	7
Mormon tea	*Ephedra viridis*	EPVI	0.19	<0.01	0.56	0.08	12
Broom snakeweed	*Gutierrezia sarothrae*	GUSA2	0.24	0.03	0.72	0.20	5
Mexican cliffrose	*Purshia mexicana*	PUME	0.40	0.06	1.20	0.20	6
Cover Components							
Perennial/Biennial Vegetation Cover			33.3	9.7			
Total Vegetation Cover			31.3	9.7			
Rock			5.5	5.7			
Litter			4.5	7.3			
Bare Soil			58.7	77.2			

Notes:

[a] relative cover = total percent cover of a perennial/biennial species divided by the total perennial/biennial cover of the sampling unit

"--"= parameter not calculated for attribute

lbs/ac = air-dry forage pounds per acre

Table 4: Summary Statistics, M-VMU-1, 2019-2023

Vegetation Metric	Year					Technical Standard
	2019	2020	2021	2022	2023	
Total Vegetation Canopy Cover (%)[2]						
Mean	31.1	40.4	26.9	28.3	31.3	None
Standard Deviation	16.9	21.1	21.0	22.0	19.6	
90% Confidence Interval	4.4	5.5	5.5	5.7	5.1	
Nmin[1]	82	78	172	172	111	
Perennial/Biennial Canopy Cover (%)[3]						
Mean	29.6	42.9	25.0	22.5	33.3	15.0
Standard Deviation	18.0	24.7	20.6	21.4	22.9	
90% Confidence Interval	4.7	6.4	5.4	5.6	6.0	
Nmin[1]	101	94	193	257	134	
Basal Cover (%)						
Mean	1.9	2.8	2.7	2.3	9.7	None
Standard Deviation	1.6	1.9	5.3	3.0	9.4	
90% Confidence Interval	0.4	0.5	1.4	0.8	2.5	
Nmin[1]	197	133	1113	4668	269	
Annual Forage Production (lbs/ac)[4]						
Mean	719	511	520	451	784	350
Standard Deviation	666	498	979	443	603	
90% Confidence Interval	173	130	255	115	157	
Nmin[1]	243	270	1006	275	168	
Shrub Density (stems/acre) from Quadrats						
Mean	2,226	6,475	3,541	4,148	7,082	None
Standard Deviation	4,194	14,513	6,023	4,627	17,882	
90% Confidence Interval	1,091	3,775	1,566	1,203	4,651	
Nmin[1]	1,008	1426	821	353	1810	
Shrub Density (stems/acre) from Belt Transect						
Mean	1,821	2,577	1,592	2,752	2,941	150
Standard Deviation	1,577	1,689	1,103	3,078	1,864	
90% Confidence Interval	820	879	574	1,601	969	
Nmin[1]	252	144	161	353	135	

Notes:

1 Minimum sample number to obtain 90% probability that the samples mean is w ithin 10% of the population mean

2 Total canopy cover for all species

3 Mean canopy cover not including annuals or noxious w eeds.

4 Annual forage production in air dry (lbs/ac) not including annuals or noxious w eeds.

5 Total production in air dry (lbs/ac) including annuals or noxious w eeds.

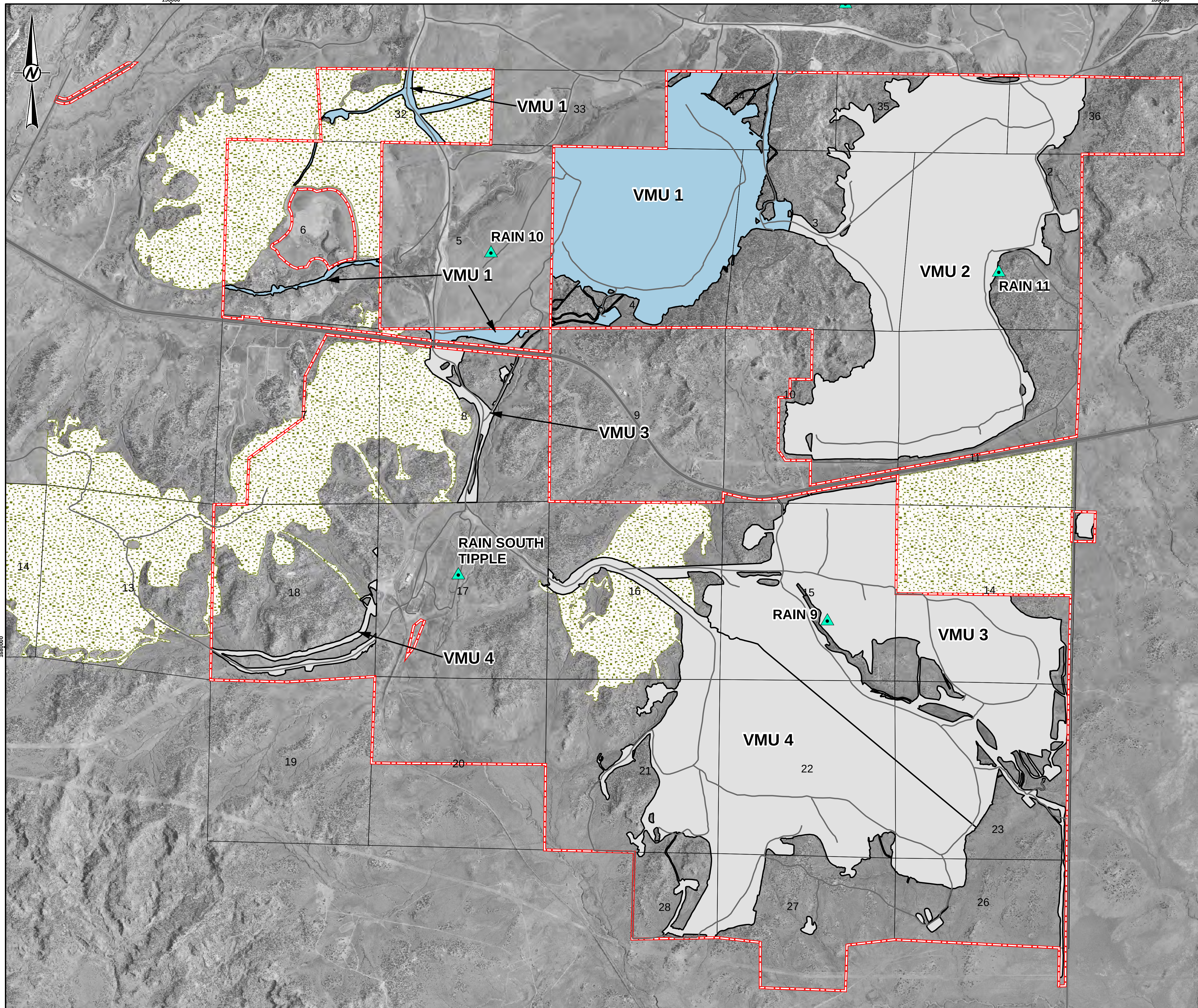
Hypothesis testing found the success standard w as not met

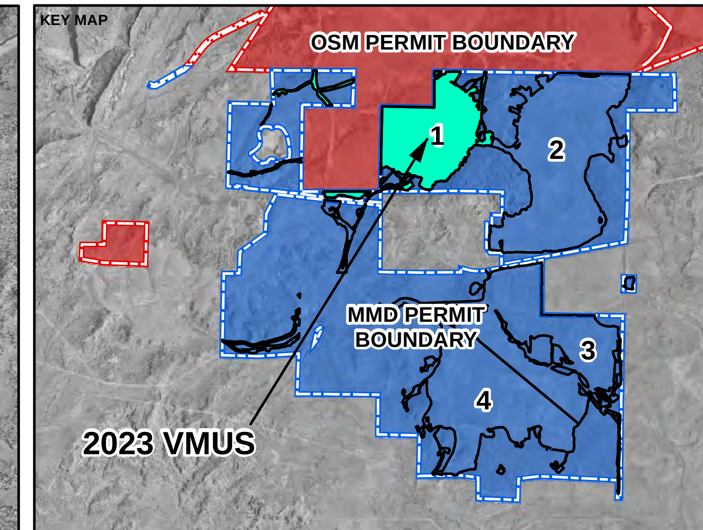
Table 5: Results for Diversity, M-VMU-1, 2019 to 2023

Diversity Component	Standard (% relative cover)	2019 Result	2019 Species	2020 Result	2020 Species	2021 Result	2021 Species	2022 Result	2022 Species	2023 Result	2023 Species
Shrubs and Subshrubs			**(6 spp.)**		**(9 spp.)**		**(7 spp.)**		**(7 spp.)**		**(6 spp.)**
Species 1	≥ 1.0%	11.96%	Four-wing saltbush	12.71%	Four-wing saltbush	13.33%	Rubber rabbitbrush	13.55%	Four-wing saltbush	15.34%	Fourwing saltbush
Species 2	≥ 1.0%	3.36%	Broom snakeweed	3.93%	Gardner's saltbush	5.84%	Mormon tea	6.21%	Shadscale saltbush	2.32%	Shadscale saltbush
Perennial Warm-Season Grasses			**(4 spp.)**		**(3 spp.)**		**(2 spp.)**		**(3 spp.)**		**(5 spp.)**
Species 1	≥ 1.0%	12.58%	James' galleta	16.23%	James' galleta	23.04%	James' galleta	23.34%	James' galleta	27.92%	James' galleta
Species 2	≥ 1.0%	0.84%	Alkali sacaton	1.14%	Alkali sacaton	0.94%	Blue grama	4.19%	Blue grama	5.85%	Alkali sacaton
Perennial Cool-Season Grasses			**(9 spp.)**		**(10 spp.)**		**(7 spp.)**		**(11 spp.)**		**(10 spp.)**
Species 1	≥ 1.0%	21.38%	Western wheatgrass	16.43%	Thickspike wheatgrass	21.15%	Russian wildrye	10.39%	Indian ricegrass	12.01%	Russian wildrye
Perennial/Biennial Forbs	≥ 1.0% combined	**2.64%**	**(15 spp.)**	**0.30%**	**(3 spp.)**	**5.25%**	**(6 spp.)**	**9.04%**	**(11 spp.)**	**0.30%**	**(7 spp.)**
Species 1		0.63%	Fendler's globemallow	0.15%	Purple aster	4.90%	Rattlesnake weed	5.55%	Chenopod	0.26%	Hoary tansyaster
Species 2		0.46%	Manyflowered ipomopsis	0.14%	Rose heath	0.14%	Palmer's penstemon	1.81%	Trailing fleabane	0.01%	Yellow salsify
Species 3		0.42%	Flixweed	0.01%	Palmer's penstemon	0.09%	Upright prairie coneflower	0.62%	Purple aster	0.01%	Sweetclover

Notes:
-- = not applicable
Indicates an unmet parameter

FIGURES





LEGEND

- Rain Gauges
- Two-tracks, Roads and Highways
- MMD Permit Boundary
- PLSS - Sections
- Liability Release
- MMD VMU 1 (~ 839 acres)

0 3,000 6,000

1 inch = 3,000 feet FEET

NOTE(S)

1. VMU = VEGETATION MANAGEMENT UNIT FOR VEGETATION SAMPLING PLAN
2. VMU 4 IS PENDING BOND RELEASE

REFERENCE(S)

1. ORTHOIMAGE: CHEVRON, 2013

COORDINATE SYSTEM: NAD 1927 STATEPLANE NEW MEXICO WEST FIPS 3003
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1927

CLIENT
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

PROJECT
MCKINLEY MINE - MMD PERMIT PHASE III BOND RELEASE,
2023 VEGETATION MONITORING SAMPLING PLAN

TITLE
GENERAL OVERVIEW OF THE MCKINLEY MMD PERMIT AREA VEGETATION MANAGEMENT UNITS (VMU), 2023

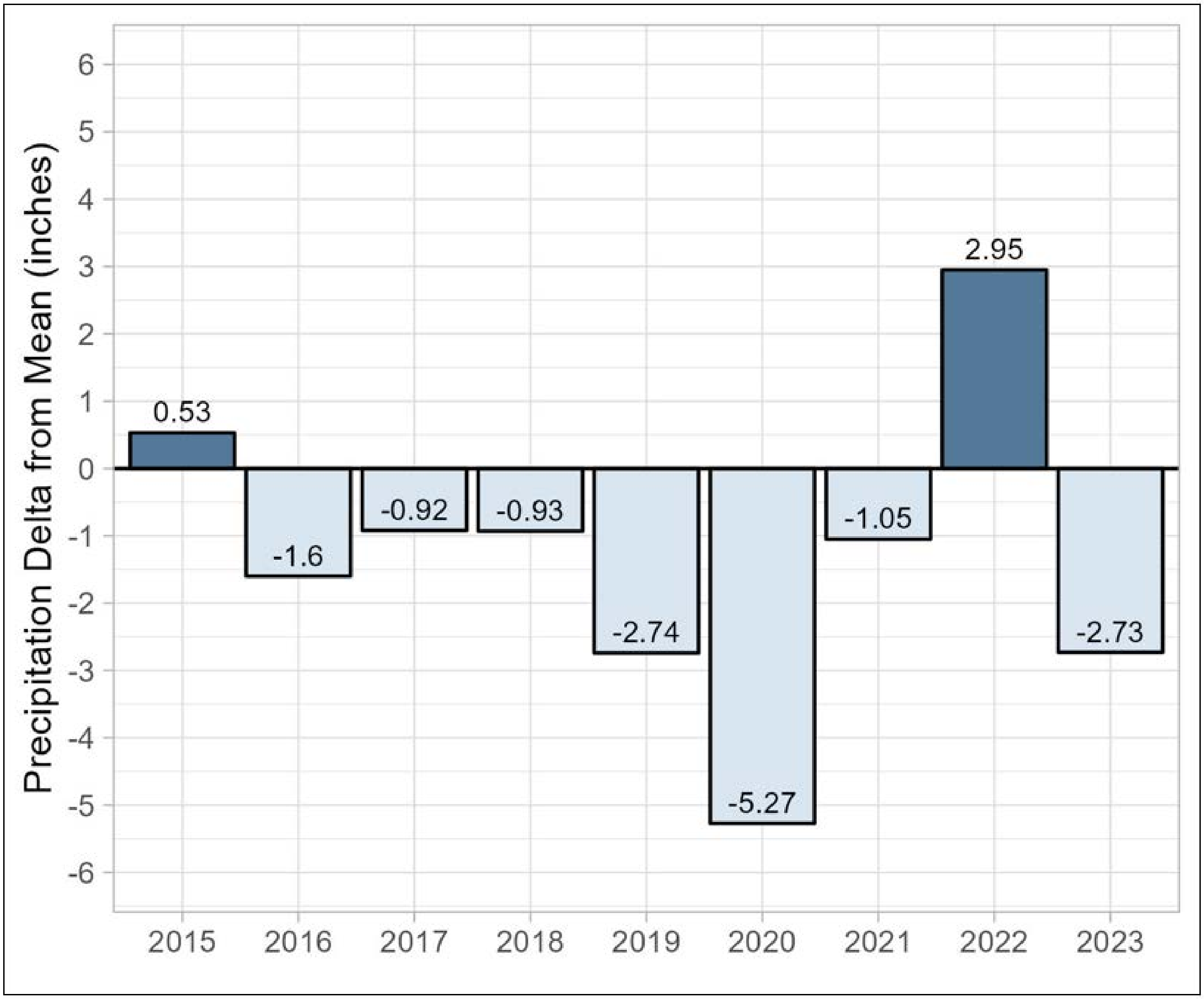
CONSULTANT

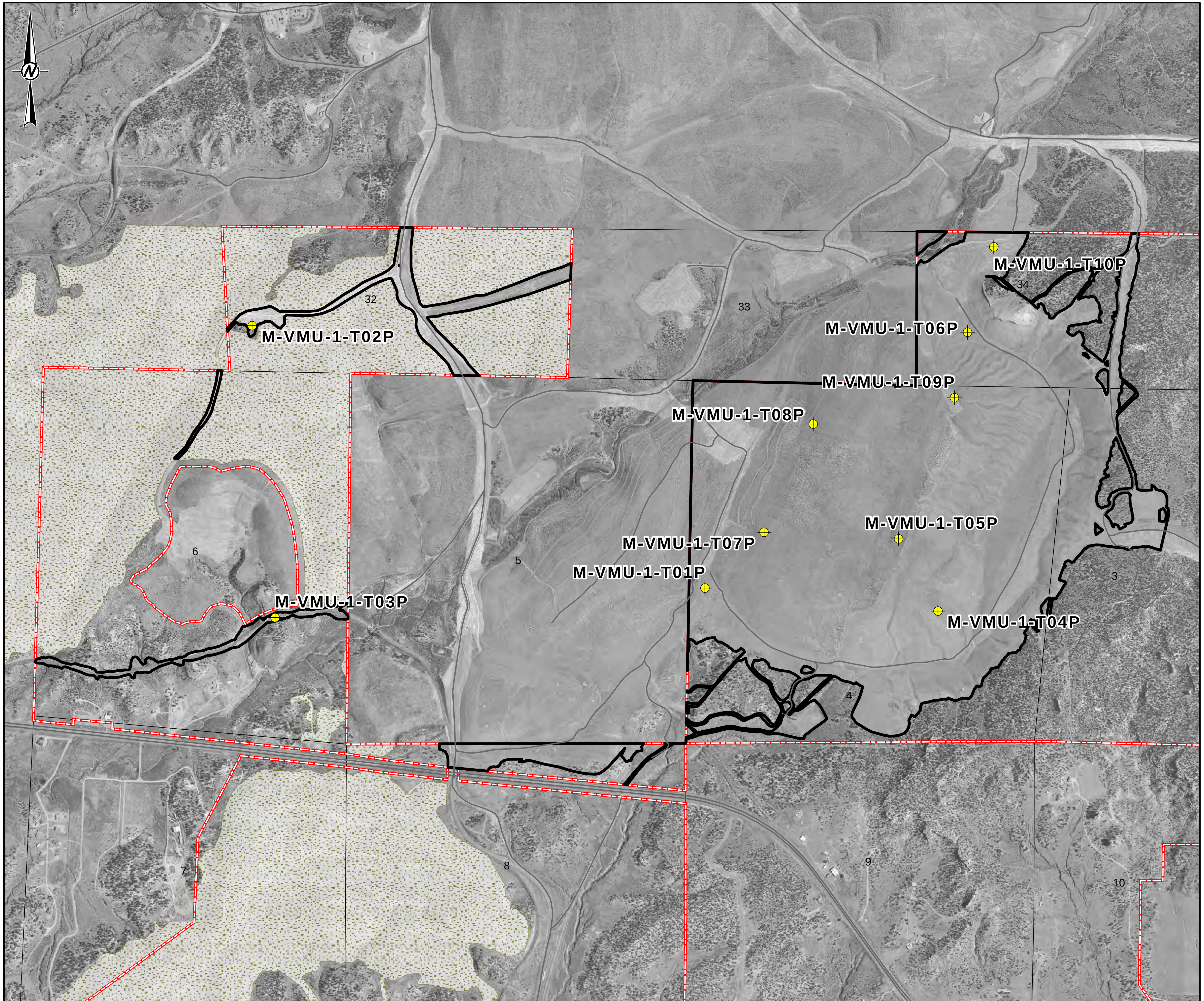
YYYY-MM-DD	2024-02-19
DESIGNED	GFD
PREPARED	GFD
REVIEWED	MR
APPROVED	DR

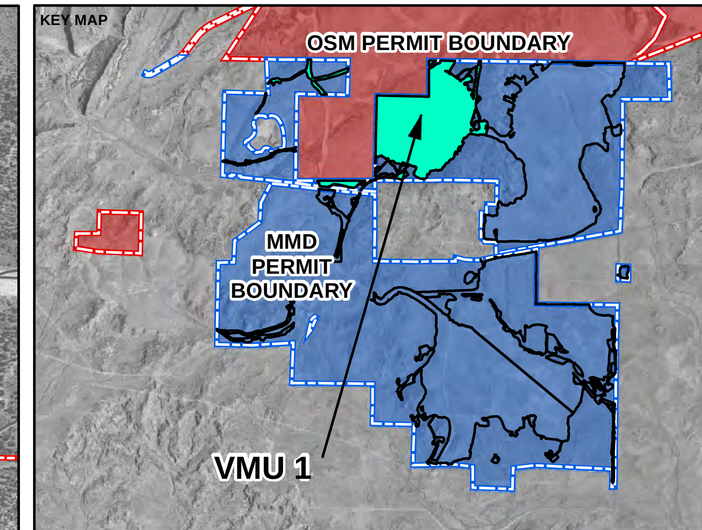
PROJECT NO.	CONTROL	REV.	FIGURE
31406184.000	B001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Figure 2: Departure of Growing Season Precipitation from Long-Term Seasonal Mean at Window Rock, Rain 10 Gauge







LEGEND

- Primary Transect
- Alternate Transect
- Two-tracks, Roads and Highways
- PLSS - Sections
- MMD VMU 1 (~ 839 acres)
- Liability Release
- MMD Permit Boundary

TRANSECT LABEL EXPLANATION:

M-VMU-1-T1P

- MMD Permit Area
- Vegetation Management Unit (VMU-#)
- Transect Number
- Primary (P) or Alternate (A)

0 1,500 3,000

1 inch = 1,500 feet FEET

NOTE(S)

1. KEY MAP SCALE IS DIFFERENT FROM OVERVIEW OF VMUS
2. TRANSECT LOCATIONS WERE CREATED IN ACCORDANCE WITH METHODS OUTLINED IN THE PERMIT

REFERENCE(S)

1. ORTHOIMAGE: CHEVRON, 2013

COORDINATE SYSTEM: NAD 1927 STATEPLANE NEW MEXICO WEST FIPS 3003
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1927

CLIENT
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

PROJECT
MCKINLEY MINE - MMD PERMIT PHASE III BOND RELEASE
2023 VEGETATION MONITORING

TITLE
VEGETATION MONITORING TRANSECTS 2023, VEGETATION MANAGEMENT UNIT 1

CONSULTANT
wsp

YYYY-MM-DD	2024-02-19
DESIGNED	GFD
PREPARED	GFD
REVIEWED	MR
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
31406184.000	B002	0	3

Figure 4: Vegetation Plot, Transect, and Quadrat Layout

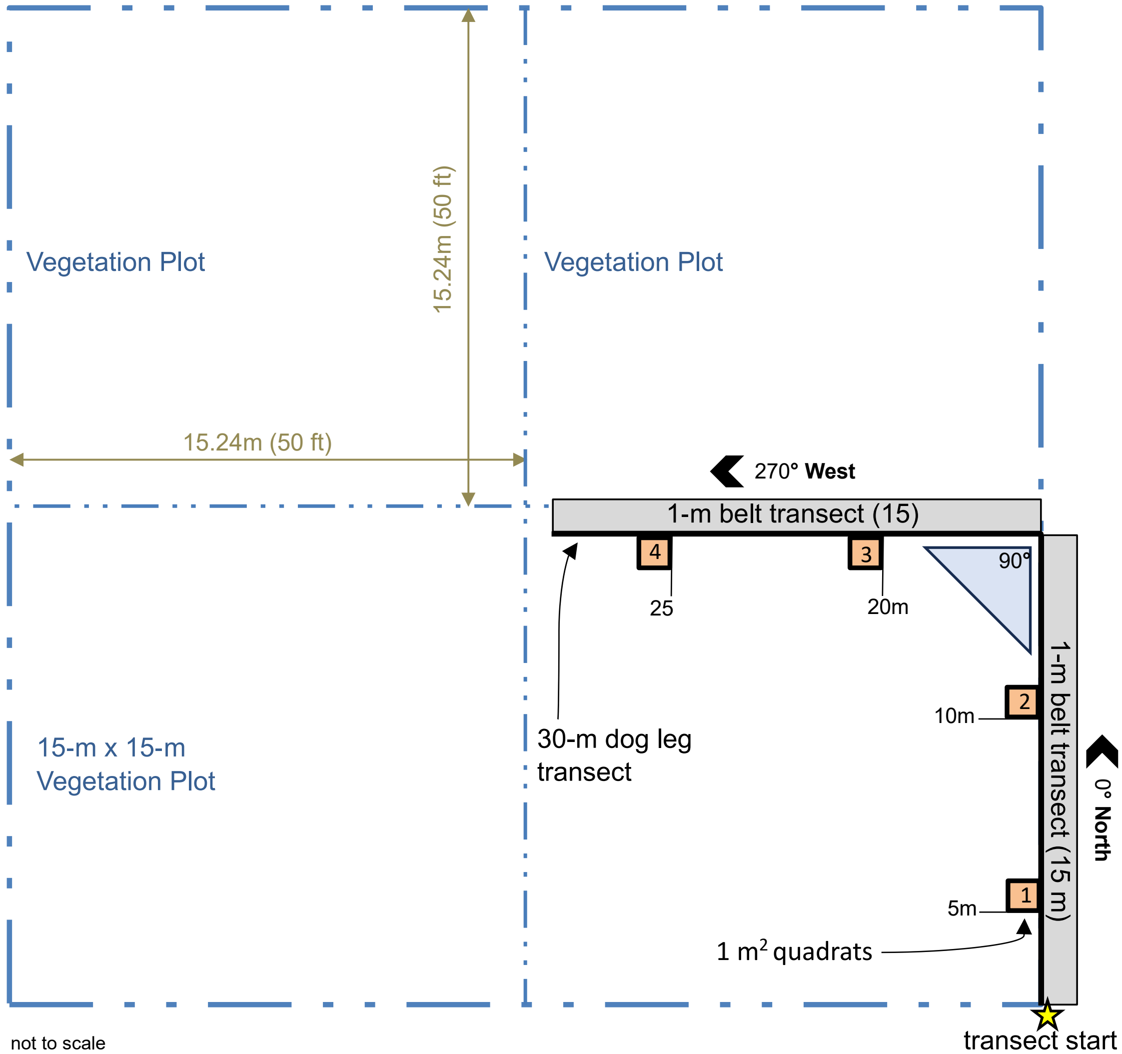


Figure 5: Typical Grass-Shrubland Vegetation in M-VMU-1, September 2023

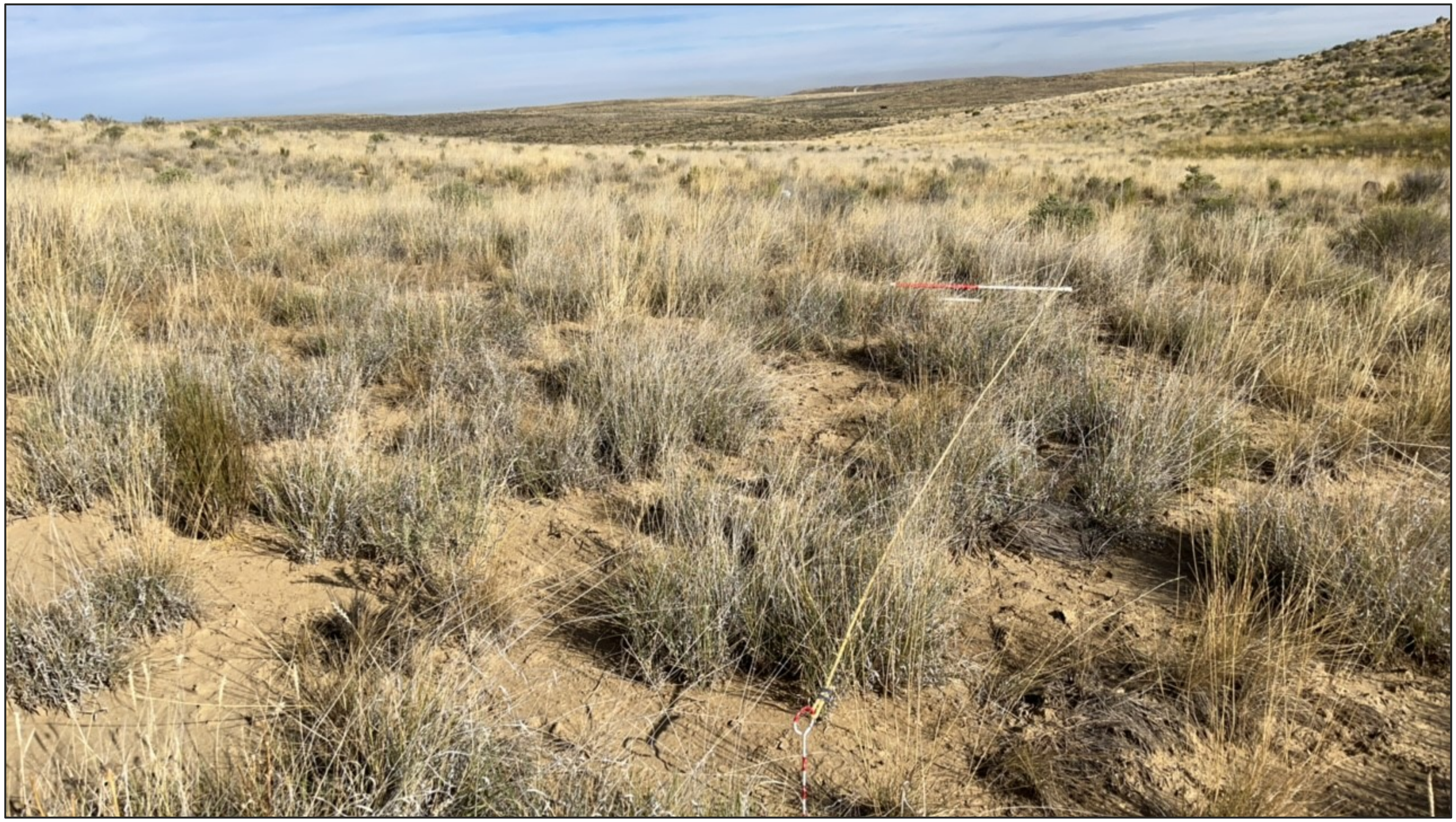


Figure 6: Stabilization of the Mean for Perennial/Biennial Canopy Cover, M-VMU-1, 2023

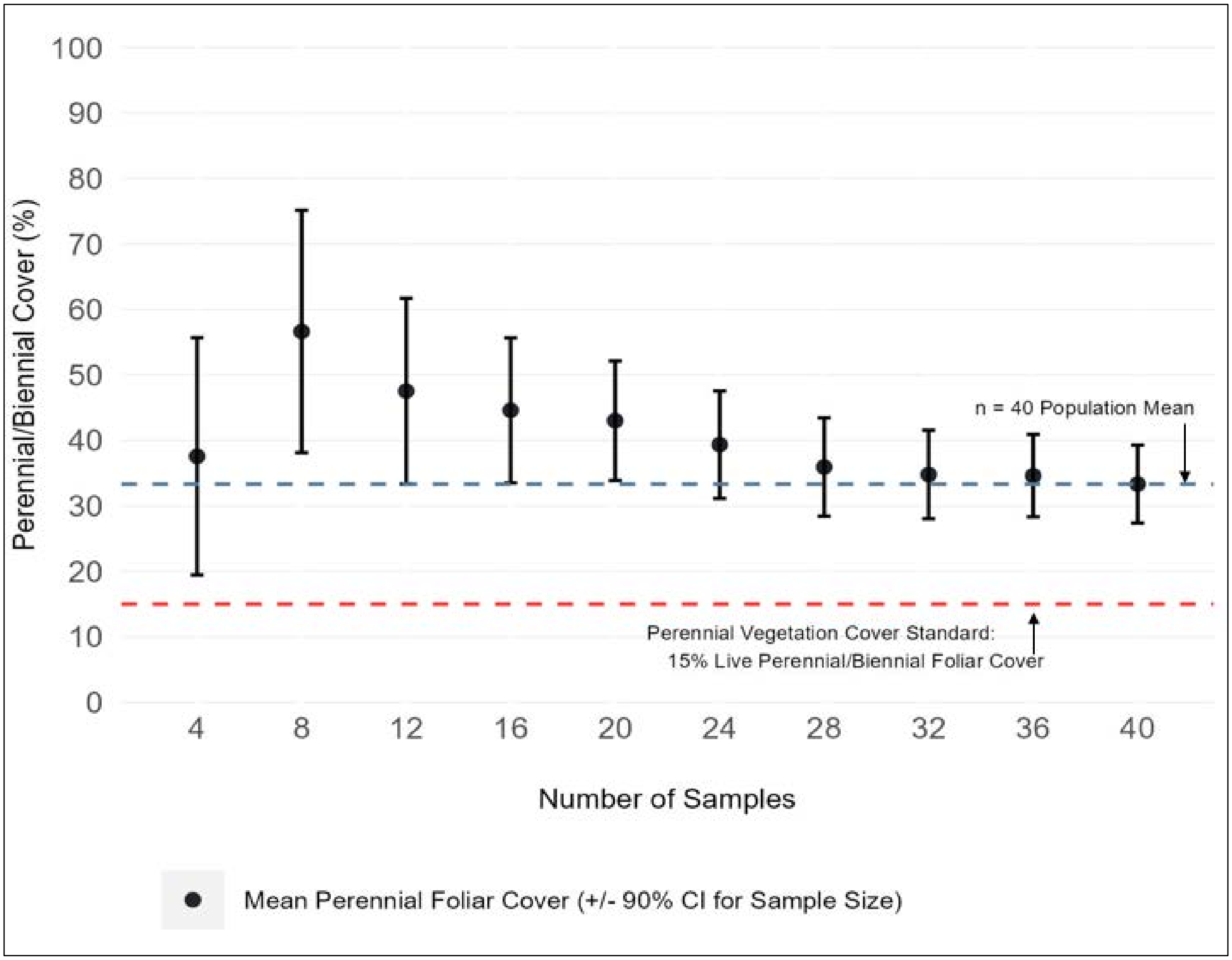


Figure 7: Stabilization of the Mean for Annual Forage Production, M-VMU-1, 2023

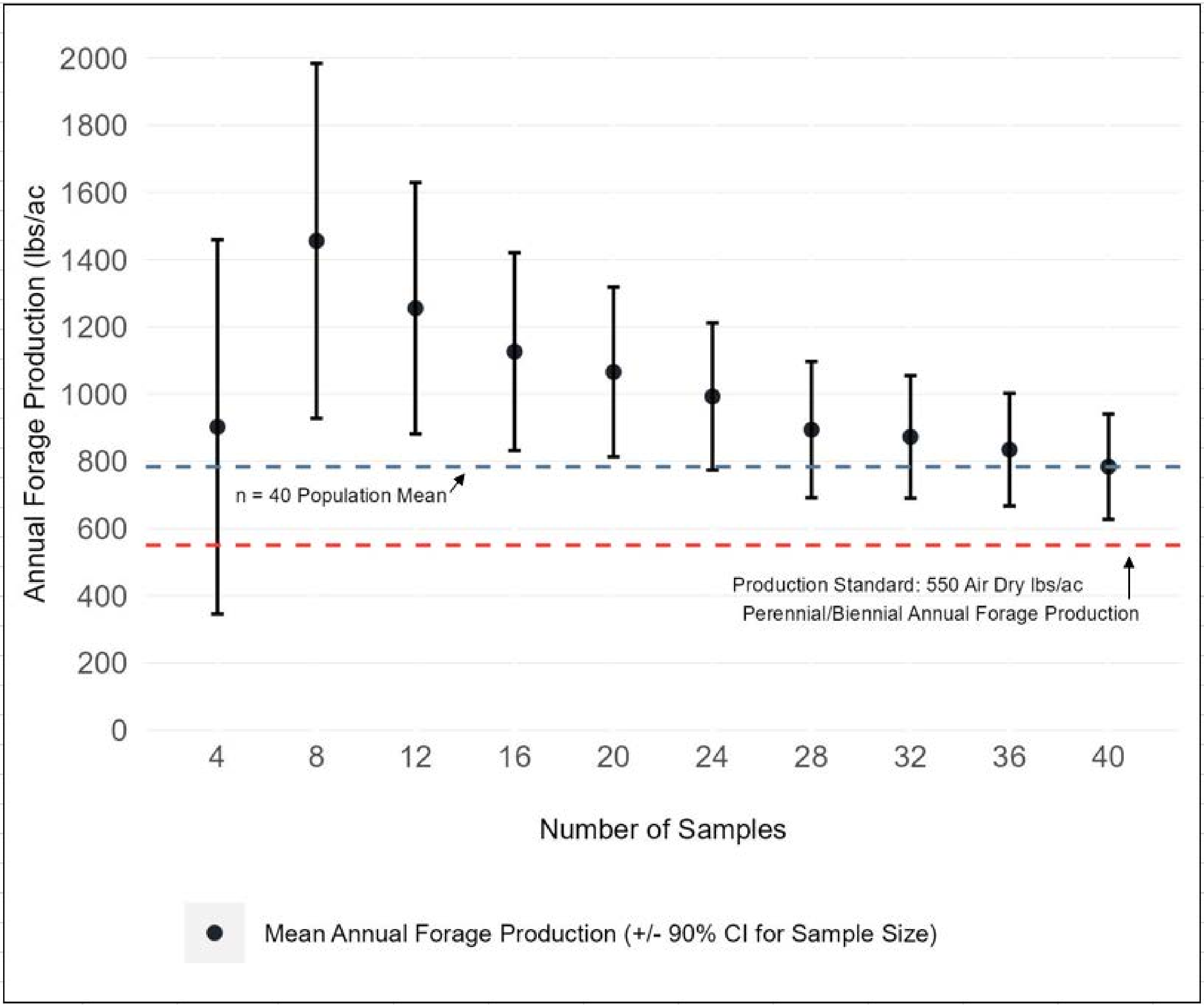
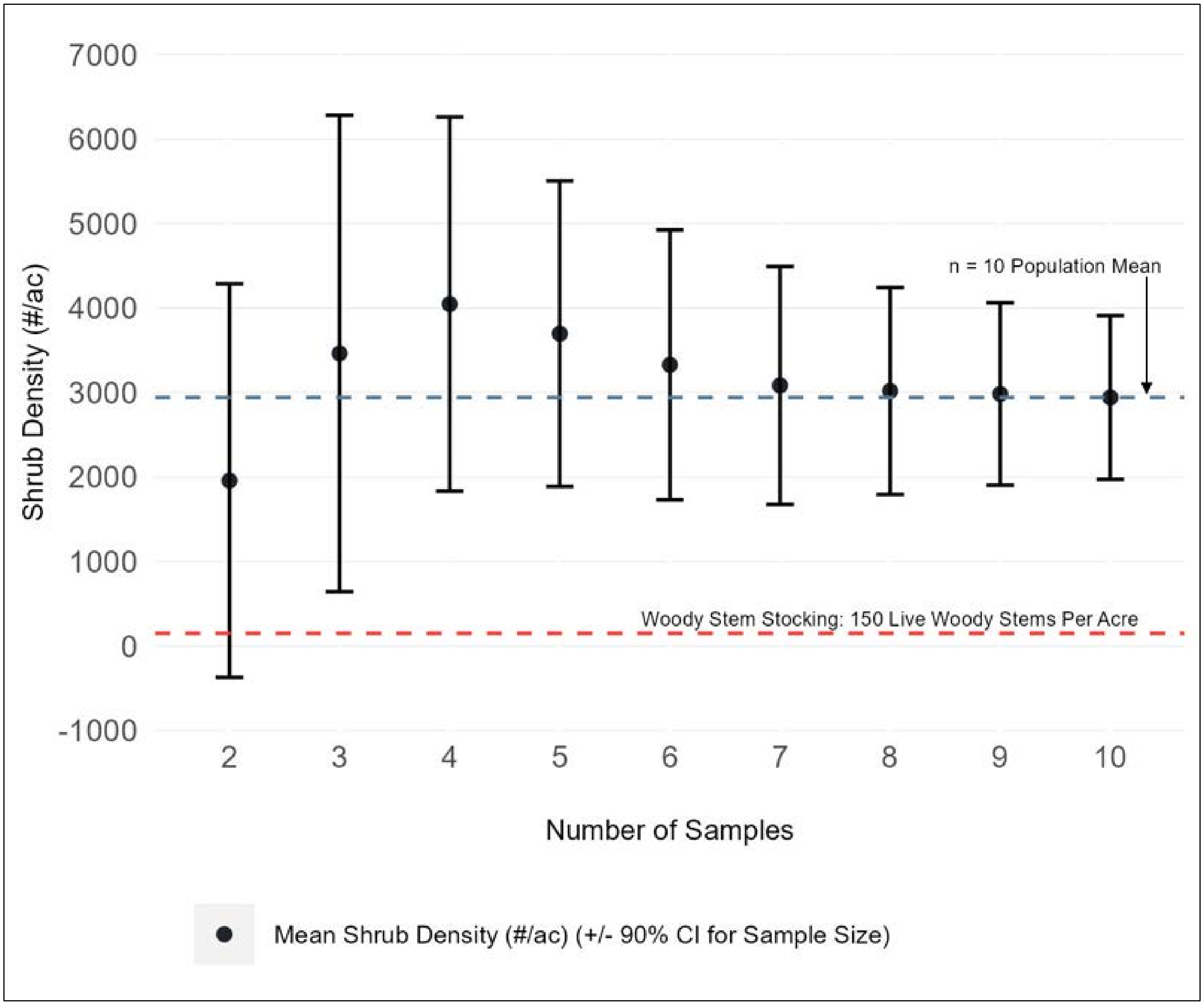


Figure 8: Stabilization of the Mean for Shrub Density, M-VMU-1, 2023



APPENDIX A

Vegetation Data Summary

Table A-1: M-VMU-1 Canopy Cover Data, 2023

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																								
Cool Season Perennials																																								
ACHY	--	4.0	0.5	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40.0	45.0	3.5	2.5	1.5	--	--	--
ELEL5	--	--	--	--	0.01	--	--	--	0.02	2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELLA3	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	6.0	1.0	0.1	--	--	--	0.5	--	5.0	6.5	--	1.5	--	--	--	--	--	--	--	--	--	1.5	--	1.8	30.0	0.1
ELTR7	--	--	--	--	7.0	--	--	--	--	--	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	10.0	--	--	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	--	--	--	--	--	8.0	--	3.0	--	25.0	8.0	2.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	--	0.5	--	0.2	--	--	--	--	12.0	1.5	--	1.5	--	12.5	0.1	--	--	--	0.1	--	--	--	--	1.0	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	0.25
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.0	--	10.0	12.0	--	--	--	--	6.1	11.0	22.0	18.0	11.0	5.0	15.0	15.0	--	--	--	--	--	--	--	--
PSSP6	--	5.0	--	15.0	12.0	--	--	--	--	10.0	--	--	12.0	15.0	--	11.0	--	--	0.3	--	--	2.5	--	5.0	--	--	--	--	21.0	--	0.1	--	11.5	--	--	--	0.2	--	--	--
THIN6	--	--	2.5	--	--	--	6.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.1	--	--
THPO7	--	6.0	--	15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cool Season Annuals																																								
BRTE	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	7.0	2.5	6.0	--	--	--	--	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--	--	4.5	--	--	--	--
BOGR2	--	--	--	1.0	0.75	--	--	2.0	--	--	--	1.0	--	--	--	--	--	--	--	--	2.0	1.0	--	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.0
PLJA	68.0	--	32.0	--	8.5	6.0	6.0	38.0	--	--	8.5	15.0	0.02	15.0	5.0	20.0	0.01	--	4.0	--	6.0	10.5	25.0	15.0	--	--	--	--	--	--	--	28.0	4.5	--	13.0	0.25	--	--	19.0	25.0
SPAI	--	--	--	--	2.5	25.0	33.0	15.0	--	--	--	--	--	--	--	--	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCR	--	--	--	0.05	--	--	--	--	0.011	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																								
Annuals																																								
BASC5	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHGL13	--	--	--	0.1	--	--	--	--	1.7	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRE4	--	0.1	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DYPA	--	0.05	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LUBR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12.0	2.5	--	--	--	--
SATR12	--	--	--	--	--	--	--	--	0.015	0.05	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--
Perennials/Biennials																																								
CHER2	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0	0.5	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCLA6	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ATCA2	--	--	--	--	66.0	--	45.0	30.0	1.5	--	--	11.0	--	--	--	--	12.01	--	0.5	35.0	--	--	--	--	--	2.5	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--
ATCO	--	--	--	--	--	--	--	--	--	22.0	9.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	--	12.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	7.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.1	--	--	--	--	6.0	0.05	--	--	--	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	2.5	0.05	5.0	8.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																								
Perennial/Biennial Vegetation Cover	68.05	15.50	35.00	31.75	96.81	31.00	90.00	85.00	16.03	47.70	17.50	36.00	21.52	53.05	25.20	43.50	49.62	25.00	22.90	49.25	8.60	14.00	30.00	31.50	6.60	15.05	22.00	18.00	33.10	15.00	15.10	44.00	56.50	51.00	16.55	8.75	4.70	3.41	49.00	30.35
Total Vegetation Cover	68.00	15.50	34.00	31.50	77.00	31.00	80.00	75.00	16.50	45.00	18.00	34.50	20.00	50.00	25.00	40.00	44.00	25.00	22.80	45.00	8.50	13.25	27.50	31.00	6.60	15.00	22.00	18.00	33.00	15.00	15.10	43.00	51.00	50.00	26.00	10.75	4.60	3.40	29.75	30.00
Rock	0.05	0.70	0.25	10.00	4.00	2.00	0.00	0.50	55.00	18.00	35.00	42.50	4.00	0.50	3.00	0.05	0.00	0.50	0.00	0.00	0.05	1.10	0.50	0.00	8.00	4.00	2.25	4.00	9.00	0.50	4.00	0.50	1.50	0.00	0.25	5.50	1.00	1.00	0.25	0.50
Litter	2.50	5.00	3.00	5.00	10.00	5.00	1.00	2.00	8.00	4.00	4.00	9.00	12.00	0.25	4.00	1.00	2.00	1.25	2.50	1.00	4.00	4.50	5.00	12.00	4.50	10.00	0.50	7.50	6.00	5.00	1.00	15.00	8.25	2.00	2.00	0.50	3.00	2.00	1.00	3.50
Bare Soil	29.45	78.80	62.75	53.50	9.00	62.00	19.00	22.50	20.50	33.00	43.00	14.00	64.00	49.25	68.00	58.95	54.00	73.25	74.70	54.00	87.45	81.15	67.00	57.00	80.90	71.00	75.25	70.50	52.00	79.50	79.90	41.50	40.00	48.00	71.75	83.25	91.40	93.60	69.00	66.00

Notes:
Species codes defined in Table A-6
Perennial/biennial vegetation cover is the sum of perennial and biennial covers by species, total vegetation cover is undifferentiated by species and estimated in the field.

Table A-2: M-VMU-1 Basal Cover Data, 2023

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
Cool Season Perennials																																								
ACHY	--	0.5	0.05	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	17.0	12.0	0.5	0.5	0.5	--	--	--
ELEL5	--	--	--	--	0.01	--	--	--	0.01	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELLA3	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	0.1	0.08	--	--	--	0.2	--	1.0	0.75	--	0.3	--	--	--	--	--	--	--	--	--	0.25	--	1.5	1.5	0.05
ELTR7	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	0.5	--	10.0	3.0	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	--	0.1	--	0.1	--	--	--	--	4.5	0.5	--	0.5	--	3.0	0.01	--	--	--	0.01	--	--	--	--	0.2	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	0.05
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.0	--	2.3	4.5	--	--	--	--	2.5	2.0	9.0	8.5	6.0	1.5	5.0	6.0	--	--	--	--	--	--	--	--
PSSP6	--	2.5	--	3.0	10.0	--	--	--	--	4.0	--	--	7.5	2.0	--	2.0	--	--	0.1	--	--	0.75	--	2.0	--	--	--	--	3.5	--	0.05	--	6.5	--	--	--	0.1	--	--	--
THIN6	--	--	0.25	--	--	--	2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.8	--	--
THPO7	--	2.0	--	2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cool Season Annuals																																								
BRTE	--	--	--	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	1.0	0.5	1.5	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--	--	--	--	2.1	--	--	--	--
BOGR2	--	--	--	0.1	0.5	--	--	0.5	--	--	--	2.5	--	--	--	--	--	--	--	--	1.0	0.8	--	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0
PLJA	45.0	--	9.0	--	5.0	1.5	3.0	3.0	--	--	3.0	4.25	0.01	4.0	1.2	5.0	0.001	--	2.0	--	3.0	3.25	7.0	3.0	--	--	--	--	--	--	--	12.0	1.5	--	2.5	0.1	--	--	6.0	7.0
SPAI	--	--	--	--	1.1	5.0	4.5	2.0	--	--	--	--	--	--	--	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCR	--	--	--	0.005	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																								
Annuals																																								
BASC5	--	--	--	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHGL13	--	--	--	0.005	--	--	--	--	0.04	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRE4	--	0.01	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DYPA	--	0.005	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LUBR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	0.1	--	--	--	--
SATR12	--	--	--	--	--	--	--	--	0.01	0.005	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--
Perennials/Biennials																																								
CHER2	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.1	0.05	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCLA6	--	--	--	--	--	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	0.02	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ATCA2	--	--	--	--	18.0	--	0.25	0.5	0.05	--	--	0.5	--	--	--	--	2.0	--	0.05	1.0	--	--	--	--	--	0.05	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--
ATCO	--	--	--	--	--	--	--	--	--	2.0	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	--	2.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	0.04	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	0.5	0.01	--	--	--	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	0.3	0.01	1.6	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																								
Perennial/Biennial Vegetation Cover	45.01	5.10	9.30	5.31	37.62	6.50	9.75	6.00	4.61	9.28	3.10	8.00	8.81	10.01	6.32	8.10	32.58	10.00	7.46	5.75	4.21	4.80	8.00	6.65	2.55	2.36	9.00	8.50	10.00	4.50	5.05	18.10	25.05	12.50	3.01	2.95	0.70	2.36	7.50	10.10
Total Vegetation Cover	45.01	5.12	9.30	5.32	37.62	6.50	9.75	6.00	4.66	9.34	3.35	7.65	8.81	10.00	6.32	8.10	32.58	10.00	7.35	5.75	4.21	4.80	10.01	6.45	2.55	2.35	9.00	8.50	10.00	4.50	5.05	18.10	25.05	12.50	3.10	3.05	0.70	2.36	7.50	10.05
Rock	0.00	0.70	0.25	12.00	4.00	3.00	0.00	1.00	50.00	20.00	40.00	45.50	4.00	0.50	3.00	0.25	0.00	0.50	0.00	0.00	0.05	1.10	0.50	0.00	8.00	4.00	2.25	4.00	9.00	0.50	4.00	0.60	0.10	0.00	0.25	5.50	1.20	1.00	0.25	0.50
Litter	1.20	5.50	5.00	7.00	51.00	10.00	18.00	10.00	7.50	10.00	4.50	15.00	12.00	0.75	5.00	1.50	1.50	1.25	4.00	5.00	4.20	4.00	7.00	13.00	4.10	11.00	3.50	7.50	6.00	5.50	3.00	18.00	8.00	9.00	2.50	0.75	3.50	1.00	0.50	4.00
Bare Soil	53.80	88.69	85.45	75.68	2.00	80.50	72.25	83.00	37.84	60.67	52.15	31.85	75.50	88.75	85.68	90.15	65.92	88.25	88.65	89.25	91.54	90.10	82.49	80.55	85.35	82.65	85.25	80.00	75.00	89.50	87.95	63.30	66.85	78.50	94.15	90.70	94.60	95.64	91.75	85.45

Notes:
Species codes defined in Table A-6
Perennial/biennial vegetation cover is the sum of perennial and biennial covers by species, total vegetation cover is undifferentiated by species and estimated in the field.

Table A-3: M-VMU-1 Frequency Data (counts), 2023

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
Cool Season Perennials																																								
ACHY	--	1	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4	2	6	4	3	--	--	--
ELEL5	--	--	--	--	1	--	--	--	2	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELLA3	2	--	--	--	--	--	--	--	--	--	--	--	--	--	33	6	8	--	--	--	4	--	10	15	--	6	--	--	--	--	--	--	--	--	--	21	--	18	24	3
ELTR7	--	--	--	--	1	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	3	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	--	--	--	--	--	4	--	1	--	10	4	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	--	8	--	8	--	--	--	--	13	11	--	4	--	11	1	--	--	--	1	--	--	--	--	5	--	--	--	--	--	--	--	--	6	--	--	--	--	--	--	6
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8	--	6	6	--	--	--	--	5	4	15	16	3	6	6	6	--	--	--	--	--	--	--	--
PSSP6	--	8	--	6	2	--	--	--	--	7	--	--	11	5	--	1	--	--	2	--	--	14	--	1	--	--	--	--	6	--	1	--	12	--	--	--	6	--	--	--
THIN6	--	--	4	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--
THPO7	--	2	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cool Season Annuals																																								
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Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	1	3	1	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	15	--	--	--	--
BOGR2	--	--	--	1	1	--	--	1	--	--	--	1	--	--	--	--	--	--	--	--	1	3	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2
PLJA	8	--	9	--	1	1	8	4	--	--	7	12	1	10	2	7	1	--	3	--	3	10	6	7	--	--	--	--	--	--	--	5	6	--	25	1	--	--	5	9
SPAI	--	--	--	--	3	5	15	2	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCR	--	--	--	3	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
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CHGL13	--	--	--	16	--	--	--	--	4	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHRE4	--	4	--	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
DYPA	--	1	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LUBR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	1	--	--	--	--
SATR12	--	--	--	--	--	--	--	--	4	3	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--
Perennials/Biennials																																								
CHER2	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCLA6	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ATCA2	--	--	--	--	1	--	4	1	1	--	--	2	--	--	--	--	2	--	1	3	--	--	--	--	--	27	--	--	--	--	--	1	--	--	--	--	--	--	--	--
ATCO	--	--	--	--	--	--	--	--	--	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	--	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	4	2	--	--	--	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	2	1	4	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

Species codes defined in Table A-6

Table A-4: M-VMU-2 Air-dry Aboveground Annual Production Data (g/m^2), 2023

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Grasses																																								
Cool Season Perennials																																								
ACHY	--	3.9	0.3	1.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65.6	66.3	11.7	4.7	3.3	--	--	--
ELEL5	--	--	--	--	1.1	--	--	--	0.5	6.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ELLA3	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	29.1	3.9	2.4	--	--	--	2.3	--	13.4	14.0	--	8.0	--	--	--	--	--	--	--	--	--	4.0	--	7.1	22.8	0.4
ELTR7	--	--	--	--	6.8	--	--	--	--	--	--	--	--	--	5.0	--	--	--	--	--	--	--	--	--	1.7	--	--	--	--	39.2	--	--	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	--	--	--	--	--	6.8	--	2.2	--	33.9	12.4	1.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	--	0.9	--	1.4	--	--	--	--	49.3	7.7	--	5.2	--	18.3	1.1	--	--	--	0.4	--	--	--	--	6.2	--	--	--	--	--	--	--	--	1.2	--	--	--	--	--	--	2.3
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	74.6	--	19.5	92.4	--	--	--	--	14.9	35.4	42.3	21.6	20.3	32.2	29.4	68.1	--	--	--	--	--	--	--	--
PSSP6	--	12.6	--	38.4	15.3	--	--	--	--	26.8	--	--	51.5	28.1	--	33.8	--	--	0.3	--	--	28.6	--	17.2	--	--	--	--	43.4	--	0.7	--	28.5	--	--	--	0.5	--	--	--
THIN6	--	--	4.0	--	--	--	39.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.9	--	--
THPO7	--	9.5	--	74.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	14.3	13.2	9.7	--	--	--	--	--	--	--	--	8.7	--	--	--	--	--	--	--	--	--	--	--	2.4	--	--	--	--
BOGR2	--	--	--	1.0	3.5	--	--	3.7	--	--	--	3.5	--	--	--	--	--	--	--	--	3.6	4.8	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.9
PLJA	199.9	--	55.9	--	25.2	20.4	11.5	74.1	--	--	43.4	28.7	0.9	35.5	10.6	41.8	0.1	--	14.3	--	22.3	47.4	71.4	38.5	--	--	--	--	--	--	--	80.9	11.3	--	29.3	0.6	--	--	38.8	48.4
SPAI	--	--	--	--	28.5	70.9	101.4	47.9	--	--	--	--	--	--	--	--	15.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCR	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																								
Perennials/Biennials																																								
CHER2	--	--	--	--	1.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.9	1.1	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SCLA6	--	--	--	--	--	--	--	--	--	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ATCA2	--	--	--	--	197.4	--	99.3	152.4	9.9	--	--	15.4	--	--	--	--	21.3	--	1.9	79.4	--	--	--	--	--	10.8	--	--	--	--	--	5.5	--	--	--	--	--	--	--	--
ATCO	--	--	--	--	--	--	--	--	--	32.7	61.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	--	32.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	52.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	6.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.7	--	--	--	--	12.1	0.4	--	--	--	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	13.8	1.1	9.7	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Air-dry Aboveground Annual Production (g/m2)																																								
Total Production	200.2	26.9	60.2	117.3	279.6	91.3	252.0	278.1	66.4	106.7	104.5	105.3	80.5	103.0	65.2	82.7	113.5	33.9	48.8	173.1	28.8	80.8	84.8	87.2	16.6	54.2	42.3	21.6	68.4	71.4	30.1	154.5	106.6	78.4	41.4	11.7	14.7	14.1	61.6	57.0
Total Air-dry Aboveground Annual Production (lbs/ac)																																								
Total Production	1786	240	536	1046	2494	814	2249	2481	592	953	933	941	718	918	581	737	1012	303	434	1544	258	721	757	777	148	483	378	192	610	636	269	1377	949	699	370	105	130	125	549	508

Notes:
g/m^2 = grams per square meter
lbs/ac = pounds per acre
1 gram per square meter (g/m^2) is equal to 8.922 pounds per acre (lbs/ac)
Species codes defined in Table A-6
Non-forage and forage determinations are based on the permit (e.g. plants of perennial and/or biennial duration are forage and plants of annual duration are non-forage; noxious weeds are non-forage)

Table A-5: M-VMU-1 Shrub Belt Transect Data, 2023

Transect	T01P	T01P	T02P	T03P	T04P	T06P	T07P	T08P	T09P	T10P
Shrubs, Trees and Cacti										
ARLU	--	--	--	10	--	1	--	--	--	11
ATCA2	2	24	18	--	14	1	9	16	3	1
ATCO	--	1	2	--	1	--	--	--	--	--
ATCO4	--	--	16	--	--	--	--	--	--	6
CHGR6	--	--	--	--	--	--	--	--	--	1
EPTR	--	--	3	--	--	--	2	1	--	--
EPVI	--	--	--	--	--	2	--	--	1	--
ERNA10	--	--	--	--	--	2	--	1	--	--
GUSA2	1	--	9	--	1	--	--	1	11	--
KRLA2	--	--	--	--	1	--	1	--	2	--
PUME	--	--	--	24	--	5	--	--	1	--
PUTR2	--	--	--	9	--	--	--	--	--	--
SEFL3	1	--	--	--	--	--	--	--	--	--
SESP3	--	--	--	--	--	--	--	--	2	--
Total	4	25	48	43	17	11	12	19	20	19

Notes:
Species codes defined in Table A-6

Table A-6 : Species Observed 2019-2023, M-VMU-1

Common Name	Scientific Name	Code
Cool-Season Grasses (15)		
Annuals (2)		
Cheatgrass	*Bromus tectorum*	BRTE
Common barley	*Hordeum vulgare*	HOVU
Perennials (13)		
Indian ricegrass	*Achnatherum hymenoides*	ACHY
Crested wheatgrass	*Agropyron cristatum*	AGCR
Smooth brome	*Bromus inermis*	BRIN2
Bottlebrush squirreltail	*Elymus elymoides*	ELEL5
Thickspike wheatgrass	*Elymus lanceolatus*	ELLA3
Thickspike wheatgrass	*Elymus lanceolatus* ssp. *lanceolatus*	ELLAL
Slender wheatgrass	*Elymus trachycaulus*	ELTR7
Needle and thread	*Hesperostipa comata*	HECO26
Western wheatgrass	*Pascopyrum smithii*	PASM
Russian wildrye	*Psathyrostachys juncea*	PSJU3
Bluebunch wheatgrass	*Pseudoroegneria spicata*	PSSP6
Intermediate wheatgrass	*Thinopyrum intermedium*	THIN6
Tall wheatgrass	*Thinopyrum ponticum*	THPO7
Warm-Season Grasses (6)		
Perennials (6)		
Purple threeawn	*Aristida purpurea*	ARPU9
Sideoats grama	*Bouteloua curtipendula*	BOCU
Blue grama	*Bouteloua gracilis*	BOGR2
James' galleta	*Pleuraphis jamesii*	PLJA
Alkali sacaton	*Sporobolus airoides*	SPAI
Sand dropseed	***Sporobolus cryptandrus***	**SPCR**
Forbs (39)		
Annuals (15)		
Burningbush	*Bassia scoparia*	BASC5
Ribseed sandmat	*Chamaesyce glyptosperma*	CHGL13
Threadstem sandmat	***Chamaesyce revoluta***	**CHRE4**
Mealy goosefoot	*Chenopodium incanum*	CHIN2
Narrowleaf goosefoot	*Chenopodium leptophyllum*	CHLE4
Lambsquarters	*Chenopodium album*	CHAL7
Fetid marigold	***Dyssodia papposa***	**DYPA**
Common sunflower	*Helianthus annuus*	HEAN3
Longleaf false goldeneye	*Heliomeris longifolia*	HELO6
Shortstem lupine	***Lupinus brevicaulis***	**LUBR2**
Fendler's desertdandelion	*Malacothrix fendleri*	MAFE
Little hogweed	*Portulaca oleracea*	POOL
Prickly Russian thistle	*Salsola tragus*	SATR12
Unknown annual forb	Unknown Annual Forb	UNKAF
Golden crownbeard	*Verbesina encelioides*	VEEN

Table A-6 : Species Observed 2019-2023, M-VMU-1

Common Name	Scientific Name	Code
Perennials/Biennials (24)		
Common yarrow	*Achillea millefolium*	ACMI2
Slimstalk spiderling	*Boerhavia gracillima*	BOGR
Unknown Boraginaceae Species	*Boraginaceae* sp.	BORAGI
Rose heath	*Chaetopappa ericoides*	CHER2
Whitemargin sandmat	*Chamaesyce albomarginata*	CHAL11
Chenopod	*Chenopodiaceae*	CHENOP
Flixweed	*Descurainia sophia*	DESO
Trailing fleabane	*Erigeron flagellaris*	ERFL
Redstem stork's bill	*Erodium cicutarium*	ERCI6
Curlycup gumweed	*Grindelia squarrosa*	GRSQ
Flatspine stickseed	*Lappula occidentalis*	LAOC3
Lewis flax	*Linum lewisii*	LILE3
Hoary tansyaster	*Machaeranthera canescens*	MACA2
Sweetclover	*Melilotus officinalis*	MEOF
Colorado four o'clock	*Mirabilis multiflora*	MIMU
Palmer's penstemon	*Penstemon palmeri*	PEPA8
Upright prairie coneflower	*Ratibida columnifera*	RACO3
Cutleaf vipergrass	***Scorzonera laciniata***	**SCLA6**
Tall tumblemustard	*Sisymbrium altissimum*	SIAL2
Silverleaf nightshade	*Solanum elaeagnifolium*	SOEL
Scarlet globemallow	*Sphaeralcea coccinea*	SPCO
Fendler's globemallow	*Sphaeralcea fendleri*	SPFE
Yellow salsify	*Tragopogon dubius*	TRDU
Salsify	*Tragopogon porrifolius*	TRPO

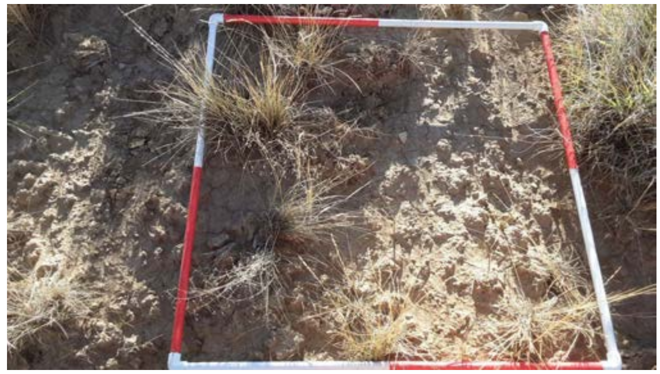
Table A-6 : Species Observed 2019-2023, M-VMU-1

Common Name	Scientific Name	Code
Shrubs, Trees and Cacti (21)		
Prairie sagewort	*Artemisia frigida*	ARFR4
White sagebrush	*Artemisia ludoviciana*	ARLU
Big sagebrush	*Artemisia tridentata*	ARTR2
Fourwing saltbush	*Atriplex canescens*	ATCA2
Shadscale saltbush	*Atriplex confertifolia*	ATCO
Mat saltbush	*Atriplex corrugata*	ATCO4
Gardner's saltbush	*Atriplex gardneri*	ATGA
Greene's rabbitbrush	*Chrysothamnus greenei*	CHGR6
Longleaf jointfir	*Ephedra trifurca*	EPTR
Mormon tea	*Ephedra viridis*	EPVI
Rubber rabbitbrush	*Ericameria nauseosa*	ERNA10
Broom snakeweed	*Gutierrezia sarothrae*	GUSA2
Winterfat	*Krascheninnikovia lanata*	KRLA2
Pale desert-thorn	*Lycium pallidum*	LYPA
Plains pricklypear	*Opuntia polyacantha*	OPPO
Eastern cottonwood	*Populus deltoides*	PODE2
Mexican cliffrose	*Purshia mexicana*	PUME
Antelope bitterbrush	*Purshia tridentata*	PUTR2
Threadleaf ragwort	***Senecio flaccidus***	**SEFL3**
Broom-like ragwort	***Senecio spartioides***	**SESP3**
Banana yucca	*Yucca baccata*	YUBA

Notes:
Bold species are newly observed on M-VMU-1 in 2023

APPENDIX B

Quadrat Photographs

M-VMU-1-T01P	
	
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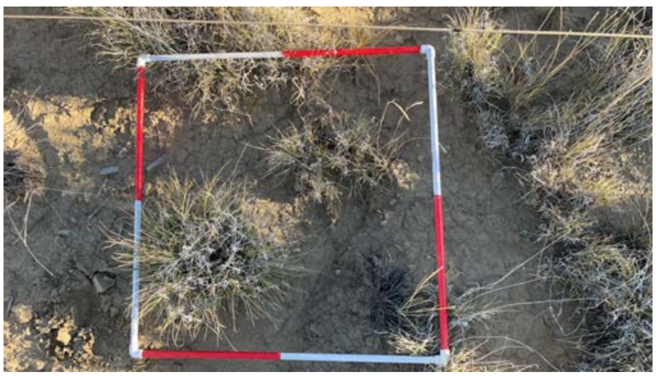	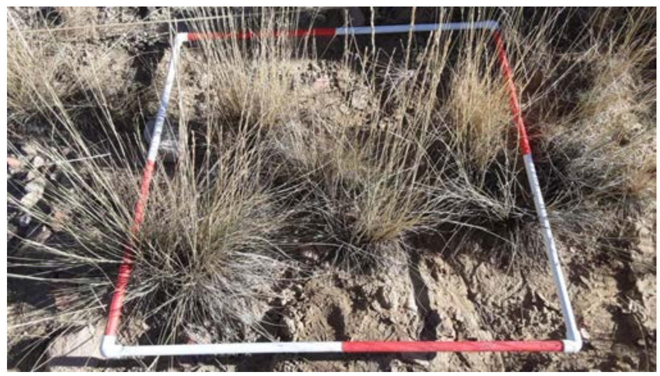
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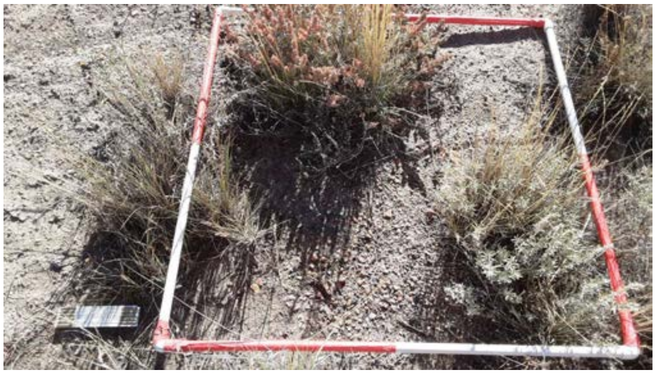
T01P	

M-VMU-1-T02P	
	
Q1	Q2
	
Q3	Q4
	
T02P	

M-VMU-1-T03P

Q1



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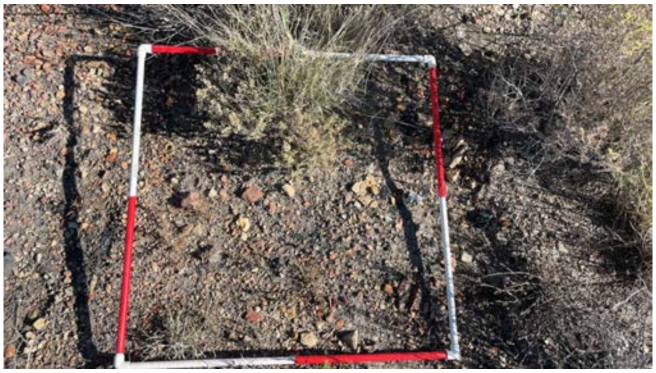


Q3

Q4

T03P

M-VMU-1-T04P	
	
Q1	Q2
	
Q3	Q4
	
T04P	

M-VMU-1-T05P

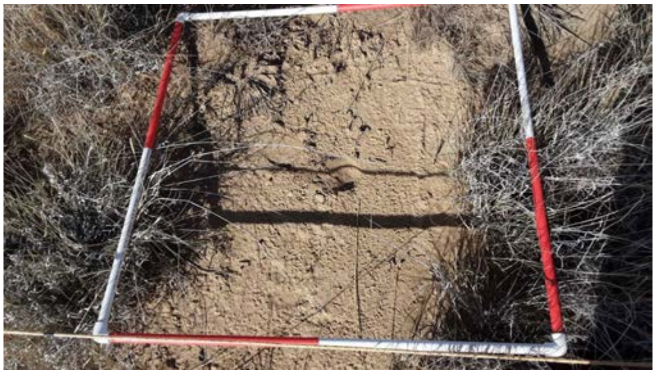
Q1

Q2

Q3

Q4

T05P

M-VMU-1-T06P	
	
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Q3	Q4
	
T06P	

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	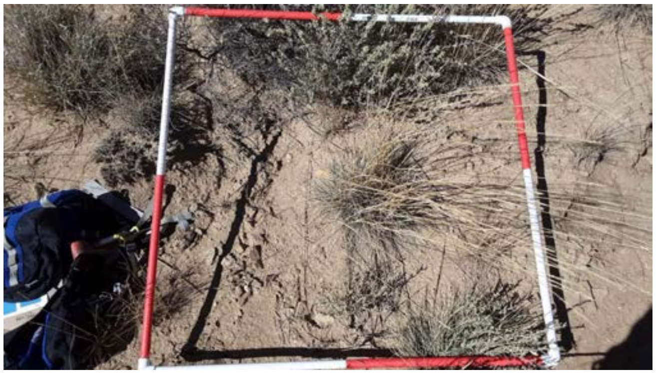
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Q3	Q4
	
T07P	

M-VMU-1-T08P	
	
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	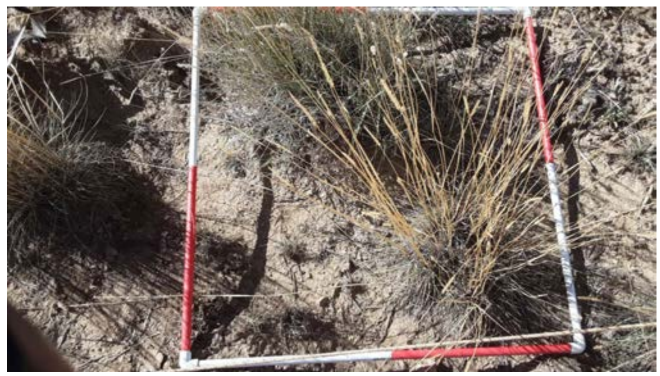
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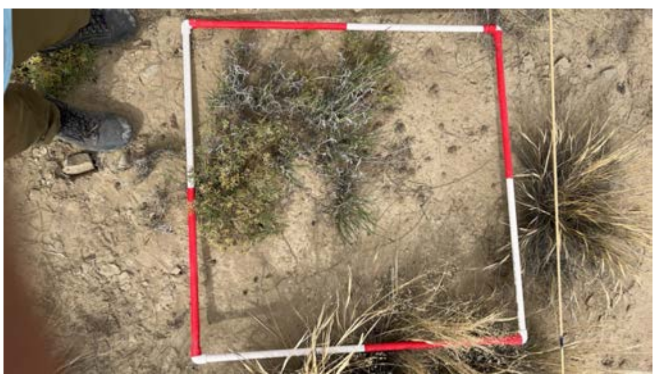
T08P	

M-VMU-1-T09P

Q1

Q2



Q3

Q4

T09P

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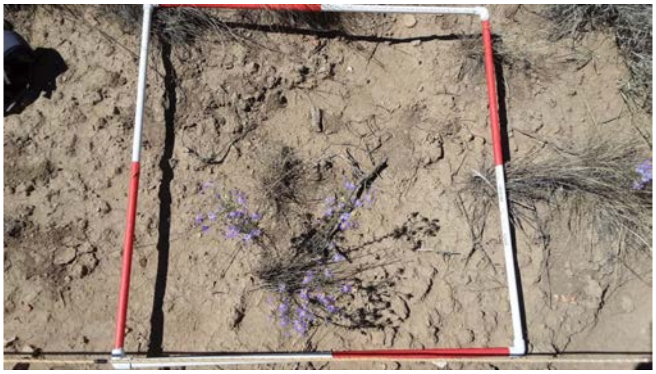
<tr><td></td><td></td></tr>
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APPENDIX C

Vegetation Statistical Analysis

Table C-1: Data for Normal Distribution and Variance Analysis, M-VMU-1, 2023

Transect	Quadrat	Raw Values			Log Values	
		Perennial/ Biennial Cover (%)	Annual Forage Production (lbs/ac)	Woody Plant Density (#/ac)	P/B Cover	AFP
M-VMU-1-T01	1	68	1786	540	1.83	3.25
	2	16	240		1.19	2.38
	3	35	537		1.54	2.73
	4	32	1046		1.50	3.02
M-VMU-1-T02P	1	97	2494	3372	1.99	3.40
	2	31	815		1.49	2.91
	3	90	2249		1.95	3.35
	4	85	2480		1.93	3.39
M-VMU-1-T03P	1	16	592	6475	1.20	2.77
	2	48	953		1.68	2.98
	3	18	933		1.24	2.97
	4	36	940		1.56	2.97
M-VMU-1-T04P	1	22	718	5800	1.33	2.86
	2	53	919		1.72	2.96
	3	25	581		1.40	2.76
	4	44	737		1.64	2.87
M-VMU-1-T05P	1	50	1013	2293	1.70	3.01
	2	25	303		1.40	2.48
	3	23	435		1.36	2.64
	4	49	1545		1.69	3.19
M-VMU-1-T06P	1	9	258	1484	0.93	2.41
	2	14	721		1.15	2.86
	3	30	756		1.48	2.88
	4	32	778		1.50	2.89
M-VMU-1-T07P	1	7	148	1619	0.82	2.17
	2	15	483		1.18	2.68
	3	22	378		1.34	2.58
	4	18	192		1.26	2.29
M-VMU-1-T08P	1	33	610	2563	1.52	2.79
	2	15	636		1.18	2.80
	3	15	269		1.18	2.43
	4	44	1378		1.64	3.14
M-VMU-1-T09P	1	57	950	2698	1.75	2.98
	2	51	699		1.71	2.85
	3	17	369		1.22	2.57
	4	9	104		0.94	2.02
M-VMU-1-T10P	1	5	131	2563	0.67	2.12
	2	3	126		0.53	2.10
	3	49	549		1.69	2.74
	4	30	508		1.48	2.71
Mean		33.3	784.0	2,941	1.41	2.77
Standard Deviation		22.9	602.6	1,864	0.34	0.35
Count		40	40	10	40	40
Variance (sample)		526	363,128	3,472,749	0.11	0.12
90% Confidence Interval		6.0	156.7	969.4	0.09	0.09
Technical Standard		15	350	150	1.18	2.54
90% of Standard		13.5	315	135	1.06	2.29

Notes:

2023 Data are found in Appendix A

All Appendix C analysis, tables, and figures computed using R software: (R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/

Table C-2: Log Perennial/ Biennial Canopy Cover, M-VMU-1, 2023, Method 3 - CMRP

$$t^* = \frac{\bar{x} \; - 0.9\ (technical\ std)}{s/\sqrt{n}}$$

2023 Log Perennial/Biennial Canopy Cover (%)	
Mean	1.41
Standard Deviation	0.34
Sample Size	40
Technical Standard	1.18
t*	6.67
1-tail t (0.1, 39)	1.304

Notes:

Decision Rules (reverse null)

t < t (1-a; n-1), failure to meet std*

t ≥ t (1-a; n-1), performance std met*

t from Appendix Table C-1 (MMD, 1999)

t*(6.67) ≥ t (1.304), **performance standard is met**

Table C-3: Log Annual Forage Production, M-VMU-1, 2023, Method 3 - CMRP

$$t^* = \frac{\bar{x} \ - 0.9\ (technical\ std)}{s/\sqrt{n}}$$

2023 Log Annual Forage Production (lbs/ac)	
Mean	2.77
Standard Deviation	0.35
Sample Size	40
Technical Standard	2.54
t*	5.02
1-tail t (0.1, 39)	1.304

Notes:

Decision Rules (reverse null)

t < t (1-a; n-1), failure to meet std*

t ≥ t (1-a; n-1), performance std met*

t from Appendix Table C-1 (MMD, 1999)

t*(5.02) ≥ t (1.304), **performance standard is met**

Table C-4: Shrub Density by the Belt Transect Method, M-VMU-1, 2023, Method 3 - CMRP

$$t^* = \frac{\bar{x} - 0.9\,(technical\ std)}{s/\sqrt{n}}$$

2023 Woody Plant Density (#/ac)	
Mean (#/ac)	2,941
Standard Deviation (#/ac)	1,864
Sample Size	10
Technical Standard (#/ac)	150
t*	4.76
1-tail t (0.1, 9)	1.383

Notes:

#/ac = Number of shrubs, trees and/or cacti per acre

Decision Rules (reverse null)

t < t (1-a; n-1), failure to meet std*

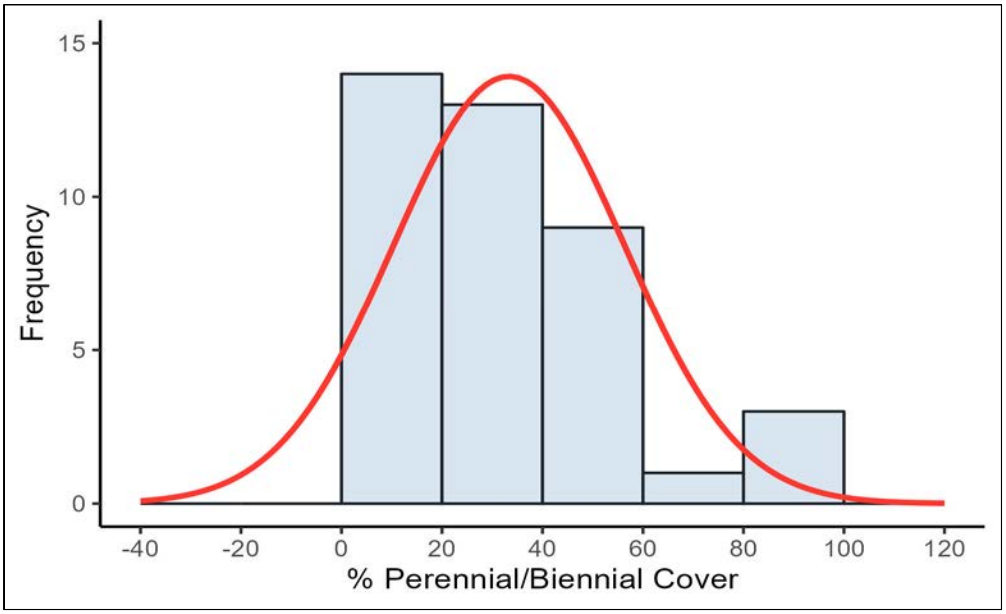
t ≥ t (1-a; n-1), performance std met*

t from Appendix Table C-1 (MMD, 1999)

t*(4.74) ≥ t (1.304), **performance standard is met**

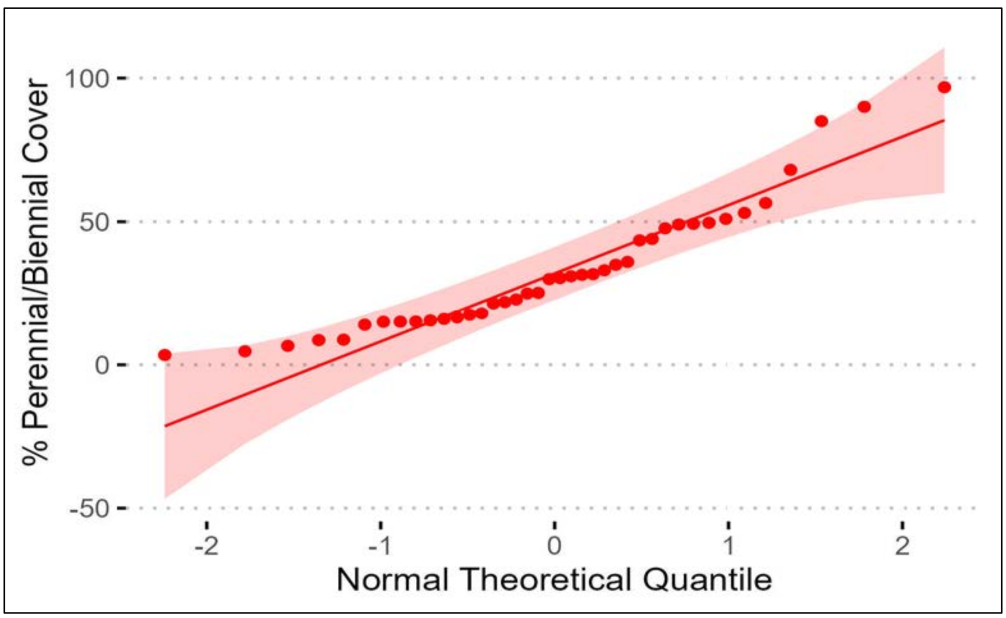
Figure C-1: Perennial/Biennial Canopy Cover, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	33.34	27.38	39.30	4	23	1.05	0.58	15.90	30.18	48.03

Normality



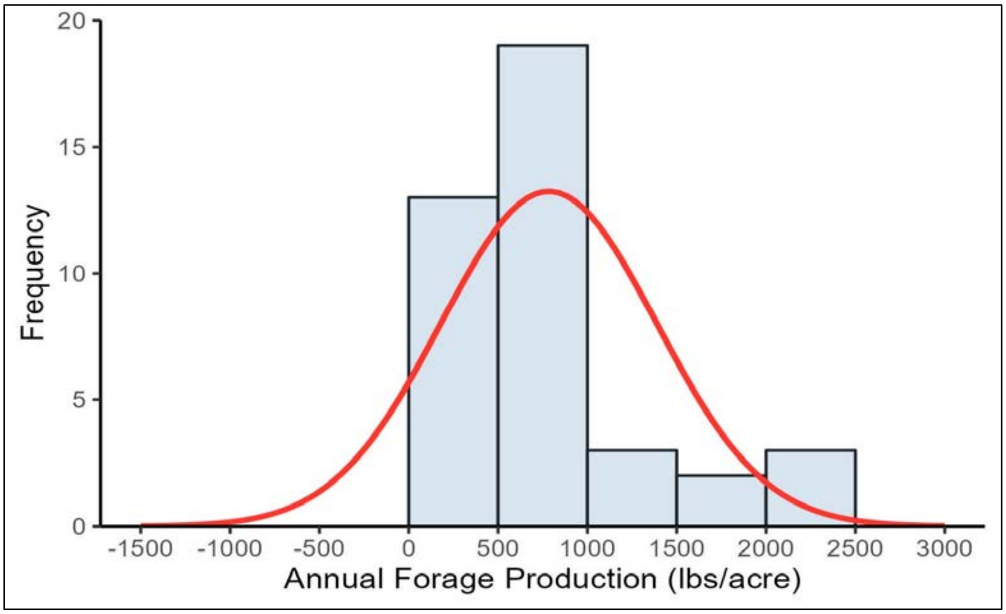
Shapiro-Wilk Test

W statistic	P-value
0.90098	0.002042

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P≤ 0.1)
(Data are not normally distributed)

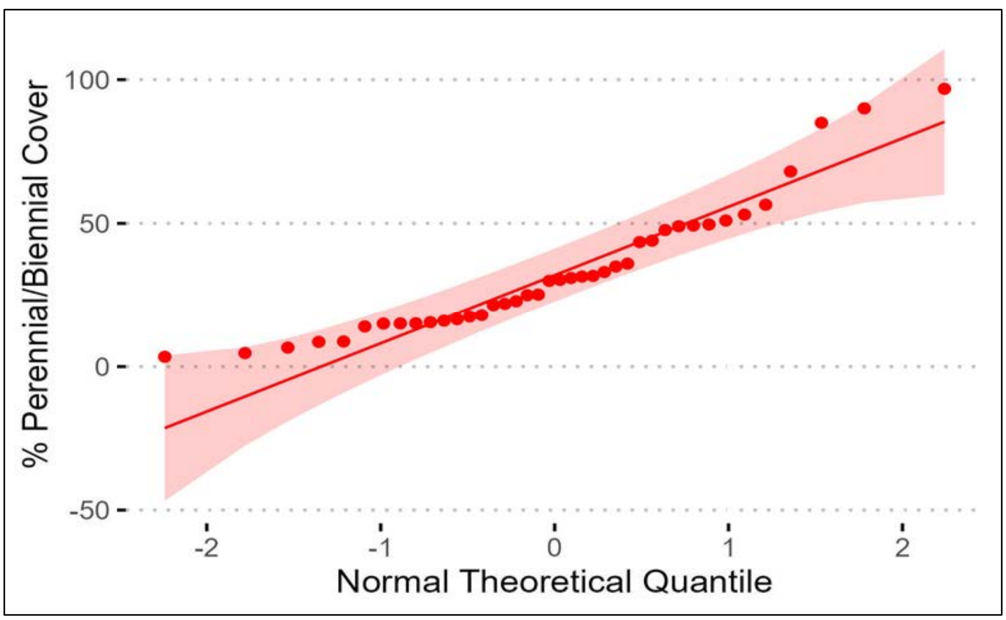
Figure C-2: Annual Forage Production, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	784	627.27	940.74	95	##	1.43	1.58	375.71	667.87	942.47

Normality



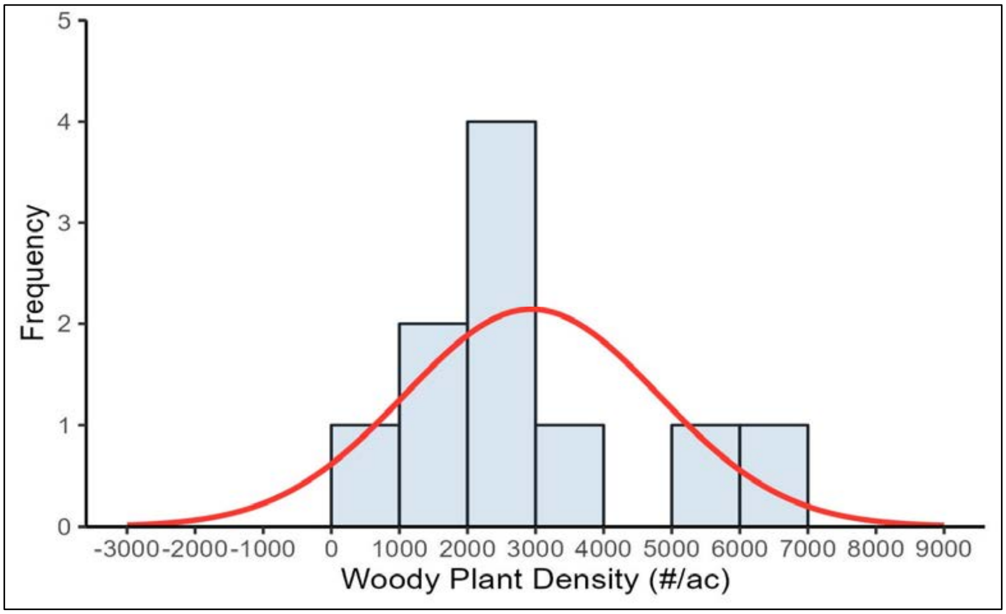
Shapiro-Wilk Test

W statistic	P-value
0.83708	0.000044

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P≤ 0.1)
(Data are not normally distributed)

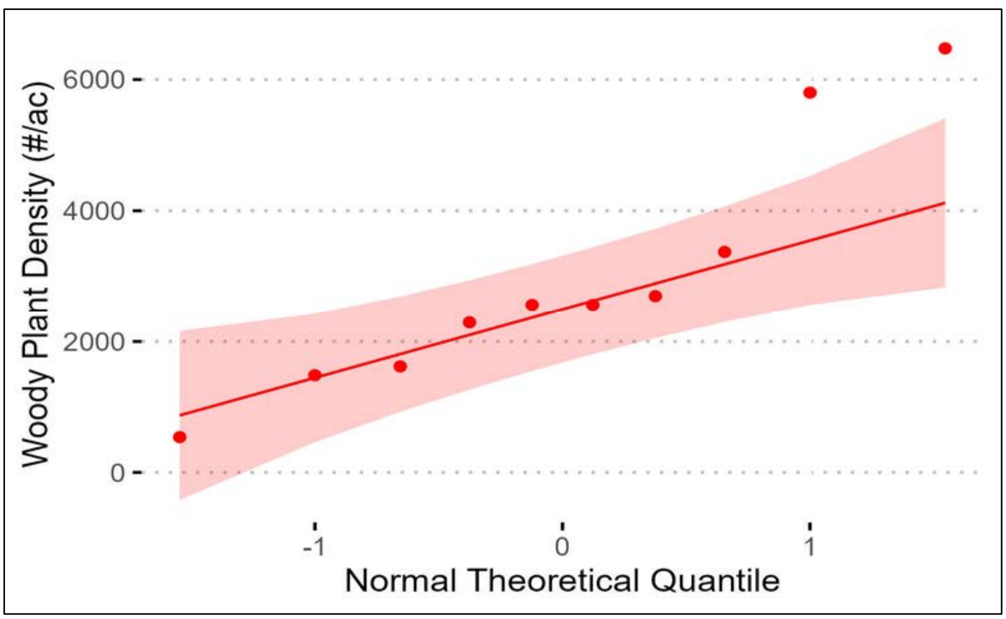
Figure C-3: Woody Plant Density, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
10	2940.72	1971.32	3910.12	589.30	1863.53	0.74	-0.81	1787.36	2563.01	3203.76

Normality



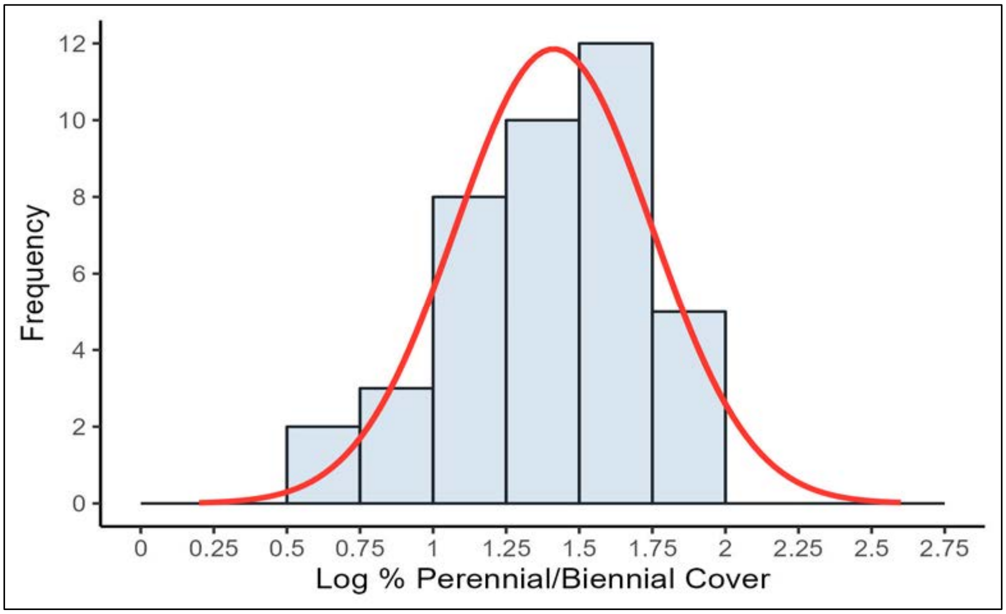
Shapiro-Wilk Test

W statistic	P-value
0.88215	0.13812

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Fail to reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P≥ 0.1)
(Data are normally distributed)

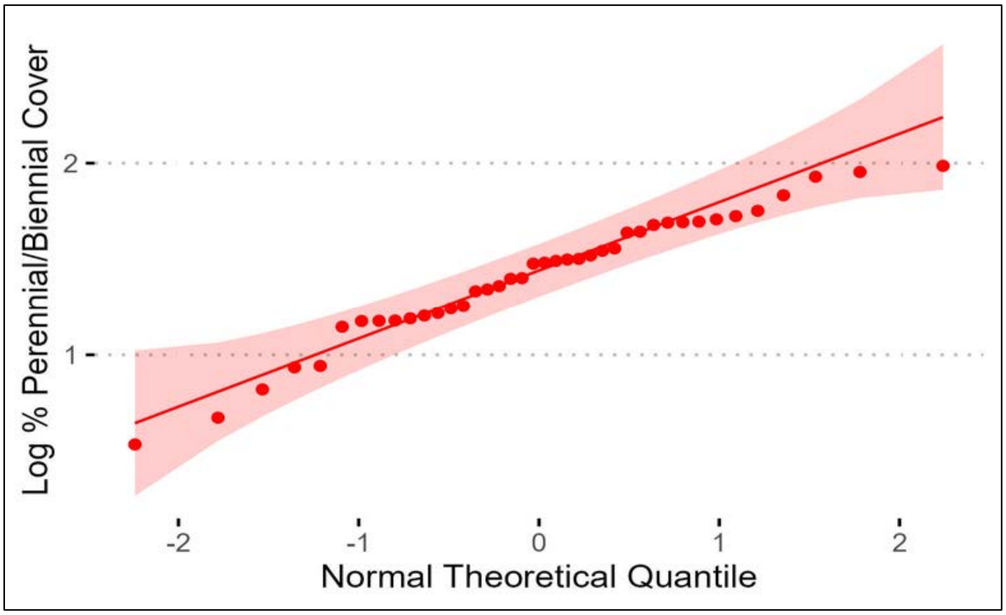
Figure C-4: Log Perennial/Biennial Canopy Cover, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	1.413	1.33	1.50	0	0	-0.55	-0.06	1.20	1.48	1.68

Normality



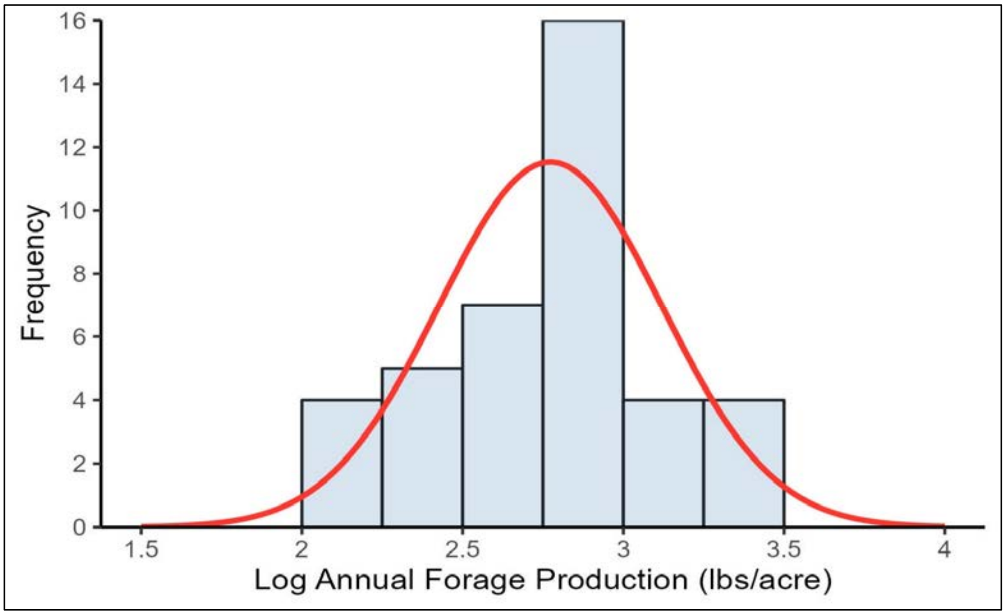
Shapiro-Wilk Test

W statistic	P-value
0.96559	0.25880

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Fail to reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P≥ 0.1)
(Data are normally distributed)

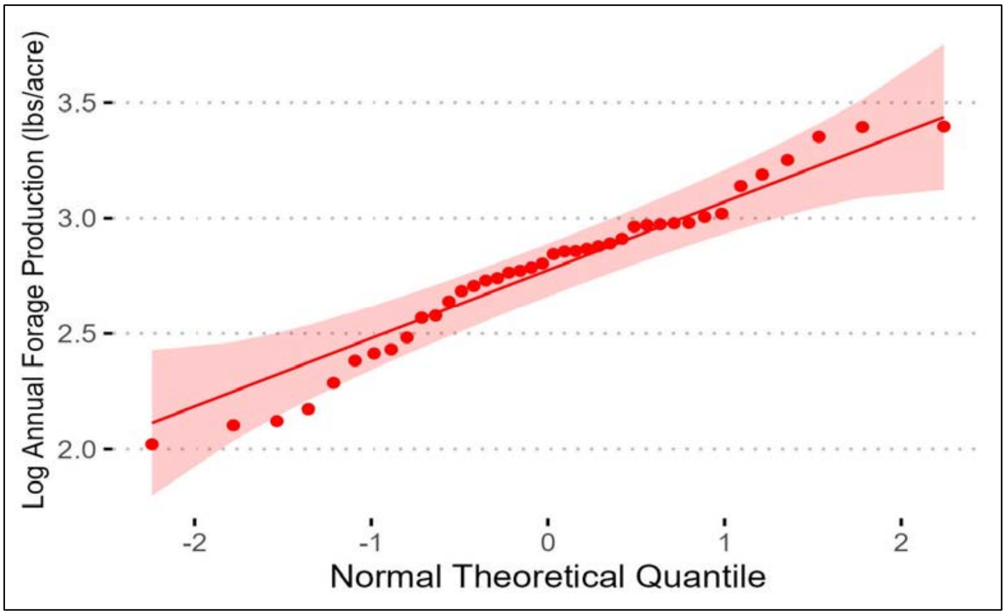
Figure C-5: Log Annual Forage Production, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	2.773	2.68	2.86	0	0	-0.33	-0.42	2.58	2.82	2.97

Normality



Shapiro-Wilk Test

W statistic	P-value
0.96571	0.261075

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Fail to reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P≥ 0.1)
(Data are normally distributed)

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REPORT

Vegetation Management Unit 1 Vegetation Success Monitoring, 2024

McKinley Mine, New Mexico - Mining and Minerals Division Permit Area

Submitted to:

Chevron Environmental Management Company

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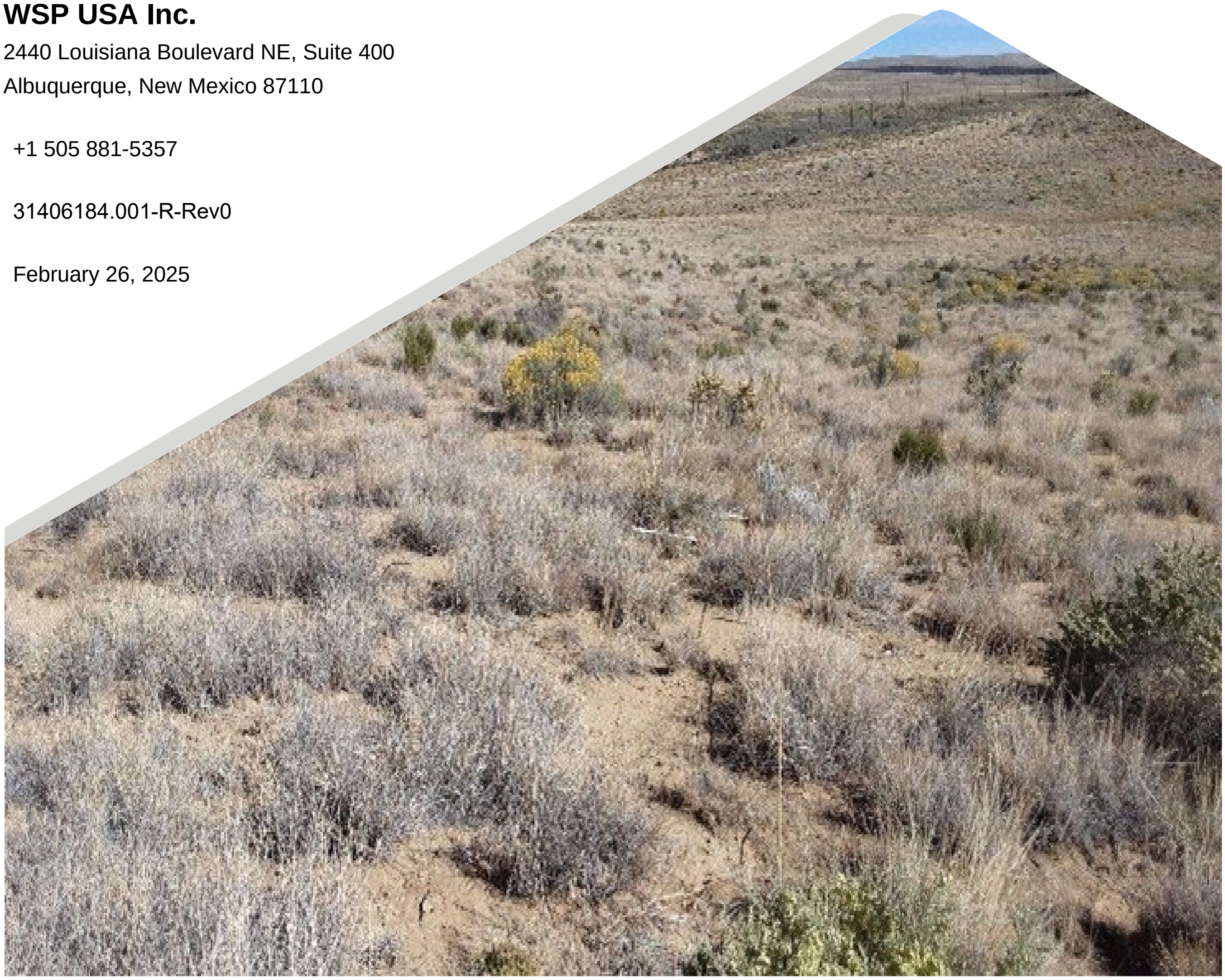
February 26, 2025



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1.0 INTRODUCTION

Mining was completed in New Mexico Mining and Minerals Division (MMD) jurisdictional lands at the McKinley Mine in 2007 (also referred to as the South Mine); most of the land is reclaimed, with only the facilities remaining. The lands mined and reclaimed included prelaw, initial-program, and permanent-program lands. Liability release has been completed on all prelaw and initial-program lands, and full bond release on a limited amount of permanent-program land.

Chevron Mining Inc. (CMI) is assessing the vegetation in the remaining permanent program reclaimed areas in anticipation of future bond and liability releases. CMI understands the importance of returning the mined lands to productive traditional uses in a timely manner. To qualify for release, the lands must be in a condition that is as good as or better than the pre-mine conditions, stable, and capable of supporting the designated postmining land use of grazing and wildlife. To make that demonstration for bond and liability release, the reclaimed land must meet the revegetation success standards contained in Permit No. 2016-02 (Permit). The extended period of responsibility before an application for bond and liability release can be submitted for a given area in the permit is at least ten years after the last major seeding effort. WSP USA Inc. (WSP) was retained to monitor and assess the success of the vegetation relative to these requirements.

1.1 Vegetation Management Unit 1

This report presents results from 2024 quantitative vegetation monitoring conducted in Vegetation Management Unit 1 (M-VMU-1), comprising about 839 acres within Area 10 and the railroad corridor west of Area 10 (Figure 1). The configuration of the M-VMU -1 was developed in consultation with MMD. The elevation in this area ranges from about 6,700 to 7,000 feet above mean sea level.

Permanent program reclamation in Area 10 started on lands disturbed after 1986 and reclamation generally was completed by 2013. The railroad corridor was also reclaimed to meet permanent programs standards in accordance with the Permit and completed in 2014. The reclamation in the majority of M-VMU-1 ranges in age approximately 10 to 30 years.

The following subsection provides a general description of the reclamation activities that were implemented. Additional details of the reclamation for specific areas can be obtained through review of McKinley's annual reports.

1.2 Reclamation and Revegetation Procedures

Reclamation methods applied in Area 10 included grading of the spoils to achieve a stable configuration, positive drainage, and approximate original contour. Graded spoil monitoring was then conducted to verify that the upper 42 inches of spoil was suitable for plant growth. A minimum of 6 inches of topdressing (topsoil or topsoil substitute) was then applied over suitable spoils.

The railroad corridor was graded to the contours approved in the Permit (Section 5.9), which were designed to blend in with the undisturbed areas and within the limits of the disturbed corridor. In accordance with the plan in the Permit, the planting medium was either in situ or hauled-in neutral dressing.

After topdressing placement, the surfaces were scarified in preparation for planting. Seeding was done using various implements that drilled and/or broadcast the seed. After the seeding, mulch consisting of either hay or straw was applied at a rate of about 2 tons/acre. The mulch was anchored 3 to 4 inches into the soil with a tractor-drawn straight coulter disc. The seeding was generally performed in the fall, which coincided with logical units for seeding that had been top-dressed over the spring and summer. Seed mixes used at McKinley have varied over time but included both warm- and cool-season grasses, introduced and native forbs, and shrubs. The early seed mixes tended to emphasize the use of alfalfa and cool-season grasses. Over time the seed mixes shifted to include more warm-season grasses and a broader variety of native forbs.

1.3 Prevailing Climate Conditions

The amount and distribution of precipitation are important determinants for vegetation establishment and performance at the McKinley Mine. Once vegetation is established, the precipitation dynamics affect the amount of vegetation cover and biomass on a year-to-year basis, with grasses and forbs showing the most immediate response. Precipitation has been monitored specifically in M-VMU-1 since 2015 with the Rain 10 gauge.

Table 1 contains a summary of precipitation recorded at all the rain gauges for the South Mine. Total annual precipitation for many of the rain gauges is unavailable as they are taken offline due to freezing conditions from December through March. Growing season precipitation was available for most gauges and provides context to evaluate vegetation performance in M-VMU-1. The departure of growing season precipitation (April through September) between the Rain 10 gauge and the Window Rock (1937-1999) long-term seasonal mean is illustrated in Figure 2. Growing season precipitation in M-VMU-1 was below the long-term seasonal mean from 2016 to 2021 with a severe drought in 2020 when the site only received 20% of the normal growing season precipitation for the region. In 2022, M-VMU-1 growing season precipitation was about 45% above the long-term average. In 2023, growing season precipitation measured at the Rain 10 gauge was 59% of the long-term average. This dry period extended into 2024, although with reduced severity; growing season precipitation was about 83% of the long-term average at Rain 10. June's heavy rainfall accounted for nearly 50% of the total growing season precipitation, while all other growing season months were at or below their monthly long-term average. Winter precipitation measured at the South Tipple and North Bluff stations was similar and indicated slightly higher than average rainfall levels in 2024 with a particularly wet March. Over the past ten years, growing season precipitation measured at the Rain 10 gauge was on average 20% below regional norms.

1.4 Objectives

This report documents the measured vegetation community attributes in M-VMU-1 and compares them to the Permit's revegetation success criteria. Section 2 describes the Permit vegetation monitoring methods that were used in 2024. Section 3 presents the results of the investigation with respect to ground cover, annual production, shrub density, and composition and diversity. Section 4 is a summary of the results for M-VMU-1 with emphasis on vegetation success.

2.0 VEGETATION MONITORING METHODS

Vegetation attributes on M-VMU-1 in Area 10 were quantified using the methods described in Section 6.5 of the Permit. Fieldwork was conducted at the end of the growing season, but prior to the first killing frost, and was completed between September 24 and 27, 2024.

2.1 Sampling Design

A systematic random sampling procedure employing a transect/quadrat system was used to select sample sites within the reclaimed area. The proposed transect locations were reviewed with MMD in advance of sampling. A 50-square-foot grid was imposed over the VMU to delineate vegetation sample plots, and random points created in a geographic information system were used to select plots for vegetation sampling. The locations of randomly selected vegetation plots are shown on Figure 3. In the field, if the transect location was determined to be unsuitable, the next alternative location was assessed for suitability. Unsuitable transects were those that fell on or would intersect roads, drainage ways, wildlife rock piles, or prairie dog colonies. However, this did not occur in 2024 at M-MVU-1.

Transects originated from the southeastern corner of the vegetation plot. Each transect was 30 meters (m) long in a dog leg pattern (Figure 4). Four 1-m^2 quadrats were located at predetermined intervals along the transect for quantitative vegetation measurements. Each quadrat is considered an individual sample where measurements were made of production, total canopy, species canopy and basal cover, surface litter, surface rock fragments, and bare soil as discussed below.

2.2 Vegetation and Ground Cover

Relative and total canopy cover, basal cover, surface litter, rock fragments, and bare soil were estimated for each quadrat. Canopy cover, excluding annuals, is the ground cover metric used in standards assessments. Canopy cover estimates include the foliage and foliage interspaces of all individual plants rooted in the quadrat. Canopy cover is defined as the percentage of quadrat area included in the vertical projection of the canopy. Total vegetation cover does not differentiate by species and is estimated in the field along with surface litter, rock fragments, and bare soil to total 100%. Conversely, perennial/biennial canopy cover is calculated from the data rather than estimated in the field due to operational challenges with segregating the cover of non-weedy species. Perennial/biennial canopy cover is made on a species basis and may exceed 100% in individual quadrats where the vegetation has multi-layered canopies and individual species overlap one another.

Basal cover is defined as the proportion of the ground occupied by the crowns of grasses and rooting stems of forbs and shrubs. Basal cover estimates were also made for surface litter, rock fragments, and bare soil. Like the total cover estimates, the basal cover estimates do not exceed 100%. Percent area cards were used to increase the accuracy and consistency of the cover estimates. Plant frequency was determined on a species-basis by counting the number of individual plants rooted in each quadrat.

2.3 Annual Forage and Biomass Production

Production was determined by clipping and weighing all annual (current year's growth) above-ground biomass within the vertical confines of a 1-m^2 quadrat. Grasses and forbs were clipped to within 5 centimeters (cm) of the soil surface, and the current year's growth was segregated from the previous year's growth (e.g., gray, weathered grass leaves and dried culms). For this sampling event, plants that were less than 5 cm tall or considered volumetrically insignificant were not collected. Production from shrubs was determined by clipping the current year's growth.

The plant biomass samples of every species collected were placed individually in labeled paper bags. The plant tissue samples were air-dried (> 90 days) until no weight changes were observed with repeated measurements on representative samples. The average tare weight of the empty paper bags was determined to correct the total sample weight to air-dry vegetation weights. The net weight of the air-dried vegetation was converted to a pounds per acre (lbs/ac) basis.

2.4 Shrub Density

Shrub density, or the number of plants per square meter, was determined using the frequency count data from the quadrats and the belt transect method (Bonham 1989). The shrub density calculation used to evaluate the performance standard uses belt transect shrub density data collected from a 1-meter-wide; 30-meter-long belt transect situated along the perimeter of the dog-legged transect (Figure 4). Shrubs rooted in the belt transect were counted on a species basis.

Shrub density was also calculated from the quadrat data by dividing the total number of individual plants counted by the number of quadrats sampled. The density per square meter from the quadrats was converted to density per acre, but this information is not used to evaluate revegetation success.

2.5 Statistical Analysis and Sample Adequacy

The procedures for financial assurance release as described in the Coal Mine Reclamation Program (CMRP), Vegetation Standards (MMD 1999), and the Permit, guided this statistical analysis. Statistical tests were performed using both Microsoft® Excel and R statistical software (version 4.4.2). The normality of each dataset was first assessed using the Shapiro-Wilk test to determine the appropriate hypothesis test method (i.e., parametric versus nonparametric). Data were considered normal when the test statistic was significant (p-value > 0.10) for alpha (α) = 0.10. Thus, the null hypothesis that the population is normally distributed was accepted if the p-value > 0.10. In cases where the data were not normally distributed, a log transformation was applied to see if it normalized the data.

All hypothesis testing used to demonstrate the vegetation success standards were met was conducted using a reverse null approach. Because vegetation performance at McKinley is compared to technical standards, the one-sample, one-sided t-test (CMRP Method 3) is used for normally distributed data to evaluate the mean and the one-sample, one-sided sign test (CMRP Method 5) to analyze the data that are not normal (MMD 1999; McDonald and Howlin 2013). The one-sided hypothesis tests using the reverse null approach were designed as follows:

Perennial/Biennial Canopy Cover

H_0: Reclaim < 90% of the Technical Standard (15%)

H_a: Reclaim ≥ 90% of the Technical Standard (15%)

Annual Forage Production

H_0: Reclaim < 90% of the Technical Standard (350 lbs/ac)

H_a: Reclaim ≥ 90% of the Technical Standard (350 lbs/ac)

Shrub Density

H_0: Reclaim < 90% of the Technical Standard (150 stems per acre [stems/ac])

H_a: Reclaim ≥ 90% of the Technical Standard (150 stems/ac)

where H_0 is the null hypothesis, that the parameter mean of the reclaimed area is less than 90% of the technical standard, and H_a is the alternative hypothesis, that the parameter mean of the reclaimed area is greater than or equal to 90% of the technical standard. All hypothesis tests were performed with a 90% level of confidence.

Under the reverse null test, the revegetation success standard is met when H_0 is rejected, and H_a is accepted. The decision criteria at 90% confidence under the reverse null hypothesis are as follows:

One-sample, one-sided t-test – Method 3 (CMRP)

If $t^* < t_{(1-\alpha;\ n-1)}$, conclude failure to meet the performance standard

If $t^* \geq t_{(1-\alpha;\ n-1)}$, conclude that the performance standard was met

One-sample, one-sided sign test – Method 5 (CMRP)

If P > 0.10, conclude failure to meet the performance standard

If P ≤ 0.10, conclude that the performance standard was met

Statistical hypothesis testing was performed on perennial/biennial cover, annual forage production, and shrub density using the one-sample, one-sided t-test and the one-sample, one-sided sign test. The hypothesis testing used the reverse null hypothesis bond release testing procedure as described in CMRP Vegetation Standards (MMD 1999).

Statistical adequacy is not required for vegetation success demonstrations at McKinley under the reverse null approach but is presented for canopy cover, production, and shrub density data. The number of samples required to characterize a particular vegetation attribute depends on the uniformity of the vegetation and the desired degree of certainty required for the analysis.

The number of samples necessary to meet sample adequacy (N_{min}) was calculated assuming the data were normally distributed using Snedecor and Cochran (1967).

$$N_{min} = \frac{t^2 s^2}{(\bar{x}D)^2}$$

Where N_{min} equals minimum number of samples required, t is the two-tailed t-distribution value based on a 90% level of confidence with n-1 degrees of freedom, s is the standard deviation of the sample data, $\bar{x}$ is the mean, and D is the desired level of accuracy, which is 10 percent of the mean.

It is often impractical to achieve sample adequacy in vegetation monitoring studies based on Snedecor and Cochran's equation and a minimum sample number approach is taken. MMD recognizes the practical limitations of achieving statistical adequacy and has provided minimum sample sizes for various quantitative methods (MMD 1999). With normally distributed data where sample adequacy cannot be met because of operational constraints or for other reasons, 40 samples are often considered adequate. The 40 -sample recommendation is based on an estimate of the number of samples needed for a t-test under a normal distribution (Sokal and Rohlf 1981). Schulz et al. (1961) demonstrated that 30 to 40 samples provide a robust estimate for most cover and density measurements with increased numbers of samples only slightly improving the precision of the estimate.

CMI collected 40 samples based on the guidance discussed above. The 40 samples came from ten transects each having four quadrats as described in Section 2.1. Each quadrat is considered a unique sampling unit. Sample adequacy was calculated to determine the number of samples that would have been required for adequacy by the Snedecor and Cochran equation. Further analysis for sample adequacy of cover, production and density attributes was also demonstrated using a graphical stabilization of the mean method (Clark 2001).

The emphasis on statistical adequacy assumes that parametric tests of normally distributed data will be conducted to demonstrate compliance with the vegetation success standards. It is important to note that normally distributed data and sample adequacy are not required for reverse-null hypothesis testing. Nonparametric hypothesis tests are used to analyze data that are not normally distributed. When sample adequacy is not achieved, it is appropriate to use the reverse null approach for hypothesis testing. The reverse null is also generally recommended to evaluate reclamation success whether N_{min} is met or not (MMD 1999). This is because the reverse null is more defensible (compared to the classic approach) where the rejection of the null hypothesis definitively concludes that the reclamation mean is greater the technical standard (McDonald and Howlin 2013).

3.0 RESULTS

The vegetation community in M-VMU-1 is well established and dominated by perennial plants. A representative photograph of the vegetation and topography in M-VMU-1 is shown in Figure 5. The vegetation cover levels from 2019-2024 demonstrate that this VMU meets the vegetation success standards.

There are vegetation success standards for four parameters: ground cover (i.e., perennial/biennial canopy cover), forage production, diversity, and woody stem stocking (Table 2). The ground cover requirement for live perennial/biennial cover on the reclamation is 15%. The productivity requirement is 350 air-dry lbs/ac perennial/biennial annual forage production. The woody stem stocking success standard is 150 live woody stems/ac.

Diversity is evaluated against numerical guidelines for different growth forms and photosynthetic pathways of the vegetation. In summary, the diversity guideline required by MMD would be met if at least two shrub or subshrub species have individual relative cover values of at least 1%; at least two perennial warm-season grass species have individual relative cover levels of at least 1%; at least one perennial cool-season grass species has an individual relative cover level of at least 1%; and at least three perennial or biennial forb species have a combined relative cover of at least 1%. MMD (1999) allows biennial forbs to be counted toward the standards because they are technically monocarpic (single flowering) perennials that annually produce a significant number of seeds and therefore, as a species, they persist in the reclaimed plant community. Relative cover is the total percent cover of a perennial/biennial species divided by the total perennial/biennial cover of the sampling unit.

Diversity is also demonstrated by evidence of colonization or recruitment of native (not seeded) plants from adjacent undisturbed native areas. Table 3 summarizes the attributes of plants recorded in the quadrats in addition to those encountered or observed but not recorded in the formal quantitative monitoring of M-VMU-1. Recruitment of these native plant species is indicative of ecological succession and the capacity of the site to support a self-sustaining ecosystem.

For Phase III bond release applications, it must be demonstrated that the total annual production and total live cover of biennials and perennials equal or exceed the approved standards for at least two of the last four years of the responsibility period. Shrub density and revegetation diversity must equal or exceed the approved standards during at least one of the two sampling years of the responsibility period (MMD 1999).

The field data for canopy and basal cover, density, production, and shrub density by the belt transect are included in Appendix A. Photographs of the quadrats are included in Appendix B. Appendix C provides the statistical analysis equations, summary data, and statistical outputs for perennial/biennial canopy cover, annual forage production, and shrub density by the belt transect method.

3.1 Ground Cover

Perennial/biennial canopy cover was calculated by summing the perennial/biennial species cover estimates after excluding the annual forbs and grasses. Any recorded noxious weeds are excluded from perennial/biennial cover. Average total ground cover in 2024 in M-VMU-1 was 57.4% comprised of 46.7% total vegetation cover, 3.5%

rock, and 7.2% litter on a canopy cover basis (Table 3). . The perennial/biennial canopy cover performance standard has been met in five of the past six years in M-VMU-1 (Table 4). Consistent with the variability observed in semi-arid rangelands, total vegetation canopy cover in the individual quadrats varied in 2024, ranging from 14.0 to 95.0% (Table A-1). On a basal area basis, average ground cover was 36.5% with 12.9% vegetation, 5.2% rock, and 18.4% litter (Table 3).

The mean perennial/biennial canopy cover in 2024 was 52.5% (± 8.2% 90% confidence interval [90% CI]), higher than all previous years. The calculated minimum sample size needed to meet N_{min} was 106 samples (Table 4). Because N_{min} was not met and called for an unreasonable number of samples, the perennial/biennial canopy cover data were evaluated using a stabilization of the mean approach (Clark 2001). Figure 6 illustrates the stabilization of the estimated mean for perennial/biennial canopy cover based on grouping four sample increments associated with a single transect. The samples were analyzed in four sample increments to allow an estimation of variability. The corresponding variability around the mean is expressed by the 90% CIs for each successive analytical increment. The analysis suggests that the mean remained relatively stable after about 20 samples, with the 90% CI showing very little change after that, suggesting that 40 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of perennial cover.

Applying the Shapiro-Wilk test to the 2024 perennial/biennial canopy cover indicated that the canopy cover data for M-VMU-1 were not normally distributed (Figure C-1). A log transformation of the canopy cover data did not result in a normal distribution (Figure C-4). As a result, hypothesis testing was conducted with a one-sided sign test using the reverse null hypothesis (MMD 1999). The one-sample, one-sided sign test was used to test the mean against 90% of the technical standard of 15% perennial/biennial canopy cover. All 40 quadrats exceeded the technical standard (Table C-2), resulting in a probability (P) of less than 0.1 of observing a Z-value less than -6.17. Therefore, under the reverse null hypothesis, we conclude that the perennial/biennial canopy cover performance standard is met in 2024.

3.2 Production

Productivity for vegetation success is assessed for above-ground annual forage production, excluding annuals and noxious weeds in air dry pounds per acre (lbs/ac). In 2024, average annual forage production was 897 (± 212 90% CI) lbs/acre, exceeding the vegetation success standard of 350 lbs/ac (Table 4). The production standard in M-VMU-1 was also met in 2019 at 719 lbs/ac and in 2023 with 784 lbs/ac. Perennial grass forage species contributed the most with 565 lbs/ac (63% of total forage production) in 2024. The mean perennial forage biomass also includes nine perennial forb species and 10 shrub species (Table 3). Three species, James' galleta (*Pleuraphis jamesii*), alkali sacaton (*Sporobolus airoides*) and fourwing saltbush (*Atriplex canscens*) accounted for over half the forage production in M-VMU-1.

The calculated minimum sample size needed to meet N_{min} at the 90% confidence level for annual forage production was estimated to be 241 samples (Table 4). Because N_{min} was not met and called for an unreasonable number of samples, the data were evaluated using a stabilization of the mean (Clark 2001). Figure 7 illustrates the stabilization of the mean and 90% CI for annual forage production. The analysis suggests that the mean remained relatively stable after about 20 samples, with the 90% CI showing very little change after that, suggesting that 40 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of perennial cover.

The 2024 annual forage production data for M-VMU-1 were not normally distributed (Figure C-2). A log transformation of the data resulted in a normal distribution (Figure C-5), so hypothesis testing was conducted with the log transformed data the one-sample, one-sided t-test using the reverse null hypothesis (MMD 1999). The calculated t*-statistic for M-VMU-1 log transformed annual forage production was 7.71, where the log transformation was applied to the following data: 897 lbs/acre with a standard deviation of 813, the technical standard of 350 lbs per acre, and a sample size of 40. The one-tail $t_{(1-0.1,\ 39)}$ value was 1.304. Therefore, under the reverse null hypothesis ($t^* \geq t_{(1-\alpha;\ n-1)}$), we conclude that the performance standard is met for annual forage production (Table C-3).

3.3 Shrub Density

Shrub density ranged from an average of 2,779 (± 968, 90% CI) stems/ac based on the belt transect method to 11,432 (±4,652, 90% CI) stems/ac with the quadrat method (Table 4). In M-VMU-1, 12 shrub species were encountered in the belt transects (Table A-5) compared to 10 species in quadrats (Table 3). Fourwing saltbush was the most common shrub encountered under both measurement methods, with hairy false golden aster (*Heterotheca villosa*), winterfat (*Krascheninnikovia lanata*), and mat saltbush (*Atriplex corrugata*) also occurring frequently in both methods.

The calculated minimum sample size needed to meet N_{min} at the 90% confidence level for shrub density by belt transect was estimated to be 151 samples (Table 4). Because N_{min} was not met for the M-VMU-1 shrub density and called for an unreasonable number of samples, the shrub density belt transect data were evaluated using a stabilization of the mean (Clark 2001). Figure 8 illustrates the stabilization of the mean and 90% CI for shrub density. The analysis suggests that the mean remained relatively stable after about eight samples, with the 90% CI showing very little change after that, suggesting that 10 samples were more than adequate, and that the collection of additional data would not improve the precision of the estimate of shrub density, which is well above the technical standard.

The shrub density data by the belt transect method were normally distributed (Figure C-3), but N_{min} was not met. Thus, hypotheses testing was conducted using the one-sample, one-sided t-test using the reverse null hypothesis (MMD 1999) on the raw shrub density data. The calculated t*-statistic for M-VMU-1 shrub density was 4.49 with an average of 2,779 stems/ac with a standard deviation of 1,862, the technical standard of 150 stems/ac, and a sample size of 10. The one-tail $t_{(1-0.1,\ 9)}$ value was 1.383, so under the reverse null hypothesis ($t^* \geq t_{(1-\alpha;\ n-1)}$), we conclude that the performance standard is met for shrub density (i.e., woody stem stocking) by the belt transect method (Table C-4).

3.4 Composition and Diversity

Diversity is assessed by comparing the relative cover of various life-forms, based on their duration to the perennial/biennial cover of the vegetation management unit. In this context, relative cover is the average percent cover of a perennial/biennial species divided by the mean perennial/biennial cover of the sampling unit. Relative canopy cover of individual species contributing to perennial cover is listed in Table 3. To date, the entire diversity suite was achieved in 2022 and 2024, with low relative cover for perennial/biennial forbs in 2020 and 2023, and warm-season grasses in 2019 and 2021.

Collectively, 13 perennial grasses comprised the canopy cover in M-VMU-1 with a combined relative canopy cover of about 70%. The warm season grass James galleta comprised the highest cover of all grasses, followed by the cool season Indian ricegrass (*Achnatherum hymenoides*) and warm season alkali sacaton (*Sporobolus airoides*) (Table 3). Ten shrubs combined to total 27% relative cover, with four-wing saltbush comprising the highest cover. Nine perennial/biennial forbs contributed 3% relative canopy cover.

Table 5 provides the diversity results for M-VMU-1 for 2019 through 2024 and is summarized below.

- The diversity standard for shrubs was achieved by six species that exceed the 1% relative cover standard, with fourwing saltbush (17.26%) and hairy golden aster (3.66%) providing the most cover.
- The diversity standard for warm-season grasses was met by three species that exceed 1% relative cover, including James' galleta (17.25%), alkali sacaton (11.27%) and blue grama (*Bouteloua gracilis*, 1.76%).
- The diversity standard for cool-season grasses is achieved by seven species that exceed 1% relative cover, including Indian ricegrass (11.37%), Russian wildrye (*Psathrostachys juncea*, 10.67%), and western wheatgrass (*Pascopyrum smithii*, 6.22%).
- The diversity standard for forbs requires a minimum of three non-annual forb taxa combining to contribute at least 1% relative cover. The combined relative cover of nine non-annual forbs was 3.00% and included sweetclover (*Melilotus officinalis*, 1.76%), Palmer's penstemon (*Penstemon palmeri*, 0.29%), and upright prairie coneflower (*Ratibida columnifera*, 0.29%). Based on 2024 sampling, the combined relative cover for all nine non-annual forbs was greater than 1%, meeting the forb diversity standard.

The recruitment of native plants and establishment of seeded species within M-VMU-1 is indicative of ecological succession and the capacity of the site to support a diverse and self-sustaining ecosystem. Over the past four years, 81 unique species have been identified on M-VMU-1. In 2024 vegetation surveys, 36 different plant species were present within the reclamation areas of M-VMU-1 (Tables A-5 & 3). Species observed include 13 grasses, 13 forbs, and 10 shrubs, trees, and cacti. Of the 13 forbs, four are annuals, and the remaining nine have variable durations or are purely perennial. Of the 13 grasses, eight are cool-season perennials and five are warm-season perennials. Cacti and trees are rare on the reclamation, while shrubs and subshrubs are more common, and only shrubs and subshrubs were captured in 2024.

During the 2024 monitoring program, noxious weeds (NMDA 2020) were infrequently encountered on M-VMU-1, and no noxious weeds were recorded in the quadrats. Noxious weeds previously observed on M-VMU-1 include cheatgrass (*Bromus tectorum*), musk thistle (*Carduus nutans*), saltcedar (*Tamarix ramosissima*), and Siberian elm (*Ulmus pumila*). The contribution of these species to the vegetation community is insignificant, with densities much lower than native rangeland beyond the permit boundary. CMI continues to monitor for noxious weeds and actively controls them through husbandry practices that include annual services for weed control. Further, competition from desirable seeded and native species is expected to inhibit any substantial increase of noxious weeds in the reclamation.

4.0 SUMMARY

McKinley Mine's vegetation success standards for the post-mining land uses of grazing and wildlife are based on canopy cover, production, shrub density, and plant diversity (Table 2). The vegetation monitoring results for the past six years indicate that the vegetation community in M-VMU-1 has progressed and now meets the revegetation success standards despite persistent drought conditions over the past several years. This progression is evident in the shrub density standard having been met in every year of observation and the perennial/biennial canopy cover standard for five of the last six years (Table 4). In 2024 and 2023, mean annual forage production was well above the standard and passed hypothesis testing. During the last six years, M-VMU-1 has met all of the diversity standards in 2022 and 2024 (Table 5), with all but a single diversity component being met in every other year. A summary of the findings from the past six years for M-VMU-1 are:

1) The standard for average live perennial/biennial canopy cover was met in 2023 and 2024. Since 2019 it has been consistently above the technical standard, though hypothesis testing in 2022 did not demonstrate that the standards were met due to high variability.

2) Average annual forage production met standards in both 2023 and 2024. In all other years, forage production was above the numeric performance standards, though hypothesis testing in 2020-2022 did not demonstrate that the standard was met due to highly variable data.

3) M-VMU-1 met all diversity standards in 2022 and 2024. In 2023, the diversity standard was not met for total forb relative cover in part due to drought conditions and variability in timing of precipitation.

Vegetation performance in M-VMU-1 is excellent considering below-average precipitation in 5 of the past 6 years including the exceptional drought in 2020. The performance of vegetation under these conditions suggests that the reclaimed plant communities are resilient and capable of sustaining themselves under the adverse conditions that are characteristic of this region. Finally, data from 2024 coupled with results from 2023, demonstrate that M-VMU-1 meets the requirements for Phase III bond release.

5.0 REFERENCES

Bonham, C.D. 1989. Measurements for Terrestrial Vegetation. John Wiley & Sons. New York, NY.

Clark, D.L. 2001. Stabilization of the mean as a demonstration of sample adequacy. American Society for Surface Mining and Reclamation Annual Meeting. Albuquerque, NM. June 3-7, 2001. ASSMR, Lexington, KY.

Mining and Minerals Division (MMD). 1999. Coal Mine Reclamation Program Vegetation Standards. Santa Fe, NM. April 30.

McDonald, L., and S. Howlin. 2013. Evaluation and comparison of hypothesis testing techniques for bond release application. University of Wyoming, Laramie, WY.

New Mexico Department of Agriculture (NMDA). 2020. New Mexico Noxious Weed List Update. New Mexico State University, Las Cruces, NM. June 2020.

Sokal, R.R. and F.J. Rohlf. 1981. Biometry (2nd edit.). W. H. Freeman and Co., San Francisco.

Schulz, A. M., R. P. Gibbens, and L. F. DeBano. 1961. Artificial populations for teaching and testing range techniques. J. Range Management. 14:236-242.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical methods applied to experiments in agriculture and biology. 6th ed. Ames, Iowa: Iowa State University Press.

Tables

Table 1: South Mine Seasonal and Annual Precipitation, 2015-2024

Year	Station	Precipitation (inches)													
		January	February	March	April	May	June	July	August	September	October	November	December	Annual Total	Growing Season Total
2015	South Tipple	2.05	1.59	0.11	0.52	1.64	1.11	2.37	1.62	0.30	1.36	1.31	0.76	14.74	*7.56*
	Rain 9	NA	NA	NA	0.50	1.38	1.22	2.88	1.25	0.22	1.13	0.99	NA	NA	*7.45*
	Rain 10	NA	NA	NA	0.42	1.32	1.11	2.59	1.39	0.30	1.10	0.78	NA	NA	*7.13*
	Rain 11	NA	NA	NA	0.48	1.88	1.02	2.80	1.69	0.26	0.97	1.08	NA	NA	*8.13*
2016	South Tipple	0.62	0.22	0.05	1.31	0.80	0.07	1.37	1.74	1.75	0.40	1.57	1.84	11.74	*7.04*
	Rain 9	NA	NA	NA	0.22	0.62	0.45	1.24	0.50	1.05	1.05	0.00	NA	NA	*4.08*
	Rain 10	NA	NA	NA	0.13	0.55	0.20	2.75	0.38	0.99	0.14	0.02	NA	NA	*5.00*
	Rain 11	NA	NA	NA	0.28	0.77	0.64	1.61	0.42	1.09	0.09	0.04	NA	NA	*4.81*
2017	South Tipple	1.25	1.64	0.48	0.35	0.77	0.42	2.48	0.90	1.34	0.15	0.09	0.02	9.89	*6.26*
	Rain 9	NA	NA	NA	1.20	1.02	0.01	0.82	1.40	1.64	0.37	0.91	NA	NA	*6.09*
	Rain 10	NA	NA	NA	1.00	0.67	0.08	0.94	1.63	1.36	0.34	0.81	NA	NA	*5.68*
	Rain 11	NA	NA	NA	1.23	1.16	0.05	0.86	2.00	1.85	0.34	0.49	NA	NA	*7.15*
2018	South Tipple	0.35	0.79	0.54	0.09	0.29	0.51	2.61	1.34	1.10	1.65	0.19	0.29	9.75	*5.94*
	Rain 9	NA	NA	NA	0.07	0.27	0.25	2.16	0.74	0.67	1.31	0.00	NA	NA	*4.16*
	Rain 10	NA	NA	NA	0.08	0.20	0.27	3.05	1.15	0.92	1.51	0.00	NA	NA	*5.67*
	Rain 11	NA	NA	NA	0.09	0.29	0.26	1.92	1.00	0.89	1.45	0.00	NA	NA	*4.45*
2019	South Tipple	1.30	1.81	1.23	0.44	1.77	0.33	0.22	0.05	1.59	0.09	1.14	0.85	10.82	*4.40*
	Rain 9	NA	NA	NA	0.16	1.36	0.24	0.46	0.37	1.84	0.05	0.07	NA	NA	*4.43*
	Rain 10	NA	NA	NA	0.20	1.49	0.37	0.19	0.27	1.34	0.03	0.05	NA	NA	*3.86*
	Rain 11	NA	NA	NA	0.20	1.50	0.19	0.44	0.20	1.72	0.06	0.08	NA	NA	*4.25*
2020	South Tipple	0.98	1.44	1.35	0.17	0.01	0.04	1.13	0.24	0.15	0.26	0.40	0.27	6.44	*1.74*
	Rain 9	NA	NA	NA	0.16	0.02	0.11	0.60	0.06	0.14	0.08	0.45	NA	NA	*1.09*
	Rain 10	NA	NA	NA	0.11	0.02	0.13	0.79	0.14	0.14	0.16	0.09	NA	NA	*1.33*
	Rain 11	NA	NA	NA	0.22	0.00	0.05	0.63	0.69	0.20	0.30	0.41	NA	NA	*1.79*
2021	South Tipple	1.11	0.34	0.40	0.07	0.08	0.37	5.45	1.24	2.12	1.77	0.55	2.26	15.76	*9.33*
	No Bluff	1.13	0.21	0.46	0.04	0.04	0.20	2.17	1.31	1.13	0.86	0.20	0.92	8.67	*4.89*
	Rain 9	NA	NA	NA	0.00	0.10	0.27	1.81	1.22	1.11	0.78	0.00	NA	NA	*4.51*
	Rain 10	NA	NA	NA	0.01	0.06	0.24	2.48	1.80	0.96	0.80	0.00	NA	NA	*5.55*
	Rain 11	NA	NA	NA	0.00	0.07	0.18	2.10	1.31	1.43	0.98	0.00	NA	NA	*5.09*
2022	South Tipple	0.36	0.74	1.25	0.00	0.01	0.66	3.68	5.36	1.51	2.92	0.59	0.74	17.82	*11.22*
	No Bluff	NA	NA	0.59	0.03	0.00	1.24	3.13	4.66	1.27	1.40	0.48	0.58	NA	*10.33*
	Rain 9	NA	NA	NA	0.00	0.00	0.51	2.38	4.05	1.02	1.77	0.41	NA	NA	*7.96*
	Rain 10	NA	NA	NA	0.00	0.00	0.69	3.57	4.27	1.02	1.83	0.33	NA	NA	*9.55*
	Rain 11	NA	NA	NA	0.00	0.00	0.56	3.30	4.62	1.09	1.97	0.51	NA	NA	*9.57*
2023	South Tipple	1.68	0.37	1.90	0.08	0.57	0.29	0.07	0.92	0.02	0.02	0.30	NA	6.22	*1.95*
	No Bluff	1.21	0.50	1.64	0.05	0.55	0.13	0.03	3.16	0.33	0.57	0.42	NA	8.59	*4.25*
	Rain 9	NA	NA	NA	0.01	0.93	0.26	0.23	2.21	0.98	0.18	0.00	NA	NA	*4.62*
	Rain 10	NA	NA	NA	0.03	0.53	0.13	0.06	2.61	0.51	0.03	0.00	NA	NA	*3.87*
	Rain 11	NA	NA	NA	0.00	0.77	0.23	0.36	2.44	0.71	0.09	0.00	NA	NA	*4.51*
2024	South Tipple	1.06	0.64	2.43	0.44	0.11	2.61	1.10	2.28	0.62	1.58	0.60	0.00	13.47	*7.16*
	No Bluff	1.06	0.58	2.22	0.45	0.03	2.27	1.17	2.33	0.32	1.18	0.36	0.00	11.97	*6.57*
	Rain 9	NA	NA	NA	0.21	0.00	2.64	0.48	2.09	0.54	0.95	0.30	NA	NA	*5.96*
	Rain 10	NA	NA	NA	0.16	0.05	2.65	0.38	1.92	0.37	0.98	0.12	NA	NA	*5.53*
	Rain 11	NA	NA	NA	0.15	0.03	2.68	0.25	2.16	0.53	1.09	0.26	NA	NA	*5.80*
Window Rock		0.72	0.68	0.88	0.61	0.49	0.47	1.75	2.05	1.23	1.14	0.83	0.95	11.80	*6.60*

Notes:

Long-term averages are from Window Rock, Arizona Station (029410), 1937 to 1999 (Western Regional Climate Center, 2020).

Growing season total precipitation is between April and September

NA=rain gauges taken offline due to freezing conditions, data unavailable.

data incomplete due to rain gauge malfunction

Table 2: Revegetation Success Standards for the Mining and Minerals Division Permit Area

Vegetative Parameter	Success Standard
Ground Cover	15% live perennial/biennial canopy cover
Productivity	350 air-dry pounds per acre perennial/biennial annual production
Diversity	A minimum of 2 shrub or subshrub taxa contributing at least 1% relative cover each.
	A minimum of 2 perennial warm-season grass taxa contributing at least 1% relative cover each.
	A minimum of 1 perennial cool-season grass taxa contributing at least 1% relative cover.
	A minimum of 3 perennial/biennial forb taxa combining to contribute at least 1% relative cover.
Woody Stem Stocking	150 live woody stems per acre

Table 3: Vegetation Cover, Density, and Production by Species, M-VMU-1, 2024

Common Name	Scientific Name	Code	Mean Vegetation Cover (%)			Mean Density (#/m²)	Mean Annual Production (lbs/ac)
			Canopy	Basal	Relative Canopy[a]		
Warm-Season Grasses (5)							
Perennials (5)							
Sideoats grama	*Bouteloua curtipendula*	BOCU	0.25	0.10	0.48	0.08	3
Blue grama	*Bouteloua gracilis*	BOGR2	0.93	0.24	1.76	0.18	9
Smooth Brome	*Bromus inermis*	BRIN2	0.03	<0.01	0.05	0.13	1
James' galleta	*Pleuraphis jamesii*	PLJA	9.05	4.73	17.25	1.13	167
Alkali sacaton	*Sporobolus airoides*	SPAI	5.91	1.85	11.27	0.70	120
Cool-Season Grasses (8)							
Perennials (8)							
Indian ricegrass	*Achnatherum hymenoides*	ACHY	5.97	1.53	11.37	2.08	68
Thickspike wheatgrass	*Elymus lanceolatus*	ELLA3	2.05	0.90	3.91	2.05	27
Needle and thread	*Hesperostipa comata*	HECO26	0.88	0.23	1.67	0.13	6
Western wheatgrass	*Pascopyrum smithii*	PASM	3.26	0.69	6.22	5.13	42
Russian wildrye	*Psathyrostachys juncea*	PSJU3	5.60	2.44	10.67	0.68	67
Bluebunch wheatgrass	*Pseudoroegneria spicata*	PSSP6	1.83	0.58	3.48	1.00	18
Intermediate wheatgrass	*Thinopyrum intermedium*	THIN6	0.34	0.04	0.64	0.08	8
Tall wheatgrass	*Thinopyrum ponticum*	THPO7	0.88	0.75	1.67	0.03	28
Forbs (13)							
Annuals (4)							
Burningbush	*Bassia scoparia*	BASC5	0.01	<0.01	--	0.03	--
Narrowleaf goosefoot	*Chenopodium leptophyllum*	CHLE4	<0.01	<0.01	--	0.05	--
Thymeleaf sandmat	*Chamaesyce serpyllfolia*	CHSE6	<0.01	<0.01	--	0.05	--
Prickly Russian thistle	*Salsola tragus*	SATR12	0.02	<0.01	--	0.20	--
Perennials/Biennials (9)							
Common yarrow	*Achillea millefolium*	ACMI2	0.01	<0.01	0.02	0.03	<1
Hoary tansyaster	*Machaeranthera canescens*	MACA2	0.03	<0.01	0.05	0.03	<1
Sweetclover	*Melilotus officinalis*	MEOF	0.93	0.03	1.76	0.28	9
Palmer's penstemon	*Pentemon palmeri*	PEPA8	0.15	0.02	0.29	0.03	8
Upright prairie coneflower	*Ratibida columnifera*	RACO3	0.15	0.01	0.29	0.08	2
Scarlet globemallow	*Sphaeralcea coccinea*	SPCO	0.08	0.01	0.14	0.55	<1
Small-leaf globemallow	*Sphaeralcea parvifolia*	SPPA2	0.01	<0.01	0.02	0.03	<1
Yellow salsify	*Tragopogon dubius*	TRDU	0.03	0.01	0.05	0.03	1
Salsify	*Tragopogon pratensis*	TRPR	0.01	<0.01	0.01	0.03	<1
Shrubs, Trees and Cacti (10)							
White sagebrush	*Artemisia ludoviciana*	ARLU	0.25	0.02	0.48	0.23	3
Fourwing saltbush	*Atriplex canescens*	ATCA2	9.05	0.74	17.26	0.45	173
Mat saltbush	*Atriplex corrugata*	ATCO4	0.61	0.10	1.17	0.10	7
Mormon tea	*Ephedra viridis*	EPVI	0.63	0.08	1.19	0.03	48
Rubber Rabbitbrush	*Ericameria nauseosa*	ERNA10	0.75	0.13	1.43	0.05	9
Broom snakeweed	*Gutierrezia sarothrae*	GUSA2	0.02	<0.01	0.04	0.05	<1
Hairy false goldenaster	*Heterotheca villosa*	HEVI4	1.93	0.45	3.67	0.33	63
Winterfat	*Krascheninnikovia lanata*	KRLA2	0.65	0.11	1.24	0.15	6
Mexican cliffrose	*Purshia mexicana*	PUME	0.10	0.01	0.19	0.03	2
Antelope bitterbrush	*Purshia tridentata*	PUTR2	0.25	0.03	0.48	0.03	<1
Cover Components							
Perennial/Biennial Vegetation Cover			52.5	15.8			
Total Vegetation Cover			46.7	12.9			
Rock			3.5	5.2			
Litter			7.2	18.4			
Bare Soil			42.6	63.7			

Notes:
[a] relative cover = total percent cover of a perennial/biennial species divided by the total perennial/biennial cover of the sampling unit
"--"= parameter not calculated for attribute
lbs/ac = air-dry forage pounds per acre

Table 4: Summary Statistics, M-VMU-1, 2019-2024

Vegetation Metric	Year						Technical Standard
	2019	2020	2021	2022	2023	2024	
Total Vegetation Canopy Cover (%)[2]							
Mean	31.1	40.4	26.9	28.3	31.3	46.7	None
Standard Deviation	16.9	21.1	21.0	22.0	19.6	24.3	
90% Confidence Interval	4.4	5.5	5.5	5.7	5.1	6.3	
Nmin[1]	82	78	172	172	111	77	
Perennial/Biennial Canopy Cover (%)[3]							
Mean	29.6	42.9	25.0	22.5	33.3	52.5	15.0
Standard Deviation	18.0	24.7	20.6	21.4	22.9	31.4	
90% Confidence Interval	4.7	6.4	5.4	5.6	6.0	8.2	
Nmin[1]	101	94	193	257	134	106	
Basal Cover (%)							
Mean	1.9	2.8	2.7	2.3	9.7	12.9	None
Standard Deviation	1.6	1.9	5.3	3.0	9.4	8.8	
90% Confidence Interval	0.4	0.5	1.4	0.8	2.5	2.3	
Nmin[1]	197	133	1113	4668	269	132	
Annual Forage Production (lbs/ac)[4]							
Mean	719	511	520	451	784	897	350
Standard Deviation	666	498	979	443	603	813	
90% Confidence Interval	173	130	255	115	157	212	
Nmin[1]	243	270	1006	275	168	241	
Shrub Density (stems/acre) from Quadrats							
Mean	2,226	6,475	3,541	4,148	7,082	11,432	None
Standard Deviation	4,194	14,513	6,023	4,627	17,882	17,885	
90% Confidence Interval	1,091	3,775	1,566	1,203	4,651	4,652	
Nmin[1]	1,008	1426	821	353	1810	695	
Shrub Density (stems/acre) from Belt Transect							
Mean	1,821	2,577	1,592	2,752	2,941	2,779	150
Standard Deviation	1,577	1,689	1,103	3,078	1,864	1,862	
90% Confidence Interval	820	879	574	1,601	969	968	
Nmin[1]	252	144	161	353	135	151	

Notes:

1 Minimum sample number to obtain 90% probability that the samples mean is within 10% of the population mean

2 Total canopy cover for all species

3 Mean canopy cover not including annuals or noxious weeds.

4 Annual forage production in air dry (lbs/ac) not including annuals or noxious weeds.

5 Total production in air dry (lbs/ac) including annuals or noxious weeds.

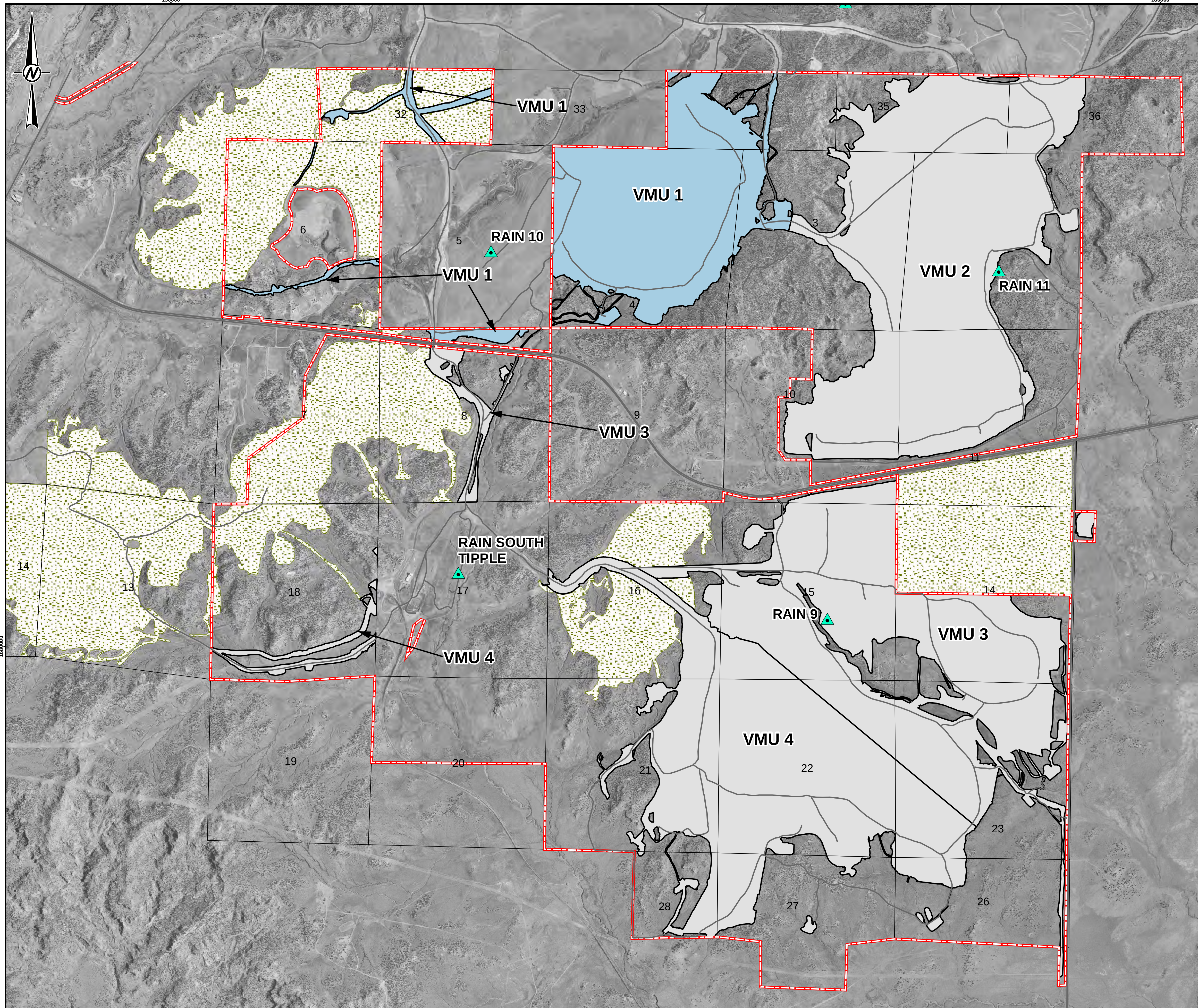
Hypothesis testing found the success standard was not met

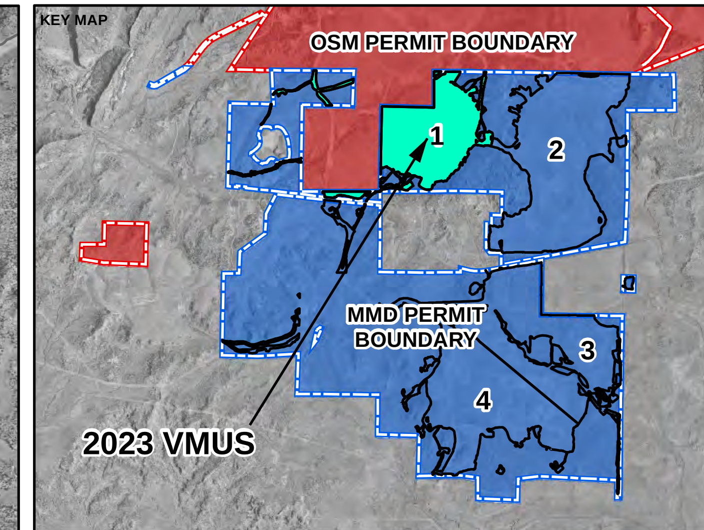
Table 5: Results for Diversity, M-VMU-1, 2019 to 2024

Diversity Component	Standard (% relative cover)	2019 Result	2019 Species	2020 Result	2020 Species	2021 Result	2021 Species	2022 Result	2022 Species	2023 Result	2023 Species	2024 Result	2024 Species
Shrubs and Subshrubs			**(6 spp.)**		**(9 spp.)**		**(7 spp.)**		**(7 spp.)**		**(6 spp.)**		**(6 spp.)**
Species 1	≥ 1.0%	11.96%	Four-wing saltbush	12.71%	Four-wing saltbush	13.33%	Rubber rabbitbrush	13.55%	Four-wing saltbush	15.34%	Fourwing saltbush	17.26%	Fourwing saltbush
Species 2	≥ 1.0%	3.36%	Broom snakeweed	3.93%	Gardner's saltbush	5.84%	Mormon tea	6.21%	Shadscale saltbush	2.32%	Shadscale saltbush	3.66%	Hairy false goldenaster
Perennial Warm-Season Grasses			**(4 spp.)**		**(3 spp.)**		**(2 spp.)**		**(3 spp.)**		**(5 spp.)**		**(3 spp.)**
Species 1	≥ 1.0%	12.58%	James' galleta	16.23%	James' galleta	23.04%	James' galleta	23.34%	James' galleta	27.92%	James' galleta	17.25%	James' galleta
Species 2	≥ 1.0%	0.84%	Alkali sacaton	1.14%	Alkali sacaton	0.94%	Blue grama	4.19%	Blue grama	5.85%	Alkali sacaton	11.27%	Alkali sacaton
Perennial Cool-Season Grasses			**(9 spp.)**		**(10 spp.)**		**(7 spp.)**		**(11 spp.)**		**(10 spp.)**		**(7 spp.)**
Species 1	≥ 1.0%	21.38%	Western wheatgrass	16.43%	Thickspike wheatgrass	21.15%	Russian wildrye	10.39%	Indian ricegrass	12.01%	Russian wildrye	11.37%	Indian Ricegrass
Perennial/Biennial Forbs	≥ 1.0% combined	**2.64%**	**(15 spp.)**	**0.30%**	**(3 spp.)**	**5.25%**	**(6 spp.)**	**9.04%**	**(11 spp.)**	**0.30%**	**(7 spp.)**	**2.34%**	**(9 spp.)**
Species 1		0.63%	Fendler's globemallow	0.15%	Purple aster	4.90%	Rattlesnake weed	5.55%	Chenopod	0.26%	Hoary tansyaster	1.76%	Sweetclover
Species 2		0.46%	Manyflowered ipomopsis	0.14%	Rose heath	0.14%	Palmer's penstemon	1.81%	Trailing fleabane	0.01%	Yellow salsify	0.29%	Upright prairie coneflower
Species 3		0.42%	Flixweed	0.01%	Palmer's penstemon	0.09%	Upright prairie coneflower	0.62%	Purple aster	0.01%	Sweetclover	0.29%	Palmer's penstemon

Notes:
-- = not applicable
Indicates an unmet parameter

Figures





LEGEND

- Rain Gauges
- Two-tracks, Roads and Highways
- MMD Permit Boundary
- PLSS - Sections
- Liability Release
- MMD VMU 1 (~ 839 acres)

0 3,000 6,000

1 inch = 3,000 feet FEET

NOTE(S)

1. VMU = VEGETATION MANAGEMENT UNIT FOR VEGETATION SAMPLING PLAN
2. VMU 4 IS PENDING BOND RELEASE

REFERENCE(S)

1. ORTHOIMAGE: CHEVRON, 2013

COORDINATE SYSTEM: NAD 1927 STATEPLANE NEW MEXICO WEST FIPS 3003
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1927

CLIENT

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY

PROJECT

MCKINLEY MINE - MMD PERMIT PHASE III BOND RELEASE, 2023 VEGETATION MONITORING SAMPLING PLAN

TITLE

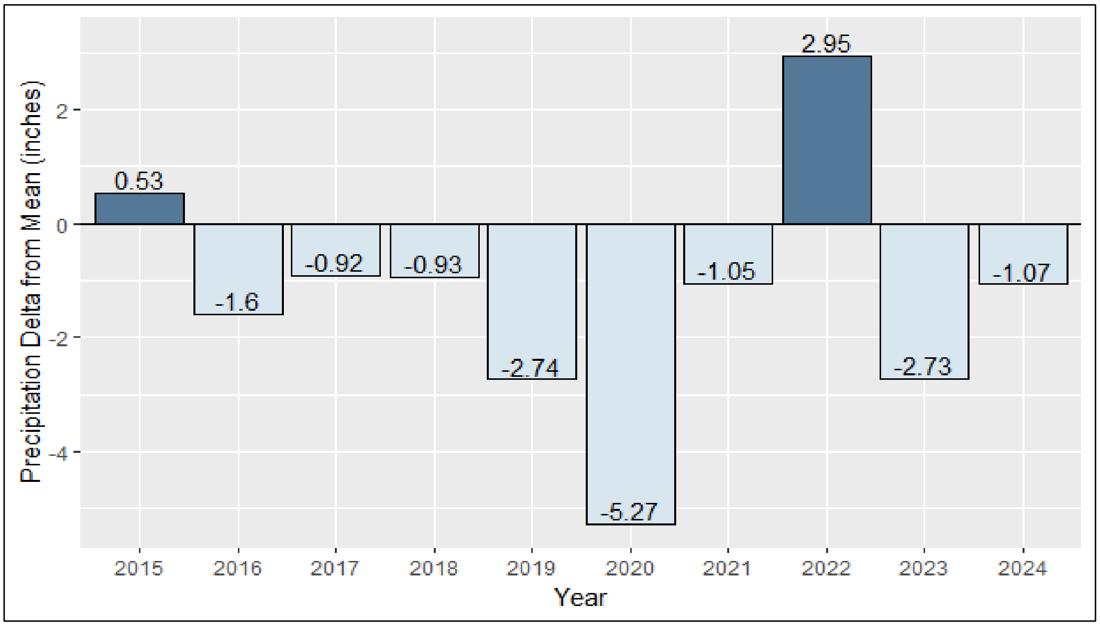
GENERAL OVERVIEW OF THE MCKINLEY MMD PERMIT AREA VEGETATION MANAGEMENT UNITS (VMU), 2024

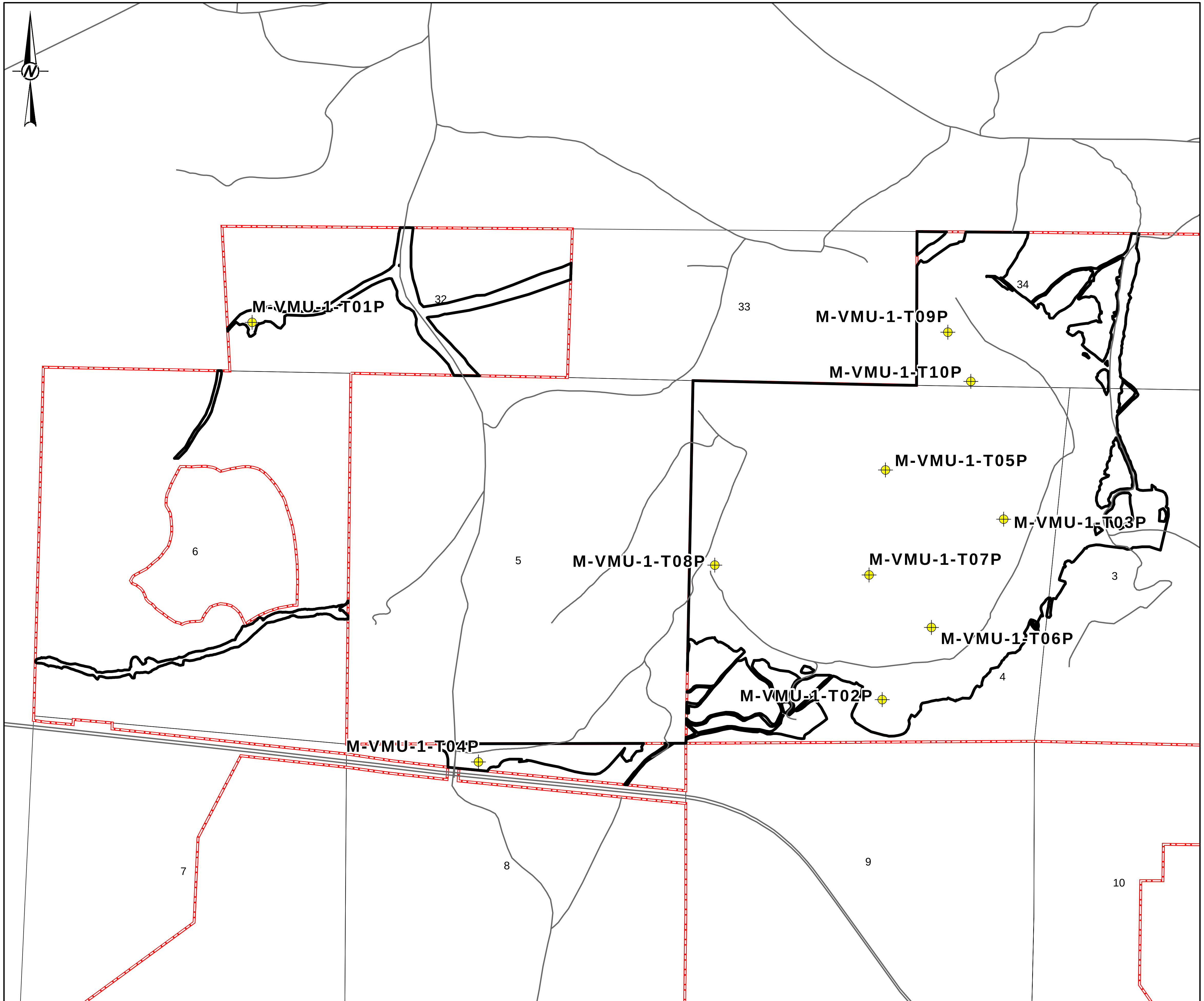
CONSULTANT

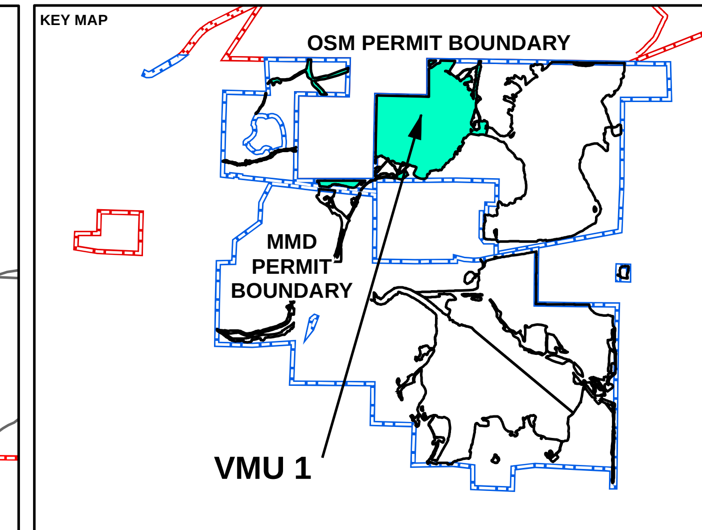
YYYY-MM-DD	2025-02-24
DESIGNED	GFD
PREPARED	GFD
REVIEWED	MR
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
31406184.000	B001	0	1

Figure 2: Departure of Growing Season Precipitation from Long-Term Seasonal Mean at Window Rock, Rain 10 Gauge







LEGEND

- Primary Transect
- Two-tracks, Roads and Highways
- PLSS - Sections
- MMD VMU 1 (~ 839 acres)
- Liability Release
- MMD Permit Boundary

TRANSECT LABEL EXPLANATION:

M-VMU-1-T1P

- MMD Permit Area
- Vegetation Management Unit (VMU-#)
- Transect Number
- Primary (P) or Alternate (A)

0 — 1,500 — 3,000

1 inch = 1,500 feet — FEET

NOTE(S)

1. KEY MAP SCALE IS DIFFERENT FROM OVERVIEW OF VMUS
2. TRANSECT LOCATIONS WERE CREATED IN ACCORDANCE WITH METHODS OUTLINED IN THE PERMIT

REFERENCE(S)

1. ORTHOIMAGE: CHEVRON, 2013

COORDINATE SYSTEM: NAD 1927 STATEPLANE NEW MEXICO WEST FIPS 3003
PROJECTION: TRANSVERSE MERCATOR
DATUM: NORTH AMERICAN 1927

CLIENT
CHEVRON ENVIRONMENTAL MANAGEMENT

PROJECT
MCKINLEY MINE - MMD PERMIT PHASE III BOND RELEASE
2024 VEGETATION MONITORING

TITLE
VEGETATION MONITORING TRANSECTS FALL 2024, VEGETATION MANAGEMENT UNIT 1

CONSULTANT
[redacted]

YYYY-MM-DD	2024-07-30
DESIGNED	GFD
PREPARED	GFD
REVIEWED	MR
APPROVED	DR

PROJECT NO.	CONTROL	REV.	FIGURE
31406184.001	C002	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Figure 4: Vegetation Plot, Transect, and Quadrat Layout

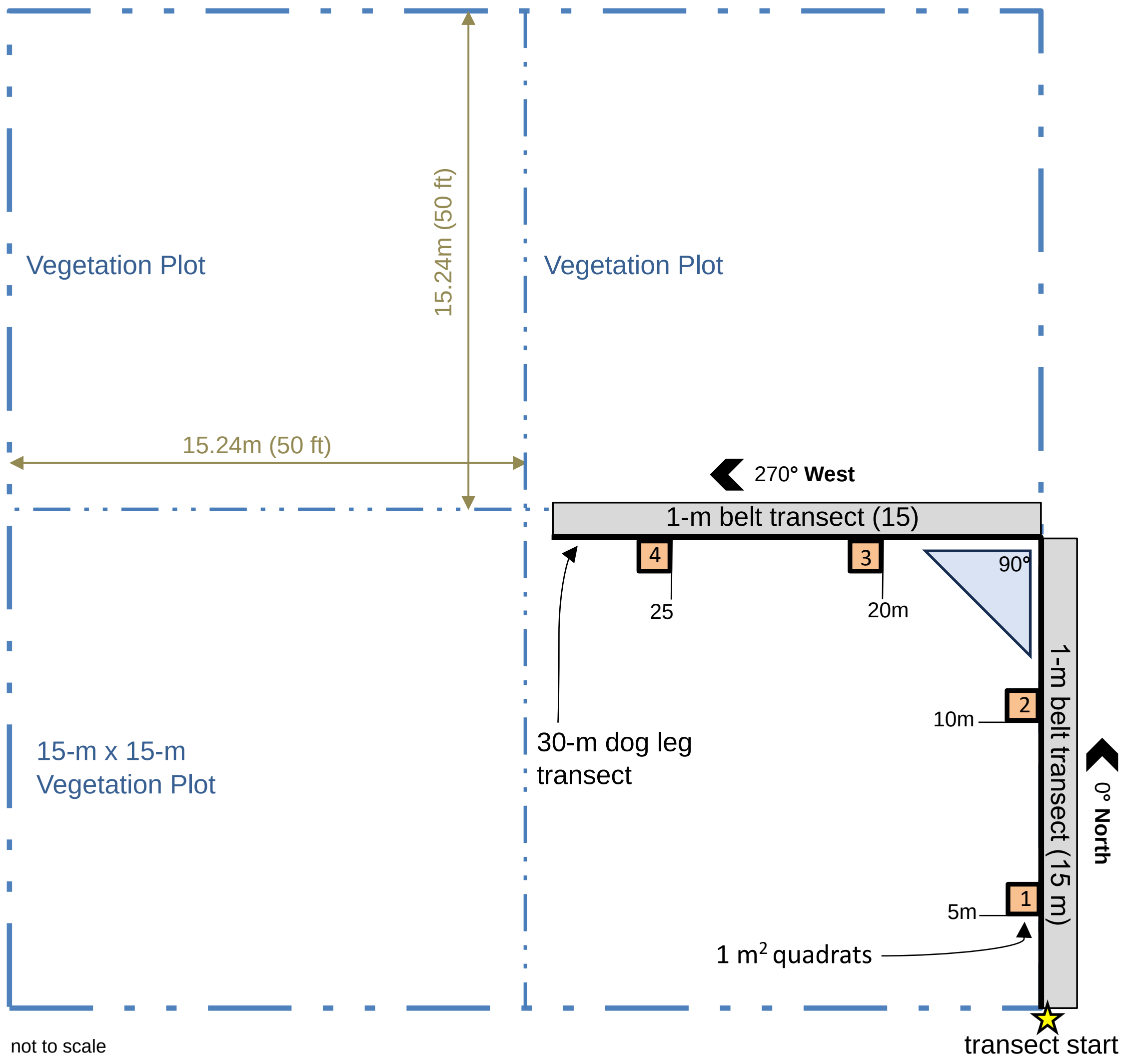


Figure 5: Typical Grass-Shrubland Vegetation in M-VMU-1, September 2024

Figure 6: Stabilization of the Mean for Perennial/Biennial Canopy Cover, M-VMU-1, 2024

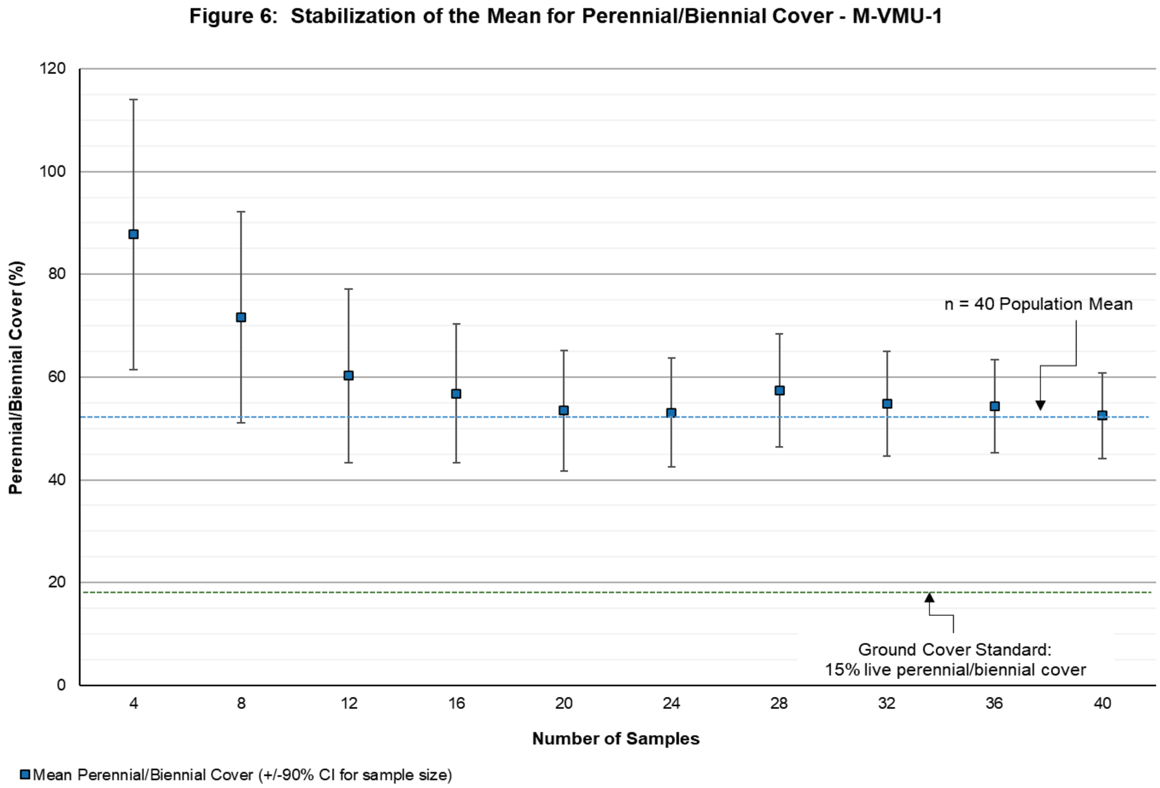


Figure 7: Stabilization of the Mean for Annual Forage Production, M-VMU-1, 2024

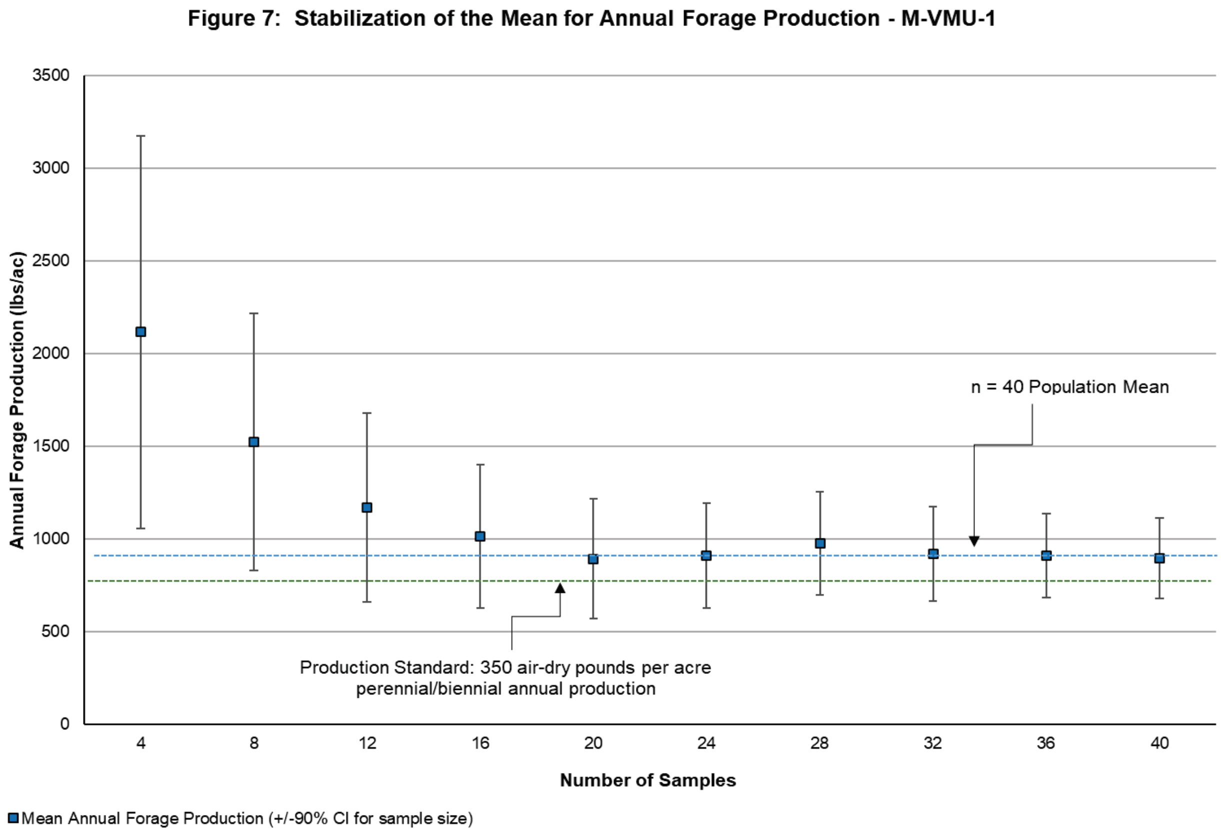
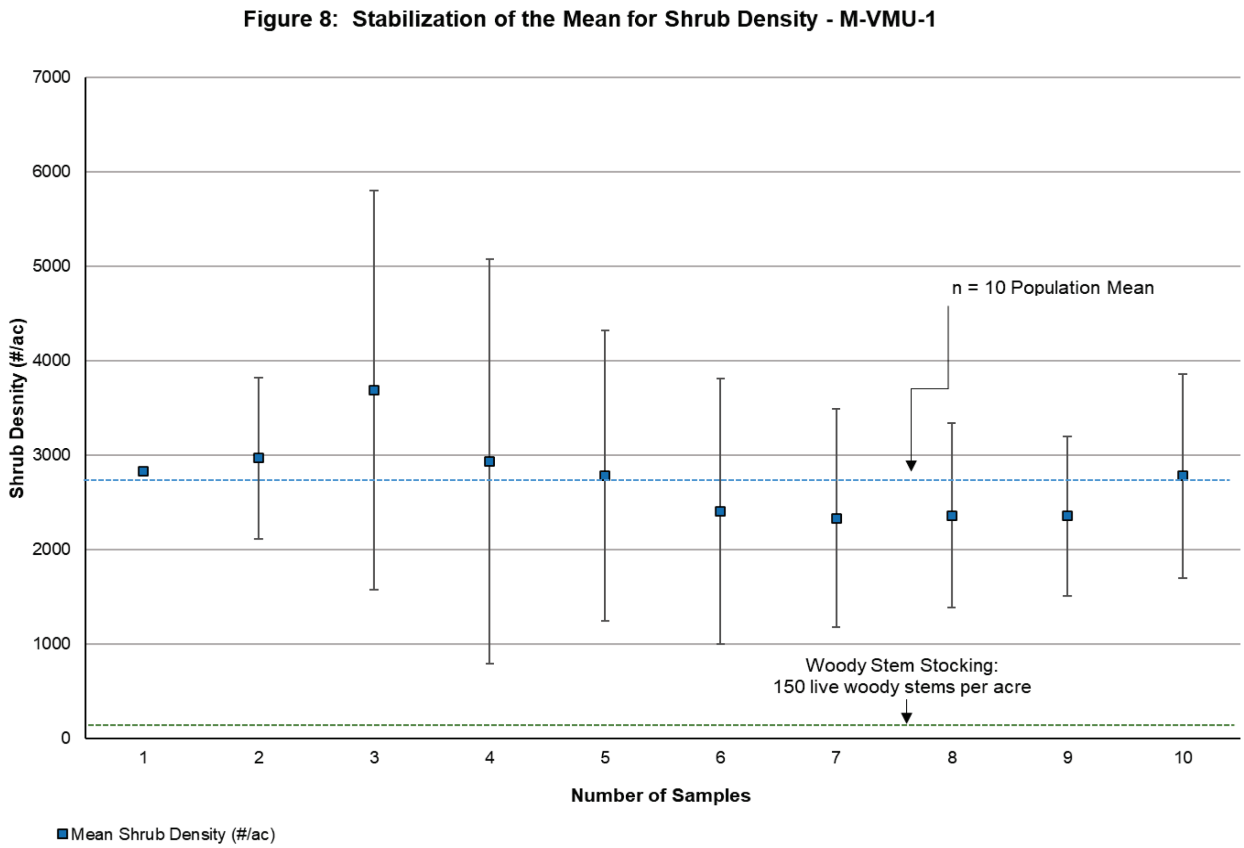


Figure 8: Stabilization of the Mean for Shrub Density, M-VMU-1, 2024



APPENDIX A

Vegetation Data Summary

Table A-1: M-VMU-1 Canopy Cover Data, 2024

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
Cool Season Perennials																																								
ACHY	--	--	--	--	--	--	8.0	0.1	--	--	--	10.0	10.0	45.0	43.0	17.0	--	--	--	--	6.0	--	--	--	0.05	--	19.0	--	--	--	--	1.5	5.0	16.0	--	7.0	2.0	6.0	25.0	18.0
ELLA3	--	--	--	--	--	--	--	20.0	23.0	--	--	4.0	--	--	--	--	--	--	--	--	--	--	--	3.5	--	--	--	1.0	--	0.5	--	4.5	2.0	--	1.0	8.0	12.0	1.0	--	1.5
HECO26	--	--	--	--	--	--	--	--	12.0	--	--	--	--	--	--	--	--	--	--	--	--	--	8.0	--	--	15.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	--	--	--	10.0	22.0	30.0	9.0	3.5	--	12.0	--	0.5	--	--	--	--	--	--	--	--	8.0	--	6.0	--	--	0.5	--	0.5	--	--	--	--	--	12.0	--	--	5.0	3.0	8.5	--
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	7.0	--	--	22.0	12.0	18.0	75.0	12.0	--	--	--	--	--	1.0	23.0	--	12.0	20.0	22.0	--	--	--	--	--	--	--	--	--
PSSP6	--	--	--	--	--	8.0	17.0	5.0	--	--	31.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12.0	--	--
THIN6	--	--	--	--	--	--	4.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.0	--	--	--	--	--	--	--	--	--	--	--	--	--
THPO7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.0	--	--	--	--	--	--	--
Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	--	--	--	--	--	20.0	--	1.0	--	14.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.0	--	--	--	--	--
BRIN2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	--	--
PLJA	--	8.0	9.0	--	--	--	7.0	15.0	--	1.0	--	--	--	--	--	--	4.0	--	3.0	33.0	--	30.0	4.0	35.0	62.0	5.0	--	35.0	--	--	--	--	15.0	36.0	45.0	15.0	--	--	--	--
SPAI	85.0	40.0	69.0	40.0	--	--	--	--	--	--	--	--	--	--	2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																								
Annuals																																								
BASC5	--	--	--	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	--	--
CHSE6	--	--	--	--	--	--	--	--	T	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SATR12	--	--	--	--	T	--	0.005	--	--	--	--	0.2	--	0.5	--	--	--	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	--	--
Perennials/Biennials																																								
ACMI2	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.0	--	--	30.0	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	6.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ARLU	--	--	--	--	--	--	--	--	--	--	10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCA2	10.0	15.0	--	65.0	--	--	--	--	--	--	--	--	--	--	--	40.0	--	--	--	--	87.0	--	--	--	--	--	89.0	--	3.0	--	10.0	43.0	--	--	--	--	T	0.1	--	--
ATCO4	--	--	--	--	--	--	--	--	20.0	3.0	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25.0
ERNA10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30.0	T	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	--	--	2.0	50.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	18.0	5.0
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.0	--	--	--	--	--
PUTR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																																								
Perennial/Biennial Vegetation Cover	95.00	63.00	78.00	115.00	22.00	38.75	67.50	94.10	56.00	16.00	61.50	16.00	17.00	45.00	45.50	79.00	16.00	21.00	78.00	45.00	101.00	30.00	24.00	48.50	95.05	21.50	140.00	77.50	15.00	20.50	32.00	79.00	57.00	64.00	52.00	30.00	19.00	22.10	51.50	49.50
Total Vegetation Cover	87.00	55.00	71.00	85.00	22.00	38.00	65.00	80.00	50.00	19.00	57.00	15.00	14.00	45.00	44.50	60.00	18.00	20.00	78.00	43.00	80.00	30.00	22.50	40.00	85.00	21.00	95.00	75.00	15.00	20.50	30.50	67.00	56.00	56.00	46.00	30.00	19.00	22.00	46.00	45.00
Rock	--	1.00	0.50	--	T	--	0.50	--	1.00	--	--	--	2.00	1.00	13.00	0.50	6.00	8.00	5.00	0.50	15.00	15.00	21.00	20.00	T	1.00	--	--	3.00	4.00	13.00	--	1.00	0.25	1.50	0.50	0.50	1.00	2.00	1.00
Litter	13.00	4.00	9.00	15.00	5.00	5.00	9.00	1.50	15.00	15.00	2.50	2.00	4.00	7.00	17.00	2.00	4.00	10.00	7.00	8.00	4.00	1.00	9.00	2.00	10.00	7.00	4.00	2.00	2.00	4.00	4.00	12.00	5.00	12.00	10.00	22.00	7.00	10.00	4.00	1.00
Bare Soil	--	40.00	17.50	--	73.00	57.00	25.50	18.50	34.00	66.00	40.50	83.00	80.00	47.00	25.50	37.50	72.00	62.00	10.00	48.50	1.00	54.00	47.50	38.00	5.00	71.00	1.00	23.00	80.00	71.50	52.50	21.00	38.00	31.75	42.50	47.50	73.50	67.00	48.00	53.00

Notes:
Species codes defined in Table A-6
Perennial/biennial vegetation cover is the sum of perennial and biennial covers by species and not estimated in the field. Conversely, total vegetation cover is undifferentiated by species and estimated in the field.

Table A-2: M-VMU-1 Basal Cover Data, 2024

Transect	T01P				T02P				T03P				T04P				T05P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
Cool Season Perennials																				
ACHY	--	--	--	--	--	--	0.75	0.01	--	--	--	3.0	4.0	15.0	9.0	4.0	--	--	--	--
ELLA3	--	--	--	--	--	--	--	5.0	20.0	--	--	1.0	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	5.0	--	--	--	--	--	--	--	--	--	--	--
PASM	--	--	--	1.0	10.0	3.0	0.75	0.5	--	1.0	--	0.05	--	--	--	--	--	--	--	--
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	4.0	--	--	10.0	6.0	12.0	18.0	10.0
PSSP6	--	--	--	--	--	3.0	3.0	2.0	--	--	7.0	--	--	--	--	--	--	--	--	--
THIN6	--	--	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--	--
THPO7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Warm Season Perennials																				
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	--	--	--	--	--	4.5	--	1.0	--	3.0	--	--	--	--	--	--	--	--	--
BRIN2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PLJA	--	5.0	3.25	--	--	--	0.75	3.0	--	0.1	--	--	--	--	--	--	3.0	--	0.5	20.0
SPAI	33.0	15.0	20.0	6.0	--	--	--	--	--	--	--	--	--	--	0.025	--	--	--	--	--
Forbs																				
Annuals																				
BASC5	--	--	--	0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHSE6	--	--	--	--	--	--	--	--	T	--	--	--	--	--	T	--	--	--	--	--
SATR12	--	--	--	--	T	--	T	--	--	--	--	0.02	--	0.05	--	--	--	--	--	--
Perennials/Biennials																				
ACMI2	--	--	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	0.3	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	0.005	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	0.01	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																				
ARLU	--	--	--	--	--	--	--	--	--	--	0.75	--	--	--	--	--	--	--	--	--
ATCA2	3.0	1.0	--	5.0	--	--	--	--	--	--	--	--	--	--	--	2.0	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	3.0	0.3	--	0.5	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERNA10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	--	--	0.01	15.0	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PUTR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																				
Perennial/Biennial Vegetation Cover	36.00	21.00	23.25	12.00	10.00	6.10	9.77	25.61	29.00	1.40	11.26	4.55	8.00	15.00	9.03	16.00	9.00	12.50	18.50	30.00
Total Vegetation Cover	36.00	21.00	23.01	12.05	10.00	6.10	9.77	16.50	29.00	1.70	11.26	2.02	8.00	15.05	9.03	16.00	9.00	12.50	18.50	30.00
Rock	--	1.00	0.75	--	T	--	0.75	--	1.00	--	--	--	2.00	1.50	25.00	0.50	6.00	8.00	9.00	0.50
Litter	64.00	6.00	33.00	87.95	5.00	20.00	20.00	15.00	15.00	28.00	4.00	4.00	4.00	15.00	33.00	2.00	4.00	15.00	19.00	8.00
Bare Soil	--	72.00	46.24	--	84.99	73.90	69.48	68.50	55.00	70.30	84.75	93.98	86.00	68.45	32.97	81.50	81.00	64.50	53.50	61.50

Transect	T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
Cool Season Perennials																				
ACHY	3.0	--	--	--	T	--	4.5	--	--	--	--	0.5	2.0	3.0	--	--	1.0	2.0	4.5	5.0
ELLA3	--	--	--	0.5	--	--	--	0.25	--	0.05	--	0.5	0.5	--	0.1	--	7.0	0.5	--	0.5
HECO26	--	--	1.25	--	--	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	3.0	--	2.0	--	--	0.1	--	0.1	--	--	--	--	--	1.0	--	--	4.0	0.5	0.75	--
PSJU3	--	--	--	--	--	0.5	6.0	--	10.0	15.0	6.0	--	--	--	--	--	--	--	--	--
PSSP6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.0	--	--
THIN6	--	--	--	--	--	--	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--
THPO7	--	--	--	--	--	--	--	--	--	--	--	--	30.0	--	--	--	--	--	--	--
Warm Season Perennials																				
BOCU	--	--	--	--	--	--	--	4.0	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.0	--	--	--	--	--
BRIN2	--	--	--	--	--	--	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--
PLJA	--	20.0	0.5	25.0	50.0	1.0	--	20.0	--	--	--	--	10.0	7.0	20.0	--	--	--	--	--
SPAI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																				
Annuals																				
BASC5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	--	--
CHSE6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SATR12	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	T	--	--	--	--
Perennials/Biennials																				
ACMI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	T	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	1.0	--	--	0.3	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																				
ARLU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCA2	5.0	--	--	--	--	--	9.0	--	T	--	0.1	4.3	--	--	--	--	T	0.01	--	--
ATCO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.0
ERNA10	--	--	--	--	--	--	--	--	--	--	--	5.0	T	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.75	1.0
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.5	--	--	--	--	--
PUTR2	--	--	--	1.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cover Components																				
Perennial/Biennial Vegetation Cover	11.00	20.00	4.50	26.50	54.01	4.60	21.00	24.75	10.00	15.05	6.10	10.30	42.50	11.00	21.60	--	12.00	11.01	8.00	9.50
Total Vegetation Cover	3.00	20.00	4.50	26.05	1.00	4.60	20.75	24.75	10.00	15.05	6.10	9.80	--	11.00	21.60	0.01	12.00	11.01	8.00	9.50
Rock	50.00	16.00	26.00	22.00	T	1.00	0.50	--	3.00	4.00	17.00	--	2.00	0.75	1.50	2.00	0.75	1.00	3.25	1.00
Litter	15.00	5.00	12.00	10.00	10.00	10.00	60.00	6.00	2.00	5.00	7.00	50.00	7.00	25.00	40.00	23.00	10.00	15.00	8.00	15.00
Bare Soil	32.00	59.00	57.50	46.95	89.00	84.40	18.75	69.25	85.00	75.95	69.90	40.20	91.00	63.25	36.90	74.99	77.25	72.99	80.75	74.50

Notes:
Species codes defined in Table A-6
Perennial/biennial vegetation cover is the sum of perennial and biennial covers by species, total vegetation cover is undifferentiated by species and estimated in the field.

Table A-3: M-VMU-1 Frequency Data (counts), 2024

Transect	T01P				T02P				T03P				T04P				T05P				T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																																								
Cool Season Perennials																																								
ACHY	--	4	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	40	45	4	3	2	--	--	--
ELLA3	--	--	--	--	>1	--	--	--	>1	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HECO26	>1	--	--	--	--	--	--	--	--	--	--	--	--	--	6	1	>1	--	--	--	1	--	5	7	--	2	--	--	--	--	--	--	--	--	--	2	--	2	30	>1
PASM	--	--	--	--	7	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	1	--	--	--	--	10	--	--	--	--	--	--	--	--	--	--
PSJU3	--	--	--	--	--	--	--	--	--	--	--	--	--	8	--	3	--	25	8	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PSSP6	--	1	--	>1	--	--	--	--	12	2	--	2	--	13	>1	--	--	--	0	--	--	--	--	1	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	>1
THIN6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35	--	10	12	--	--	--	--	6	11	22	18	11	5	15	15	--	--	--	--	--	--	--	--
THPO7	--	5	--	15	12	--	--	--	--	10	--	--	12	15	--	11	--	--	0	--	--	3	--	5	--	--	--	--	21	--	>1	--	12	--	--	--	>1	--	--	--
Warm Season Perennials																																								
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	7	3	6	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	5	--	--	--	--
BOGR2	--	--	--	1	1	--	--	2	--	--	--	1	--	--	--	--	--	--	--	--	2	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5
BRIN2	68	--	32	--	9	6	6	38	--	--	9	15	>1	15	5	20	>1	--	4	--	6	11	25	15	--	--	--	--	--	--	--	28	5	--	13	>1	--	--	19	25
PLJA	--	--	--	--	3	25	33	15	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPAI	--	--	--	>1	--	--	--	--	>1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																																								
Annuals																																								
BASC5	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CHLE4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--
CHSE6	--	--	--	--	--	--	--	--	1	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SATR12	--	--	--	--	1	--	1	--	--	--	--	2	--	1	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--
Perennials/Biennials																																								
ACMI2	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																																								
ARLU	--	--	--	--	--	--	--	--	--	--	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCA2	1	2	--	2	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	1	--	--	--	--	--	1	--	1	--	1	5	--	--	--	--	1	1	--	--
ATCO4	--	--	--	--	--	--	--	--	2	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
ERNA10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	--	--	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	1
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--
PUTR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Species codes defined in Table A-6

Table A-4: M-VMU-2 Air-dry Aboveground Annual Production Data (g/m²), 2024

Transect	T01P				T02P				T03P				T04P				T05P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
Cool Season Perennials																				
ACHY	--	--	--	--	--	--	6.32	0.2	--	--	--	21.23	9.12	60.9	49.5	21.99	--	--	--	--
ELLA3	--	--	--	--	--	--	--	29.07	30.14	--	--	7.53	--	--	--	--	--	--	--	--
HECO26	--	--	--	--	--	--	--	--	4.8	--	--	--	--	--	--	--	--	--	--	--
PASM	--	--	--	18.27	17.96	44.55	7.28	10.41	--	31.86	--	0.56	--	--	--	--	--	--	--	--
PSJU3	--	--	--	--	--	--	35.92	--	--	--	--	--	43.7	--	--	27.81	10.8	13.57	84.38	16.99
PSSP6	--	--	--	--	--	14.57	10.45	6.85	--	--	42.29	--	--	--	--	--	--	--	--	--
THIN6	--	--	--	--	--	--	8.15	--	--	--	--	--	--	--	--	--	--	--	--	--
THPO7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Warm Season Perennials																				
BOCU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	--	--	--	--	--	27.18	--	0.9	--	11.76	--	--	--	--	--	--	--	--	--
BRIN2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PLJA	--	15.78	28.07	--	--	--	5.74	20.68	--	0.31	--	--	--	--	--	--	0.81	--	3.14	52.18
SPAI	228.54	103.61	146.18	68.08	--	--	--	--	--	--	--	--	--	--	2.62	--	--	--	--	--
Forbs																				
Perennials/Biennials																				
ACMI2	--	--	--	--	--	--	--	-0.03	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	10.16	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	2.29	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	0.14	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	-0.11	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																				
ARLU	--	--	--	--	--	--	--	--	--	--	14.0	--	--	--	--	--	--	--	--	--
ATCA2	34.42	32.93	--	293.31	--	--	--	--	--	--	--	--	--	--	--	35.62	--	--	--	--
ATCO4	--	--	--	--	--	--	--	--	26.45	5.62	--	2.02	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ERNA10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	0.39	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	--	--	1.99	177.77	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.08	--	--
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PUTR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Air-dry Aboveground Annual Production (g/m2)																				
Total Production	263.0	152.3	174.3	379.7	18.0	59.5	103.0	244.8	62.3	40.1	78.4	31.3	52.8	60.9	52.1	85.4	11.6	17.7	87.5	69.2
Total Air-dry Aboveground Annual Production (lbs/ac)																				
Total Production	2295	1330	1521	3314	157	519	899	2137	544	350	684	274	461	532	455	746	101	154	764	604

Transect	T06P				T07P				T08P				T09P				T10P			
Quadrat	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Grasses																				
Cool Season Perennials																				
ACHY	14.1	--	--	--	5.24	--	23.57	--	--	--	--	2.01	7.28	6.54	--	11.53	1.96	7.42	31.57	33.24
ELLA3	--	--	--	5.15	--	--	--	4.0	--	0.58	--	13.32	4.14	--	4.44	6.95	12.53	2.12	--	2.23
HECO26	--	--	6.56	--	--	15.66	--	--	--	--	--	--	--	--	--	--	--	--	--	--
PASM	25.33	--	7.4	--	--	1.19	--	1.3	--	--	--	--	--	10.92	--	--	8.91	1.53	5.38	--
PSJU3	--	--	--	--	--	1.27	22.21	--	19.67	16.19	14.26	--	--	--	--	--	--	--	--	--
PSSP6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.05	--	--
THIN6	--	--	--	--	--	--	30.46	--	--	--	--	--	--	--	--	--	--	--	--	--
THPO7	--	--	--	--	--	--	--	--	--	--	--	--	126.23	--	--	--	--	--	--	--
Warm Season Perennials																				
BOCU	--	--	--	--	--	--	--	15.73	--	--	--	--	--	--	--	--	--	--	--	--
BOGR2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.04	--	--	--	--	--
BRIN2	--	--	--	--	--	--	--	3.29	--	--	--	--	--	--	--	--	--	--	--	--
PLJA	--	49.9	3.68	111.54	220.33	6.72	--	54.51	--	--	--	--	16.36	48.74	93.15	34.88	--	--	--	--
SPAI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Forbs																				
Perennials/Biennials																				
ACMI2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MACA2	--	--	--	--	1.67	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MEOF	--	--	--	--	10.3	--	--	31.89	--	--	--	--	--	--	--	--	--	--	--	--
PEPA8	--	--	36.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
RACO3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPCO	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SPPA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TRDU	--	--	--	--	--	--	--	--	--	--	--	--	3.6	--	--	--	--	--	--	--
TRPR	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Shrubs, Trees, and Cacti																				
ARLU	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ATCA2	193.29	--	--	--	--	--	73.95	--	5.28	--	3.6	119.79	--	--	--	--	-0.03	-0.13	--	--
ATCO4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	218.82
ERNA10	--	--	--	--	--	--	--	--	--	--	--	43.65	-0.17	--	--	--	--	--	--	--
GUSA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
HEVI4	--	--	--	--	109.09	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
KRLA2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15.49	6.16
PUME	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.93	--	--	--	--	--
PUTR2	--	--	--	1.98	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Air-dry Aboveground Annual Production (g/m2)																				
Total Production	232.7	49.9	53.7	118.7	346.6	24.8	150.2	110.7	25.0	16.8	17.9	178.8	157.4	66.2	107.6	53.4	23.4	20.0	52.4	260.5
Total Air-dry Aboveground Annual Production (lbs/ac)																				
Total Production	2031	436	469	1036	3026	217	1311	967	218	146	156	1561	1374	578	939	466	204	174	458	2274

Notes:

g/m^2 = grams per square meter

lbs/ac = pounds per acre

1 gram per square meter (g/m^2) is equal to 8.922 pounds per acre (lbs/ac)

Species codes defined in Table A-6

Non-forage and forage determinations are based on the permit (e.g. plants of perennial and/or biennial duration are forage and plants of annual duration are non-forage; noxious weeds are non-forage)

Table A-5: M-VMU-1 Shrub Belt Transect Data, 2024

Transect	T01P	T01P	T02P	T03P	T04P	T06P	T07P	T08P	T09P	T10P
Shrubs, Trees and Cacti										
ARLU	--	13	6	--	--	--	--	--	--	--
ATCA2	20	3	6	3	5	1	1	14	1	12
ATCO	--	--	--	--	1	--	--	--	--	--
ATCO4	--	--	23	--	--	--	--	--	--	--
EPVI	--	--	--	--	--	--	--	--	7	9
ERNA10	--	--	2	2	--	--	--	3	--	3
GUSA2	--	2	--	--	--	--	--	--	--	--
HEVI4	--	3	--	--	--	--	13	--	--	--
KRLA2	--	--	1	--	10	3	--	2	5	19
OPPH	1	--	--	--	--	--	--	--	--	--
PUME	--	--	--	--	--	--	--	--	4	2
PUTR2	--	2	--	--	--	--	--	--	--	4
Total	21	23	38	5	16	4	14	19	17	49

Notes:
Species codes defined in Table A-6

Table A-6 : Species Observed 2019-2024, M-VMU-1

Common Name	Scientific Name	Code
Cool-Season Grasses (15)		
Annuals (2)		
Cheatgrass	*Bromus tectorum*	BRTE
Common barley	*Hordeum vulgare*	HOVU
Perennials (13)		
Indian ricegrass	*Achnatherum hymenoides*	ACHY
Crested wheatgrass	*Agropyron cristatum*	AGCR
Smooth brome	*Bromus inermis*	BRIN2
Bottlebrush squirreltail	*Elymus elymoides*	ELEL5
Thickspike wheatgrass	*Elymus lanceolatus*	ELLA3
Thickspike wheatgrass	*Elymus lanceolatus* ssp. *lanceolatus*	ELLAL
Slender wheatgrass	*Elymus trachycaulus*	ELTR7
Needle and thread	*Hesperostipa comata*	HECO26
Western wheatgrass	*Pascopyrum smithii*	PASM
Russian wildrye	*Psathyrostachys juncea*	PSJU3
Bluebunch wheatgrass	*Pseudoroegneria spicata*	PSSP6
Intermediate wheatgrass	*Thinopyrum intermedium*	THIN6
Tall wheatgrass	*Thinopyrum ponticum*	THPO7
Warm-Season Grasses (6)		
Perennials (6)		
Purple threeawn	*Aristida purpurea*	ARPU9
Sideoats grama	*Bouteloua curtipendula*	BOCU
Blue grama	*Bouteloua gracilis*	BOGR2
James' galleta	*Pleuraphis jamesii*	PLJA
Alkali sacaton	*Sporobolus airoides*	SPAI
Sand dropseed	***Sporobolus cryptandrus***	**SPCR**
Forbs (39)		
Annuals (15)		
Burningbush	*Bassia scoparia*	BASC5
Ribseed sandmat	*Chamaesyce glyptosperma*	CHGL13
Threadstem sandmat	***Chamaesyce revoluta***	**CHRE4**
Mealy goosefoot	*Chenopodium incanum*	CHIN2
Narrowleaf goosefoot	*Chenopodium leptophyllum*	CHLE4
Lambsquarters	*Chenopodium album*	CHAL7
Fetid marigold	***Dyssodia papposa***	**DYPA**
Common sunflower	*Helianthus annuus*	HEAN3
Longleaf false goldeneye	*Heliomeris longifolia*	HELO6
Shortstem lupine	***Lupinus brevicaulis***	**LUBR2**
Fendler's desertdandelion	*Malacothrix fendleri*	MAFE
Little hogweed	*Portulaca oleracea*	POOL
Prickly Russian thistle	*Salsola tragus*	SATR12
Unknown annual forb	Unknown Annual Forb	UNKAF
Golden crownbeard	*Verbesina encelioides*	VEEN
Perennials/Biennials (24)		
Common yarrow	*Achillea millefolium*	ACMI2
Slimstalk spiderling	*Boerhavia gracillima*	BOGR
Unknown Boraginaceae Species	*Boraginaceae* sp.	BORAGI
Rose heath	*Chaetopappa ericoides*	CHER2
Whitemargin sandmat	*Chamaesyce albomarginata*	CHAL11
Chenopod	*Chenopodiaceae*	CHENOP
Flixweed	*Descurainia sophia*	DESO
Trailing fleabane	*Erigeron flagellaris*	ERFL
Redstem stork's bill	*Erodium cicutarium*	ERCI6
Curlycup gumweed	*Grindelia squarrosa*	GRSQ
Flatspine stickseed	*Lappula occidentalis*	LAOC3
Lewis flax	*Linum lewisii*	LILE3
Hoary tansyaster	*Machaeranthera canescens*	MACA2
Sweetclover	*Melilotus officinalis*	MEOF
Colorado four o'clock	*Mirabilis multiflora*	MIMU
Palmer's penstemon	*Penstemon palmeri*	PEPA8
Upright prairie coneflower	*Ratibida columnifera*	RACO3
Cutleaf vipergrass	***Scorzonera laciniata***	**SCLA6**
Tall tumblemustard	*Sisymbrium altissimum*	SIAL2
Silverleaf nightshade	*Solanum elaeagnifolium*	SOEL
Scarlet globemallow	*Sphaeralcea coccinea*	SPCO
Fendler's globemallow	*Sphaeralcea fendleri*	SPFE
Yellow salsify	*Tragopogon dubius*	TRDU
Salsify	*Tragopogon porrifolius*	TRPO

Table A-6 : Species Observed 2019-2024, M-VMU-1

Common Name	Scientific Name	Code
Shrubs, Trees and Cacti (21)		
Prairie sagewort	*Artemisia frigida*	ARFR4
White sagebrush	*Artemisia ludoviciana*	ARLU
Big sagebrush	*Artemisia tridentata*	ARTR2
Fourwing saltbush	*Atriplex canescens*	ATCA2
Shadscale saltbush	*Atriplex confertifolia*	ATCO
Mat saltbush	*Atriplex corrugata*	ATCO4
Gardner's saltbush	*Atriplex gardneri*	ATGA
Greene's rabbitbrush	*Chrysothamnus greenei*	CHGR6
Longleaf jointfir	*Ephedra trifurca*	EPTR
Mormon tea	*Ephedra viridis*	EPVI
Rubber rabbitbrush	*Ericameria nauseosa*	ERNA10
Broom snakeweed	*Gutierrezia sarothrae*	GUSA2
Winterfat	*Krascheninnikovia lanata*	KRLA2
Pale desert-thorn	*Lycium pallidum*	LYPA
Plains pricklypear	*Opuntia polyacantha*	OPPO
Eastern cottonwood	*Populus deltoides*	PODE2
Mexican cliffrose	*Purshia mexicana*	PUME
Antelope bitterbrush	*Purshia tridentata*	PUTR2
Threadleaf ragwort	***Senecio flaccidus***	**SEFL3**
Broom-like ragwort	***Senecio spartioides***	**SESP3**
Banana yucca	*Yucca baccata*	YUBA

Notes:

Bold species are newly observed on M-VMU-1 in 2024

APPENDIX B

Quadrat Photographs

M-VMU1-T01P

Q1

Q2

Q3

Q4

Belt

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M-VMU1-T03P	
	
Q1	Q2
	
Q3	Q4
	
Belt	

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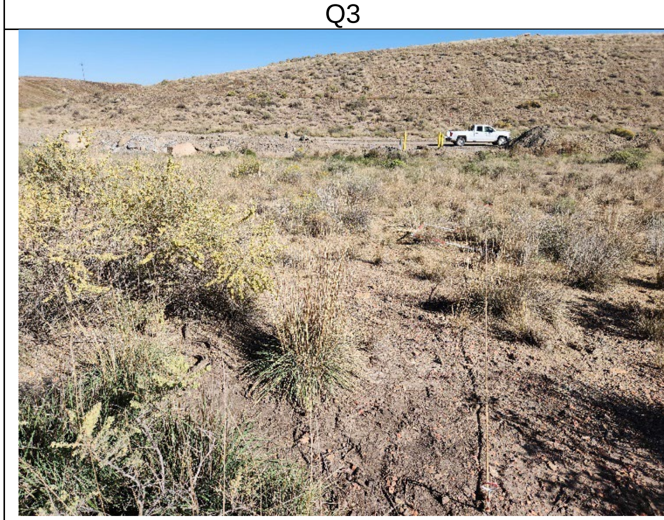
<tr><td></td><td></td></tr>
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M-VMU1-T05P	
	
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Q3	Q4
	
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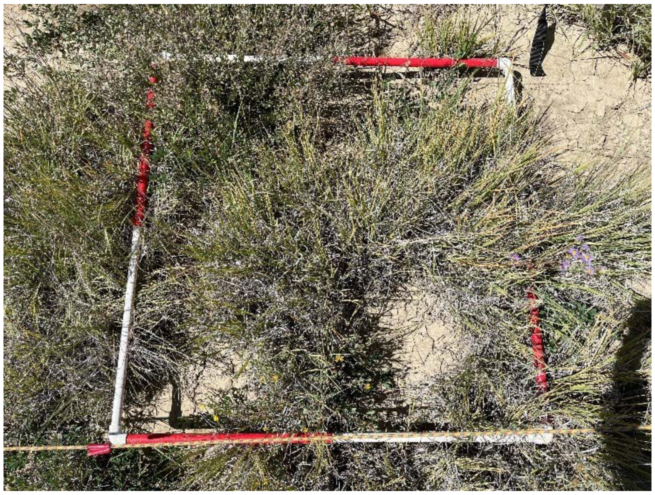	
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Q3	Q4
	
Belt	

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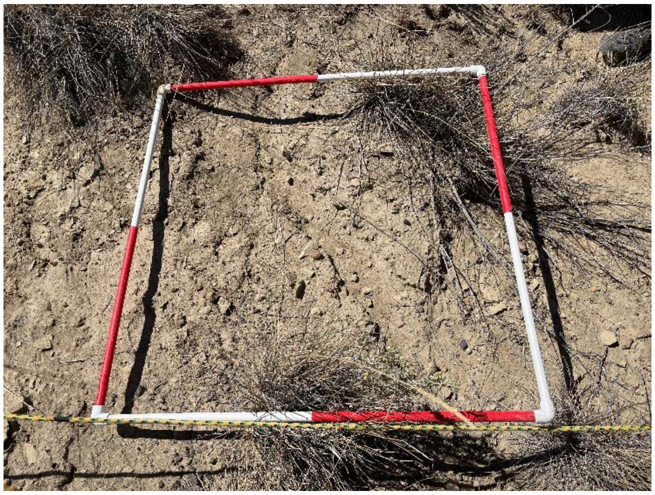
<tr><td></td><td></td></tr>
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M-VMU1-T09P	
	
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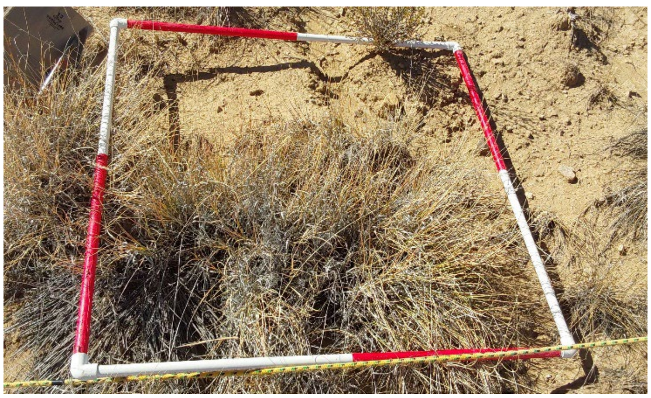
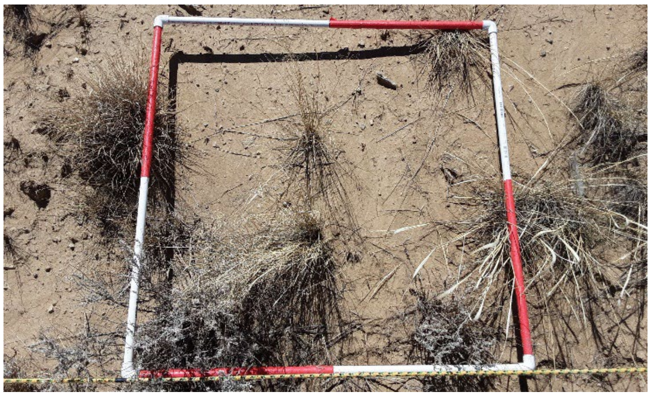
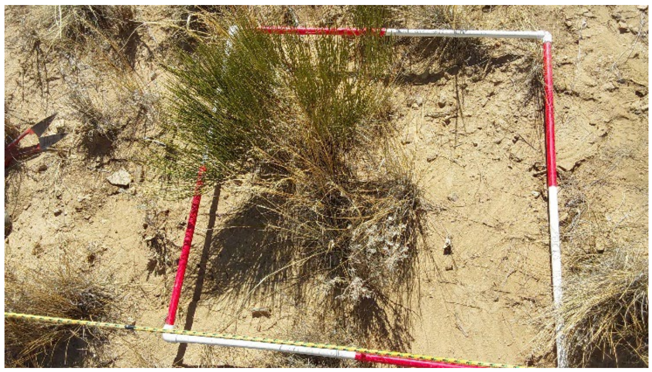
	
Q3	Q4
	
Belt	

M-VMU1-T10P	
	
Q1	Q2
	
Q3	Q4
	
Belt	

APPENDIX C

Vegetation Statistical Analysis

Table C-1: Data for Normal Distribution and Variance Analysis, M-VMU-1, 2024

Transect	Quadrat	Raw Values			Log Values	
		Perennial/ Biennial Cover (%)	Annual Forage Production (lbs/ac)	Woody Plant Density (#/ac)	P/B Cover	AFP
M-VMU-1-T01	1	95	2295	2833	1.98	3.36
	2	63	1330		1.80	3.12
	3	78	1521		1.89	3.18
	4	115	3314		2.06	3.52
M-VMU-1-T02P	1	22	157	3103	1.34	2.20
	2	39	519		1.59	2.72
	3	68	899		1.83	2.95
	4	94	2137		1.97	3.33
M-VMU-1-T03P	1	56	544	5126	1.75	2.74
	2	16	350		1.20	2.54
	3	62	684		1.79	2.84
	4	16	274		1.20	2.44
M-VMU-1-T04P	1	17	461	674	1.23	2.66
	2	45	532		1.65	2.73
	3	46	455		1.66	2.66
	4	79	746		1.90	2.87
M-VMU-1-T05P	1	16	101	2158	1.20	2.01
	2	21	154		1.32	2.19
	3	78	764		1.89	2.88
	4	45	604		1.65	2.78
M-VMU-1-T06P	1	101	2031	540	2.00	3.31
	2	30	436		1.48	2.64
	3	24	469		1.38	2.67
	4	49	1036		1.69	3.02
M-VMU-1-T07P	1	95	3026	1889	1.98	3.48
	2	22	217		1.33	2.34
	3	140	1311		2.15	3.12
	4	78	967		1.89	2.99
M-VMU-1-T08P	1	15	218	2563	1.18	2.34
	2	21	146		1.31	2.17
	3	32	156		1.51	2.19
	4	79	1561		1.90	3.19
M-VMU-1-T09P	1	57	1374	2293	1.76	3.14
	2	64	578		1.81	2.76
	3	52	939		1.72	2.97
	4	30	466		1.48	2.67
M-VMU-1-T10P	1	19	204	6610	1.28	2.31
	2	22	174		1.34	2.24
	3	52	458		1.71	2.66
	4	50	2274		1.69	3.36
Mean		52.5	897.0	2778.8	1.64	2.78
Standard Deviation		31.4	813.2	1861.8	0.28	0.40
Count		40	40	10	40	40
Variance (sample)		985	661235	3466279	0	0
90% Confidence Interval		8.2	211.5	968.4	0.1	0.1
Technical Standard		15	350	150	1.18	2.54
90% of Standard		13.5	315	135	1.06	2.29

Notes:
2024 Data are found in Appendix A

All Appendix C analysis, tables, and figures computed using R software: (R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/

Table C-2: Perennial/Biennial Cover, one-sample, one-sided sign test- reverse null, M-VMU-1, 2024

Transect	Perennial/Biennial Cover (%)	90% of Technical Standard	Difference
O-VMU1-T01P	95.0	13.5	81.5
O-VMU1-T02P	63.0	13.5	49.5
O-VMU1-T03P	78.0	13.5	64.5
O-VMU1-T04P	115.0	13.5	101.5
O-VMU1-T05P	22.0	13.5	8.5
O-VMU1-T06P	38.8	13.5	25.3
O-VMU1-T07P	67.5	13.5	54.0
O-VMU1-T08P	94.1	13.5	80.6
O-VMU1-T09P	56.0	13.5	42.5
O-VMU1-T10P	16.0	13.5	2.5
O-VMU1-T11P	61.5	13.5	48.0
O-VMU1-T12P	16.0	13.5	2.5
O-VMU1-T13P	17.0	13.5	3.5
O-VMU1-T14P	45.0	13.5	31.5
O-VMU1-T15P	45.5	13.5	32.0
O-VMU1-T16P	79.0	13.5	65.5
O-VMU1-T17P	16.0	13.5	2.5
O-VMU1-T18P	21.0	13.5	7.5
O-VMU1-T19P	78.0	13.5	64.5
O-VMU1-T20P	45.0	13.5	31.5
O-VMU1-T21P	101.0	13.5	87.5
O-VMU1-T22P	30.0	13.5	16.5
O-VMU1-T23P	24.0	13.5	10.5
O-VMU1-T24P	48.5	13.5	35.0
O-VMU1-T25P	95.1	13.5	81.6
O-VMU1-T26P	21.5	13.5	8.0
O-VMU1-T27P	140.0	13.5	126.5
O-VMU1-T28P	77.5	13.5	64.0
O-VMU1-T29P	15.0	13.5	1.5
O-VMU1-T30P	20.5	13.5	7.0
O-VMU1-T31P	32.0	13.5	18.5
O-VMU1-T32P	79.0	13.5	65.5
O-VMU1-T33P	57.0	13.5	43.5
O-VMU1-T34P	64.0	13.5	50.5
O-VMU1-T35P	52.0	13.5	38.5
O-VMU1-T36P	30.0	13.5	16.5
O-VMU1-T37P	19.0	13.5	5.5
O-VMU1-T38P	22.1	13.5	8.6
O-VMU1-T39P	51.5	13.5	38.0
O-VMU1-T40P	49.5	13.5	36.0
		k	0
		n	40
		z	-6.17
		Standard one-tailed normal curve area (Table C-3; MMD, 1999)	0.4990
		P	<0.1

Notes:
Data is from Table C-2
When k exceeds 50% of n-observations, the performance standard has not been met
P = 0.5-Area = prob of observing z; ≤0.1 performance standard met
z value calculation:

$$z = \frac{(k+0.5)-0.5n}{0.5\sqrt{n}}$$

k (0) ≤ 20, P ≤ 0.1, **performance standard is met**

Table C-3: Log Annual Forage Production, M-VMU-1, 2024, Method 3 - CMRP

$$t^* = \frac{\bar{x} - 0.9\,(technical\ std)}{s/\sqrt{n}}$$

2024 Log Annual Forage Production (lbs/ac)	
Mean	2.78
Standard Deviation	0.40
Sample Size	40
Technical Standard	2.54
t*	7.71
1-tail t (0.1, 39)	1.304

Notes:

Decision Rules (reverse null)

t < t (1-a; n-1), failure to meet std*

t ≥ t (1-a; n-1), performance std met*

t from Appendix Table C-1 (MMD, 1999)

t*(7.71) ≥ t (1.304), **performance standard is met**

Table C-4: Shrub Density by the Belt Transect Method, M-VMU-1, 2024, Method 3 - CMRP

$$t^* = \frac{\bar{x} - 0.9\,(technical\ std)}{s/\sqrt{n}}$$

2024 Woody Plant Density (#/ac)	
Mean (#/ac)	2,779
Standard Deviation (#/ac)	1,862
Sample Size	10
Technical Standard (#/ac)	150
t*	4.49
1-tail t (0.1, 9)	1.383

Notes:

#/ac = Number of shrubs, trees and/or cacti per acre

Decision Rules (reverse null)

t < t (1-a; n-1), failure to meet std*

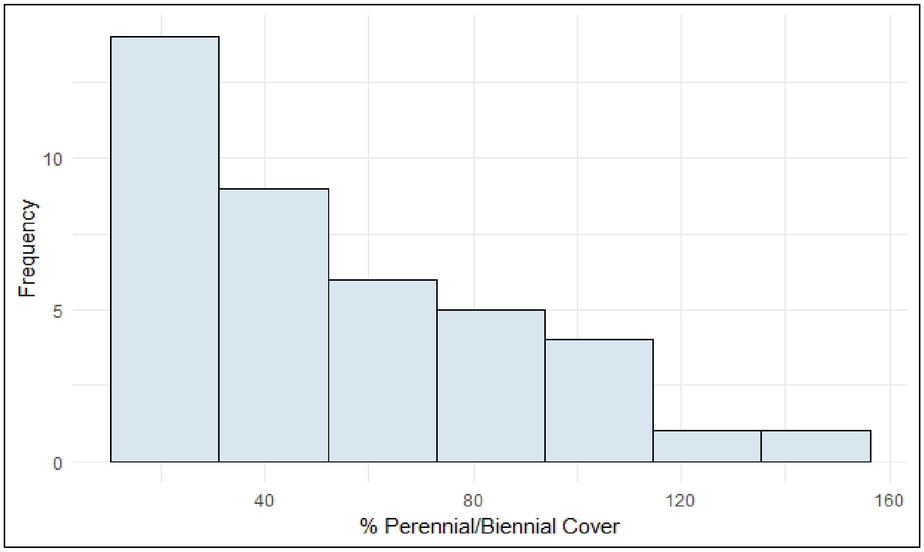
t ≥ t (1-a; n-1), performance std met*

t from Appendix Table C-1 (MMD, 1999)

t*(4.49) ≥ t (1.304), **performance standard is met**

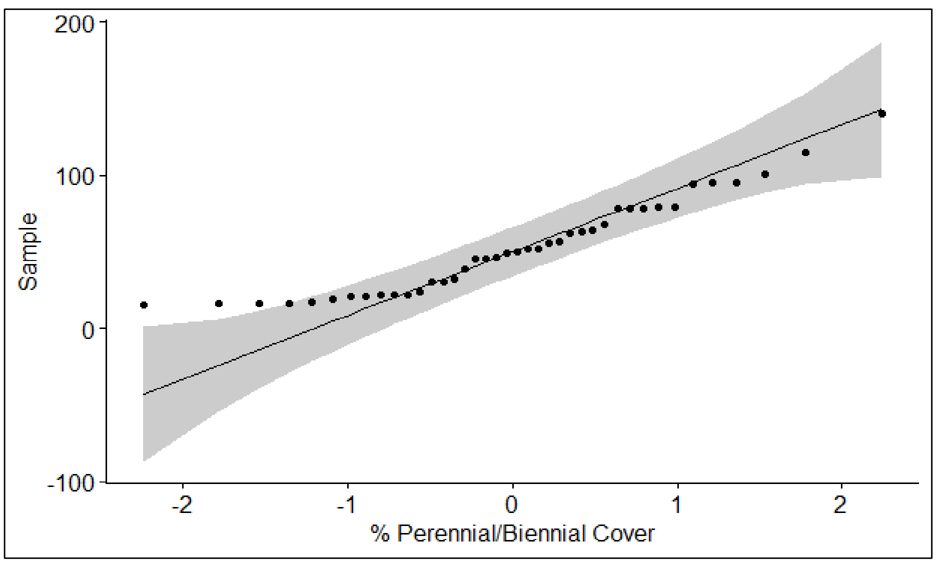
Figure C-1: Perennial/Biennial Canopy Cover, M-VMU-1, 2024

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	52.58	8.16	44.42	5	31	0.72	2.91	22.00	49.50	78.00

Normality



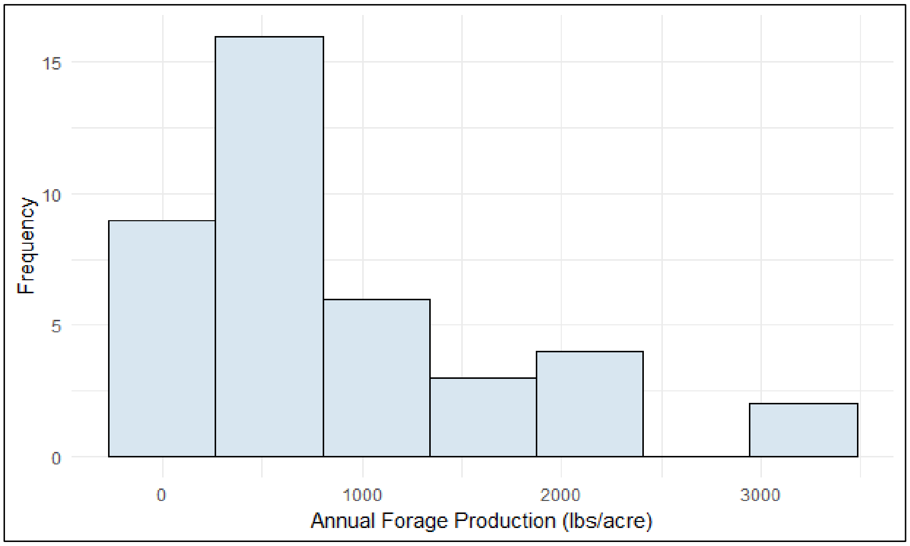
Shapiro-Wilk Test

W statistic	P-value
0.92393	0.010260

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P ≤ 0.1)
(Data are not normally distributed)

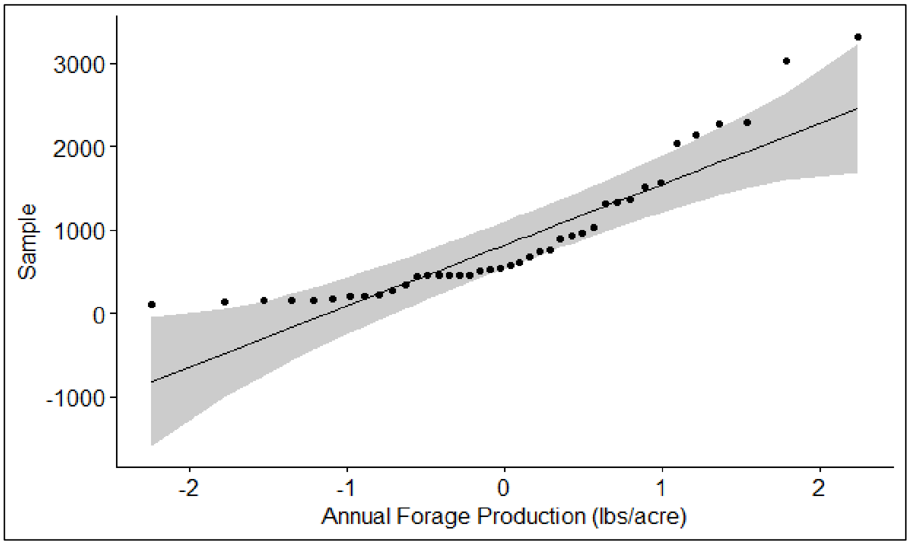
Figure C-2: Annual Forage Production, M-VMU-1, 2024

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	897.05	211.47	685.58	129	813.1173	1.38	4.19	331.00	561.00	1315.75

Normality



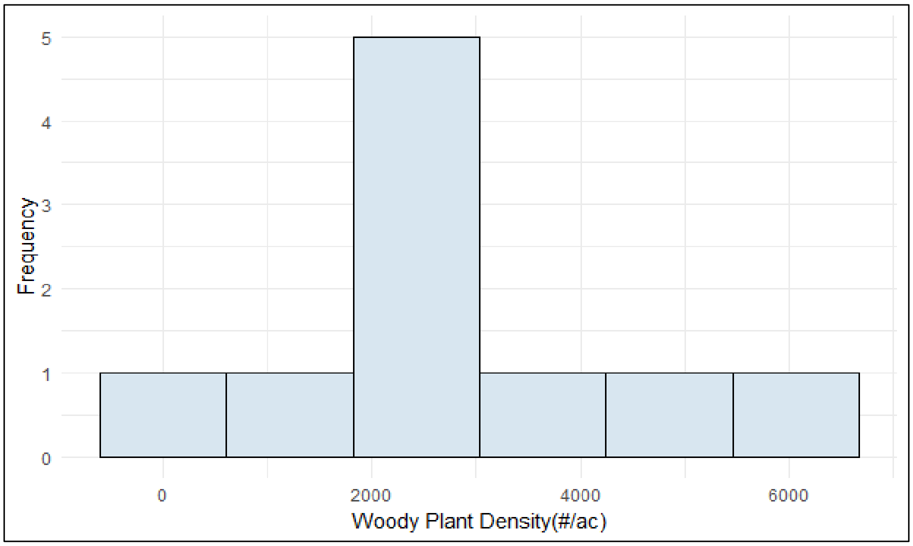
Shapiro-Wilk Test

W statistic	P-value
0.82934	0.000029

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P ≤ 0.1)
(Data are not normally distributed)

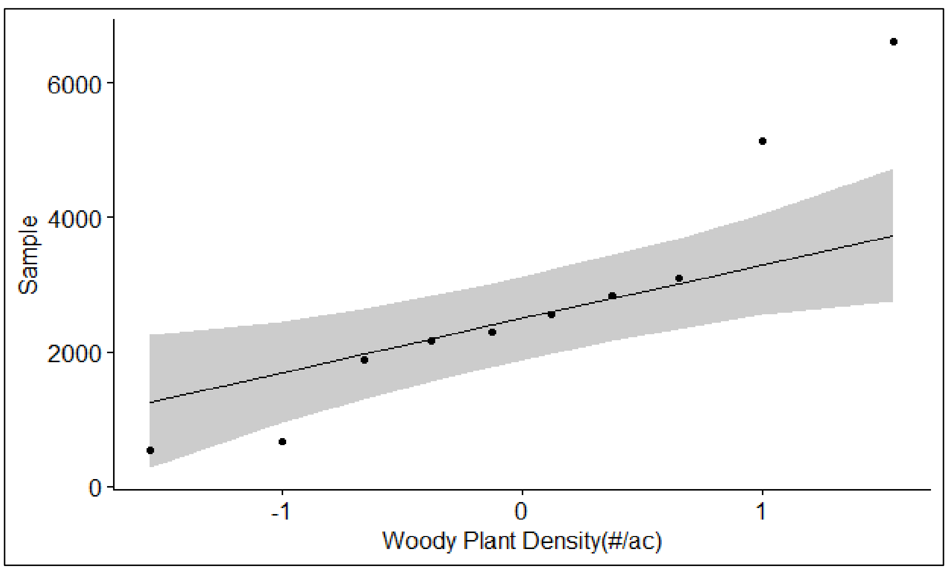
Figure C-3: Woody Plant Density, M-VMU-1, 2024

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
10	2778.90	968.43	1810.47	588.76	1861.83	0.86	2.99	1956.25	2428.00	3035.50

Normality



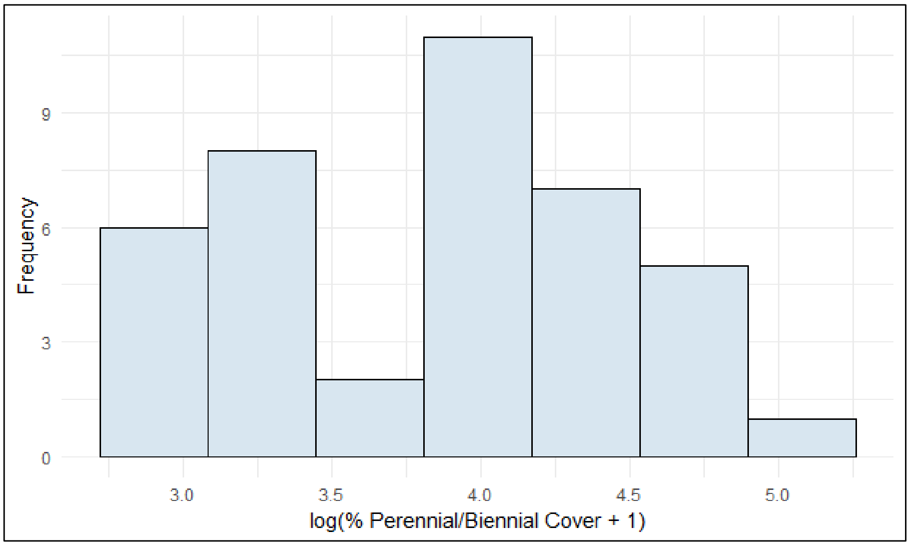
Shapiro-Wilk Test

W statistic	P-value
0.90071	0.22310

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Fail to reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P ≥ 0.1)
(Data are normally distributed)

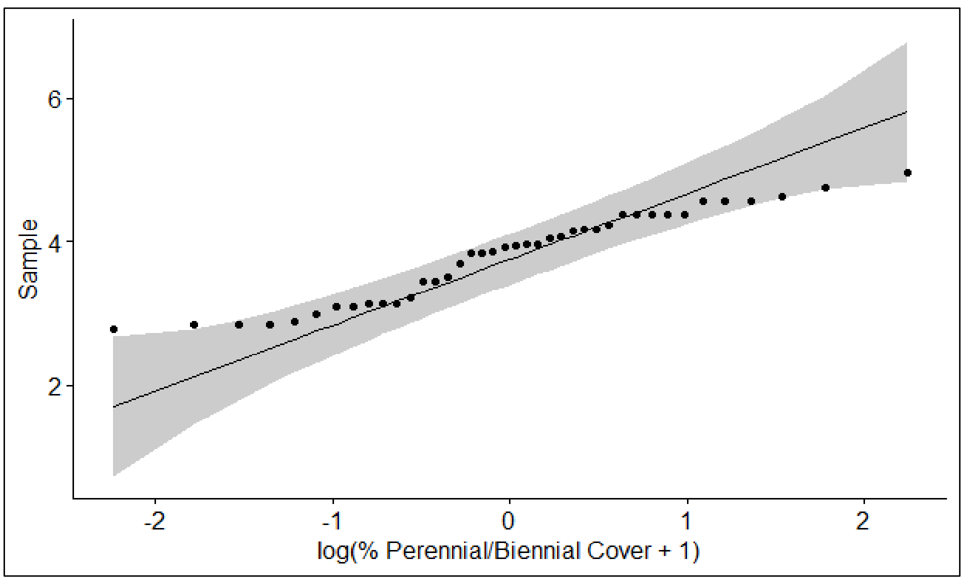
Figure C-4: Log Perennial/Biennial Canopy Cover, M-VMU-1, 2023

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	3.8	0.16	3.64	0	1	-0.16	1.80	3.14	3.92	4.37

Normality



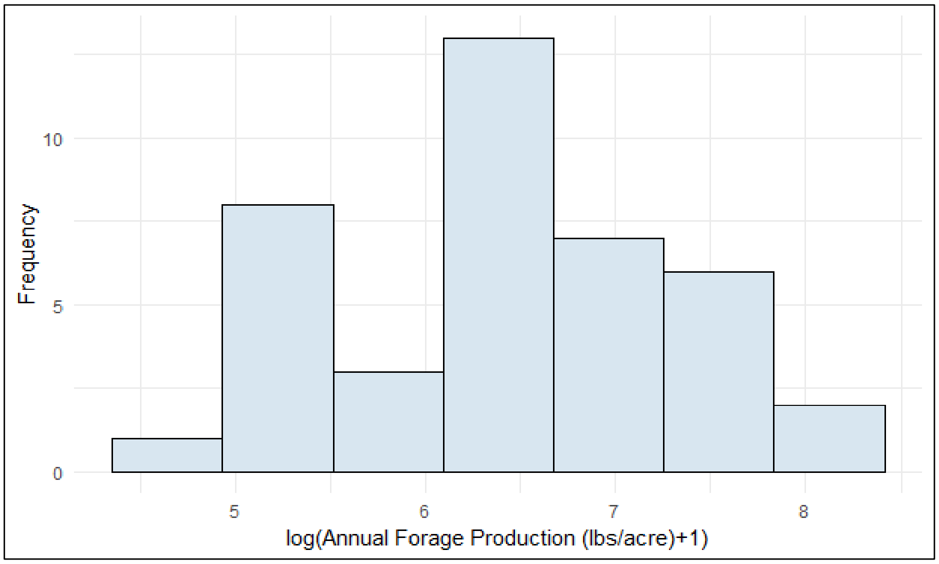
Shapiro-Wilk Test

W statistic	P-value
0.94049	0.035920

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P ≤ 0.1)
(Data are not normally distributed)

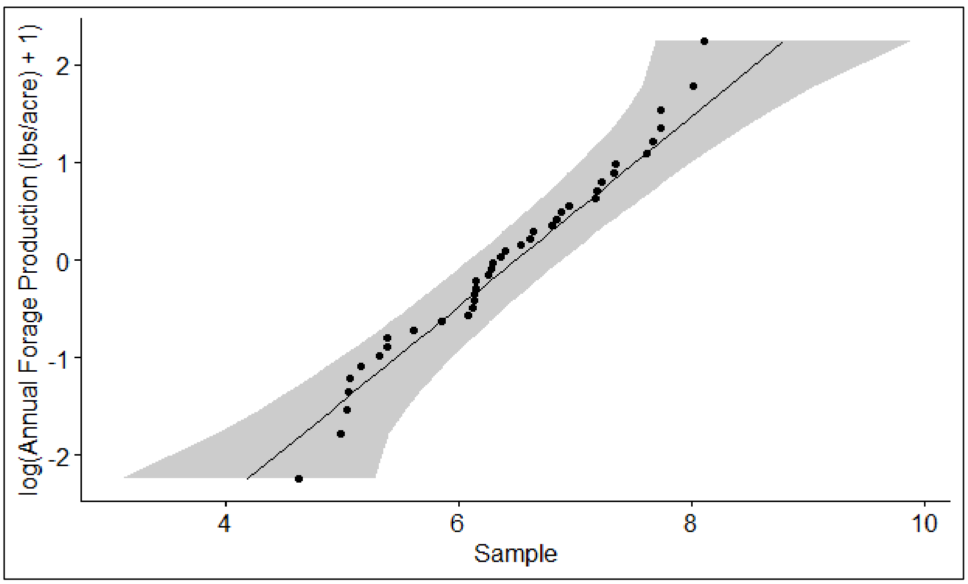
Figure C-5: Log Annual Forage Production, M-VMU-1, 2024

Descriptives



N	Mean	90% CI		SE	SD	Skew	Kurtosis	1st Quartile	Median	3rd Quartile
40	6.407	0.24	6.17	0	1	-0.03	2.11	5.80	6.33	7.18

Normality



Shapiro-Wilk Test

W statistic	P-value
0.96928	0.341400

H0: F(Y) = N(μ, σ)
The population is normally distributed.
H1: F(Y) ≠ N(μ, σ)
The population is not normaly distributed
Fail to reject the null hypothesis in favor of the alternative hypothesis with 90% confidence (P ≥ 0.1)
(Data are normally distributed)

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Appendix 10: VMU 1, Bond Release Application, Groundwater, and Surface Water Evaluation

MMD VMU-1 (AREA 10)

BOND RELEASE APPLICATION

GROUNDWATER AND SURFACE WATER EVALUATION

CHEVRON MINING INC. – MCKINLEY MINE

NEAR GALLUP, NEW MEXICO

August 1, 2025

Project #: CHEVR-025-0034

SUBMITTED BY: Trihydro Corporation

1252 Commerce Drive, Laramie, WY 82070

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PEOPLE YOU CAN TRUST.

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1.0 INTRODUCTION

This report contains a surface water and groundwater assessment in support of the Phase III bond release application for Vegetation Management Unit 1 (VMU 1). The report is inclusive of a small acreage contained in the application for Phase I, II and III. VMU 1 is located on reclaimed land north of New Mexico Highway 264 on the McKinley Mine (Mine) permitted under New Mexico Mining and Minerals Division Permit No. 2016-02 (Mine Permit). This report was prepared in accordance with Mine Permit, Section 3.0, Baseline and Background Information as well as the New Mexico Administrative Code (NMAC) 19.8.14.1412 Requirement to Release Performance Bonds. Requirements for Probable Hydrologic Consequences (PHC) and the Cumulative Hydrologic Impact Assessment (CHIA) are provided in Mine Permit 2016-02, Section 3.0, and included in Appendix A of this report.

The Mine is located approximately 24 miles northwest of Gallup, New Mexico. The Mine began operations in the early 1960s and ceased operations in 2009. Since that time, the Mine has been in various phases of reclamation including grading to post-mine topography, placement of topsoil, and revegetation. VMU 1 surface and groundwater sources have been monitored through a network of surface water monitoring stations and wells. Figure 2-1 shows the location of these monitoring facilities.

Trihydro Corporation (Trihydro) began collecting water quality data in October 2012 and managing water quality in January 2013. This report provides an evaluation of water data from 2013 through 2024 because data during this time period are representative of post-mining conditions and are the most complete verified dataset available to Trihydro. The data analysis includes comparisons to baseline information, effluent standards, and the PHC.

A summary of the hydrologic setting and protection requirements for the Mine are included in this report in Section 2.0. Section 3.0 reviews the long-term chemical and physical characteristics of the Tse Bonita Wash (TBW) which receives waters from the VMU 1 area. Section 4.0 provides a review of the long-term chemical and physical characteristics of the groundwater monitoring locations nearest to VMU 1. There are no impoundments located within or adjacent to the proposed release area.

2.0 HYDROLOGIC SETTING AND PROTECTION

2.1 GEOLOGIC SETTING AND CLIMATE

The Mine is located in the southwest corner of the San Juan Basin in a structural sub-basin known as the Gallup Sag. The San Juan Basin, which is roughly circular in shape, occupies much of northwestern New Mexico, a narrow strip of northeastern Arizona, and a small portion of southwestern Colorado. The basin is bordered on the north by the San Juan Mountains, on the east by the Nacimiento Uplift, on the south by several uplifts including the Lucero Uplift and Zuni Uplift, and on the west by the Defiance Monocline, which separates it from the Black Mesa Basin.

The sedimentary rocks in the San Juan Basin are predominantly of Mesozoic age with some Tertiary rocks outcropping in the central basin and some Paleozoic and Pre-Cambrian rocks upturned along the basin margins. The sediments increase in thickness toward the basin's center. The geology in the vicinity of Gallup and McKinley County is comprised of Middle to Upper Jurassic (175-145 million years old) and Quaternary (less than 1-million years old) rocks. Older rocks, the Triassic River deposits of the Chinle Group, are exposed in the plains to the south and Cretaceous rocks form the high ridges. The rock formations include sandstone, shale, limestone, coal, and mudstone.

The San Juan Basin is characterized by low surface relief. Most of the basin is a relatively featureless plain with wide shallow valleys and some low mesas and cuestas. Elevations in the area range from 5,000 feet above mean sea level (ft amsl) in the north to 7,000 ft amsl in the south. A prominent north-south trending range, the Chuska Mountains, occurs along the western part of the basin with elevations exceeding 9,500 ft amsl. The Mt. Taylor volcanic area, with elevations up to 10,000 ft amsl, occurs within the southeast corner of the basin. The margins of the basin are characterized by hogback ridges, which are associated with the tectonic uplifts defining the basin boundaries.

The majority of the Mine is located in the Puerco River Drainage Basin with a small portion of the mine located in the San Juan River Drainage. The main drainages or watersheds in the mine are the headwaters of Defiance Draw (DD) and its tributary, Defiance Draw Tributary (DDT), Tse Bonita Wash (TBW), Coal Mine Wash (CMW) and its tributary, Coal Mine Wash Tributary (CMWT), and an unnamed tributary to Black Creek. A small portion of the mine lease area is in the headwaters of Deer Springs Wash and Black Springs Wash (both in the San Juan River Drainage Basin). Of the drainage basins listed above, DD is the largest drainage basin with an area of 27.5 square miles. TBW is the drainage basin that encompasses the highest percentage within the mine boundary at 35.0%.

The watershed encompassing VMU 1 discharges surface water run-off to the TBW and DD watersheds. The reclamation in the VMU 1 area is fairly homogeneous and is a small contributor to the larger watersheds measured by

DD and TBW monitoring locations. Sampling data from the TBW watershed was chosen as an example of what is being observed at the large watershed level, and the TBW sampling location is much closer to VMU 1 lands than DD. The TBW sampling location is approximately 0.5-1.0 miles downstream of VMU 1 where DD is over 8 miles distant. The TBW sampling location is shown on Figure 2-1.

As presented in the Mine Permit, Section 3.4, groundwater resources within the Mine fall into three main types: alluvial, bedrock, and aquifer. Alluvial and bedrock groundwater resources are discontinuous, of poor physical and chemical quality, and of limited extent. The first major deep aquifer is the Gallup Sandstone Aquifer (GSA). The aquifer lies well below the zone of mining impact and is overlain by several impermeable shale members. Most recharge to the GSA comes from the Chuska Mountains to the northwest of the Mine. In addition to these three types, groundwater may also be found in spoil material above bedrock.

The groundwater monitoring well nearest VMU 1 is GSA Well 3. The location of Well 3 is shown on Figure 2-1. No bedrock wells or alluvial wells are near VMU 1.

The Mine climate is semi-arid with an average annual precipitation of approximately 11 inches (in.) per year. More than half the annual precipitation typically falls during the months of July through October. Precipitation often occurs as rainfall from intense, localized thunderstorms that occur sporadically in the region. This can result in high suspended solids levels in the runoff. In addition, soil chemistry and geomorphology contribute to the high levels of dissolved solids, salinity, and alkalinity. Within the general area of the Mine, runoff due to precipitation events occurs in the form of surface runoff. Natural drainages or watersheds convey or temporarily store the runoff as it is routed to the Puerco River or San Juan River.

Precipitation data nearest to VMU 1 are reported from the precipitation stations at the Mine, Rain 9, Rain 10, and Rain 11 (Figure 2-1), which are located southeast of VMU 1, in the southwest portion of VMU 1 east of Well 3, and east of VMU 1 just west of wells DT2A and DT2B, respectively. These stations only operate between late April and mid-November and are shut down annually during the winter months.

Table 2-1 provides the monthly and annual precipitation data from Rain 9, Rain 10, and Rain 11 for the reporting period. Average monthly precipitation across these stations ranged from 0.50 in. in June to 1.56 in. in August during the 12-year evaluation period. On average, most of the precipitation is received between July and September. The month with the highest 1-month precipitation total was May 2014 with 17.00 in., followed by August 2022 with 4.62 in. Precipitation data are referenced throughout the report to help explain some of the observations presented for surface and groundwater stations.

2.2 HISTORICAL WATER QUALITY DATA

The Mine began operations in the early 1960s, before the passage of the Surface Mine Control and Reclamation Act and other regulations governing coal mining on Indian lands. At that time, baseline surface and groundwater quality and quantity data were not required before mining. As a result, comparisons cannot be made with pre-mining watershed conditions of the Mine as a single unit.

The original 1980 Geohydrology Associates Inc. (GAI) baseline groundwater report, incorporated into the Mine permits, provides surface and groundwater quality and quantity data that can be referenced for evaluating trends since that time. There are no baseline groundwater data applicable to the Mine site. Groundwater monitoring is reported annually as required by MMD Mine Permit 201602. The monitoring requirements were recently changed so all wells are sampled annually per Permit Modification Mod 23-04, which was approved by MMD on February 21, 2024. Groundwater resources within the Mine include alluvial, bedrock, Gallup Sandstone Aquifer, and spoil.

Alluvial groundwater is present in some fill and low-lying soils at the Mine. Wells penetrating the alluvial groundwater are designed to monitor the quality and quantity of shallow groundwater in alluvial valley-fill sediments. Valley-fill sediments in the Mine area serve as a reservoir for meteoric water to reside. Because the area is semi-arid and annual precipitation is limited, the presence of alluvial groundwater is generally dependent on rainfall and, to a lesser extent, snowfall quantities.

In 1980, five bedrock wells (MBR1, MBR2, MBR3, MBR4, and MBR5) were installed approximately 50 feet (ft) below the Green Coal Seam to monitor groundwater below this unit. The Green Coal Seam was the lower-most recoverable coal seam at the Mine. These monitoring wells, referred to as McKinley bedrock wells, were located in and around the major drainage watersheds throughout the mine. Three of the original five wells (MBR1, MBR3, and MBR4) were mined through and not replaced. The active bedrock monitoring wells include MBR2 and MBR5, with neither well located in the vicinity of VMU 1.

The original 1980 GAI baseline groundwater report concluded that these bedrock wells had little potential as a meaningful groundwater resource. The transmissivity of the bedrock deposits was less than 6 square feet per day (ft2/day) and not capable of maintaining a sustained yield of 1 gallon per minute (gpm). Even though groundwater was present, none of the strata had sufficient continuity to be considered an aquifer.

Five water wells (1, 2, 3, 3A, and 4) have been completed in the GSA throughout the Mine area. These wells were used as primary water sources for mine activities and reclamation. The wells now provide domestic water, dust-control water, and also used as monitoring wells. Because of the relatively low permeability of the shale units overlying the

GSA and the geologic structure in the area, the GSA can be under artesian conditions. Moreover, due to the presence of the overlying shales, there is no hydraulic connection between the underlying Gallup Sandstone and the mined strata. Gallup Sandstone Aquifer Well 3A is located near the bond release area and within the same, larger watershed.

Five spoil recharge wells (2G2, 4A, 9A, 9S, and 11) were constructed in the Mine area. Two spoil wells 4A and 9A on MMD regulated lands were installed in 1990; of these two wells, only 9A remains. Well 4A was not monitored after 2015 following approval by MMD to discontinue monitoring this well because the land at the well location had a full reclamation liability release. Well 4A was abandoned October 29, 2018.

In April 2013, these spoil recharge wells were constructed and designated as wells 2G2 (on Office of Surface Mining Reclamation and Enforcement (OSMRE) lands), 11 (on MMD lands), and 9S (on MMD lands). Spoil recharge wells were installed throughout the mine in reclaimed areas to determine chemical presence and groundwater properties. These wells were terminated at bedrock and their screens encompassed the spoil interval immediately above bedrock. Spoil Well 11 is near VMU 1, and consistently contains sufficient groundwater for sampling.

Surface water has been monitored since the early 1980s through active and passive surface water monitoring stations, although the number and locations of stations have evolved over time. The currently monitored active, Mine Permit related surface water stations for large watersheds are located in and around the major drainage watersheds throughout the Mine and include the DD, TBW, DDT6, CMW, and CMWT stations. In the annual hydrology report, Station CMW is used to monitor flow and water quality from a relatively undisturbed large watershed drainage; the data from this station are used as background information and to contrast against the rest of the stations, which have data from large, disturbed watersheds.

2.3 APPLICABLE PROTECTION STANDARDS

2.3.1 SURFACE WATER COMPARISON

Stormwater runoff from the Mine drains through impoundments and/or hydraulic control structures (e.g., check dams, lined channels, etc.) before discharging into Defiance Draw, a tributary to the Puerco River segment from the Arizona border to the Gallup wastewater treatment plant in McKinley County. Data collected from the disturbed stations in the large watersheds are compared to data collected at the undisturbed CMW station, which are considered background data. The comparison is used to determine impacts from mining activities. This comparison is provided in the annual hydrology report, which is an appendix to the annual reclamation report that is submitted to MMD (Trihydro 2025).

2.3.2 NPDES REQUIREMENTS

The Mine also operates under NPDES Permit No. NN0029386, which was last renewed July 1, 2017. As required under NPDES Permit No. NN0029386, the Mine submitted an updated Sediment Control Plan on September 5, 2017, and is currently awaiting approval from USEPA. Until then, the Mine is operating under the current Sediment Control Plan dated March 15, 2013. All watersheds within the mine are classified as Western Alkaline, and in accordance with NPDES Permit No. NN0029386, reclamation inspections are conducted quarterly within the drainage basins associated with the Sediment Control Plan and inspection findings are summarized in quarterly reports. Additionally, discharge sampling is conducted at NPDES outfalls. There are several watersheds and NPDES outfalls associated with VMU 1. Outfalls are shown on Figure 2-1. The Mine will continue conducting quarterly reclamation inspections and sampling discharge through final bond release.

2.3.3 GROUNDWATER PROTECTION STANDARDS

The Mine Permit does not contain or reference groundwater protection standards. Instead water monitoring data is trended to monitor for potentially adverse changes to water quality over time. NMAC groundwater standards, however, are provided here only to provide an idea of the utility of ground water at the McKinley Mine.

The NMAC standards are for groundwater, which have a total dissolved solids (TDS) concentration of 10,000 mg/l or less, for present and potential future use as domestic and agricultural water supply (NMAC 20.6.2.3103). Groundwater standards are numbers that represent the pH range and maximum concentrations of water contaminants in the groundwater which still allow for the present and future use of ground water resources. Quantitative criteria for these groundwater sources that correspond with available data from the Mine are listed below.

Analyte	Upper Limit (unless otherwise indicated)
pH	6.0-9.0 s.u.
Fluoride	1.6 mg/L
Nitrate as N	10 mg/L
Nitrite as N	1 mg/L
Selenium	0.05 mg/L
Chloride	250 mg/L
Iron	1 mg/L
Manganese	0.2 mg/L
Sulfate	600 mg/L
TDS	1,000 mg/L
Zinc	10 mg/L

Criteria listed for chloride, iron, manganese, sulfate, TDS, zinc, and pH represent the maximum concentration for domestic water supply.

2.4 PROTECTION OF HYDROLOGICAL BALANCE

The Mine Permit includes preventative and remedial measures for any potential adverse hydrologic consequences identified in the Probable Hydrologic Consequences (PHC) determination. The Permit includes sections on the PHC determination, groundwater and surface water monitoring plans, general plans to address possible hydrologic consequences, and a CHIA, as provided by the MMD/OSMRE. These items can be found in Section 3.4 of the Mine Permit. Related Mine Permit sections are summarized below. A copy of the active and approved Mine Permit Section 3.4 is provided as Appendix A.

2.4.1 PHC DETERMINATION

The current and approved PHC determination is provided in Mine Permit No. 2016-02, Section 3.4.4. and included in Appendix A of this report. The PHC first reviews the possible impacts of the impoundments on other surface waters, which are reviewed here for the purposes of a PHC update. Assumptions for and analysis of runoff to the impoundments and consumptive losses from the impoundments are provided. The impoundments have no negative impacts on regional water quantity and should enhance local property use for livestock and wildlife. The PHC also acknowledges and evaluates the possible impact from impoundment stormwater discharge on downstream water chemistry. Review of available data indicated identifiable impact as related to pre- and post-mine monitoring stations along Defiance Draw and its tributaries. Lastly, the PHC considers the possible impacts of the groundwater, located in the alluvial, bedrock, and GSA. This last item will be further discussed in Section 4.5.3.

2.4.2 CUMULATIVE HYDROLOGIC IMPACT ASSESSMENT (CHIA)

A CHIA was prepared by Radian Corporation for OSMRE and MMD in 1995 for the Mine. The CHIA follows the PHC language in Appendix A. Sections 3.0 and 4.0 summarize possible surface and groundwater impacts/material damages concluded by the CHIA.

2.4.3 SURFACE AND GROUNDWATER MONITORING PLANS

Per Section 6.3.2.1 of the Mine Permit, surface-water monitoring in large watersheds is conducted at five stations identified as DD, TBW, DDT6, CMW, and CMWT. Groundwater monitoring is conducted on the following sources: alluvial groundwater, bedrock groundwater, Gallup Sandstone Aquifer, and spoil recharge groundwater. McKinley Mine Permit required analytes vary by water source, which are provided in Table 2-2.

3.0 SURFACE WATER MONITORING, TSE BONITA WASH

There are two watershed stream monitoring stations downstream of VMU 1: TBW along Tse Bonita Wash (Figure 2-1) and DD along Defiance Draw. The reclamation in the VMU 1 area is fairly homogeneous, and is a small contributor to the larger watersheds measured by DD and TBW monitoring locations. Sampling data from the TBW watershed was chosen as an example of what is being observed at the large watershed level, and the TBW sampling location is much closer to the VMU 1 area than the DD sampling location. The TBW sampling location is approximately 0.5-1.0 miles downstream of VMU 1 where DD is over 8 miles distant. The TBW sampling location is shown on Figure 2-1.

Stream water quality data are available from this location since July 2013. The TBW water quality may be further compared with the undisturbed watershed Coal Mine Wash (CMW) ISCO station as outlined in the McKinley Mine 2024 Annual Report - Hydrology Section (Trihydro 2025) Sections 3.1 and 3.3. Required analyte data are presented in Table 3-1. Appendix B presents temporal plots for stream monitoring data at TBW from 2013 to 2024.

Temporal plots were developed for a graphical representation of surface water monitoring data. A statistical analysis was performed on the data as the temporal plots were developed. Outliers noted during the statistical analysis are depicted as a red dot on the temporal plots. As these are relatively small datasets (less than 30 observations for each given parameter), outliers are detected using Dixon’s Test. The test focuses on the most extreme observation in a given data set and determines if the observation is an outlier by assessing the gap between the extreme values and its nearest neighbor relative to the overall range of the data. Dixon’s Test is a standardized test and was used to identify outliers on the stream water quality data set.

3.1 TBW STREAM WATER QUALITY DATA

Analytical data for the stream monitoring location along TBW (Appendix B) are summarized below. Chemical parameters are included in Table 3-1 for TBW. Further discussion is then provided to highlight the observed geochemical trends.

- Alkalinity is a useful parameter when discussing bicarbonate and carbonate, which are the two most important compounds that determine alkalinity. Alkalinity and bicarbonate have each ranged from 68 to 127 mg/L of calcium carbonate during the reporting period. Both parameters had a generally positive trend.
- Total calcium concentrations fluctuated from approximately 33 mg/L to 180 mg/L at TBW during the reporting period with the exception of one outlier in 2024.

- Carbonate concentrations have historically not been detected by the laboratory detection limit or the limit of quantification and have been an insignificant component of total alkalinity for the historic pH levels.
- The calculated cation/anion balance has fluctuated and has had an increasing trend during the reporting period.
- Chloride concentrations have been variable during the reporting period with a downward trend.
- Total Hardness concentration has fluctuated over the reporting period with a spike in 2024, ranging from 120 to 1200 mg/L of calcium carbonate.
- Dissolved iron concentrations have generally been stable since 2013 with the exception of one outlier in 2018.
- Total iron concentrations shown on the temporal plot in Appendix B have exhibited a highly variable trend that has a slightly increasing trend over the reporting period.
- Total magnesium concentrations as shown on the temporal plot in Appendix B have been highly variable and have a generally neutral trend over the reporting period with a spike in 2024.
- The dissolved manganese concentration as shown on the temporal plot in Appendix B has been highly variable but generally neutral through 2021. The concentrations from 2022 to date have all been below 0.25 mg/L.
- Total manganese values shown on the temporal plot in Appendix B fluctuate with a mostly neutral trend during the reporting period. Analytical results indicate that a greater amount of suspended manganese was present than dissolved manganese over the sample events.
- Total mercury concentrations were below the limit of quantification from 2013 through 2018. Mercury concentrations after 2018 have been below the detection limit, with the exception of one sample in 2024 which was 0.00093 mg/L.
- Nitrate, expressed as nitrogen, concentrations are variable with a high outlier in 2017 and the majority of samples from 2021 to 2024 having no detectable nitrogen.
- The laboratory pH levels as shown on the temporal plot in Appendix B have fluctuated between approximately 7.5 and 8.1 standard units during the reporting period with one outlier. The pH levels after 2018 have been 8.0 standard units plus or minus 0.2 standard units with two exceptions.
- Phosphate levels have fluctuated during the reporting period until 2019. All readings from 2019 on have had no detectable phosphate.
- Total phosphorus concentrations show a neutral or slightly increasing trend with more fluctuation and one outlier after 2021.

- Total potassium concentrations in TBW are variable with a neutral to slightly increasing trend over the reporting period.
- Total selenium concentrations were not detectable with one exception prior to 2021. The selenium concentrations from 2021 through 2024 have been detectable. The temporal plot shows a neutral to slightly increasing trend.
- The sodium adsorption ratio at TBW has been relatively stable over the reporting period with a slightly decreasing trend since 2017.
- Total sodium concentrations at TBW have spiked in 2014 and 2024 with an overall decreasing trend during the reporting period.
- Sulfate concentrations have been relatively stable and have a decreasing trend across the reporting period.
- Settleable solids concentrations at TBW have decreased over the reporting period and appear to have stabilized.
- Total dissolved solids concentrations have been variable with a neutral trend during the reporting period. Spikes have been recorded in 2013, 2018, 2021, and 2024, as shown on the temporal plot in Appendix B.
- Total suspended solids concentrations have been slightly variable with no discernable trend, excluding one outlier in 2024. The majority of the cations found in surface water exist in the suspended phase relative to the dissolved phase.

Examination of the collective analytical trends discussed above indicates that water quality concentrations have varied significantly. Fluctuations in analyte concentrations are expected to vary to a greater degree in stormwater runoff relative to groundwater. Year-to-year concentrations of many analytes tend to rise and fall in a similar fashion, likely due to storm intensities during a particular quarter. Most analytes do not exhibit any strong trends, supporting the presumption that adverse impacts from mining and reclamation operations on surface water quality at TBW have not occurred.

3.2 ASSESSMENT OF SURFACE WATER DATA

3.2.1 COMPARISON TO BASELINE WATER QUALITY

TBW surface water quality data from 2020 to 2024 are compared with data from the relatively undisturbed CMW watershed in the McKinley Mine 2024 Annual Report. Comparisons of analyte concentrations may not be as significant as the overall year-to-year variability associated with climactic factors such as variable storm intensities between years and quarters. Most TBW analytes do not exhibit strong trends, and concentrations were similar to, or higher, in samples from CMW than in samples from the disturbed TBW watershed. Based on this comparison, the data indicate that mining and reclamation operations have not adversely affected surface water quality at TBW. A full comparison is available in the McKinley Mine 2024 Annual Report - Hydrology Section (Trihydro 2025) Sections 3.1 and 3.3.

3.2.2 COMPARISON TO PROBABLE HYDROLOGIC CONSEQUENCES

The PHC determination (Mine Permit Section 3.4.4) acknowledges the possible consequence of stormwater on downstream water chemistry. Data show that there are no deleterious effects to watershed health of the Puerco River. Regional surface waters are also protected because of ephemeral flow patterns of the streams of interest and limited constituent loadings to downstream reaches as a result. Full discussion of the surface water quality from each of the mine watersheds is included in the 2024 Annual Hydrology Report (Trihydro 2025) Section 3.0.

4.0 GROUNDWATER MONITORING

Groundwater at the Mine is monitored at four sources: alluvial, bedrock, Gallup Sandstone Aquifer, and spoil. A summary of data for the four groundwater sources is provided below followed by a comparison of results to baseline water quality and the PHC, as applicable. Depth to water data for the groundwater sources are presented in Table 4-1. Tabulated water quality data for the groundwater sources are presented in Tables 4-2, 4-3, 4-4, and 4-5 with temporal plots presented in Appendices C, D, and E. Though not required, historical groundwater data tables include relevant groundwater standards for reference.

Temporal plots were developed for a graphical representation of the long-term groundwater monitoring. The groundwater temporal plots are found in Appendices C through E. A statistical analysis was performed on the data as the temporal plots were developed. Any outliers noted during the statistical analysis are depicted as a red dot on the temporal plots. As these are relatively small datasets (less than 30 observations for each given parameter), outliers are detected using Dixon's Test. The test focuses on the most extreme observation in a given data set and determines if the observation is an outlier by assessing the gap between the extreme values and its nearest neighbor relative to the overall range of the data. Dixon's Test is a standardized test and was used to identify outliers on the alluvial, GSA, and spoil well data sets.

4.1 ALLUVIAL GROUNDWATER

Alluvial wells are located in and around major drainage watersheds throughout the Mine. Since water levels in these wells are dependent on direct precipitation, the depth to groundwater and the saturated thickness in wells vary to some degree based on rain and snowfall.

In 2016, OSM and MMD approved a permit modification to monitor only seven alluvial wells. Four of these wells have historically been considered recharging (DT2A, DT2B, TB2B2, and TB3D) whereas the remainder of the wells (CMC, D2C, and D3B2) have historically been dry. Wells DT2A and DT2B are near VMU 1. Well TB3D is also near VMU 1. However, because Well TB3D has historically been dry, groundwater quality data are not available for this evaluation. The dry TB3D well is consistent with the PHC.

4.1.1 WATER QUALITY

Alluvial well sampling for Wells DT2A and DT2B has been conducted quarterly for multiple parameters. Significant chemical parameters are included in Table 4-2 for Well DT2A and Table 4-3 for Well DT2B. Appendix C presents temporal plots for Well DT2A and Well DT2B based on available data from 2013 to 2024. Due to the shallow and ephemeral nature of the alluvial groundwater resources, limited groundwater data exists from these wells. Temporal plots for both Well DT2A and DT2B only contain data from 2013-2016 as the wells have been mainly dry or without sufficient amounts of water to sample from 2016 to present day.

Examination of the analytical data and temporal plots for the reporting period associated with DT2A indicate that:

- Alkalinity and bicarbonate concentrations have decreased between 2013 and 2016.
- Total calcium concentrations in Well DT2A decreased during the reporting period.
- Carbonate was not detected in DT2A during the reporting period.
- The cation-anion balance remained generally stable under 10% with two exceptions in August and November of 2014.
- Chloride concentrations were generally stable with the exception of the first two samples taken at DT2A in 2013 which showed significantly higher chloride concentrations.
- Conductivity measured in DT2A slightly decreased during the reporting period.
- Hardness was not measured until August 2014 and showed a slight decreasing trend in calcium carbonate concentrations through the sampling period.
- Dissolved iron was generally not been detectable during the reporting period. There was one spike of dissolved iron in May 2013 with a measured concentration of 11.9 mg/L. This was the only instance where the dissolved iron concentration surpassed the 1 mg/L groundwater standard.
- Total iron concentrations was variable in the DT2A well. Concentrations ranged from approximately 0.1 to 26.2 mg/L.
- Total magnesium concentrations showed a decreasing trend during the reporting period.
- Dissolved manganese concentrations remained fairly stable with two peaks in May 2013 and September 2015.
- Total manganese concentrations in DT2A ranged from 0.0026 to 0.363 mg/L during the reporting period and 10 of the 14 samples returned concentrations less than 0.1 mg/L.
- Nitrate, expressed as Nitrogen, concentrations fluctuated and decreased throughout the sampling period, ranging from 48.4 to 7.2 mg/L. At the end of the sampling period, the concentrations were generally below the groundwater standard of 10 mg/L.
- Laboratory pH was variable during the sampling period with a positive trend, ranging from 7.5 to 8.3 standard units.

- Phosphate concentrations were not analyzed during March, May, and August of 2013. An initial concentration was measured at 7.1 mg/L in November 2013. Phosphate was not detected after November 2013.
- Total phosphorus concentrations were generally stable during the monitoring period, ranging from undetectable to 0.425 mg/L.
- Total potassium concentrations were variable in Well DT2A with concentrations ranging from approximately 1 to 5 mg/L during the sampling period.
- Total selenium was detected twice during the monitoring period with both values being below the 0.005 mg/L groundwater standard. These occurrences happened in February 2015 and February 2016.
- Total sodium concentrations in Well DT2A decreased over the sampling period.
- Sulfate concentrations decreased over the sampling period of Well DT2A.
- Total dissolved solids concentrations decreased since the sampling period began.

Examination of the analytical data and temporal plots for the reporting period associated with DT2B indicate that:

- Alkalinity and bicarbonate concentrations found in samples from March 2013 to August 2013 decreased, but overall, the concentrations increased during the reporting period.
- Total calcium concentrations were variable across the sampling period.
- Carbonate was not been detected in DT2B since monitoring began.
- The cation-anion balance remained generally stable under 10% with two exceptions in August and November of 2014.
- Chloride concentrations were variable with a slightly negative trend during the sampling period.
- Conductance trended slightly negatively with the exception of one spike in February 2014.
- Total hardness was not measured until August 2014. After August 2014, the hardness was variable with a slightly decreasing trend during the sampling period.
- Dissolved iron concentrations were stable throughout the monitoring period. Dissolved iron was not detectable in 7 of the 13 samples.
- Total iron concentrations were generally stable and increased over the duration of monitoring. A large spike occurred on the last sample date in 2016.

- Total magnesium concentrations of Well DT2B were variable with a generally neutral trend over the duration of sampling.
- Dissolved manganese concentrations were highly variable and had a slightly increasing trend over the sampling period. Since 2014, dissolved manganese has been over the groundwater standard of 0.2 mg/L with the exception of one sample.
- Total manganese concentrations were highly variable in Well DT2B, ranging from 0.181 to 1.31 mg/L with an increasing trend over the monitoring period.
- Nitrate, expressed as nitrogen, concentrations slightly decreased over the monitoring period, ranging from 23.5 to 3.5 mg/L. At the end of the sampling period, the concentrations stayed below the groundwater standard of 10 mg/L.
- Lab pH slightly increased during the sampling period. Values reported were all between 7.6 and 7.8 standard units.
- Phosphate was not analyzed until November 2013. Phosphate was largely not detected throughout the monitoring period with two exceptions occurring in September 2015 and February 2016.
- Total phosphorus remained stable during most of the sampling period but had two significant spikes towards the end of monitoring. These spikes occurred in September 2015 and February 2016. Otherwise, phosphorus stayed below 0.258 mg/L.
- Total potassium concentrations of Well DT2B increased over the monitoring period, ranging from 3.44 to 9.02 mg/L, including a spike in 2016.
- Selenium was not detected in any samples of Well DT2B.
- Total sodium concentrations slightly decreased over the monitoring period.
- Sulfate concentrations had a negative trend over the monitoring period.
- Total dissolved concentration levels had an overall negative trend over the monitoring period.

Examination of the previously discussed analytical trends suggests that water-quality concentrations remained relatively consistent or slightly decreased over the reporting period at both Well DT2A and Well DT2B. Overall, these trends support the presumption that impacts from mining and reclamation operations on alluvial ground water have not occurred. Reductions in water levels in DT2A and DT2B due to the prolonged drought conditions in the region did not allow monitoring past May 2016. Water-quality concentrations in DT2B were generally higher than concentrations found in DT2A.

4.2 GALLUP SANDSTONE AQUIFER

Five water wells (1, 2, 3, 3A, and 4) have been completed in the GSA throughout the Mine area. These wells were used as primary water sources for mine activities and reclamation. The wells now provide domestic water, dust-control water, or are only monitored. Because of the impermeability of the shale units overlying the GSA and the geologic structure in the area, the GSA can be under artesian conditions. Moreover, due to the presence of the overlying shales, there is no hydraulic connection between the underlying Gallup Sandstone and the mined strata. Of the five GSA wells only Well 3 is located in the vicinity of VMU 1.

4.2.1 WATER LEVELS

Water level and saturated thickness are presented in Table 4-1 for Well 3. Depth to groundwater in Well 3 has been variable since 2017 with corresponding increase/decrease in saturated thickness.

4.2.2 WATER QUALITY

Sampling of GSA Well 3 has been conducted quarterly for multiple parameters. Chemical parameters are included in Table 4-4 for Well 3. Appendix D presents temporal plots for Well 3 based on available 2013 to 2024 data.

Examination of the analytical data and temporal plots for the reporting period associated with Well 3 indicate that:

- Alkalinity is a useful parameter when discussing bicarbonate and carbonate trends below. Alkalinity and bicarbonate concentrations have generally shown a neutral trend since 2015 at Well 3. The first sample taken in 2013 was not considered for this trend as it is an outlier. Nearly all the alkalinity present in bedrock groundwater is attributable to bicarbonate as carbonate is a relatively minor component. There have been 11 reported outliers for both alkalinity and bicarbonate during the 12 years of sampling.
- Dissolved calcium concentrations have been stable at Well 3 since 2015. Eight dissolved calcium concentration samples have been deemed outliers between 2013 and 2022.
- Carbonate concentrations have not been above the detection limit in Well 3 during the reporting period. These results indicate that carbonate concentrations are an insignificant component of total alkalinity.
- Chloride concentrations have been generally stable at Well 3 since 2015. Seven samples were deemed outliers from 2013 to 2020.
- Fluoride concentrations have remained fairly consistent since 2015. Eight outliers were reported from 2015 to 2020.

- Hardness in Well 3 has slightly decreased since 2015, with eight outliers being reported from the start of sampling through 2020.
- Total iron concentrations at Well 3 have slightly decreased from 2015, with five outliers reported between 2013 and 2023.Dissolved magnesium concentrations in Well 3 have remained constant from 2013. The samples have hovered around 22 mg/L excluding outliers.
- Total Manganese concentrations at Well 3 have slightly decreased since 2015. Eight outliers were reported from samples taken from 2013 through 2019.
- The laboratory pH of samples taken from Well 3 have been highly variable but remain slightly basic. The samples ranged from approximately 7.2 through 7.7 standard units, excluding outliers. Five outliers have been reported from sampling from 2017 through 2022.
- Phosphate concentrations have largely not been detectable with exceptions occurring in June 2015 and February 2020.
- Dissolved potassium concentrations have remained constant from 2013 with sample concentrations ranging from approximately 5.2 to 5.7 mg/L. One dip occurred in October 2020 with a concentration of 2.5 mg/L. Seven other outliers have been reported from samples taken from 2017 through 2022 at Well 3.
- Dissolved sodium concentrations have been highly variable since 2015. The concentrations have been generally stable during the sampling period. Seven outliers have been reported from 2015 through 2021.
- Sulfate concentrations have been relatively stable since 2015 at Well 3. The reported concentrations have ranged from 254 to 220 mg/L excluding outliers. Including two spikes occurring in May 2018 and January 2021, 8 total concentrations have been deemed outliers from 2015 through 2021.
- TDS concentrations at Well 3 have been relatively stable since 2015 with values ranging from 602 to 633 mg/L excluding outliers. Twelve sample concentrations were deemed outliers between 2015 and 2022.
- Turbidity in Well 3 has been highly variable since 2015. With one outlier exception, all values have been below 30 Nephelometric Turbidity Units (NTU). Both the trend and variability have been decreasing over the sampling period.

Samples taken from 2013 have largely been deemed outliers and were subsequently disregarded when looking at trends. Examination of the previously discussed analytical trends suggests that water-quality concentrations have remained relatively consistent over the reporting period at Well 3. Overall, these trends support the presumption that impacts from mining and reclamation operations on GSA groundwater have not occurred or are limited.

4.3 SPOIL GROUNDWATER

Five spoil recharge wells (2G2, 4A, 9A, 9S, and 11) were constructed in the Mine area. Spoil recharge wells were installed throughout the mine in reclaimed areas to determine chemical presence and groundwater properties. These wells were terminated at bedrock and their screens encompassed the spoil interval immediately above bedrock. Two spoil wells (4A and 9A on MMD lands) were installed in 1990; of these two wells, only 9A remains. Well 4A was not monitored after 2015 following approval by MMD to discontinue monitoring this well because the land at the well location had a full bond and liability release. Well 4A was abandoned October 29, 2018. In April 2013, three additional spoil recharge wells were constructed and designated as wells 2G2 (on OSM lands), 11, and 9S (on MMD lands). To date, only Well 11 has contained sufficient groundwater for sampling. Of the spoil recharge wells, only Well 11 lies near the VMU 1 area.

4.3.1 WATER LEVELS

Water level and saturated thickness are presented in Table 4-1 for Well 11. Water levels and associated saturated thicknesses in spoil recharge wells are characterized by limited fluctuations where groundwater is present. Approximately 28 to 31 ft of groundwater has been present in Well 11 over the reporting period.

4.3.2 WATER QUALITY

Sampling of Well 11 has been conducted quarterly for multiple parameters since 2013. Chemical parameters are included in Table 4-5 for Well 11. Appendix E presents temporal plots for Well 11 based on available 2013 to 2024 data.

A review of the analytical data and temporal plots for the reporting period associated with Well 11 indicate that:

- Alkalinity and bicarbonate in Well 11 have ranged from 1,435 and 1,369 respectively to 2,200 mg/L of calcium carbonate during the reporting period. Over the reporting period, the alkalinity and bicarbonate concentrations of the samples have increased slightly, with two low points in July 2016 and May 2021. Total boron concentrations in Well 11 are highly variable with a slightly increasing trend since 2013.
- Total calcium concentrations have increased slightly since the reporting period started, with an elevated period from March 2017 to June 2019.
- Carbonate concentrations have historically been undetectable and have been an insignificant component of total alkalinity concentrations. Carbonate concentration was detected on one occasion in May 2021.
- The calculated cation/anion balance has remained mostly between 0 and 10% with two anomalous values in March 2017 and February 2023.

- Chloride concentrations have remained fairly stable since 2013, with one spike in February 2018.
- Field conductance has remained fairly stable since monitoring began with periods of variability from the beginning of the sampling period through February 2014, and from March 2019 to October 2020.
- Fluoride concentrations have been largely undetected in Well 11. Three samples from February 2015, April 2015, and January 2021 had detectable fluoride concentrations.
- Total hardness concentration has fluctuated over the reporting period, ranging from 5,16 to 1,090 mg/L of calcium carbonate. The trend has been slightly positive with the exception of an elevated period between 2017 and mid-2019.
- Dissolved iron concentrations had some variability at the beginning of the reporting period and went through an elevated period between 2017 and mid-2019. The dissolved iron concentrations have been generally stable from August 2019 through the remaining sampling period, ranging from 0.12 to 1.7 mg/L. Most dissolved iron concentrations since August 2019 have been below the 1 mg/L groundwater standard.
- Total iron concentrations have been highly variable and have exhibited a fairly stable trend over the reporting period.
- Total magnesium concentrations have a slightly increasing trend over the reporting period with some variability and an elevated period from March 2017 to May 2019.
- The dissolved manganese concentration have been slightly increasing from the start of the return period. An elevated period of sampling concentrations can be observed from March 2017 to May 2019 before returning to the initial trend levels from August 2019 through the remainder of the sampling period. Outside of the elevated period, the dissolved manganese concentrations have ranged from approximately 0.6 to 1.7 mg/L, with all samples exceeding the 0.2 mg/L domestic water supply standard.
- Total manganese values fluctuate with a slightly increasing trend during the reporting period. Analytical results indicate that a greater amount of dissolved manganese was present than suspended manganese over the sample events. Sampling concentrations experienced an elevated period from March 2017 to May 2019, with the concentrations returning to the initial trend line in August 2019 continuing through the remainder of the sampling period.
- Nitrate, expressed as nitrogen, concentrations are variable with a high outlier in 2013 and the majority of samples during the reporting period have no detectable nitrogen.
- The laboratory pH levels have fluctuated between 6.7 and 7.5 standard units during the reporting period. A majority of the pH levels have been 7.2 standard units plus or minus 0.2 standard units.

- Phosphate concentration levels in Well 11 have been largely undetectable. Of the three detectable readings, two readings were below previous detection thresholds, and the one reading in June 2017 spiked to 3,410 mg/L.
- Total phosphorus concentrations show a neutral or slightly increasing trend generally close to 0.05 mg/L through November 2019, with more fluctuation after 2019. No detection readings have been more common after 2019, with only three detectable readings from that date to present, ranging from 0.079 to 0.35 mg/L.
- Total potassium concentrations in Well 11 were variable with an elevated period from approximately November 2016 to May 2019. Total potassium concentrations are variable with a neutral trend from May 2019 through the remainder of the sampling period.
- Total selenium concentrations have been undetectable with two exceptions since the start of the reporting period in Well 11. All concentrations detected fell within the water quality standard of 0.05 mg/L.
- Total sodium concentrations in Well 11 are highly variable with a slightly increasing trend during the reporting period.
- Sulfate concentrations have been highly variable and have a relatively neutral trend across the reporting period, ranging from 3,200 to 4,610 mg/L. All sulfate concentrations exceeded the 600 mg/L domestic water supply standard.
- Total dissolved solids concentrations have been variable with a neutral to slightly increasing trend during the reporting period. Low spikes have been recorded in 2017 and 2020. All total dissolved solids concentrations exceeded the 1,000 mg/L domestic water supply standard, ranging from 3,100 to 8,790 mg/L.
- Zinc concentrations have been variable since the start of the reporting period and have a generally neutral trend. Zinc has not been detected in Well 11 since February 2022.

Examination of the previously discussed analytical trends suggests that water quality concentrations have remained stable, with most analytes fluctuating over a relatively small range since 2020 at spoil recharge Well 11. Trends from Well 11 show a relatively stable water source with consistent water quality likely due to water recharging from or through the graded spoil to a backfilled mining pit where the well is located.

4.4 BEDROCK GROUNDWATER

Five bedrock wells (MBR1, MBR2, MBR3, MBR4, and MBR5) were installed approximately 50 feet (ft) below the Green Coal Seam to monitor groundwater below this unit. These monitoring wells, referred to as McKinley bedrock wells, are located in and around the major drainage watersheds throughout the mine. Three of the original five wells

(MBR1, MBR3, and MBR4) were mined through and not replaced. The active bedrock monitoring wells include MBR2 and MBR5; neither of which are near VMU-1 and are therefore not evaluated here.

4.5 ASSESSMENT OF GROUNDWATER DATA

4.5.1 COMPARISON TO BASELINE WATER QUALITY

There are no baseline groundwater data from pre-mining conditions available for comparison to current groundwater quality data. Therefore, this comparison is not included in this report.

4.5.2 COMPARISON TO REGULATORY STANDARDS

Under the Mine Permit, water quality from the alluvial aquifer, Gallup Sandstone Aquifer, and spoil recharge groundwater are not subject to the regulatory standards established for the maximum allowable concentrations of groundwater of 10,000 mg/L TDS or less (NMAC 20.6.2.3103). Comparison to these regulatory standards, however, is provided here only to show the utility of these groundwater resources. Tables 4-2, 4-3, 4-4, and 4-5 include these standards at the bottom, allowing for easy comparison to water quality data from wells DT2A, DT2B, 3, and 11, with bolded values indicating exceedances. Only the following monitored constituents are covered by the referenced standards: fluoride, nitrate and nitrite as N, and selenium for human health standards and chloride, iron, manganese, sulfate, TDS, zinc, and pH for domestic water supply standards.

From Well 3 in the Gallup Sandstone Aquifer, there were no exceedances of water quality standards associated with the regulated constituents included in analysis, chloride, fluoride, pH, sulfate, and TDS, across the 2013 to 2024 sampling period.

In samples from Well 11 in spoil recharge groundwater, concentrations of iron, manganese, sulfate, and TDS exceeded domestic water supply standards. Exceedances in concentrations of iron have been occasional and relatively close to concentration standard across the 2013 to 2024 sampling period, with the exception of an elevated period from 2017 to 2019. Concentrations of manganese, sulfate, and TDS have consistently exceeded the concentration standard.

4.5.3 COMPARISON TO PROBABLE HYDROLOGIC CONSEQUENCES

Data establish that alluvial and spoil recharge groundwaters are of poor quality that cannot be used for beneficial purposes. Data also show, however, that they have had no deleterious effect on established surface or groundwater uses. Data establish that the Gallup Sandstone groundwaters meet the applicable water quality standards. Upon the final stages of bond release, wells will be plugged and abandoned in accordance with NMAC 19.27.4.30.C.1.

5.0 SURFACE AND GROUNDWATER ASSESSMENT SUMMARY

As required for bond release of long-term surface and groundwater monitoring, water quality and quantity data are provided in this report. Evaluation of the data was presented in two separate sections to confirm that mining activities at the McKinley Mine have not adversely disturbed the hydrologic balance in or around the site. Findings from the 1980 GAI Report, comparison with the undisturbed Coal Mine Wash watershed, comparison with regulatory standards showing the resource utility, and the PHC determination indicate that mining and reclamation have had minimal impact on the quality and quantity of this resource. The following provides a brief summary of those findings.

5.1 SURFACE WATER ASSESSMENT

The PHC determination (Mine Permit Section 3.4.4) acknowledges the possible consequence of stormwater on downstream water chemistry. Data from TBW show that there are no deleterious effects for the monitored analytes to watershed health of the Puerco River. Regional surface waters are also protected because of ephemeral flow patterns of the streams of interest and limited constituent loadings to downstream reaches as a result.

5.2 GROUNDWATER ASSESSMENT

Water-quality concentrations have remained relatively consistent over the reporting period at Well 3. Overall, the trends observed at Well 3 support the presumption that impacts from mining and reclamation operations on GSA groundwater have not occurred or are limited. As discussed in the PHC, because of the impermeability of the shale units overlying the Gallup Sandstone Aquifer and the geologic structure in the area, there is no hydraulic connection between the underlying Gallup Sandstone and the mined strata. As a potential future resource, water quality was within standards.

Well DT2A and Well DT2B water-quality concentrations have remained relatively consistent or slightly decreased over the 2013 to 2016 period. As discussed in the PHC, alluvial water is practically nonexistent, with recharge principally occurring during snowmelt and the summer runoff season. This is exemplified by the fact that Wells DT2A and DT2B had insufficient groundwater to collect samples after 2016. These trends support the presumption that impacts from mining and reclamation operations on alluvial ground water have not occurred.

Water quality at Well 11 remained stable over the course of the sampling time frame. As discussed in Section 4.3.2 above, water from the spoil recharge groundwater is a stable water source with consistent water quality likely due to water recharging from or through the graded spoil to a backfilled mining pit where the well is located. As a potential future resource, comparisons to standards showed that iron, manganese, sulfate, and TDS were high.

Data agree with the PHC determination that no permanent changes to the groundwater quality and quantity would result from mining activities, qualifying the McKinley Mine for bond release of long-term groundwater monitoring. Upon the final stages of bond release, the bedrock wells will be plugged and abandoned.

6.0 REFERENCES

Geohydrology Associates, Inc. (GAI). 1980. Hydrology Study of the McKinley Mine.

National Pollutant Discharge Elimination System (NPDES) Permit No. NN0029386. 2022. April 6.

New Mexico Administrative Code (NMAC). 2007. Title 19, Natural Resources and Wildlife Chapter 8, Coal Mining Part 14: General Requirements for Bonding of Surface Coal Mining and Reclamation Operations. December 31.

New Mexico Administrative Code (NMAC). 2022. Title 20, Environmental Protection Chapter 6, Water Quality Part 4: Standards for Interstate and Intrastate Surface Waters. April 23.

New Mexico Administrative Code (NMAC). 2017. Title 19, Natural Resources and Wildlife Chapter 27, Underground Water Part 4: Well Driller Licensing; Construction, Repair, and Plugging of Wells. June 30.

New Mexico Administrative Code (NMAC). 2007. Title 20, Environmental Protection Chapter 6, Water Quality Part 2: Ground and Surface Water Protection. June 1.

Trihydro Corporation (Trihydro). 2025. McKinley Mine – 2024 Annual Report Hydrology Section. February 26.

TABLES

TABLE 2-1. PRECIPITATION DATA, RAIN 9, RAIN 10, AND RAIN 11
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Month	2013			2014			2015			2016		
	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)
January	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--
March	0.00	0.00	0.00	--	--	--	--	--	--	--	--	--
April	0.27	0.19	0.33	0.08	0.02	0.05	0.50	0.42	0.48	1.20	1.00	1.23
May	0.02	0.00	0.00	0.19	17.00	0.25	1.38	1.32	1.88	1.02	0.67	1.16
June	0.02	0.07	0.12	0.00	0.00	0.00	1.22	1.11	1.02	0.01	0.08	0.05
July	2.02	2.26	3.75	0.88	0.72	1.06	2.88	2.59	2.80	0.82	0.94	0.86
August	2.61	2.09	2.80	1.04	0.72	1.47	1.25	1.39	1.69	1.40	1.63	2.00
September	2.87	3.37	2.21	2.20	2.05	2.17	0.22	0.30	0.26	1.64	1.36	1.85
October	0.62	0.43	0.54	0.24	0.28	0.32	1.13	1.10	0.97	0.37	0.34	0.34
November	0.54	0.45	0.53	0.03	0.00	0.03	0.99	0.78	1.08	0.91	0.81	0.49
December	--	--	--	--	--	--	--	--	--	--	--	--

Total Annual Precipitation

Year	2013			2014			2015			2016		
Apr-Nov (inches)	8.97	8.86	10.28	4.66	20.79	5.35	9.57	9.01	10.18	7.37	6.83	7.98

Notes:

-- - precipitation station not operating due to freezing temperatures

(green shading) Partial operating month

in - inches

Apr - April

Nov - November

TABLE 2-1. PRECIPITATION DATA, RAIN 9, RAIN 10, AND RAIN 11
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

	2017			2018			2019			2020		
Month	**Rain 9 (in)**	**Rain 10 (in)**	**Rain 11 (in)**	**Rain 9 (in)**	**Rain 10 (in)**	**Rain 11 (in)**	**Rain 9 (in)**	**Rain 10 (in)**	**Rain 11 (in)**	**Rain 9 (in)**	**Rain 10 (in)**	**Rain 11 (in)**
January	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--	--	--
April	0.22	0.13	0.28	0.07	0.08	0.09	0.16	0.20	0.20	0.16	0.11	0.16
May	0.62	0.55	0.77	0.27	0.20	0.29	1.36	1.49	1.50	0.02	0.02	0.02
June	0.45	0.20	0.64	0.25	0.27	0.26	0.24	0.37	0.19	0.11	0.13	0.11
July	1.24	2.75	1.61	2.16	3.05	1.92	0.46	0.19	0.44	0.60	0.79	0.60
August	0.50	0.38	0.42	0.74	1.15	1.00	0.37	0.27	0.20	0.06	0.14	0.06
September	1.05	0.99	1.09	0.67	0.92	0.89	1.84	1.34	1.72	0.14	0.14	0.14
October	0.05	0.14	0.09	1.31	1.51	1.45	0.05	0.03	0.06	0.08	0.16	0.08
November	0.00	0.02	0.04	0.00	0.00	0.00	0.07	0.05	0.08	0.45	0.09	0.45
December	--	--	--	--	--	--	--	--	--	--	--	--

Total Annual Precipitation

Year	2017			2018			2019			2020		
Apr-Nov (inches)	4.13	5.16	4.94	5.47	7.18	5.90	4.55	3.94	4.39	1.62	1.58	1.62

Notes:

-- - precipitation station not operating due to freezing temperatures

(green shading) Partial operating month

in - inches

Apr - April

Nov - November

TABLE 2-1. PRECIPITATION DATA, RAIN 9, RAIN 10, AND RAIN 11
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Month	2021			2022			2023			2024		
	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)	Rain 9 (in)	Rain 10 (in)	Rain 11 (in)
January	--	--	--	--	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--	--	--	--	--
April	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.21	0.16	0.15
May	0.10	0.06	0.07	0.00	0.00	0.00	0.93	0.53	0.77	0.00	0.05	0.03
June	0.27	0.24	0.18	0.51	0.69	0.56	0.26	0.13	0.23	2.64	2.65	2.68
July	1.81	2.48	2.10	2.38	3.57	3.30	0.23	0.06	0.36	0.48	0.38	0.25
August	1.22	1.80	1.31	4.05	4.27	4.62	2.21	2.61	2.44	2.09	1.92	2.16
September	1.11	0.96	1.43	1.02	1.02	1.09	0.98	0.51	0.71	0.54	0.37	0.53
October	0.78	0.80	0.98	1.77	1.83	1.97	0.18	0.03	0.09	0.95	0.98	1.09
November	0.00	0.00	0.00	0.41	0.33	0.51	0.00	0.00	0.00	0.30	0.12	0.26
December	--	--	--	--	--	--	--	--	--	--	--	--

Total Annual Precipitation

Year	2021			2022			2023			2024		
Apr-Nov (inches)	5.29	6.35	6.07	10.14	11.71	12.05	4.80	3.90	4.60	7.21	6.63	7.15

Notes:

-- - precipitation station not operating due to freezing temperatures

(green shading) Partial operating month

in - inches

Apr - April

Nov - November

TABLE 2-1. PRECIPITATION DATA, RAIN 9, RAIN 10, AND RAIN 11
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Month	Average (2013-2024) (in)	Maximum (2013-2024) (in)
January	--	--
February	--	--
March	--	--
April	0.23	1.23
May	0.96	17.00
June	0.50	2.68
July	1.52	3.75
August	1.56	4.62
September	1.16	3.37
October	0.64	1.97
November	0.27	1.08
December	--	--

Average (2013-2024) (in)	6.84
Rain 9 Average (in)	6.15
Rain 10 Average (in)	8.08
Rain 11 Average (in)	6.71

Year
Apr-Nov (inches)

TABLE 2-2. McKINLEY MINE WATER ANALYSIS PARAMETERS
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Parameter	Sample Type		
	Surface	Alluvial	Bedrock/Spoil
Bicarbonate	*	*	*
Boron			*
Calcium, Total	*	*	*
Carbonate	*	*	*
Cation-Anion Balance	*	*	*
Chloride	*	*	*
Conductance, Field	*	*	*
Fluoride			*
Hardness	*	*	*
Iron, Dissolved	*@	*@	*@
Iron, Total	*	*	*
Magnesium, Total	*	*	*
Manganese, Dissolved	*@	*@	*@
Mercury, Total	*		
Manganese, Total	*	*	*
Nitrate	*	*	*
pH, Lab	*	*	*
pH, Field	*	*	*
Phosphate	*	*	*
Phosphorus, Total	*	*	*
Potassium, Total	*	*	*
SAR	*		
Selenium, Total	*	*	*
Settleable Solids	*		
Sodium, Total	*	*	*
Sulfate	*	*	*
Total Dissolved Solids	*	*	*
Total Suspended Solids	*		
Zinc, Total			*
Depth to water		*	*

Notes: * indicates that sample is analyzed for this parameter.
@ indicates a 0.45 micron filter is utilized.

TABLE 3-1. HISTORICAL SURFACE WATER DATA - TSE BONITA WASH (TBW)
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L $CaCO_3$	Bicarbonate mg/L $CaCO_3$	Calcium, Total mg/L	Carbonate mg/L $CaCO_3$	Cloride mg/L	Hardness, Total mg/L $CaCO_3$	Iron, Dissolved mg/L	Iron, Total mg/L	Magnesium, Total mg/L	Manganese, Dissolved mg/L	Manganese, Total mg/L	Mercury, Total mg/L	Nitrogen, Nitrate mg/L	pH, Laboratory S.U.	Phosphate mg/L	Phosphorus, Total mg/L	Potassium, Total mg/L	Selenium, Total mg/L	Sodium, Total mg/L	Sulfate mg/L	Total Dissolved Solids mg/L	Total Suspended Solids mg/L
7/20/2013	76	76	176	ND(2)	3.5	NM	38.1	197	59.5	0.65	3.58	NA	0.66	7.8	1.5	3.71	36.6	0.0096	37.8	142	574	13700
7/29/2013	93	93	33.7	ND(2)	11.9	NM	0.0604	19.8	9.02	0.0194	0.222	NA	0.72	7.8	3.6	0.408	9.69	ND(0.02)	18	70.4	1050	8300
8/6/2013	80	80	85	ND(2)	3.7	NM	8.44	76.8	25.6	0.136	1.76	NA	0.42	7.7	0.77	1.52	16.7	ND(0.02)	19.5	62.5	1650	4200
9/29/2014	87	87	55.1	ND(2)	8	200	ND(0.2)	19.4	16.5	0.0014	0.348	ND(0.0002)	0.32	8	ND(0.31)	0.371	9.96	ND(0.02)	70.2	213	697	860
7/13/2015	76	76	48.1	ND(2)	4.4	201	0.0546	25.3	14.6	0.0056	0.342	0.000054	0.39	7.9	1.2	0.454	10.1	ND(0.02)	33.6	111	370	663
7/15/2015	79	79	44.3	ND(2)	3.2	179	0.311	28.3	13.5	0.004	0.485	0.00011	0.38	7.9	1.7	0.519	10.1	ND(0.02)	21.1	68.6	322	950
8/31/2015	127	127	60.6	ND(200)	3.2	225	0.137	41.7	18.8	0.0107	0.689	0.00028	0.37	8.4	2.4	0.725	12.8	ND(0.02)	17.9	71.2	470	2770
7/24/2017	76	76	40.3	ND(5)	5	162	ND(0.2)	41.6	14.9	0.0033	0.514	0.00014	2.8	7.6	2.6	0.769	16.5	ND(0.02)	17.5	18.7	424	1360
7/18/2018	127	116	169	ND(50)	3.6	554	53.1	97.9	45.2	1.44	3.85	0.00052	0.94	7.9	7.9	2.54	27.7	ND(0.05)	14	9.8	1770	6700
9/2/2018	103	103	58.1	ND(25)	4.1	151	10.4	64.3	19.5	0.139	0.951	ND(0.002)	1.3	7.7	4.6	1.09	13.9	ND(0.05)	14.6	28.8	536	1590
7/12/2021	86	86	87	ND(2)	6	360	3.4	130	36	0.8	1.7	ND(0.0008)	ND(1)	7.9	ND(2.5)	3.4	28	0.011	14	17	700	5900
7/24/2021	73	73	34	ND(2)	4.7	130	0.41	34	11	0.0084	0.33	ND(0.0008)	1.4	7.5	ND(2.5)	0.7	14	0.0059	16	26	920	250
8/3/2021	88	88	41	ND(2)	ND(5)	160	0.78	38	13	0.04	0.33	ND(0.0008)	1.4	7.9	ND(2.5)	0.71	13	0.0062	18	32	1160	520
8/11/2021	68	68	180	ND(2)	ND(5)	690	5.8	230	61	1	4.9	ND(0.0008)	ND(1)	8	ND(5)	6.6	35	0.029	8.3	7.2	1600	6300
10/6/2021	90	90	35	ND(2)	4.7	120	0.35	10	7.7	0.014	0.1	ND(0.0002)	ND(0.5)	8.1	ND(2.5)	ND(0.5)	7.8	0.0031	15	39	335	170
8/17/2022	86	86	40	ND(2)	2.5	150	4.3	49	13	0.16	0.52	ND(0.0002)	ND(0.5)	7.9	ND(2.5)	0.87	13	0.0048	9	23	810	920
9/22/2022	87	87	42	ND(2)	ND(2.5)	160	2.1	63	14	0.14	0.51	ND(0.0002)	ND(0.5)	7.8	ND(2.5)	0.67	13	0.0051	9.1	23	590	980
10/17/2022	101	101	36	ND(2)	2.6	130	1.4	15	8.9	0.056	0.19	ND(0.0002)	ND(1)	8	ND(2.5)	0.27	8.5	0.0032	9.3	22	530	230
6/27/2024	100	100	350	ND(2)	3.5	1200	0.068	230	82	0.0035	4.1	ND(0.0002)	1.4	8	ND(2.5)	16	38	0.022	56	100	ND(2500)	62000
7/25/2024	95	95	160	ND(2)	3.2	620	0.02	130	53	0.006	3.2	0.00093	ND(1)	8	ND(0.5)	5	35	0.017	26	15	1600	9200
8/24/2024	120	120	62	ND(2)	4.3	230	0.038	46	18	0.0024	0.58	ND(0.0002)	ND(1)	8	ND(2.5)	1.2	15	0.0045	14	37	510	1600

Abbreviations:
mg/L - milligrams per liter
mg/L $CaCO_3$ - milligrams per liter as calcium carbonate
NA - Not Analyzed
ND - non-detect (detection limit in parentheses
NM - not mesured
NTU - Nephelometric Turbidity Units
S.U. - Standard Units

TABLE 4-1. ANNUAL WATER LEVEL SUMMARY
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

YEAR	WELL DT2A, TD = 49.67 ft bmp		WELL DT2B, TD = 47.06 ft bmp		WELL 3, TD = 1,055 ft bmp		WELL 11, TD = 86.65 ft bmp	
	DTW ft bmp	Saturated Thickness ft	DTW ft bmp	Saturated Thickness ft	DTW ft bmp	Saturated Thickness ft	DTW ft bmp	Saturated Thickness ft
2013	**39.64**	8.36	**41.57**	4.43	600	455	NM	NM
2014	**40.24**	7.76	**42.03**	3.98	**581.5**	473.50	**56.02**	28.79
2015	**41.22**	6.79	**43.78**	2.22	**613.5**	441.50	**41.22**	43.59
2016	**45.77**	2.23	**45.75**	0.25	ND	NM	**57.33**	27.47
2017	**47.14**	2.53	**46.21**	0.85	ND	NM	**55.30**	31.36
2018	**47.87**	1.80	ND	NM	**647.2**	407.80	**57.67**	28.98
2019	**48.50**	1.17	**46.83**	0.23	**642.6**	412.40	**57.90**	28.75
2020	**48.82**	0.85	ND	NM	**644.9**	410.10	**57.64**	29.01
2021	ND	NM	ND	NM	**649.5**	405.50	**57.78**	28.87
2022	ND	NM	ND	NM	**649.5**	405.50	**57.38**	29.27
2023	**47.29**	2.38	ND	NM	**647.2**	407.80	**56.94**	29.71
2024	ND	NM	ND	NM	**648.35**	406.65	**56.00**	30.65

Notes:

1. Values in bold represent arithmetic means calculated from at least two measurements from the same year.
1. Wells DT2A and DT2B received new casing in 2016, changing the total depth from 48 to 49.67 ft bmp and 46 to 47.06 ft bmp respectively.

Abbreviations:

bmp - below measuring point

DTW - depth to water

ft - feet

ND - non-detect/dry well

NM - not measured

TABLE 4-2. WELL DT2A HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Calcium, Total mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Hardness mg/L CaCO3	Iron, Dissolved mg/L	Iron, Total mg/L	Magnesium, Total mg/L	Manganese, Dissolved mg/L	Manganese, Total mg/L	Nitrogen Nitrate, mg/L	pH, Lab s.u.	Phosphate mg/L	Phosphorus, Total mg/L	Potassium, Total mg/L	Selenium, Total mg/L	Sodium, Total mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L
3/20/2013	703	703	117	ND(2)	27.6	nm	0.0517	0.57	49.7	0.0096	0.0116	**39.6**	7.6	na	0.0076	1.1	ND(0.02)	551	**2180**	**824**
5/23/2013	726	726	103	ND(2)	45.4	nm	**11.9**	18.1	43.7	0.13	0.35	**48.4**	7.6	na	0.198	4.98	ND(0.02)	626	**2310**	**881**
8/21/2013	636	636	71.7	ND(2)	10.1	nm	0.21	1.97	31.1	0.0055	0.0338	9.5	7.9	na	ND(0.1)	1.05	ND(0.02)	448	**1480**	589
11/7/2013	647	647	86.6	ND(2)	14	nm	ND(0.2)	26.2	38.3	0.0071	0.338	**14.6**	7.6	7.1	0.425	3.46	ND(0.02)	442	**1390**	547
2/12/2014	678	678	89.3	ND(2)	15.9	nm	ND(0.2)	1.01	37.7	0.0069	0.0118	**20.4**	7.6	ND(0.31)	ND(0.1)	1.13	ND(0.02)	453	**1570**	586
4/15/2014	677	677	87.5	ND(2)	14.6	nm	ND(0.2)	2.02	37.9	0.0033	0.0332	**19**	7.5	ND(0.31)	ND(0.1)	1.16	ND(0.02)	455	**1650**	514
8/21/2014	660	660	86.1	ND(2)	16.4	373	ND(0.2)	0.479	36.3	0.0052	0.0115	**19.1**	7.9	ND(0.31)	0.0123	1.13	ND(0.02)	477	**1600**	550
11/5/2014	670	670	82.5	ND(2)	17.2	403	ND(0.2)	0.815	35.4	0.0062	0.0125	**22**	7.8	ND(0.31)	0.0108	1.32	ND(0.02)	434	**1580**	541
2/10/2015	670	670	78.2	ND(2)	14.2	328	ND(0.2)	0.081	33.3	0.0024	0.0026	**14.4**	8.1	ND(0.31)	0.0102	1.04	0.0048	440	**1440**	510
4/29/2015	645	645	70.8	ND(2)	9.2	299	0.0369	1.21	30.6	0.0015	0.0224	7.2	8	ND(0.31)	0.0134	1.24	ND(0.02)	405	**1280**	487
9/1/2015	652	652	63.6	ND(2)	13.1	303	ND(0.2)	19.8	27.9	0.0679	0.363	8.8	7.6	ND(0.31)	0.256	4.88	ND(0.02)	518	**1650**	563
11/3/2015	603	603	61.2	ND(2)	11.6	274	ND(0.2)	4.04	26.4	0.0097	0.0696	8.2	7.8	ND(0.31)	0.0819	1.62	ND(0.02)	355	**1380**	408
2/24/2016	604	604	62.3	ND(2)	13.5	309	ND(0.2)	2.28	26.1	0.0097	0.0691	**11.9**	8.3	ND(0.31)	0.0427	1.44	0.0116	351	**1230**	356
5/24/2016	587	587	50.9	ND(2)	11.6	235	ND(0.2)	0.219	22.9	0.002	0.0039	9	8	ND(0.31)	ND(0.1)	1.73	ND(0.02)	375	**1290**	342
Standard	-	-	-	-	250	-	1	-	-	0.2	-	10	6 - 9	-	-	-	0.05	-	1000	600

Bold values indicate concentration or detection limit exceeds groundwater quality standard
Abbreviations:
CaCO3 - calcium carbonate, molecular weight of 100.06 g
mg/L - milligrams per liter
na - not analyzed
ND - non-detect (detection limit in parentheses)
nm - not measured
NTU - Nephelometric Turbidity Units
s.u. - standard units

TABLE 4-3. WELL DT2B HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Calcium, Total mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Hardness mg/L CaCO3	Iron, Dissolved mg/L	Iron, Total mg/L	Magnesium, Total mg/L	Manganese, Dissolved mg/L	Manganese, Total mg/L	Nitrogen Nitrate, mg/L	pH, Lab s.u.	Phosphate mg/L	Phosphorus, Total mg/L	Potassium, Total mg/L	Selenium, Total mg/L	Sodium, Total mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L
3/20/2013	855	855	127	ND(2)	41.8	na	0.384	ND(0.2)	59.2	**0.405**	0.333	**16.4**	7.6	na	0.0127	3.64	ND(0.02)	897	**3440**	**1690**
5/23/2013	832	832	140	ND(2)	46	na	0.553	2.32	65.1	**0.333**	0.865	**14.2**	7.6	na	0.0818	4.2	ND(0.02)	969	**3640**	**1780**
8/21/2013	781	781	165	ND(2)	44.8	na	0.0988	7.28	77.7	0.111	1.11	**23.5**	7.6	na	0.258	5.12	ND(0.02)	1110	**3650**	**2220**
11/7/2013	797	797	129	ND(2)	35.9	na	ND(0.2)	0.191	63.9	0.149	0.181	**15.7**	7.6	ND(0.31)	ND(0.1)	3.83	ND(0.02)	942	**3300**	**1560**
2/12/2014	820	820	138	ND(2)	40.4	na	ND(0.2)	2.75	65.5	**0.258**	0.472	**12.4**	7.6	ND(0.31)	0.101	3.92	ND(0.02)	946	**3510**	**1760**
4/15/2014	811	811	124	ND(2)	31.5	na	ND(0.2)	0.28	61.3	0.165	0.193	**13.7**	7.6	ND(0.31)	ND(0.1)	3.44	ND(0.02)	910	**3190**	**1590**
8/21/2014	849	849	148	ND(2)	46.7	682	ND(0.2)	2.8	72.2	**0.524**	0.667	7.3	7.7	ND(0.31)	0.0967	4.34	ND(0.02)	1020	**3930**	**1850**
10/22/2014	851	851	164	ND(2)	44	776	ND(0.2)	1.27	77.3	**0.375**	0.631	5.4	7.6	ND(0.31)	0.0561	4.21	ND(0.02)	967	**3820**	**1950**
2/10/2015	889	889	174	ND(2)	43	725	0.0944	0.705	81.4	**0.573**	0.929	4.3	7.8	ND(0.31)	0.0526	4.5	ND(0.02)	1060	**4040**	**2000**
4/29/2015	881	881	149	ND(2)	36.1	735	ND(0.2)	2.65	72.8	**0.706**	0.668	6.1	7.8	ND(0.31)	0.0969	3.96	ND(0.02)	1020	**3290**	**1800**
9/1/2015	894	894	157	ND(2)	42.7	987	0.323	17.6	72.5	**0.34**	1	3.5	7.6	11.2	0.51	6.29	ND(0.02)	983	**3340**	**1590**
11/3/2015	910	910	107	ND(2)	32.4	514	0.594	2.57	50.6	**0.409**	0.635	4	7.8	ND(0.31)	0.0996	3.73	ND(0.02)	811	**2630**	**1420**
2/24/2016	906	906	125	ND(2)	30.2	605	ND(0.2)	47.3	56.9	**0.496**	1.31	5.5	7.8	1.6	1.14	9.02	ND(0.1)	810	**2400**	**1040**
Standard	-	-	-	-	250	-	1	-	-	0.2	-	10	6 - 9	-	-	-	0.05	-	1000	600

Bold values indicate concentration or detection limit exceeds groundwater quality standard
Abbreviations:
CaCO3 - calcium carbonate, molecular weight of 100.06 g
mg/L - milligrams per liter
na - not analyzed
ND - non-detect (detection limit in parentheses)
nm - not measured
NTU - Nephelometric Turbidity Units
s.u. - standard units

TABLE 4-4. WELL 3 HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING,INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Calcium, Dissolved mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Fluoride mg/L	Hardness mg/L CaCO3	Iron, Total mg/L	Magnesium, Dissolved mg/L	Manganese, Total mg/L	pH, Lab s.u.	Phosphate mg/L	Potassium, Dissolved mg/L	Sodium, Dissolve d mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L	Turbidity NTU
5/23/2013	159	159	98.3	ND(2)	4.7	ND(0.5)	366	0.656	22.3	0.0514	7.3	na	5.4	24.8	526	250	2.6
6/4/2015	196	196	87.9	ND(2)	21	0.65	353	1.87	20.5	0.0642	7.7	0.26	5.17	66.5	572	217	7.9
9/2/2015	185	185	90.3	ND(2)	19.9	0.84	330	2.69	21.8	0.0898	7.7	ND(0.31)	5.45	66.4	618	232	23
11/3/2015	188	188	97.4	ND(2)	18.8	0.53	368	3.18	23.7	0.104	7.4	ND(0.31)	5.73	65.5	631	246	11.4
2/24/2016	226	226	89	ND(2)	36.9	1.1	333	3.35	21.6	0.0676	7.5	ND(0.31)	5.65	109	655	223	29.2
5/24/2016	206	206	91.1	ND(2)	28.2	1.2	287	2.61	22.1	0.0797	7.5	ND(0.31)	5.71	88.8	633	265	22.6
7/28/2016	204	204	86.6	ND(5)	26.2	1.1	346	2.59	21.2	0.0797	7.5	ND(0.31)	5.45	79.9	649	245	25.4
11/9/2016	199	199	88.4	ND(5)	22.3	1.1	337	3.02	21.2	0.0836	7.3	ND(0.31)	5.43	72.6	581	254	17
3/3/2017	231	231	87.8	ND(5)	36.1	1.2	315	2.81	21.4	0.0841	7.6	ND(0.31)	5.54	106	620	227	31
6/7/2017	210	210	91.8	ND(5)	27.8	1.2	332	2.74	22.1	0.0698	7.8	ND(0.31)	5.83	88.5	614	294	21.8
9/27/2017	200	200	83.6	ND(5)	42.5	0.94	342	2.71	20.6	0.0735	7.4	ND(0.31)	5.77	77	613	235	20
11/20/2017	183	183	90.1	ND(5)	19.7	1.1	351	2.55	21.5	0.0824	7.3	ND(0.31)	5.78	61.4	581	210	5.5
2/22/2018	204	204	88.9	ND(5)	38.8	1.1	152	2.49	21.6	0.064	7.5	ND(0.31)	5.51	92.1	628	235	9.1
5/16/2018	184	184	93.5	ND(5)	19.5	0.98	329	2.27	22.4	0.0853	7.6	ND(0.31)	5.87	70.1	579	95.9	20
9/12/2018	221	221	87.1	ND(5)	26.6	0.97	304	2.68	21.2	0.0601	7.6	ND(0.31)	5.36	96.5	672	240	27
11/15/2018	221	221	89.1	ND(5)	24.6	1.2	311	2.28	21.6	0.0613	7.9	ND(0.31)	5.58	91.3	642	182	2.5
3/6/2019	203	203	92.8	ND(5)	25.3	0.72	323	2.33	22.3	0.0668	7.7	ND(0.31)	5.47	76.6	615	275	23
5/8/2019	189	189	93.5	ND(5)	19.6	1.4	346	2.55	22.4	0.0738	7.6	ND(0.31)	5.66	68.2	605	238	3.4
8/20/2019	194	194	98	ND(8)	20.8	0.8	334	2.63	23.8	0.0831	7.5	ND(0.31)	5.82	70.4	621	227	19
11/13/2019	199	199	92.4	ND(8)	23.7	1	376	1.88	22.1	0.0698	8	ND(0.31)	5.48	73.2	602	239	23
2/20/2020	207	207	86.1	ND(8)	29	1.1	340	1.51	21	0.0613	7.7	2.1	5.12	81.2	614	252	15
4/29/2020	204	204	90.2	ND(8)	24.8	1.4	391	1.86	21.7	0.0628	7.6	ND(0.31)	5.42	81.4	632	249	22
9/9/2020	220	220	85	ND(8)	38	1.3	360	1.8	21	0.056	7.5	ND(0.31)	5.3	100	670	220	19
10/22/2020	170	170	37	ND(8)	3.3	0.6	130	1.2	5	0.055	8.1	ND(0.31)	2.5	52	170	45	3.7
1/26/2021	200	200	88	ND(8)	27	1.1	330	1.8	23	0.064	7.6	ND(0.31)	5.4	94	610	230	17
5/12/2021	198.8	198.8	91	ND(2)	21	0.85	320	1.6	23	0.063	7.19	ND(2.5)	5.6	75	621	220	5.1
8/10/2021	188.5	188.5	99	ND(2)	17	0.76	340	2.6	25	0.065	7.16	ND(2.5)	5.6	69	568	240	8.2
10/27/2021	208	208	88	ND(2)	28	1.1	310	1.5	22	0.055	7.56	ND(2.5)	5.4	85	627	240	12
2/10/2022	192.8	192.8	91	ND(2)	20	0.96	320	2.1	23	0.059	7.23	ND(2.5)	5.4	64	616	230	5
4/26/2022	195.5	195.5	98	ND(2)	21	0.85	330	1.8	24	0.061	7.19	ND(0.5)	5.1	75	621	250	8.6
8/31/2022	197.6	197.6	92	ND(2)	22	0.98	320	1.5	23	0.056	7.21	ND(2.5)	5.5	75	615	230	6.4
12/7/2022	194.8	194.8	89	ND(2)	20	0.93	350	1.7	22	0.064	7.03	ND(2.5)	5.2	71	609	250	6.4
2/9/2023	204.4	204.4	92	ND(2)	22	1	320	1.4	22	0.056	7.52	ND(2.5)	5.3	77	607	230	5
6/8/2023	204.4	204.4	87	ND(2)	24	0.93	310	1.8	23	0.054	7.21	ND(2.5)	5.4	82	614	230	3.8

TABLE 4-4. WELL 3 HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING,INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Calcium, Dissolved mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Fluoride mg/L	Hardness mg/L CaCO3	Iron, Total mg/L	Magnesium, Dissolved mg/L	Manganese, Total mg/L	pH, Lab s.u.	Phosphate mg/L	Potassium, Dissolved mg/L	Sodium, Dissolve d mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L	Turbidity NTU
7/12/2023	199.3	199.3	94	ND(2)	20	0.96	330	1.2	22	0.065	7.23	ND(2.5)	5.2	75	605	220	9.5
11/16/2023	212.8	212.8	89	ND(2)	27	1.2	310	1.7	22	0.054	7.53	ND(2.5)	5.2	87	625	230	7.8
1/17/2024	206.8	206.8	89	ND(2)	25	0.99	310	1.6	22	0.056	7.26	ND(0.5)	5.3	80	626	240	8.3
12/4/2024	220	220	90	ND(2)	30	1.2	330	2.2	22	0.059	7.3	ND(0.5)	5.2	89	610	250	11
Standard	-	-	-	-	250	1.6	-	-	-	-	6 - 9	-	-	-	1000	600	-

Bold values indicate concentration or detection limit exceeds groundwater quality standard
Abbreviations:
CaCO3 - calcium carbonate, molecular weight of 100.06 g
mg/L - milligrams per liter
na - not analyzed
ND - non-detect (detection limit in parentheses)
nm - not measured
NTU - Nephelometric Turbidity Units
s.u. - standard units

TABLE 4-5. WELL 11 HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

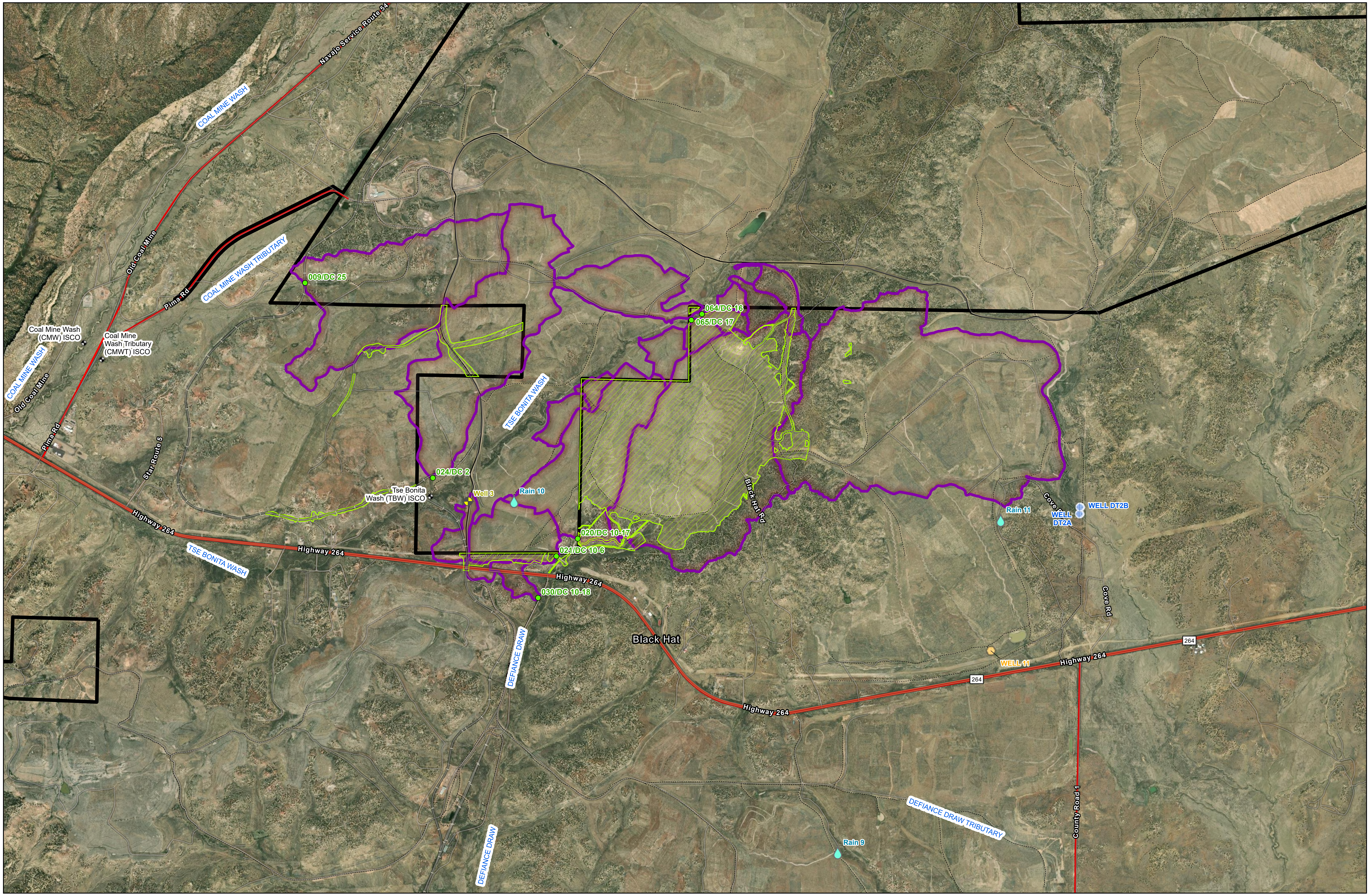
Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Boron, Total mg/L	Calcium, Total mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Fluoride mg/L	Hardness mg/L CaCO3	Iron, Dissolved mg/L	Iron, Total mg/L	Magnesium, Total mg/L	Manganese, Dissolved mg/L	Manganese, Total mg/L	Nitrate, mg/L	pH, Lab s.u.	Phosphate mg/L	Phosphorus, Total mg/L	Potassium, Total mg/L	Selenium, Total mg/L	Sodium, Total mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L	Zinc, Total mg/L
8/21/2013	1820	1820	0.261	144	ND(2)	36	ND(0.5)	na	0.566	2.64	48.7	**0.678**	0.664	1.8	7.0	ND(0.1)	0.0464	15.4	ND(0.02)	2380	**6400**	**3960**	0.0138
11/7/2013	1940	1940	0.271	168	ND(2)	36.8	ND(0.5)	na	0.267	2.51	55.8	**1.52**	1.53	ND(0.1)	6.9	ND(0.31)	ND(0.1)	18.2	ND(0.02)	2360	**7200**	**3570**	0.0141
2/12/2014	1860	1860	0.253	139	ND(2)	37.2	ND(0.5)	na	0.979	3.91	46.8	**0.649**	0.651	ND(1)	7.0	ND(0.31)	ND(0.1)	15.5	ND(0.02)	2210	**7760**	**4400**	0.0152
4/15/2014	1850	1850	0.25	149	ND(2)	35.1	ND(0.5)	na	0.655	3.09	49.9	**0.8**	0.766	ND(0.1)	7.0	ND(0.31)	ND(0.1)	15.7	ND(0.02)	2260	**8300**	**4110**	0.011
8/21/2014	1820	1820	0.267	144	ND(2)	35.2	ND(0.5)	568	0.0782	1.73	47.3	**0.715**	0.732	ND(0.5)	7.3	ND(0.31)	0.0143	15.4	ND(0.02)	2350	**6940**	**3320**	0.0141
10/22/2014	1850	1850	0.254	146	ND(2)	39.7	ND(0.5)	551	**3.64**	3.74	49	**0.809**	0.814	ND(1)	7.1	ND(0.31)	0.0406	16.1	ND(0.02)	2370	**5570**	**3200**	0.0196
2/10/2015	1890	1890	0.258	146	ND(2)	36.2	0.29	618	0.141	2.25	48.3	**0.761**	0.748	ND(1)	7.3	0.28	0.0525	15.9	0.0065	2250	**7990**	**3500**	0.0154
4/29/2015	1870	1870	0.236	139	ND(2)	31.3	0.46	598	0.231	4.16	47.4	**0.726**	0.733	ND(0.1)	7.4	ND(0.31)	0.0418	15.6	ND(0.02)	2280	**5720**	**3470**	0.019
9/1/2015	1780	1780	0.251	139	ND(2)	38.1	ND(0.5)	669	0.359	3.59	46.1	**0.74**	0.738	ND(0.1)	7.2	ND(0.31)	0.0279	15.7	ND(0.02)	2260	**7840**	**3340**	0.0143
11/5/2015	1850	1850	0.228	141	ND(2)	37.2	ND(0.5)	598	**3.09**	5.34	46.6	**0.953**	0.949	ND(0.1)	7.2	ND(0.31)	0.0189	17.9	ND(0.02)	2130	**7780**	**3690**	0.0093
2/24/2016	1860	1860	0.253	141	ND(2)	35.8	ND(0.5)	614	**1.2**	2.92	47.8	**0.797**	0.754	ND(0.1)	7.4	ND(0.31)	0.0282	15.5	ND(0.02)	1970	**7250**	**3430**	0.0141
5/24/2016	1850	1850	0.268	153	ND(2)	34.9	ND(0.5)	591	0.885	1.99	50.7	**0.798**	0.807	ND(0.1)	7.3	ND(0.31)	0.0146	15.4	ND(0.02)	2160	**6970**	**3620**	0.0067
7/28/2016	1560	1560	0.255	145	ND(50)	35.6	ND(0.5)	597	0.915	2.01	46.7	**0.751**	0.762	ND(0.1)	7.1	ND(0.31)	0.0141	15.2	ND(0.02)	2150	**7010**	**3610**	0.0064
11/9/2016	1930	1930	0.256	151	ND(5)	33.7	ND(0.5)	612	0.59	1.5	51.1	**0.814**	0.807	ND(0.1)	7.1	ND(0.31)	0.0141	21.5	ND(0.02)	2190	**5980**	**3710**	0.0071
3/1/2017	2030	2030	0.26	239	ND(5)	38	ND(0.5)	861	0.724	4.12	73.4	**2.25**	2.46	0.23	7.1	ND(0.31)	ND(0.1)	19.5	ND(0.02)	2330	**7260**	**4610**	0.0192
6/8/2017	2000	2000	0.273	221	ND(5)	38.8	ND(0.5)	807	**6.23**	10.9	69.5	**2.13**	2.21	0.077	6.7	3410	0.0459	21	ND(0.02)	2250	**8660**	**4480**	0.017
8/23/2017	2020	2020	0.244	242	ND(5)	39.6	ND(0.5)	860	**6.87**	7.68	75.1	**2.68**	2.68	ND(0.1)	6.9	ND(0.31)	0.05	22.4	ND(0.02)	2450	**7500**	**4020**	0.0278
11/14/2017	2020	2020	0.239	226	ND(5)	40.8	ND(0.5)	849	**6.51**	9.42	75.2	**2.48**	2.52	ND(0.1)	7.0	ND(0.31)	0.0515	23.9	ND(0.02)	2410	**3870**	**4410**	0.015
2/21/2018	2000	2000	0.229	242	ND(5)	106	ND(0.5)	771	**3.47**	7.59	73.6	**2.57**	2.76	ND(0.1)	7.0	ND(0.31)	ND(0.1)	19.9	ND(0.02)	2500	**8000**	**4030**	0.0152
5/3/2018	2060	2060	0.239	263	ND(5)	38.1	ND(0.5)	949	**5.15**	7.92	78.7	**2.72**	3.19	0.083	6.7	ND(0.31)	0.0439	19.6	ND(0.02)	2290	**8790**	**4230**	0.0247
8/2/2018	2010	2010	0.26	266	ND(5)	38.8	ND(0.5)	939	**8.08**	9.61	82.5	**3.14**	3.21	ND(0.1)	6.9	0.26	0.0555	19.8	ND(0.05)	2570	**6420**	**4150**	0.0297
11/14/2018	2070	2070	0.252	266	ND(5)	30.8	ND(0.5)	1070	**8.17**	9.4	83	**3.11**	3.21	0.068	7.2	ND(0.31)	0.0621	21	ND(0.05)	2390	**8620**	**3650**	0.0199
3/7/2019	2100	2100	0.231	243	ND(5)	35.7	ND(0.5)	1090	**7.53**	7.98	76.6	**3.5**	2.93	ND(0.1)	7.4	ND(0.31)	0.0654	17	ND(0.05)	2220	**7660**	**4390**	0.0143
5/14/2019	2030	2030	0.252	265	ND(5)	38.2	ND(0.5)	1000	**5.12**	10.9	86.6	**3.53**	3.3	ND(0.1)	7.2	ND(0.31)	0.0579	19.6	ND(0.05)	2430	**8250**	**4120**	0.0169
8/20/2019	2060	2060	0.253	158	ND(8)	41.8	ND(0.5)	610	0.638	2.34	52.6	**0.958**	0.973	ND(0.1)	7.0	ND(0.31)	ND(0.1)	18.1	ND(0.05)	2280	**7390**	**3620**	0.0188
11/13/2019	2050	2050	0.26	160	ND(8)	36.1	ND(0.5)	516	0.619	3.15	52.7	**0.932**	0.958	ND(0.1)	7.5	ND(0.31)	0.0398	16.3	ND(0.05)	2220	**7760**	**3620**	0.0185
2/19/2020	2020	2020	0.233	157	ND(8)	33.8	ND(0.5)	684	0.559	1.79	52.7	**0.946**	0.881	ND(0.1)	7.2	ND(0.31)	ND(0.1)	16	ND(0.05)	2000	**5990**	**3430**	0.0113
5/13/2020	2040	2040	0.257	156	ND(8)	32.7	ND(0.5)	669	0.418	2.01	52.1	**0.865**	0.906	ND(0.1)	7.4	ND(0.31)	ND(0.1)	15.2	ND(0.05)	2140	**7350**	**3520**	0.007
9/1/2020	2100	2100	0.25	160	ND(8)	53	ND(0.5)	670	0.18	0.74	53	**1**	1	0.093	7.2	ND(0.31)	ND(0.1)	16	ND(0.05)	2300	**7300**	**3500**	0.0096
10/22/2020	2200	2200	0.27	160	ND(8)	52	ND(0.5)	660	0.97	0.68	50	**0.94**	1	ND(0.1)	7.3	ND(0.31)	ND(0.1)	18	ND(0.05)	2200	**3100**	**3700**	0.01
1/21/2021	1900	1900	0.3	160	ND(8)	46	0.81	710	0.53	1.9	57	**0.9**	0.97	ND(0.1)	7.4	ND(0.31)	ND(0.1)	17	ND(0.05)	2400	**7500**	**4600**	0.0089
5/5/2021	1435	1369	0.26	150	66.2	34	ND(0.5)	590	0.28	1.8	54	**0.96**	0.9	ND(0.5)	7.4	ND(2.5)	ND(0.05)	17	ND(0.001)	2200	**7480**	**3400**	ND(0.01)
8/10/2021	2036	2036	0.27	160	ND(5)	35	ND(0.5)	620	0.55	1.8	54	**0.98**	0.94	ND(0.5)	6.9	ND(2.5)	ND(0.1)	17	ND(0.005)	2300	**7400**	**3700**	ND(0.05)
11/10/2021	2020	2020	0.26	140	ND(5)	33	ND(0.5)	570	0.78	1.9	52	**0.89**	0.92	ND(0.5)	7.1	ND(2.5)	ND(0.05)	15	ND(0.005)	2500	**7500**	**3500**	ND(0.01)
2/9/2022	2056	2056	0.26	170	ND(5)	34	ND(0.5)	680	0.12	1.5	62	**1.7**	1.5	ND(0.5)	7.2	ND(2.5)	ND(0.25)	17	ND(0.005)	2300	**8140**	**4000**	0.017
4/26/2022	2093	2093	0.28	200	ND(5)	34	ND(0.5)	760	**1.7**	11	64	**1.3**	1.8	ND(0.5)	7.0	ND(2.5)	0.3	17	ND(0.001)	2500	**7740**	**3500**	ND(0.05)
9/26/2022	2051	2051	0.28	170	ND(5)	33	ND(0.5)	660	**1.5**	2.3	57	**0.91**	0.94	ND(0.5)	7.2	ND(2.5)	ND(0.05)	16	ND(0.005)	2600	**6580**	**3300**	ND(0.01)
11/10/2022	1943	1943	0.23	170	ND(5)	33	ND(0.5)	680	0.89	3.2	60	**0.81**	0.81	ND(1)	7.5	ND(2.5)	0.079	15	ND(0.005)	2300	**7840**	**3500**	ND(0.01)
2/8/2023	1996	1996	0.29	170	ND(5)	33	ND(1)	650	**1.3**	2.5	55	**0.8**	0.91	ND(1)	6.8	ND(5)	ND(0.25)	17	ND(0.005)	2600	**6260**	**3700**	ND(0.01)
5/4/2023	1998	1998	0.3	190	ND(5)	33	ND(0.5)	700	**1.1**	2	58	**0.95**	1.2	ND(0.5)	7.2	ND(2.5)	ND(0.05)	17	0.0053	2300	**7820**	**3500**	ND(0.01)
7/12/2023	2010	2010	0.26	160	ND(5)	33	ND(1)	610	0.96	1.8	52	**1**	0.94	ND(1)	7.0	ND(5)	ND(0.05)	16	ND(0.001)	2600	**7280**	**3600**	ND(0.01)
10/5/2023	1965	1965	0.26	170	ND(5)	34	ND(1)	660	0.43	1.9	58	**0.91**	0.97	ND(1)	7.0	ND(5)	ND(0.25)	18	ND(0.001)	2500	**8630**	**3800**	ND(0.01)

TABLE 4-5. WELL 11 HISTORICAL GROUNDWATER QUALITY DATA
CHEVRON MINING, INC, McKINLEY MINE
NEAR GALLUP, NEW MEXICO

Date Sampled	Alkalinity mg/L CaCO3	Bicarbonate mg/L CaCO3	Boron, Total mg/L	Calcium, Total mg/L	Carbonate mg/L CaCO3	Chloride mg/L	Fluoride mg/L	Hardness mg/L CaCO3	Iron, Dissolved mg/L	Iron, Total mg/L	Magnesium, Total mg/L	Manganese, Dissolved mg/L	Manganese, Total mg/L	Nitrate, mg/L	pH, Lab s.u.	Phosphate mg/L	Phosphorus, Total mg/L	Potassium, Total mg/L	Selenium, Total mg/L	Sodium, Total mg/L	Solids, Total Dissolved mg/L	Sulfate mg/L	Zinc, Total mg/L
1/18/2024	2032	2032	0.27	190	ND(5)	36	ND(0.5)	760	0.35	2.3	67	**0.99**	1.7	ND(0.5)	7.2	ND(2.5)	0.35	17	ND(0.005)	2400	**7670**	**4100**	ND(0.01)
10/10/2024	2100	2100	0.29	180	ND(5)	39	ND(1)	690	0.57	2.8	62	**1**	1.1	ND(1)	7.1	ND(5)	ND(0.05)	17	ND(0.001)	2400	**7900**	**4500**	ND(0.01)
Standard	-	-	-	-	-	250	1.6	-	1	-	-	0.2	-	10	6 - 9	-	-	-	0.05	-	1000	600	10

Bold values indicate concentration or detection limit exceeds groundwater quality standard
Abbreviations:
CaCO3 - calcium carbonate, molecular weight of 100.06 g
mg/L - milligrams per liter
na - not analyzed
ND - non-detect (detection limit in parentheses)
nm - not measured
NTU - Nephelometric Turbidity Units
s.u. - standard units

FIGURE



EXPLANATION

- NPDES OUTFALLS 201901
- GSA GROUNDWATER WELL
- ALLUVIAL GROUNDWATER WELL
- SPOIL WELL
- STREAM MONITORING STATION (ISCO)
- WEATHER MONITORING STATION
- HIGHWAY
- ANCILLARY ROAD
- TWO TRACK TRAIL
- MINE BOUNDARY
- PHASE III RELEASE AREA
- WATERSHED BOUNDARY

N

0 2,000 4,000'

Trihydro CORPORATION
1252 Commerce Drive
Laramie, WY 82070
www.trihydro.com
(P) 307/745.7474 (F) 307/745.7729

FIGURE 2-1

VMU-1 PROPOSED BOND RELEASE AREA

CHEVRON MINNING INC.
MECKINLEY MINE
MCKINLEY COUNTY, NEW MEXICO

Drawn By: BS	Checked By: TR	Scale: 1" = 2,000'	Date: 7/31/25	File: C_VMU_1_PBR

APPENDIX A

MCKINLEY MINE PERMIT SECTION 3.4, HYDROLOGY INFORMATION

- (108°56'40"; 35°41'38") 16.1 ac-ft/annum (File No. G-93)
- (108°54'35"; 35°40'52") 16.1 ac-ft/annum (File No. G-94)
- (SW¼, NW¼, SE¼ Sec 14, T16N, R20W) 16.1 ac-ft/annum (File No. G-95)
- (NW¼, SE¼, NW¼ Sec 9, T16N, R20W) Domestic/Sanitary (File No. G-258)

A search of the Office Of The State (NM) Engineer records indicates the following additional groundwater rights holders in the vicinity of McKinley Mine (Appendix 3.4-A):

- (NW¼, NE¼ Sec 3, T16N, R21W) (File No. G-160, M. Abukhalil, Domestic)
- (NE¼, NW¼, Sec 1, T16N, R21W) (File No. G-28, W. Bald, Domestic)
- (SE¼, NE¼, SE¼ Sec 11, T16N, R20W) (File No. G-51, C. Wilhelm, Stock)
- (NW¼, SE¼, SE¼ Sec 9, T16N, R20W) (File No. G-390, N. Murphy, Domestic)
- (NW¼, NW¼ Sec 9, T16N, R20W) (File No. G-976, B. Nicholson, Domestic)
- (NE¼, NE¼ Sec 7, T16N, R20W) (File No. G-131, C. Harris, Domestic/Stock)
- (SW¼, NW¼, SE¼ Sec 1, T16N, R20W) (File No. G-677, N. Nation, Domestic)

3.4.3 HYDROLOGIC MODELING

Appendix 3.4-E contains modeling information which characterizes and contrasts surface water quality and quantity for medium sized watersheds in undisturbed, disturbed, and reclaimed surficial conditions.

3.4.4 PROBABLE HYDROLOGIC CONSEQUENCES (PHC)

The PHC addresses existing mining areas and the new mining area referred to as the "East Wing." The addition of 1870 acres in the East Wing Revision does not alter any of the surface or groundwater parameters addressed in the PHC. To address the addition of the East Wing, a separate and detailed update follows this general PHC analysis.

The validity of the PHC for the existing mining areas and the East Wing is supported by surface and ground water sampling programs conducted by P&M since 1980, which verify the original assumptions of runoff quantity and quality in the PHC. Surface and groundwater monitoring data is submitted to the OSM quarterly and as part of the Annual Report. A collection of studies, which analyze the data for both surface and groundwater, further verify the validity of the basis for the PHC and are included in this PAP at Appendix 3.4-G for surface water and Appendix 3.4-H for ground water.

Data collected from the surface water sampling program includes small (1.2 - 6.1 acres), medium (188 - 235 acres) and large (5.7 - 27.5 square miles) paired watersheds. Quarterly ground water sampling results show a slight reduction in the sparse alluvial and bedrock aquifers, and confirm the stagnant nature and poor quality of the aquifers. Sampling of the Gallup Aquifer shows no reduction in pumping quantity other than ordinary well usage drawdown and no change in quality.

In summary, more surface water will be retained on the reclaimed areas resulting in a slight reduction in runoff to the Puerco River drainage. The quality of surface runoff from the reclaimed areas has been shown to improve due to lower suspended solids and total settleable solids. PATFM management will improve effluent levels of dissolved solids, salinity, and alkalinity. The ground water quantity will be reduced slightly in the alluvial and bedrock aquifers. There will be negligible impact on ground water quality in the alluvial and bedrock aquifers, and none in the Gallup Sandstone.

SURFACE WATER QUANTITY

Surface water quantity may be increased on the reclaimed areas through the construction of small impoundments. These impoundments will be used to provide water for livestock and wildlife and to create small riparian habitats for small mammals, birds and reptiles. The amount of postmining runoff as compared to the premining runoff to the Puerco River drainage will be diminished by the harvesting of the water in the impoundments and other riparian areas. This reduction of runoff is supported by the hydrologic model included in Appendix 3.4-E of this application. However, the impact on the Puerco River drainage will be negligible due to the small percentage of the drainage area that the McKinley Mine comprises.

SURFACE WATER QUALITY

For a short term following reclamation of an area there may be a slight increase in the levels of total dissolved solids, sulfates, and other soluble elements in the overburden. This increase will eventually lessen as the runoff leaches the overburden. This potential slight increase will be documented by the collection and analysis of surface water runoff during the permit term as described in Section 6.3. The long term surface water PHC is described below.

Physical Quality

Surface water physical quality will be improved through stabilization of the reclamation areas and the creation of post mining impoundments. These actions will result in lower TSS and T-Set-S in the runoff from the disturbed areas. The PHC is evaluated using hydrologic models contained in Appendix 3.4-E of the permit application, and through the collection of TSS and T-Set-S samples during flow events. The modeling indicated that per acre sediment yields from the mining and post-mining areas will be less than from the pre-mining areas. The analytical results indicate that the TSS concentrations from the disturbed watershed are consistently lower than the undisturbed watershed concentrations since monitoring began as documented in the Annual Hydrology Reports submitted to OSM. The following section provides a summary of the sediment yield modeling provided in Appendix 3.4.E.

The Area 6 total sediment yield from the 10-year, 24-hour precipitation event was estimated to be 415.4 tons, 472.3 tons, and 189.1 tons for the pre-mining, mining and reclamation, and post-mining evaluations, respectively. On a per acre basis, sediment delivery equates to 0.45 tons/acre, 0.41 tons/acres, and 0.16 tons/acre for the pre-mining, mining and reclamation, and post-mining disturbance phases, respectively.

The average per acre sediment loading for the pre-mining condition is higher than for the mining and reclamation or post-mining conditions. For the mining and reclamation conditions, low sediment volumes are generated from reclaimed areas with BTCA sediment control practices, while somewhat higher sediment volumes are generated from the graded spoils where BTCA practices were not implemented. Nevertheless, the worst-case mining and reclamation condition does not exceed the pre-mining condition's average sediment loading values.

The volume of the sediment generated during the post-mining disturbance phase (when all disturbed areas have received a BTCA sediment control treatment) is significantly lower than either the pre-mining or mining and reclamation conditions. This leads to the conclusion that once BTCA practices are fully implemented, sediment transport is significantly reduced at the Mine compared to pre-mining conditions.

The times to peak sediment loading were estimated to occur at 12.4 hours, 12.0 hours and 12.2 hours for the pre-mining, mining and reclamation, and post-mining disturbance phases, respectively. These represent the period between commencement of the storm event and the time the peak sediment loading will be realized in runoff waters. The time to peak sediment loading for the pre-mining model corresponds to the time of peak runoff. The time to peak loading for the mining and reclamation and post-mining condition occurs approximately one hour before peak runoff occurs.

The predicted runoff volumes from the 10-year, 24-hour precipitation event for the three disturbance phase conditions are as follows: Pre-mining = 0.0389 acre-feet per acre of watershed, Mining and Reclamation = 0.0338 acre-feet per acre of watershed, and Post-mining = 0.023 acre-feet per acre of watershed. On a per acre basis, the largest volume of runoff occurs from lands in the pre-mining condition. The BTCA practices of land imprinting, mulching and revegetation utilized during the mining and reclamation, and post-mining disturbance phases reduce the overland flow velocity. As flow velocity is reduced, the runoff has increased opportunity to infiltrate into the soil and further reduce the volume of overland flow. Reduction in flow in turn reduces runoff, sediment carrying capacity and sediment delivery. Thus, the regulatory objective of preventing the contributions of additional suspended solids is met through the BTCA practices designed to harvest water and enhance soil moisture conditions in reclaimed areas. Also, water harvesting acts to stimulate plant growth and development. Increased vegetation cover in turn acts to improve the hydrologic characteristics of reclaimed lands.

Chemical Quality

Surface water chemical quality will be unaffected or could possibly improve by minimizing the potential of runoff coming into contact with potentially acid or toxic materials (PATFM). These materials consist of those uncovered during the mining operations, native soil materials that of are poor quality, and naturally occurring exposed coal seams. The PATFM Management program which is discussed in Section 5.2 of this permit, will identify graded spoil areas that have acid or toxic materials present in or near the rooting zone. Areas identified through this program will be mitigated prior to revegetation. These actions will prevent the degradation of the surface water quality within the mine and improve the effluent levels of dissolved solids, salinity, and alkalinity.

GROUNDWATER QUANTITY

Gallup Sandstone Aquifer

As discussed above, the Gallup Sandstone Aquifer is used as the primary source of water for the mine and for the McKinley County area. This aquifer occurs 400 to 1,000 feet below the lowest coal seam to be recovered and has no local recharge features. The recharge area for this aquifer is located to the north of McKinley Mine in the Chuska Mountains.

P&M drilled it's first large scale water supply well in 1975 and began measurement of withdrawals from their four supply wells in 1986. The average rate of groundwater withdrawal for the Mine between 1986 and 2002 is 275 ac-ft/yr. Under the imposed pumping stress, the potentiometric surface (as defined by the Mines production wells) has sustained a maximum rate of decline of 3.1 ft/yr in Wells #1 and #3, a 14-foot rise at Well #2, and has remained stable at Well #3A (Tetra Tech EM Inc. 2003).

The potentiometric surface defined by Wells #2 and #3A suggest that water levels in much of the Mine area are stable or rising. This condition has resulted from less water production or use of Wells #2 and 3A over the last five years.

Measured drawdown of the potentiometric surface within the Gallup Sandstone aquifer is between 700 to 1,000 feet in some of the older wells in the Yah-ta-hey well field located east of the Mine (NWCOG, 1998). This is the primary source of water for the City of Gallup. The dramatic decline in local water levels is the result of low storage within the Gallup Sandstone and large pumping interferences between closely spaced production wells.

Under the current Mine water production schedule, the probable hydrologic consequence of continued pumping is minimal to non-existent. Annual water withdrawals at the Mine represent less than 5% of total groundwater withdrawals from the Gallup Sandstone aquifer in the region.

To further substantiate this information and to show current information pertaining to the Gallup Sandstone formation, P&M developed a revised structure map of the Gallup Sandstone formation. This map has been included in this application as Exhibit 3.4-1. It should be noted that this map supplements or supersedes information provided in Appendix 3.4-C pertaining to the Gallup Sandstone formation. The changes made in the Gallup Sandstone Structure map are based on information collected from the drill logs for the four Gallup Sandstone Aquifer wells in use at McKinley Mine, therefore only the information in the immediate vicinity of the Mine has been modified.

In addition, P&M has developed a map showing the potentiometric surface of the Gallup Aquifer (Exhibit 3.4-2). Elevations of the potentiometric surface of the Gallup Sandstone Aquifer reflect an estimate of current static water levels for the four Gallup Sandstone Aquifer wells in use at McKinley Mine. As with Exhibit 3.4-1, only the information in the immediate vicinity of the Mine has been modified.

The potentiometric surface depicted on Exhibit 3.4-2 of the Mine permit application shows that groundwater flows in an east-northeast direction in the vicinity of the Mine. The potentiometric surface slopes from the hogback located immediately west of the Mine toward a pronounced trough defined by the 6600-, 6500-, and 6400-foot contours. The trough appears to drain groundwater toward the northeast or San Juan Basin. Geohydrology Associates, Inc (1980) were the first investigators to identify the trough feature, which appears to still exist.

Alluvial Aquifers

As discussed above, alluvial water is practically nonexistent, occurring generally in close proximity to arroyos, and in direct relation to the rate and amount of runoff in the arroyos. Water soaks into the sides and bottoms of the arroyos during runoff events. This type of recharge occurs principally during snowmelt and the summer runoff season. The only instance where this type of groundwater will be affected by the mining operations, is where alluvial areas are actually mined. The hydrologic impact on this groundwater source will be complete removal of the resource when encountered during mining. However, due to the limited areal extent of the resource, any impacts would be considered negligible.

Bedrock Aquifers

Bedrock water quantity is minimal in extent, consisting only as small pockets of perched water in the various stratums. The quantity and areal extent of these pockets of water are not of sufficient quantity or quality to be considered significant. This water is normally observed as seepage from the highwall or small amounts of water on the pit floor. The mining operation results in removal of this insignificant groundwater source.

GROUNDWATER QUALITY

Gallup Sandstone Aquifer

As noted above in the discussion on groundwater quantity, there will be no impact by mining on the recharge zones of the Gallup Sandstone Aquifer. Therefore, there will be no impact on the quality of the Gallup Sandstone Aquifer by the mining operations.

Alluvial Aquifers

Alluvial water quality, in undisturbed areas, will continue to be influenced primarily by the amount of runoff in the arroyos and characteristics of the soils in the area of infiltration. There will be minimal impacts on the quality of this resource by the mining operations.

Bedrock Aquifers

The bedrock water encountered during mining will be removed in the mining process. This removal will have no effect on the water present in areas not affected by mining. This is due to the low transmissivity of the formations associated with this type of water.

PROBABLE HYDROLOGIC CONSEQUENCES EAST-WING UPDATE

The section contains a detailed East Wing update regarding the Probable Hydrologic Consequences from this operation. The update also provides the necessary background information to show that there are no adverse impacts to the hydrologic regime from current mining and nor any expected from East Wing operations. This information also serves to show that surface and ground water monitoring mechanisms are in place to maintain an active watch over the hydrologic behavior of the East Wing and the rest of the mine. In order to accomplish this update, it was necessary to discuss information collected over the years mine wide from surface and ground water monitoring program.

<u>Surface Water Monitoring</u>

Major Drainage results and comparisons

Surface water from major drainages has been monitored since the early 1980's through active surface water monitoring stations. Four stations (TBW, CMWT, DDT6, DD) collect samples that have disturbed-area watersheds. One station (CMW) collects samples from a relatively undisturbed channel. The CMW station data is used as background information to contrast against the other four stations. One additional station has been constructed in the East Wing (EW1). EW1 went online in 2001 and provides baseline information concerning the East Wing area.

Data from the disturbed-watershed monitoring stations was contrasted with information from the undisturbed-drainage monitoring station in the 2000 Annual Report. That data has been included here under Appendix 3.4-I. The data ranges from the early 1980's through 2000. The following parameters are summarized in the report, as agreed upon with OSM, and include: pH, TDS, TSS, dissolved selenium, total iron, and dissolved boron. The data collected for a given year has been averaged and graphed. The original data for the entire list of parameters tested are submitted quarterly and are on file with OSM.

In general, the contrasted data shows a high level of agreement for nearly all the stations for most of the parameters over many years. That is, the background levels did not markedly differ from the disturbed watershed values. In very few instances, did the disturbed exceed the background levels significantly.

Various factors can affect the level of agreement between any of the watersheds. Perhaps of highest consideration is the effect localized thunderstorms can have on each watershed. For example, a high runoff event in one watershed could dilute TDS and raise total suspended solids (TSS). A low runoff event in another watershed could record a more concentrated TDS and lower TSS. Subsequently, the comparability of the two watersheds could be difficult at times. Therefore, to help evaluate the data, standards will be referenced where possible to see how the overall water quality measures up.

The CHIA for McKinley Mine (1984) established a value of 5000 mg/L of total dissolved solids (TDS) that could constitute material damage. The value represents the maximum TDS concentration recommended for livestock or irrigation. In the mid-1980's, a few high TDS averages are observed for some of the disturbed watersheds. While the counterpart TDS from CMW were generally less, the TDS were still below the 5000 mg/L reference.

The CHIA (1984) established that very high concentrations of TSS would be expected. The graphs show that most of the time TSS were higher for the undisturbed wash versus the other four disturbed watersheds. TBW had no data recorded in 1989, subsequently, no valid comparisons can be made that year.

As expected, average pH for both undisturbed and disturbed watersheds were alkaline. Generally, there was relatively good agreement in pH between the undisturbed and disturbed watersheds. The graphs show that pH averages were above 7.0 and below 9.0; quite often, the undisturbed watershed had the higher pH.

The other three parameters of interest are total iron, dissolved selenium, and dissolved boron. Initial data shows that the values for total iron and selenium were higher the first few years of sampling before leveling off. In those instances the undisturbed drainage had the higher values. The total iron for CMW and CMWT seems artificially high, but there is no information available at this point to confirm the data. Subsequent data, however, reflects constant parallel values between the undisturbed and disturbed watersheds that are low.

Boron comes into play around 1991. While disturbed and undisturbed watershed data for dissolved boron values agree at times, other times they vary by up to 0.2 mg/L. The highest averages do not go above 0.4 mg/L, which is below the New Mexico Administrative Code standard for irrigation of 0.75 mg/L, and 5.0 mg/L for livestock watering.

The EW1 major drainage surface water monitoring station was constructed in late 2000, and data is available for 2001. This data is contained in Appendix 3.4-I. The station captures runoff from an undisturbed watershed that will be affected by the East Wing mining operations. Subsequently, this data will serve as baseline data to contrast against information gathered from the disturbed watershed.

The initial EW1 data for various key parameters is summarized in the Table 3.4-1. The maximum values (pH includes minimum) recorded are shown.

Table 3.4-1
East Wing Surface Water Monitoring Station Data

Parameter	pH	TDS (mg/L)	TSS (mg/L)	SAR	Sulfate (mg/L)	Total Iron (mg/L)	Boron (mg/L)
	7.78-8.84	320	83000	3025	104	100	0.2

In summary, no additional major drainage watershed monitoring stations are necessary to construct. The EW1 surface water monitoring station will provide adequate representation of the East Wing mining areas, and to the overall hydrologic regime.

Medium Drainage results and comparisons
There are three medium watershed-monitoring stations at McKinley Mine (DDT9, DDT10, and A12). All three monitoring stations are in the Defiance Draw watershed (the Defiance Draw drainage also includes the East Wing mining area watersheds). DDT9 and DDT10 are downstream from areas affected by mining. The A12 monitoring station is in an undisturbed watershed in Area 12 just southeast of the East Wing mining areas.

The 2000 annual report data from the three stations is provided in Appendix 3.4-I. The data represent average values for the runoff season. Detailed data for parameters in the 2000 annual report, plus all the other parameters tested were submitted to OSM via quarterly reports.

The graphs show consistent ranges of values for most years for the parameters shown for the undisturbed versus the disturbed watersheds. DDT9 shows a spike in total iron in 1998; however, nearly all the runoff to this location came from alluvial areas ahead of mining. Subsequently, it is difficult to quantify the spike. Most other years, there was good agreement with iron.

No additional medium-drainage monitoring stations are needed for the East Wing since the A12 monitoring station is already near the East Wing. Since the East Wing is in the Defiance Draw drainage, the three medium-drainage monitoring stations are adequate to characterize surface water from medium drainages into Defiance Draw.

Ground Water Monitoring

Alluvial wells

Alluvial well transects are located in various locations throughout the mine. The intent of the transects was to monitor valley-fill water resources. The transects are located in five drainage locations that include Tse Bonita Wash, Coal Mine Wash, and Defiance Draw.

These drainages have one or more transects. The Tse Bonita Wash (TB) transect consists of 6 wells at two transects (TB2 and TB3). The Coal Mine wash (CM) transect consists of 6 wells. The Defiance Draw Drainage (the largest of the drainage systems) consists of three transect locations: DT2 (4 wells), D2 (5 wells), and D3 (4 wells).

Well information for key parameters agreed to between OSM and P&M from the 2000 annual report is provided in Appendix 3.4-I. Data is collected quarterly from some wells, and annually from others. Quarterly data was averaged by year for the 2000 annual report. Detailed data for 2000 annual report parameters, and all the other parameters tested were submitted to OSM via quarterly reports. The appendix also includes information regarding what alluvial wells have been historically dry.

The wells nearest to the East Wing are the four DT2 wells located to the southwest in Area 11. Over the past 15 years, water levels in three of the wells have not changed significantly (the 4th well is dry). An overview of the key chemical parameters shows that these values have remained fairly constant with the values originally recorded in the wells. Occasional spikes do appear, but have been short-lived and probably related to precipitation levels.

As reported in the original baseline report done by Geohydrology Associates, Inc., (1980), there were no existing wells which tap the valley-fill deposits of Defiance Draw. It was concluded in the report that Defiance Draw valley-fill material did not constitute an aquifer.
Geohydrology Associates, Inc. (1980) did a water quality evaluation of the well samples using the drinking water standards available at that time from the U.S. Public Health Service. None of the samples met these drinking-water recommendations for sulfate or dissolved solids.

Monitoring over the years has not shown any changes that would negate the original evaluation. Since the remaining alluvial fills in the East Wing are also tributary to Defiance Draw, it is apparent that drilling more transects in these upper reaches of Defiance Draw would not provide information that is not already captured in the existing wells. Given the proximity of the DT2 wells to the East Wing, and the fact that there already exist three sets of transects in the Defiance Draw watershed, no additional transects are needed in the East Wing.

Bedrock wells

Five bedrock wells were drilled to a depth of about 50 feet below the Green coal. The holes were referred to as McKinley bedrock (MBR) wells and distributed around the lease. The five wells are referred to as MBR1, MBR2, MBR3, MBR4, and MBR5. MBR4, located in Area 9 (south of Highway 264) was mined through and not replaced.

Well information for key parameters agreed to between OSM and P&M from the 2000 annual report is provided in Appendix 3.4-I. The wells are sampled annually. Detailed data for 2000 annual report parameters, and all the other parameters tested were submitted to OSM via quarterly reports.

The original baseline report by Geohydrology Associates, Inc. (1980) concluded that the wells had little potential as meaningful groundwater resources. The transmissivity of the bedrock deposits were low, less than 6 ft^2/day and not capable of maintaining a constant discharge of 1 gallon per minute sustained yield. Also, even though ground water was present, none of the strata had sufficient continuity to be considered an aquifer.

Quality-wise, Geohydrology Associates, Inc.'s (1980) baseline work showed that the ground water that was there did not meet the recommended maximum drinking-water standards set by the U.S. Public Health Service. The total mineralization was more than twice the recommended standard, fluoride was three times above the standard for MBR 2 and 3, and sulfate values were above the standard (250 mg/L) for MBR 2 (325 mg/L).

The wells that provide the most useful information in assessing the existing and expected bedrock-hydrology of the East Wing are MBR2 and MBR3. MBR2 will be reviewed to see how it has behaved since mining has occurred around that site and because it is the second nearest well to the East Wing. MBR3 will be evaluated since it is located in the middle of the East Wing. The period 1995 – 2000 has been averaged and listed below and contrasted against the 1980 values in the baseline report, and the standards contained in The Safe Drinking Water Act.

Table 3.4-2
MBR2 and MBR3 Quality Evaluation (mg/L)

	Sulfate	TDS	Nitrate	Chloride	Iron	Fluoride
MBR2						
(95-00)	527	1458	0.3	13.3	0.5	5.1
1980	325	1136	0.4	6.4		5.5
MBR3						
(95-00)	120	1537	0.16	82.5	0.6	6.9
1980	70	1368	0.5	86		5.7
Standard	250	500	10	250	0.3	2.0

The data contrast shows that little has changed in either well. TDS and fluoride still remain unacceptably high in both wells. In MBR2, sulfate that was already above the threshhold, still remains above the threshold. Chloride did increase for MBR2, but still below the standard.

MBR3 shows little change from what was originally reported in the baseline assessment. Given that little has changed from the original 1980 evaluation, the need to keep MBR3 does not seem necessary. The well was originally determined to be a poor resource for ground water from a quantitative and qualitative perspective—nothing has changed to negate that finding. In conclusion, the well will be mined through and not replaced.

Gallup Sandstone Aquifer

The potential effect of mining on the Gallup Sandstone Aquifer is monitored through the sampling of four wells: Well 1, Well 2, Well 3, and Well 3A. As stated in the Geohydrology Associates, Inc. report (1980), the Gallup aquifer is under artesian conditions because of the impermeable shales above it. Data from the wells also had shown that transmissivity was quite variable from well to well.

The data from the 2000 annual report is included in Appendix 3.4-I. The data collected quarterly was averaged for each year for the annual report. The information shows key parameters that P&M and OSM agreed to include in the Annual Report. Detailed data for the 2000 annual report parameters, and for all the other parameters tested were submitted to OSM via quarterly reports.

The McKinley Mine CHIA (1984) contained initial information on total dissolved solids (TDS) that will be useful to evaluate. The CHIA states that total dissolved solids for the Gallup Sandstone Aquifer averaged 1,121 milligrams per liter (presumably the overall aquifer).

Data from the four McKinley Mine wells show that total dissolved solids from these wells had a better quality initially than the average aquifer value of 1,121 mg/L. None of the wells started out with TDS above 700 milligrams per liter. Over the years, TDS for some wells has gone up and down; however, the quality has generally improved or stayed about the same. By 2000, TDS for three of the wells were below 400 mg/L; the fourth well was just below 500 mg/L.

The same trending and conclusions can be made about sulfate values, which also have gone up and down over time. By 2000, sulfate values have either decreased, or stayed close to the original 1983 values.

Iron values have stayed low and fairly constant over the past ten years. One spike, however, is noted in 1990 for Well 1; this anomaly is likely a sample contamination or lab error since the other values were very low (seven times less than the spike) and had not changed very much the other 17 years. Some other high iron values were recorded in the late 1980's for the other wells; since then, however, iron values have stayed consistently low. For the most part, iron values for two wells have been less than the original values (wells 3 and 3A); iron values for the other two wells (1 and 2) have generally stayed near the originally-tested values.

Static water levels have generally increased or stayed close to the initial recorded levels according to the data. Subsequently, no problem is noted with well recharge.

In summary, the well data show that the character of the aquifer has changed little and generally improved. Therefore, it is concluded that mining at the McKinley Mine is not adversely impacting the Gallup Sandstone aquifer. No future impact of the Gallup Sandstone Aquifer is likely; the recharge zone is not located in the McKinley Mine area, and the aquifer lies below impermeable shales.

3.4.5 CHIA (SYNOPSIS)

The Cumulative Hydrologic Impact Assessment (CHIA), completed by the Radian Corporation for the Office of Surface Mining as part of the Technical Analyses and Environmental Assessment by OSMRE on Permit No. NM-0001B/3-10P, covers all of the areas to be mined by this application and is still valid. Included below is a brief synopsis of the conclusions of the CHIA:

- Surface water use in the area is primarily stock watering with some irrigation. There are no permitted water rights holders downstream of the mining operation in the cumulative impact area. Indicator parameters related to hydrologic concerns in the basin are total dissolved solids and total suspended solids (TSS) concentrations.
- Cumulative impacts to the quantity of the flow in the Puerco River are

insignificant.

- Cumulative impacts to the quality (TDS and TSS) of flows in the Puerco River are minimal and should not cause significant changes in baseline conditions. No material damage to the hydrologic balance is expected.
- Ground water is an important source of water in the Gallup area. The major ground water pumping centers are at the Santa Fe and Yah-ta-hey well fields, both completed in the Gallup Sandstone and operated by the city of Gallup. Shallow ground water is not widely used owing to the relatively poor chemical quality and small well yields.
- Cumulative impacts related to ground-water quality are not expected: ground-water quality in terms of TDS and sulfate has not been demonstrated to change significantly and the poor physical properties of the near-surface zones are not greatly altered by mining.
- Ground-water quantity in the Gallup aquifer may be affected by the cumulative impacts of mining, particularly if declared water rights are fully used by P&M. Calculations of water-level drawdowns indicate that the Yah-ta-hey well field could experience up to 3 feet of drawdown attributable to mining activities; this does not constitute material damage. No material damage, based upon a criterion of a decline of 25% of available hydraulic head, is predicted as a result of surface coal mining.

Thus, based upon the report, P&M feels that any impacts which have or will occur on the hydrologic systems at the McKinley Mine are insignificant.

3.4.6 DEVELOPED WATER RESOURCES

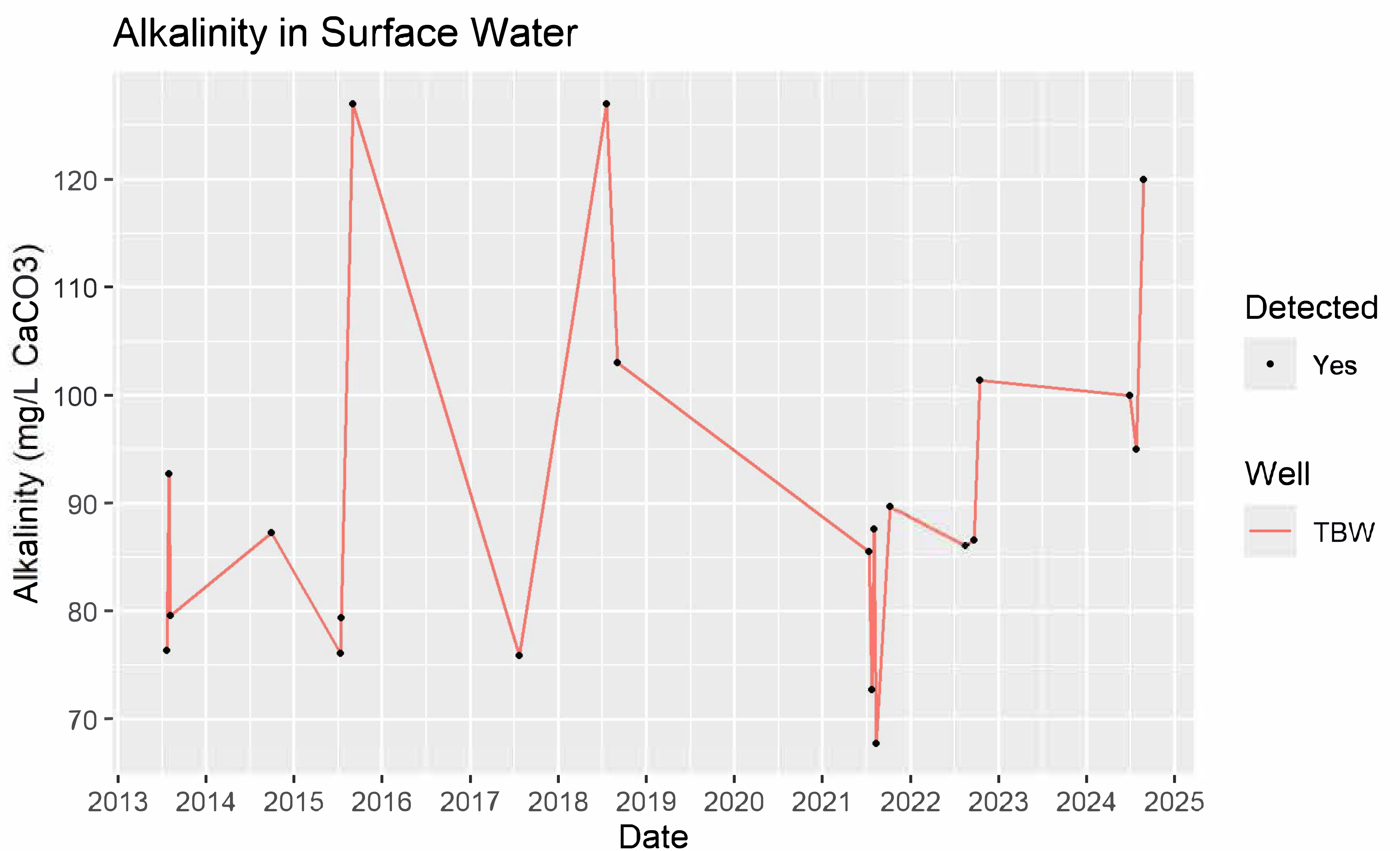
SURFACE WATER RESOURCES

All identified developed surface water resources within the proposed permit area and within 1000 feet of the proposed permit boundary are shown on Exhibit 3.4-3. A total of 8 developed surface water resources were identified. All six of the resources are stockponds. Two of the resources will be disturbed by mining during this permit term; whereas, the other six resources will not be disturbed during this permit term. Replacement of the stockponds that will be disturbed during this permit term is discussed in Section 5.7.

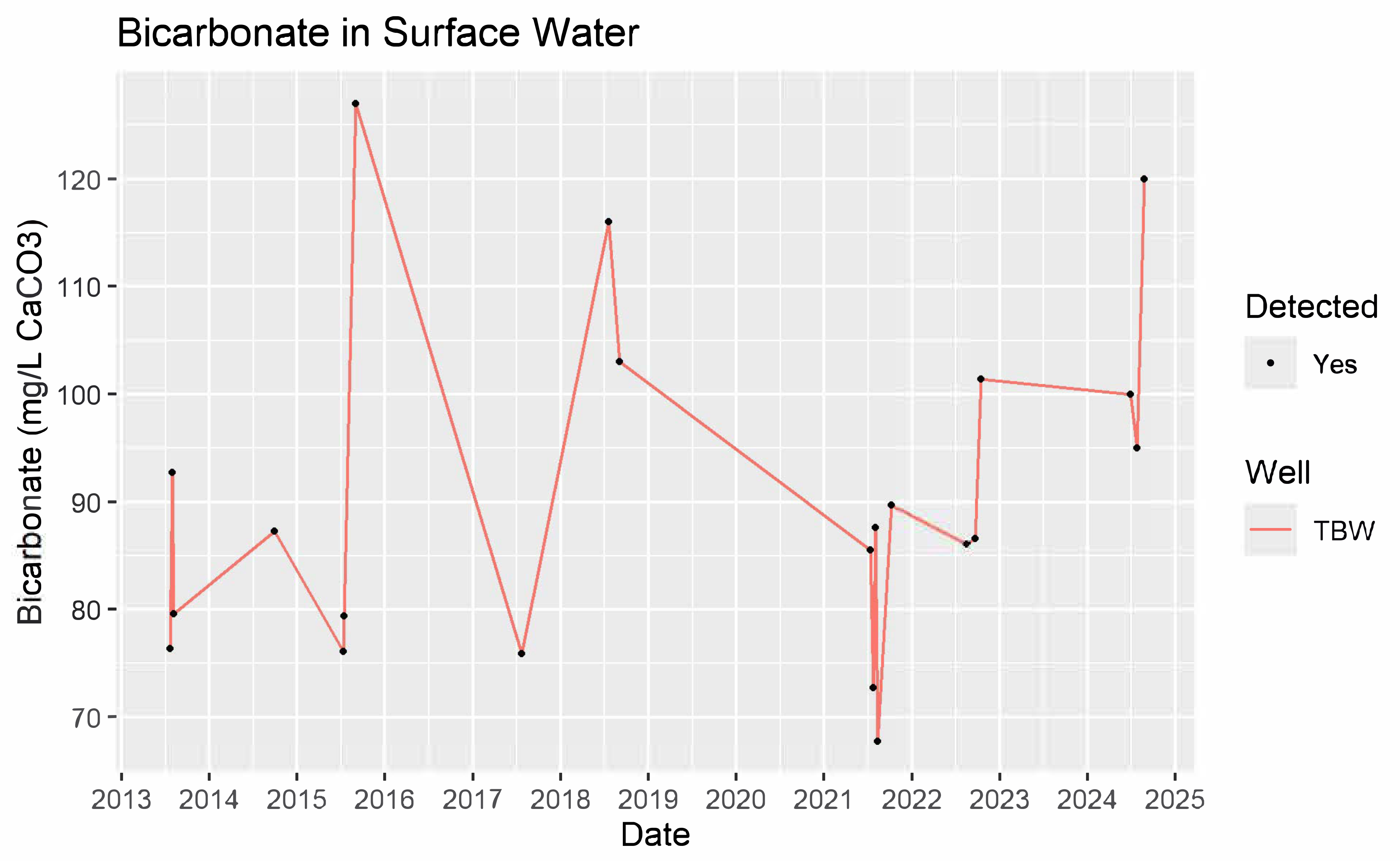
Permit NM-0001B Exhibit 2.9-1 depicted an impoundment located in the center of section 5. Subsequently, the impoundment was noted as a Stockpond in the original Developed Water Resource documentation. However, this impoundment was not a stockpond but a temporarily abandoned mining pit which was being temporarily used to impound water for dust control. This pit was covered by a surface water user permit which allowed for the diversion of the Tse Bonita Wash into it for water storage. Mining has since resumed in this pit and it no longer exists. At no time was this pit ever used for any other purpose but mining related storage.

APPENDIX B

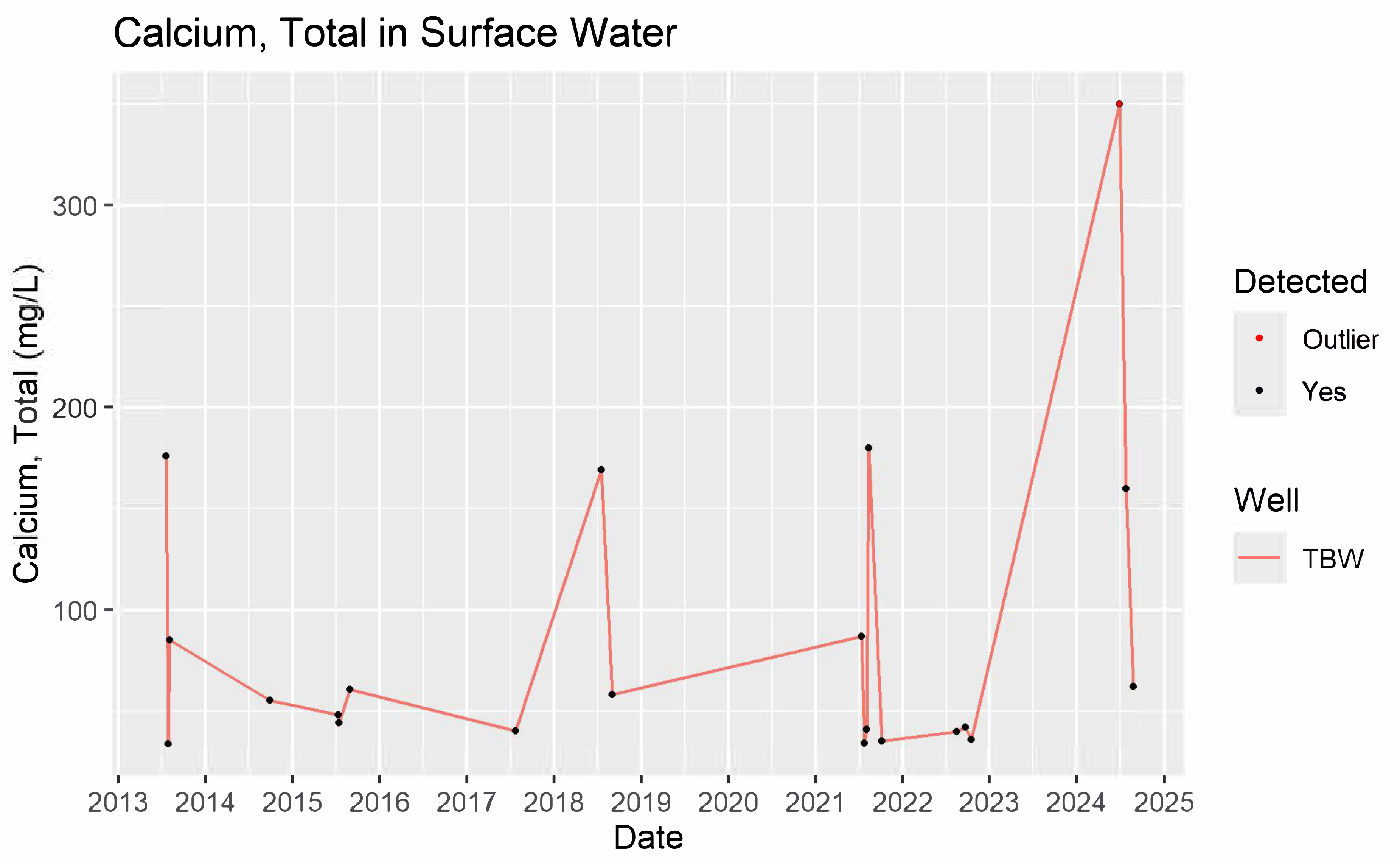
SURFACE WATER QUALITY: TEMPORAL PLOTS



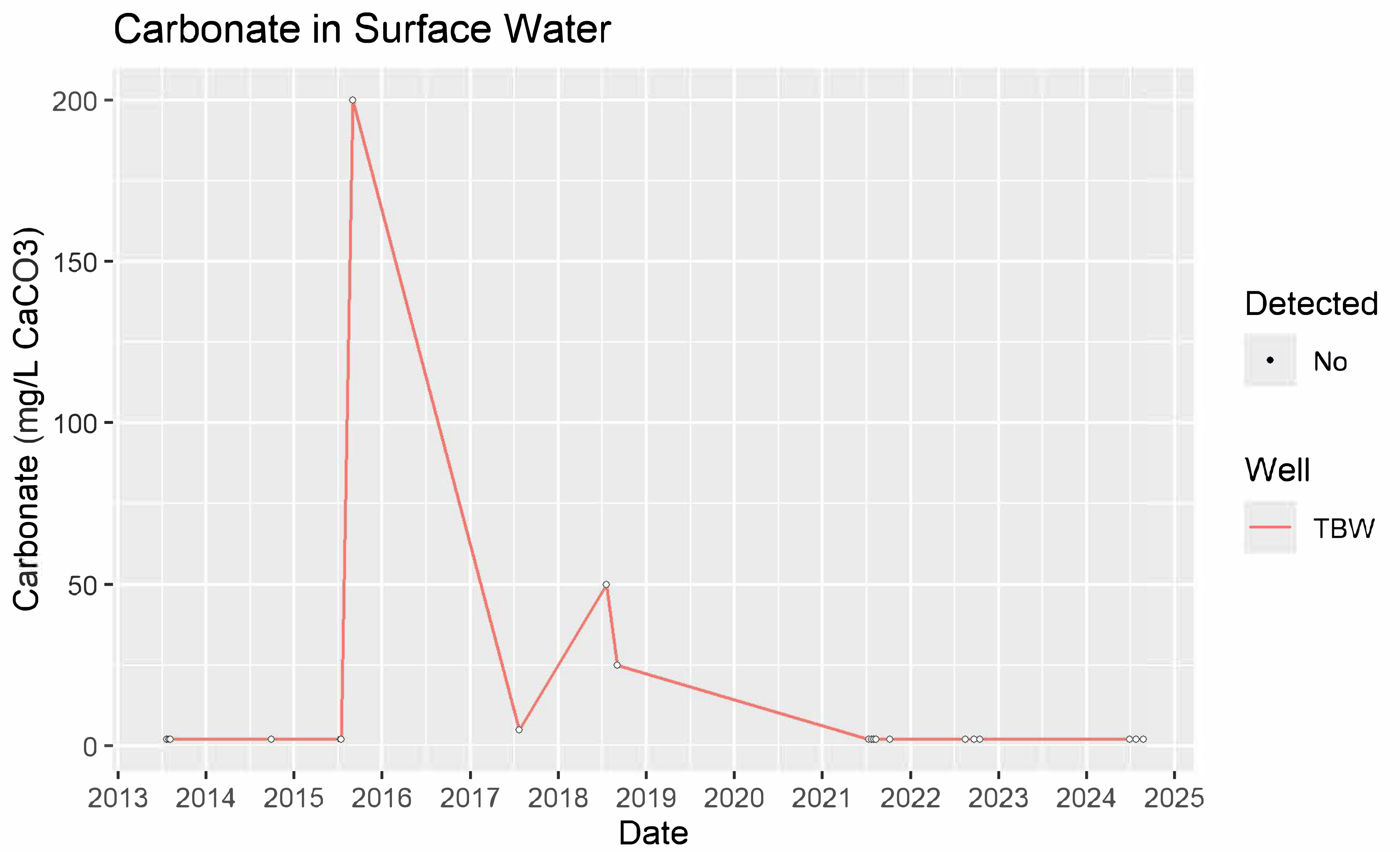
Alkalinity in Surface Water
Alkalinity (mg/L CaCO3)
120
110
100
90
80
70
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

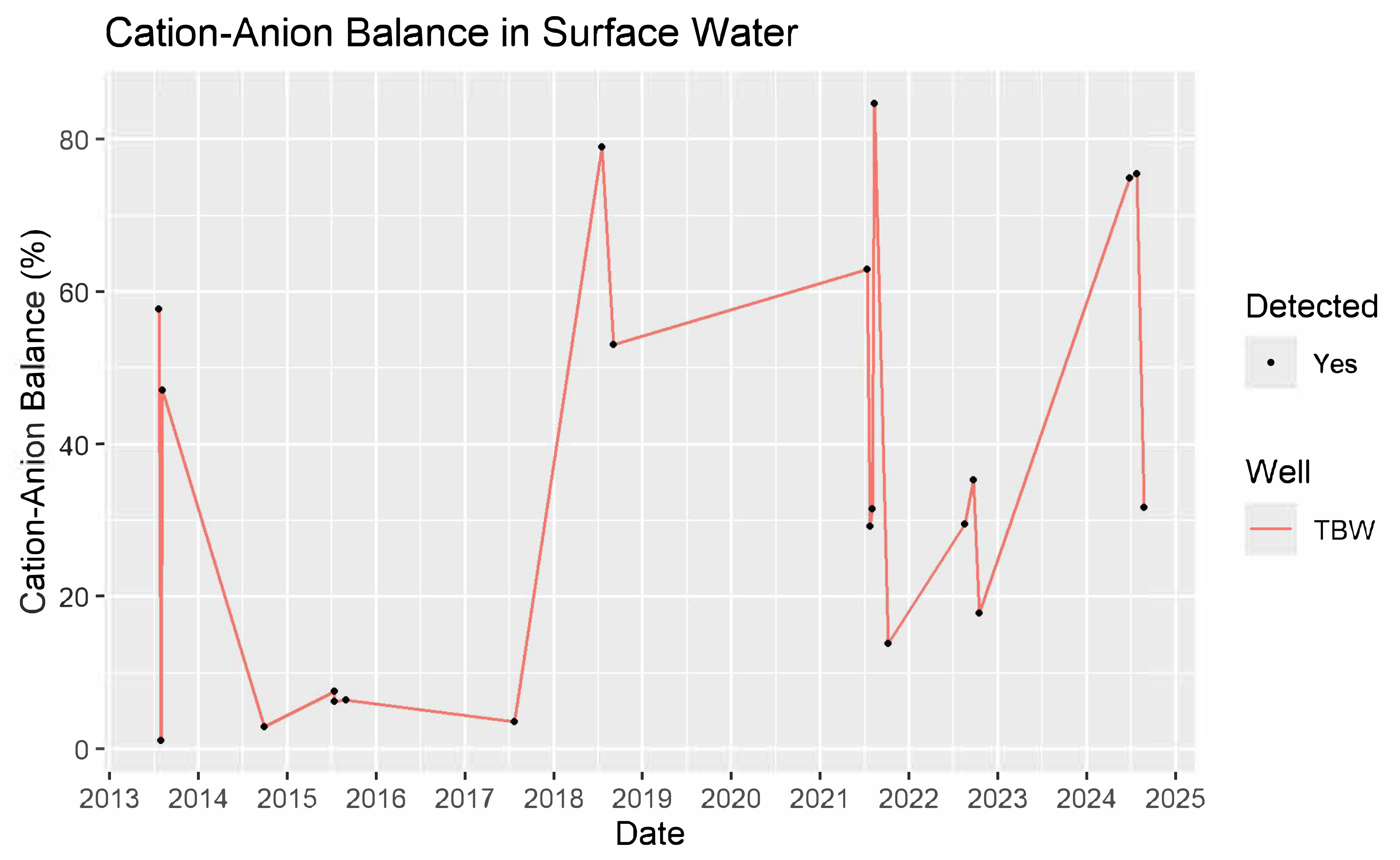


Bicarbonate in Surface Water
Bicarbonate (mg/L CaCO3)
120
110
100
90
80
70
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

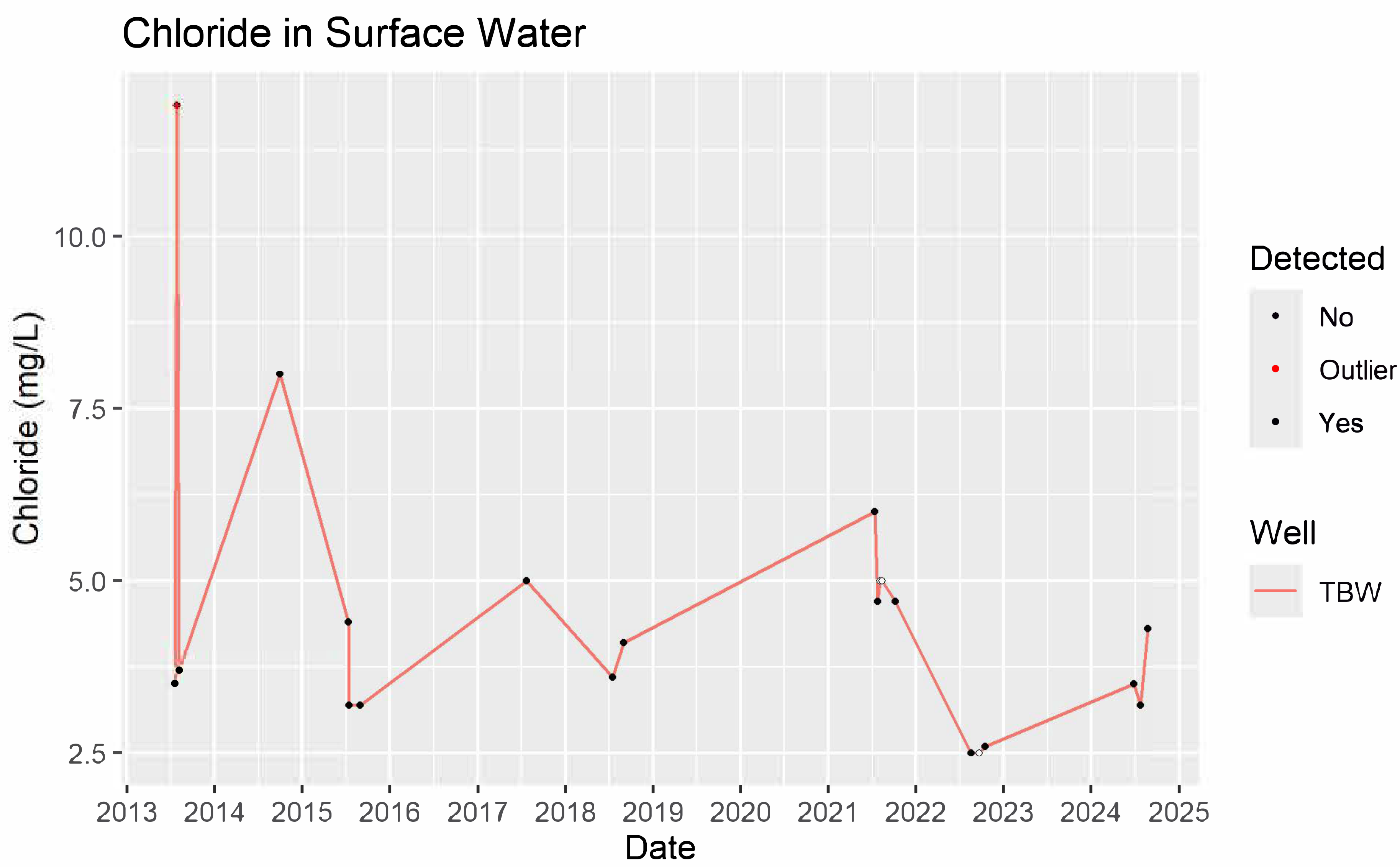


Calcium, Total in Surface Water
Calcium, Total (mg/L)
300
200
100
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW

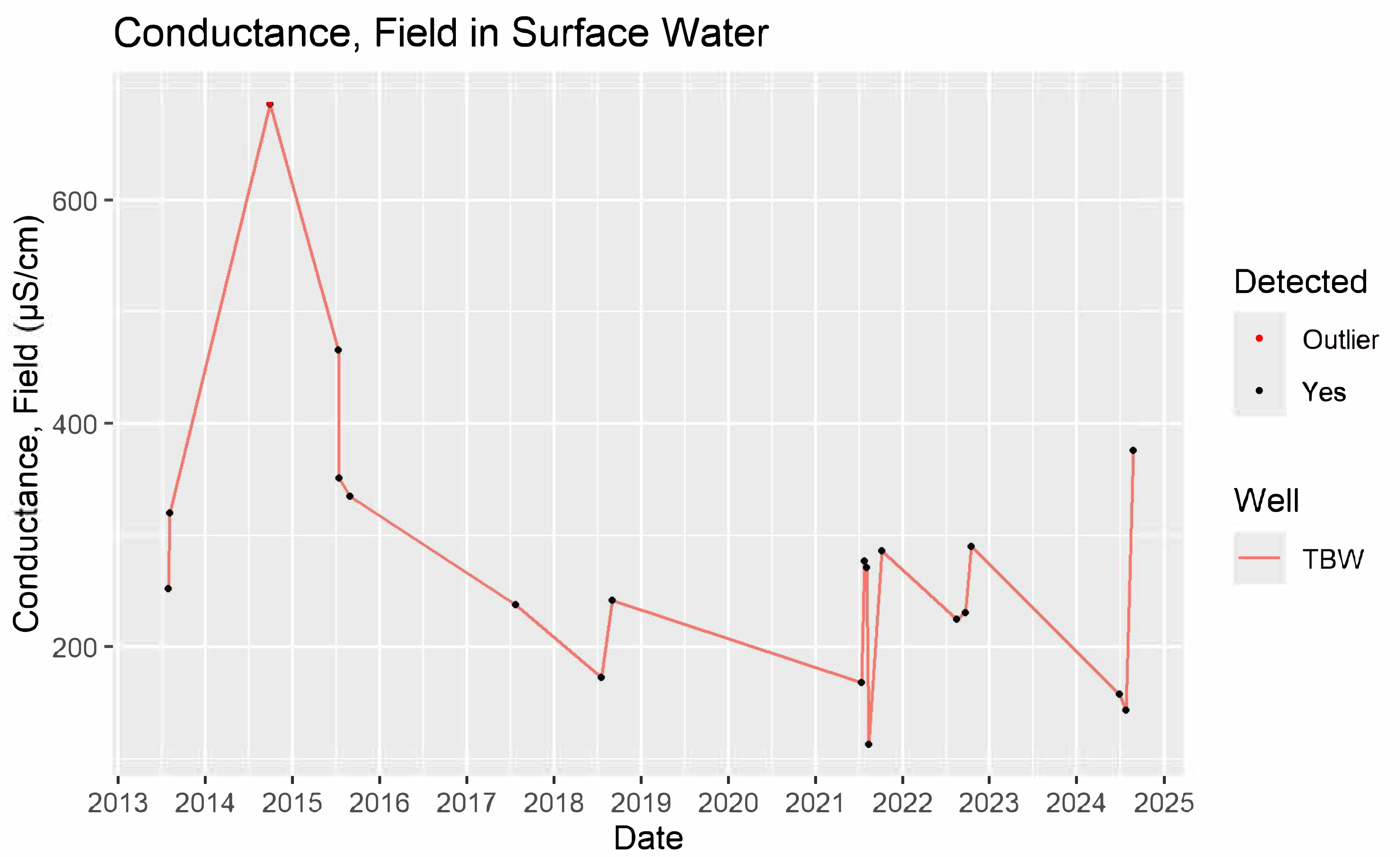

Carbonate in Surface Water
Carbonate (mg/L CaCO3)
200
150
100
50
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Well
TBW



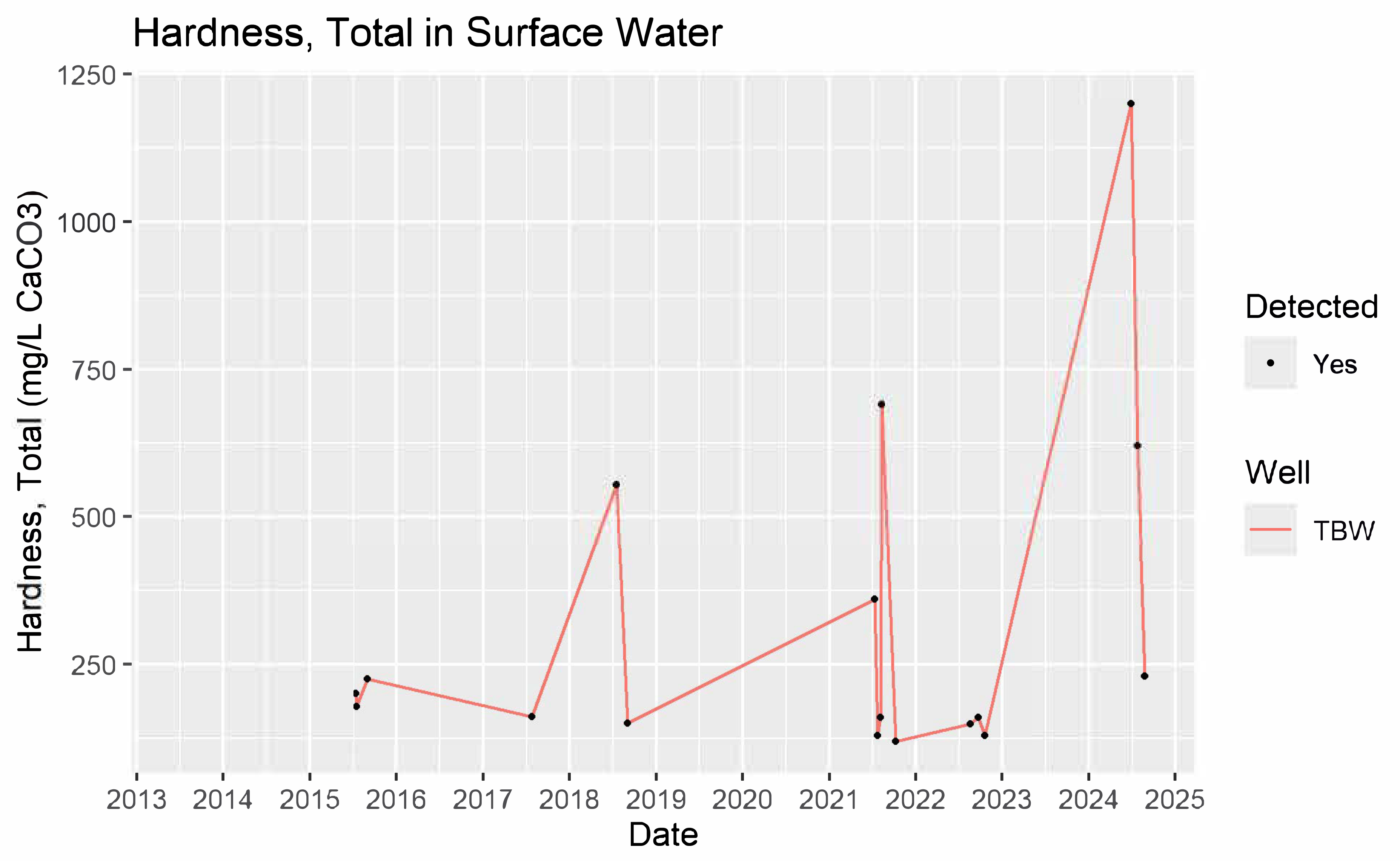
Cation-Anion Balance in Surface Water
Cation-Anion Balance (%)
0
20
40
60
80
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW



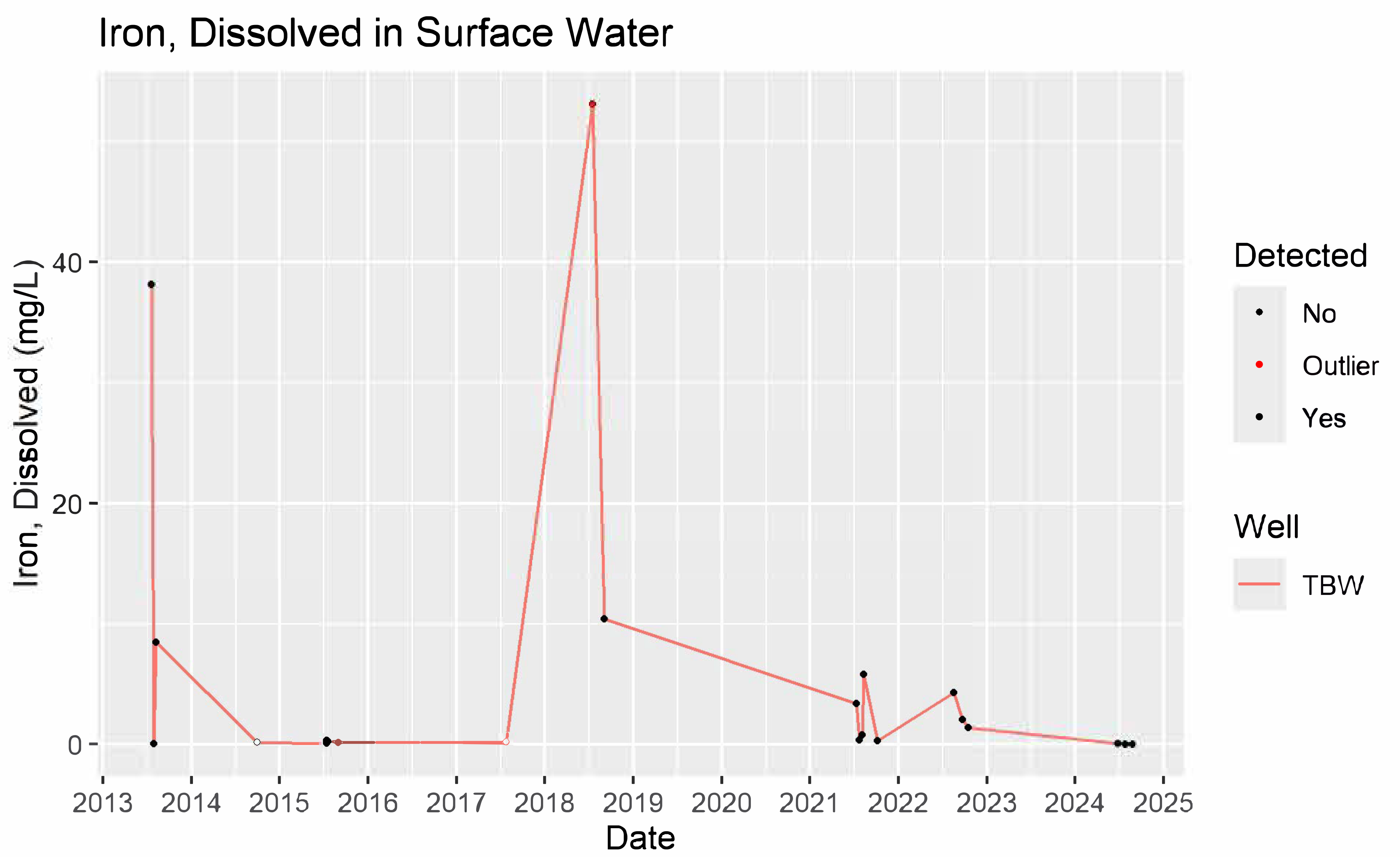
Chloride in Surface Water
Chloride (mg/L)
10.0
7.5
5.0
2.5
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Outlier
Yes
Well
TBW



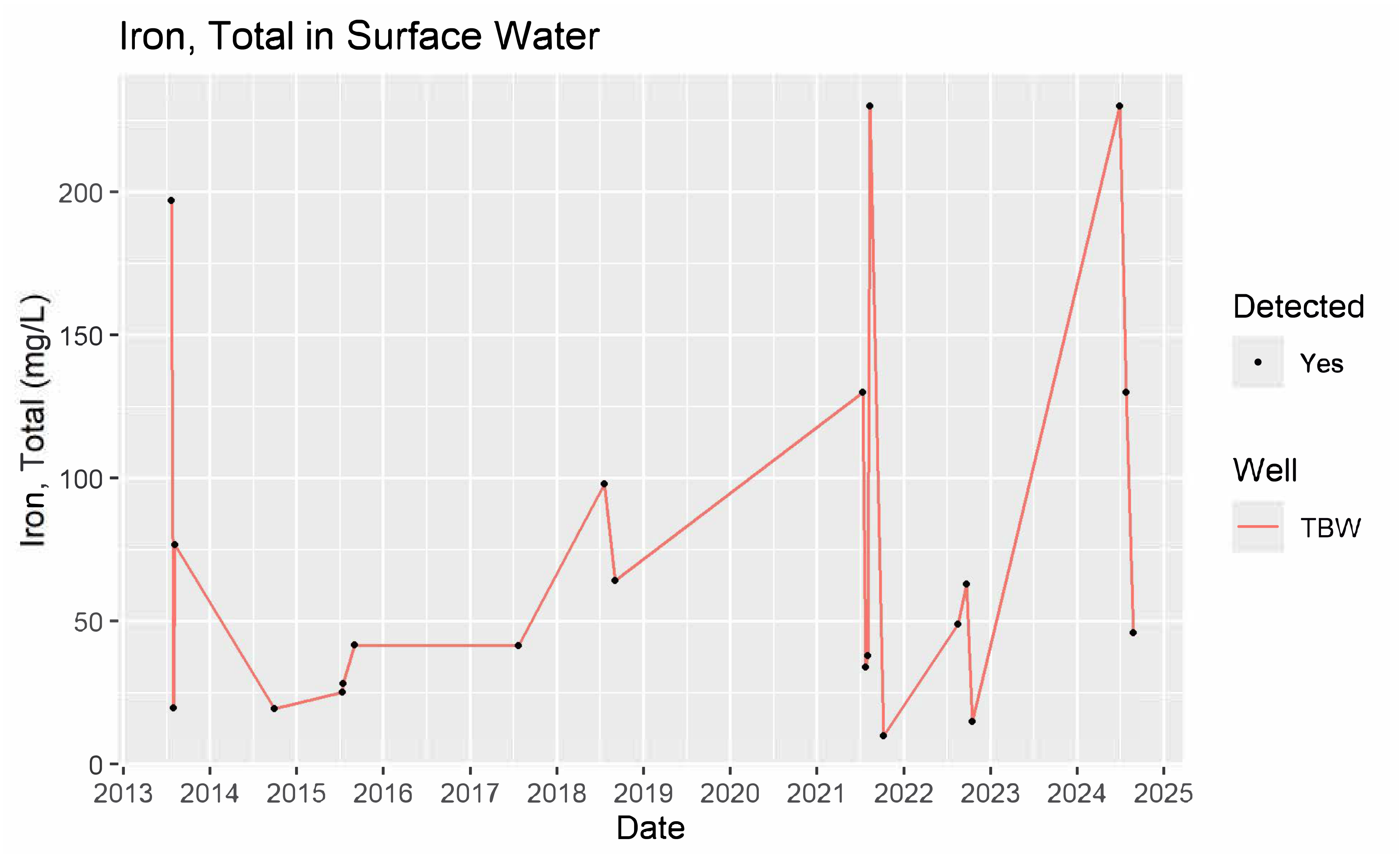
Conductance, Field in Surface Water
Conductance, Field (µS/cm)
600
400
200
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW



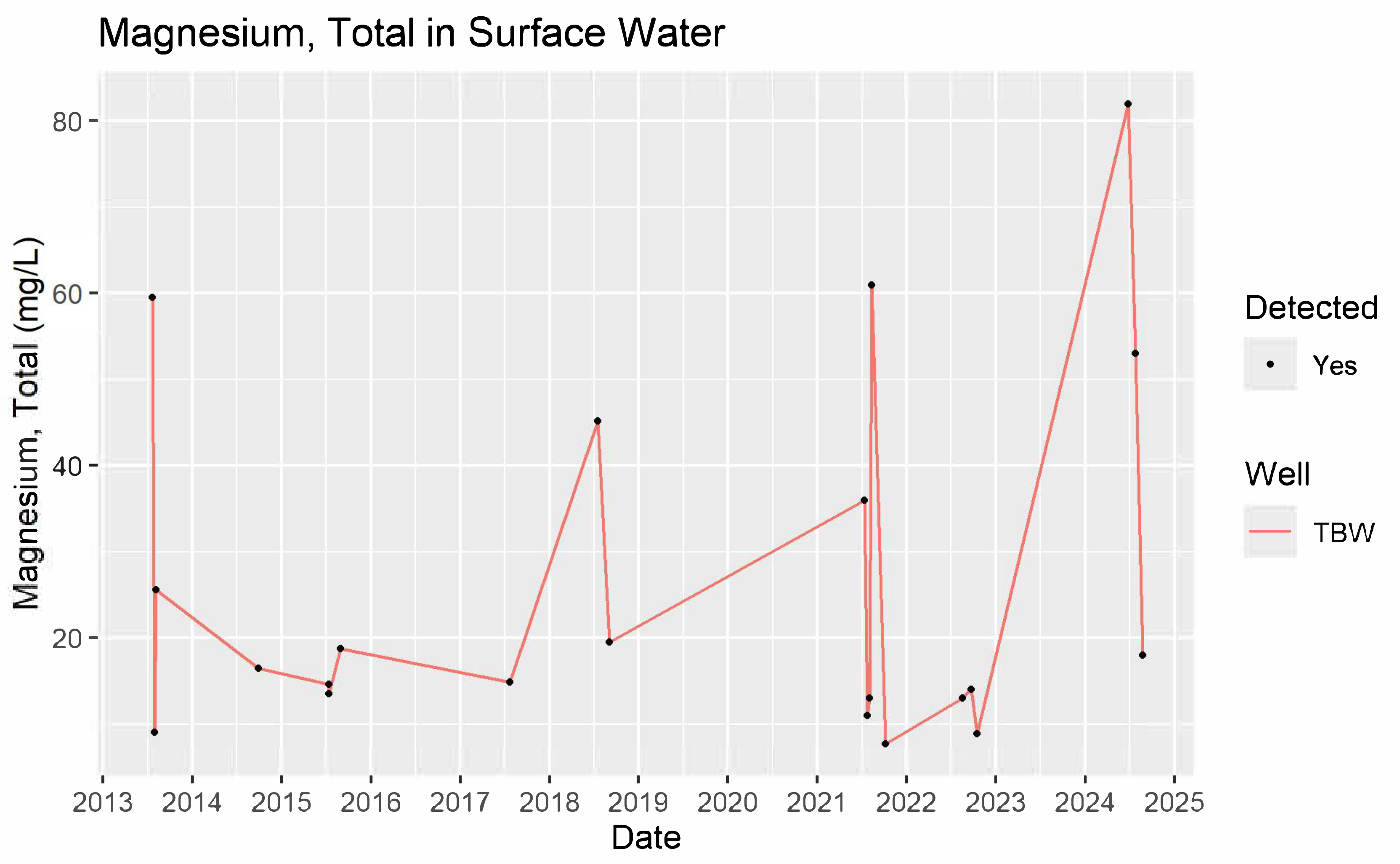
Hardness, Total in Surface Water
Hardness, Total (mg/L CaCO3)
1250
1000
750
500
250
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW



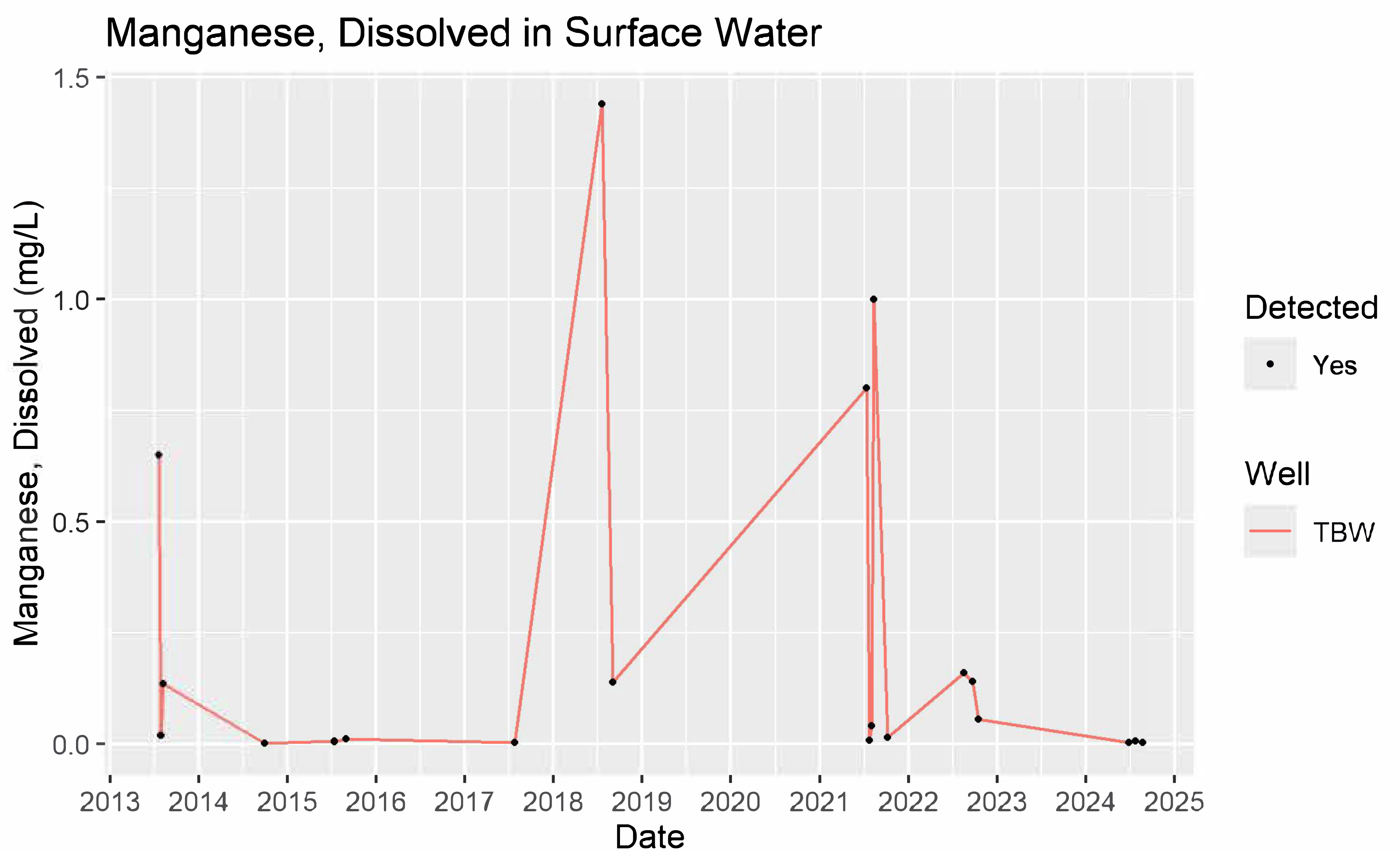
Iron, Dissolved in Surface Water
Iron, Dissolved (mg/L)
40
20
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Outlier
Yes
Well
TBW



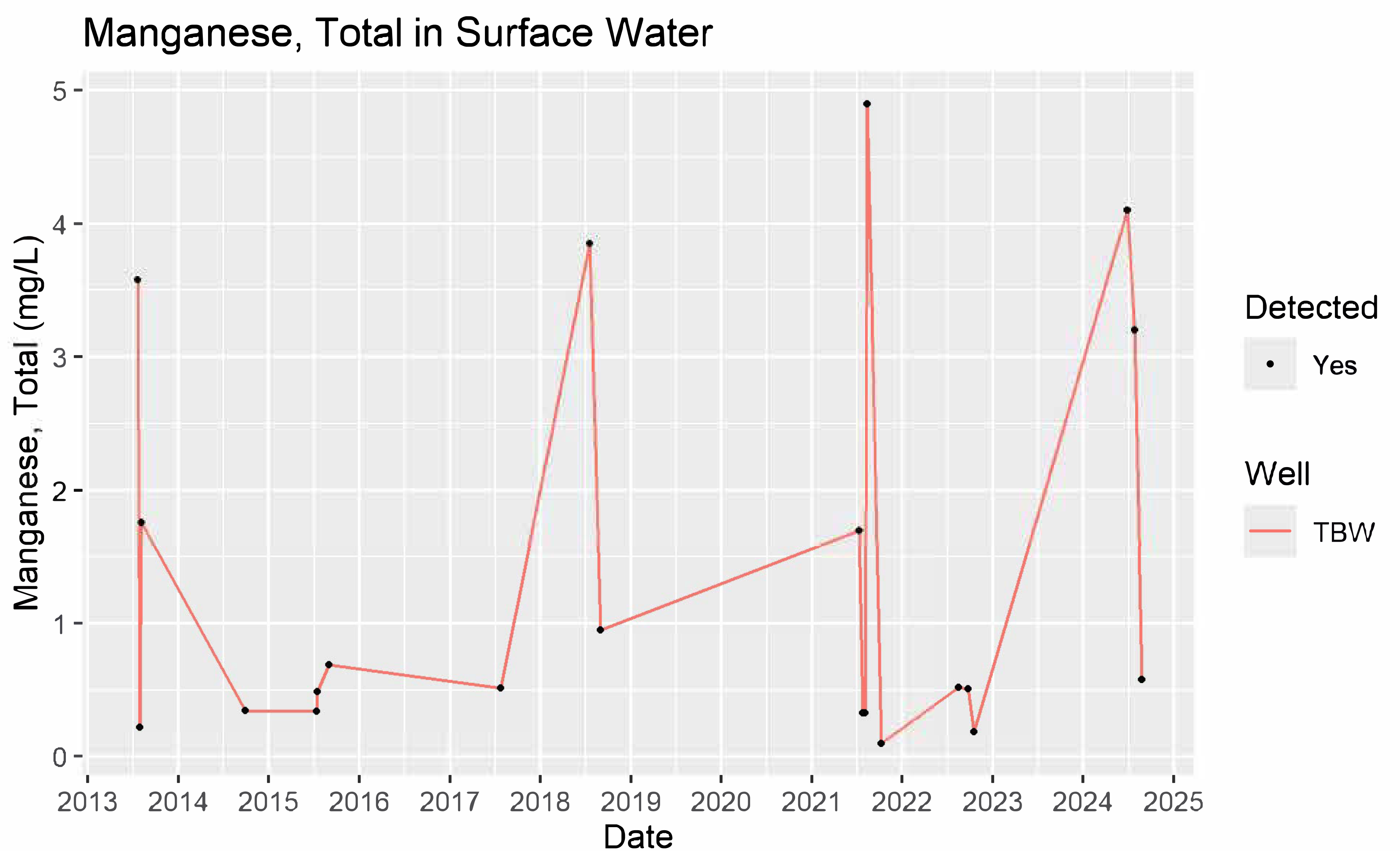
Iron, Total in Surface Water
Iron, Total (mg/L)
200
150
100
50
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

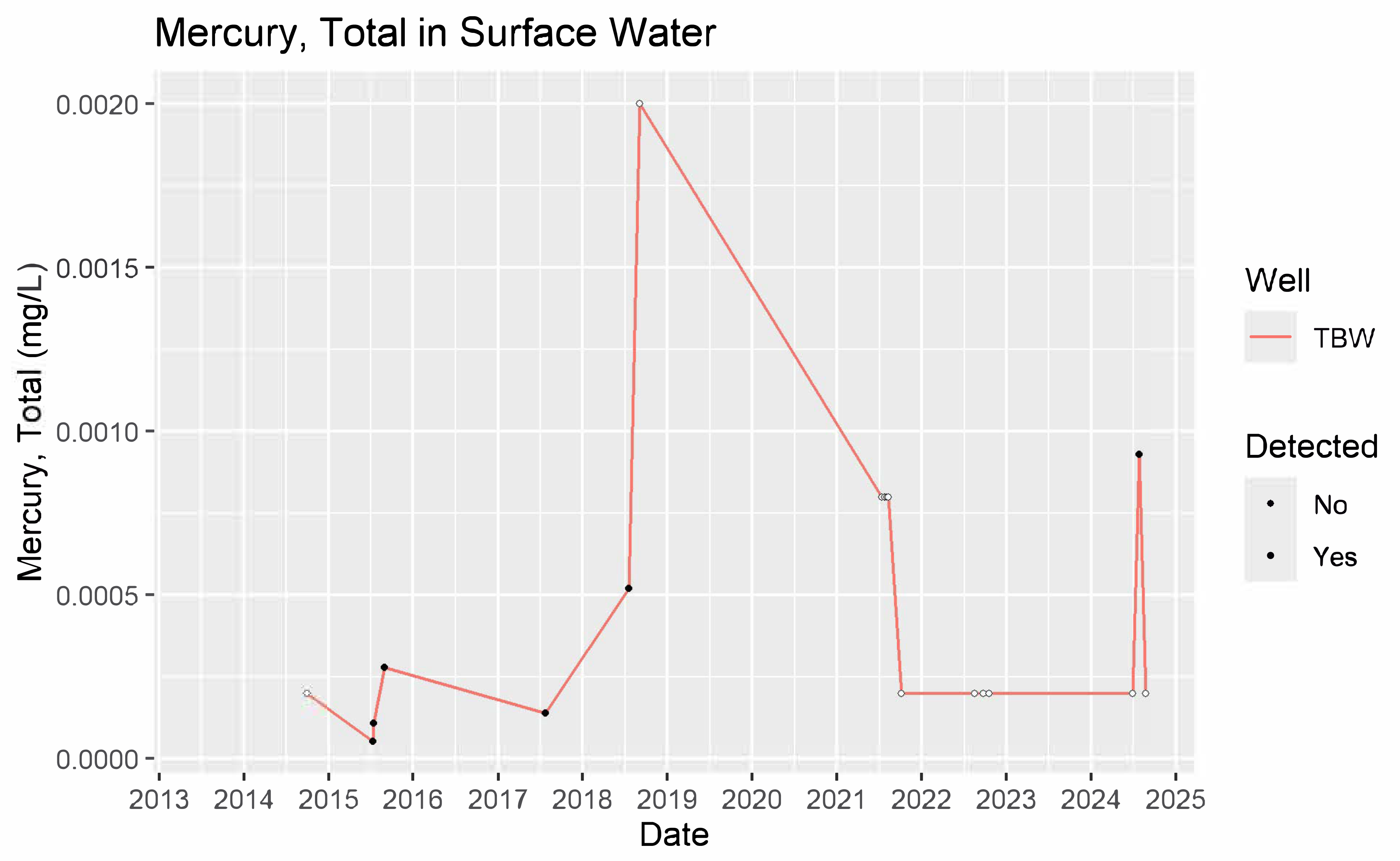


Magnesium, Total in Surface Water
Magnesium, Total (mg/L)
80
60
40
20
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

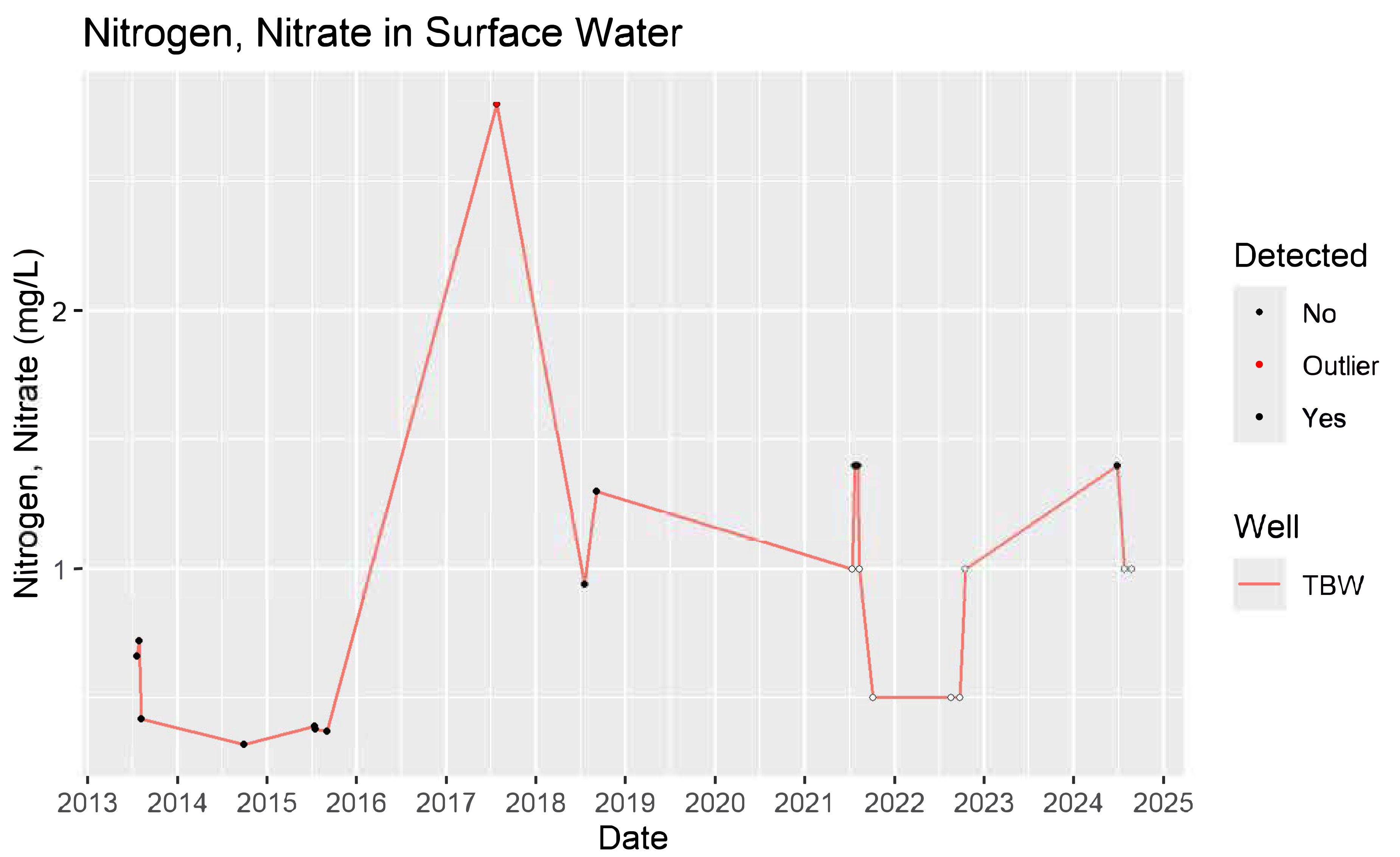


Manganese, Dissolved in Surface Water
Manganese, Dissolved (mg/L)
1.5
1.0
0.5
0.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

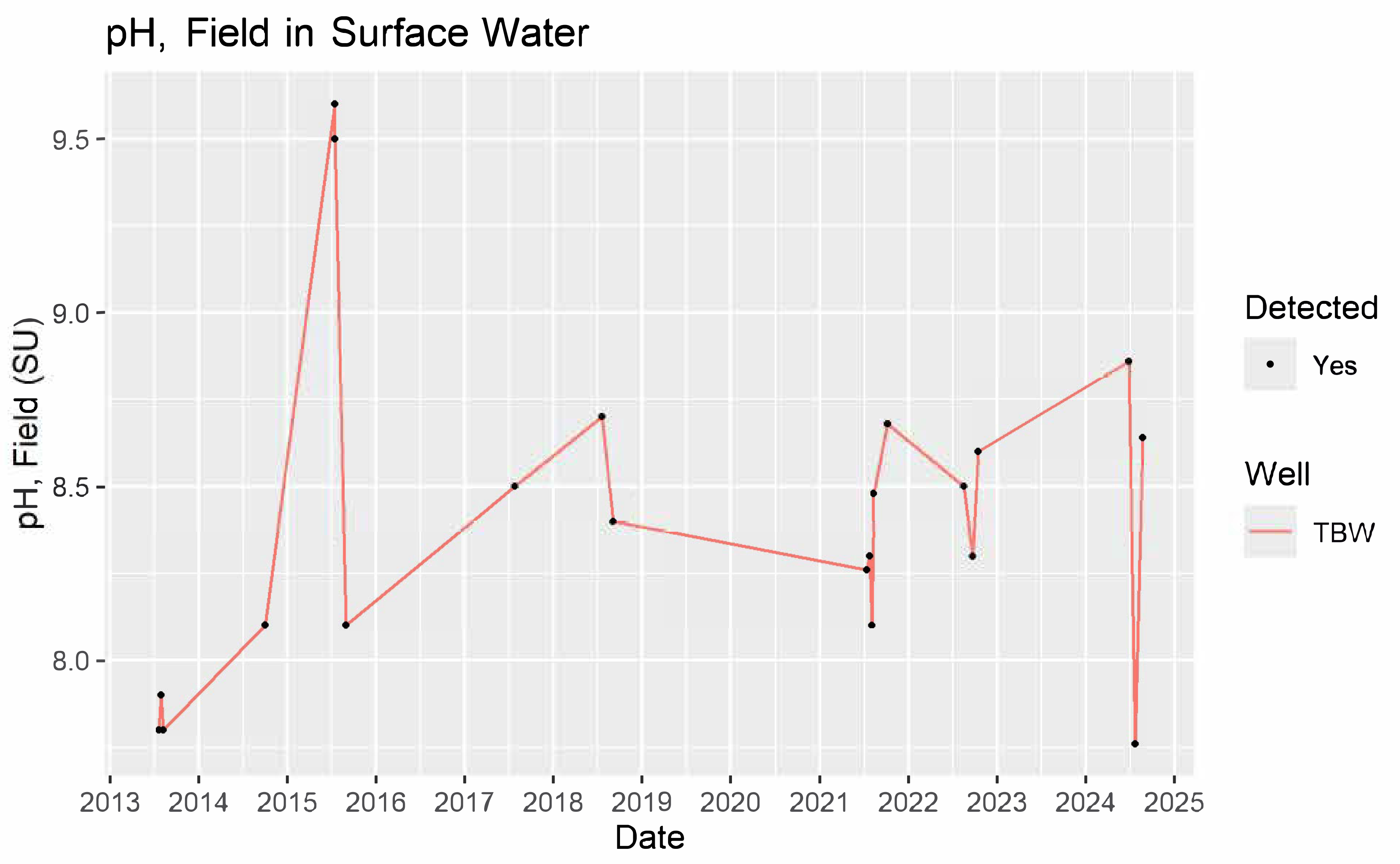

Manganese, Total in Surface Water
Manganese, Total (mg/L)
0
1
2
3
4
5
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW



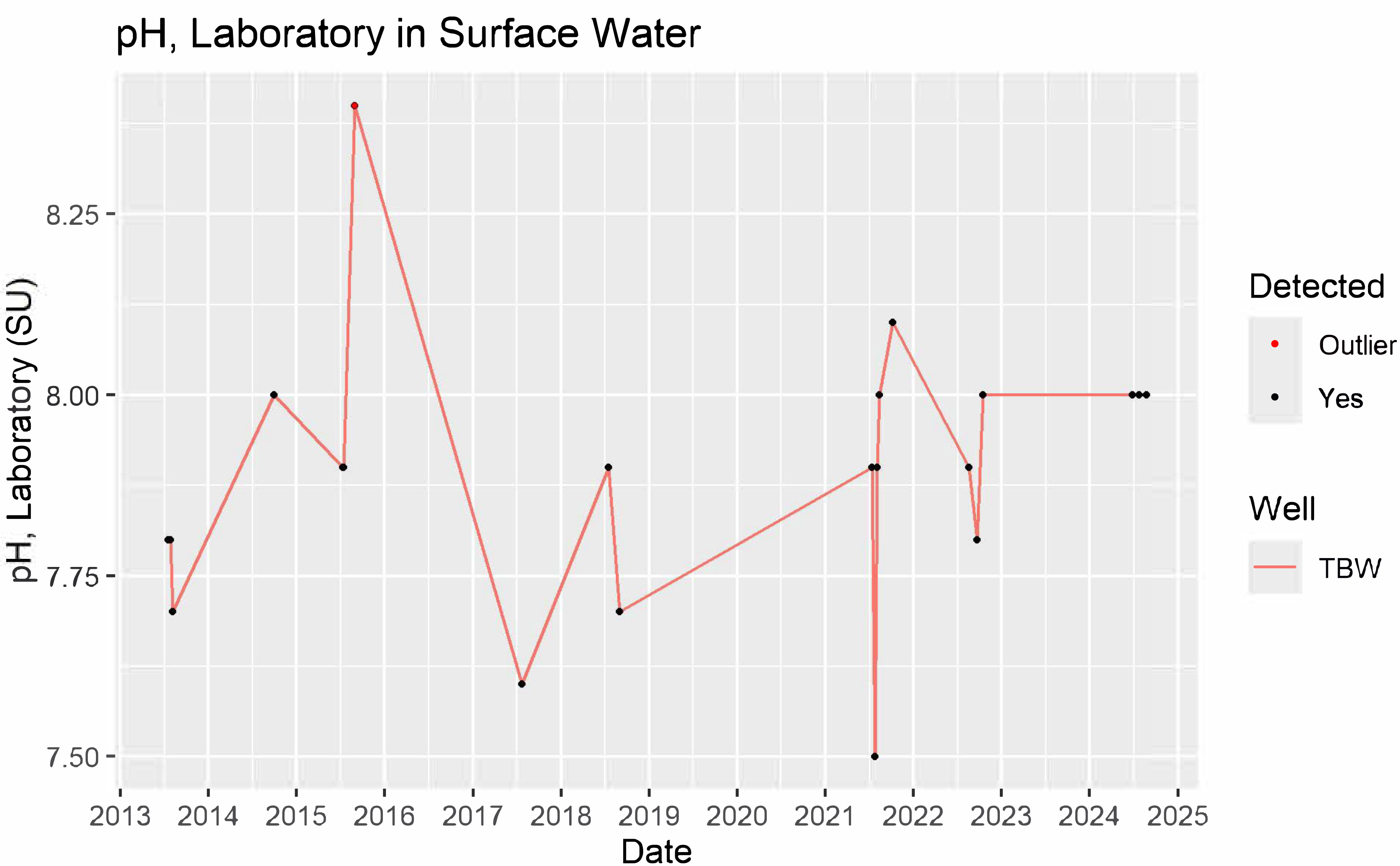
Mercury, Total in Surface Water
Mercury, Total (mg/L)
0.0020
0.0015
0.0010
0.0005
0.0000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
TBW
Detected
No
Yes



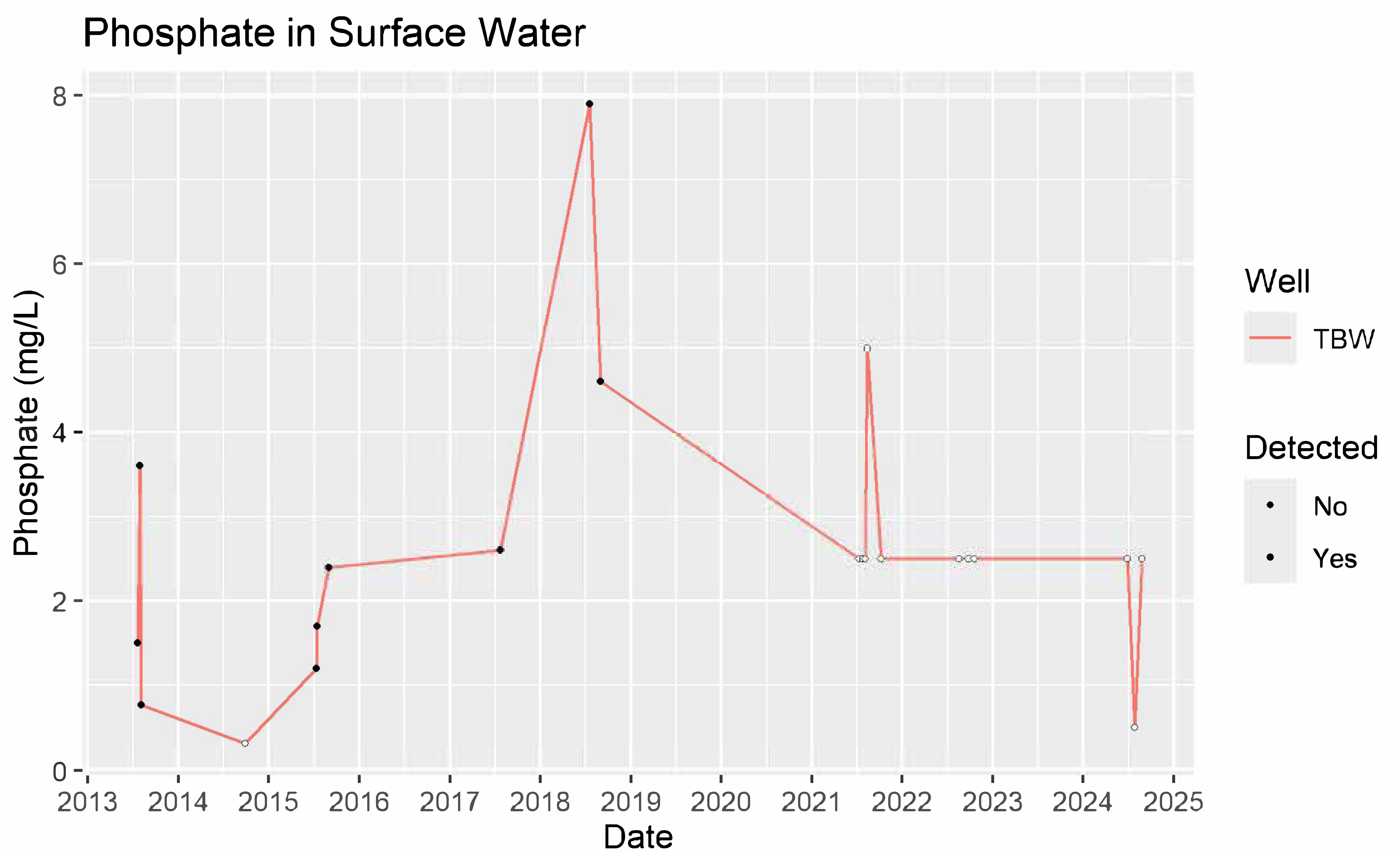
Nitrogen, Nitrate in Surface Water
Nitrogen, Nitrate (mg/L)
2
1
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Outlier
Yes
Well
TBW



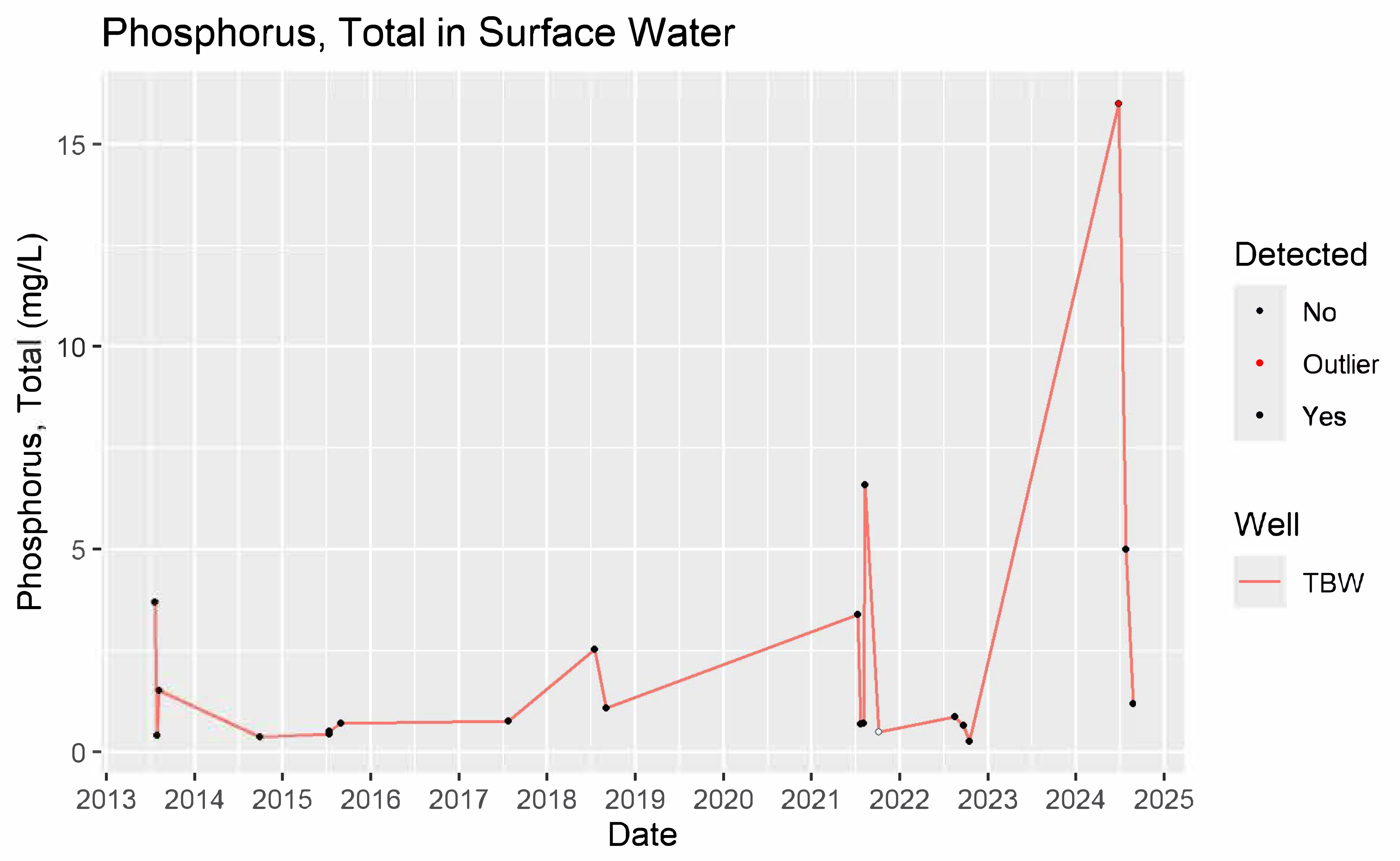
pH, Field in Surface Water
pH, Field (SU)
9.5
9.0
8.5
8.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW



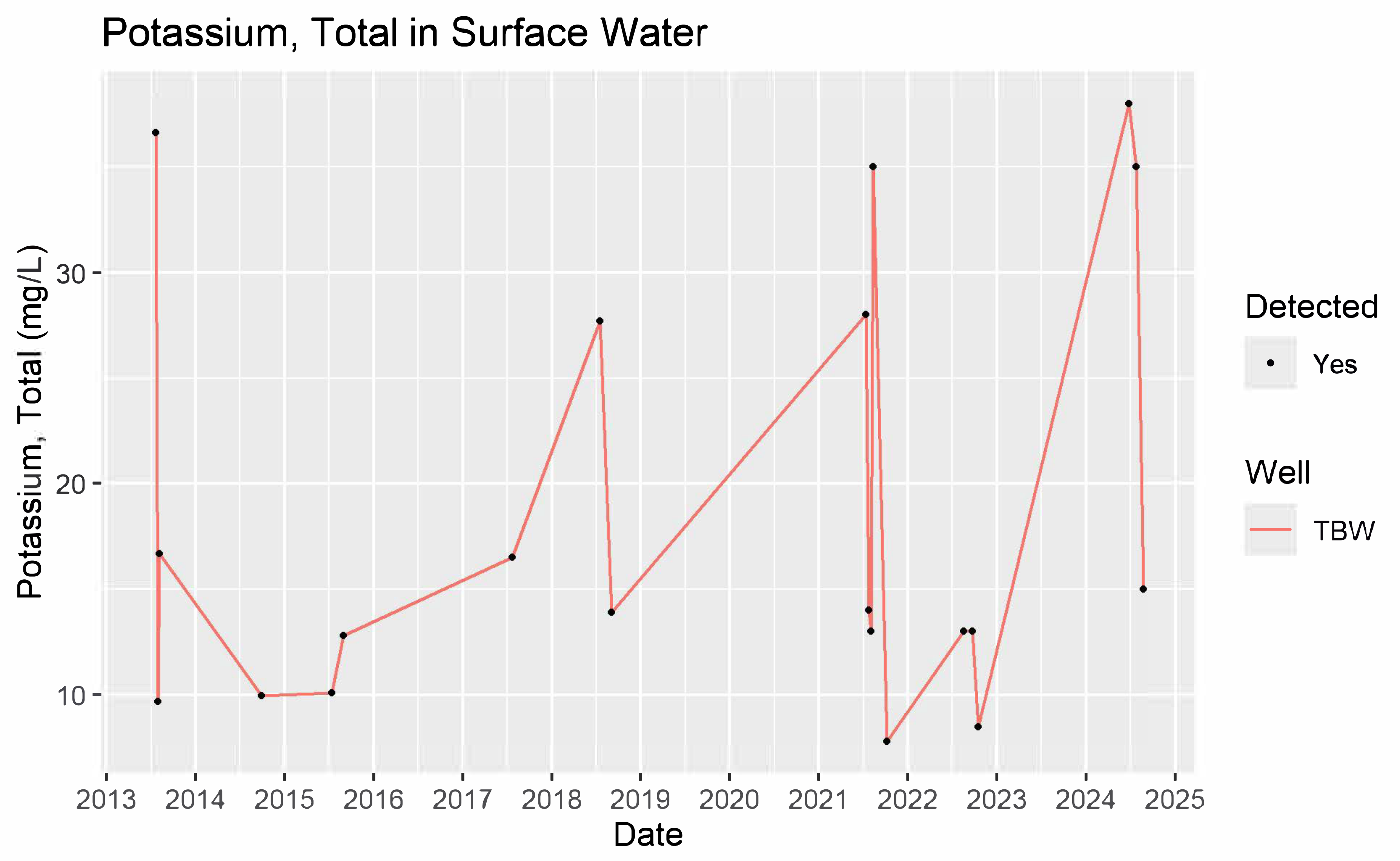
pH, Laboratory in Surface Water
pH, Laboratory (SU)
8.25
8.00
7.75
7.50
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW



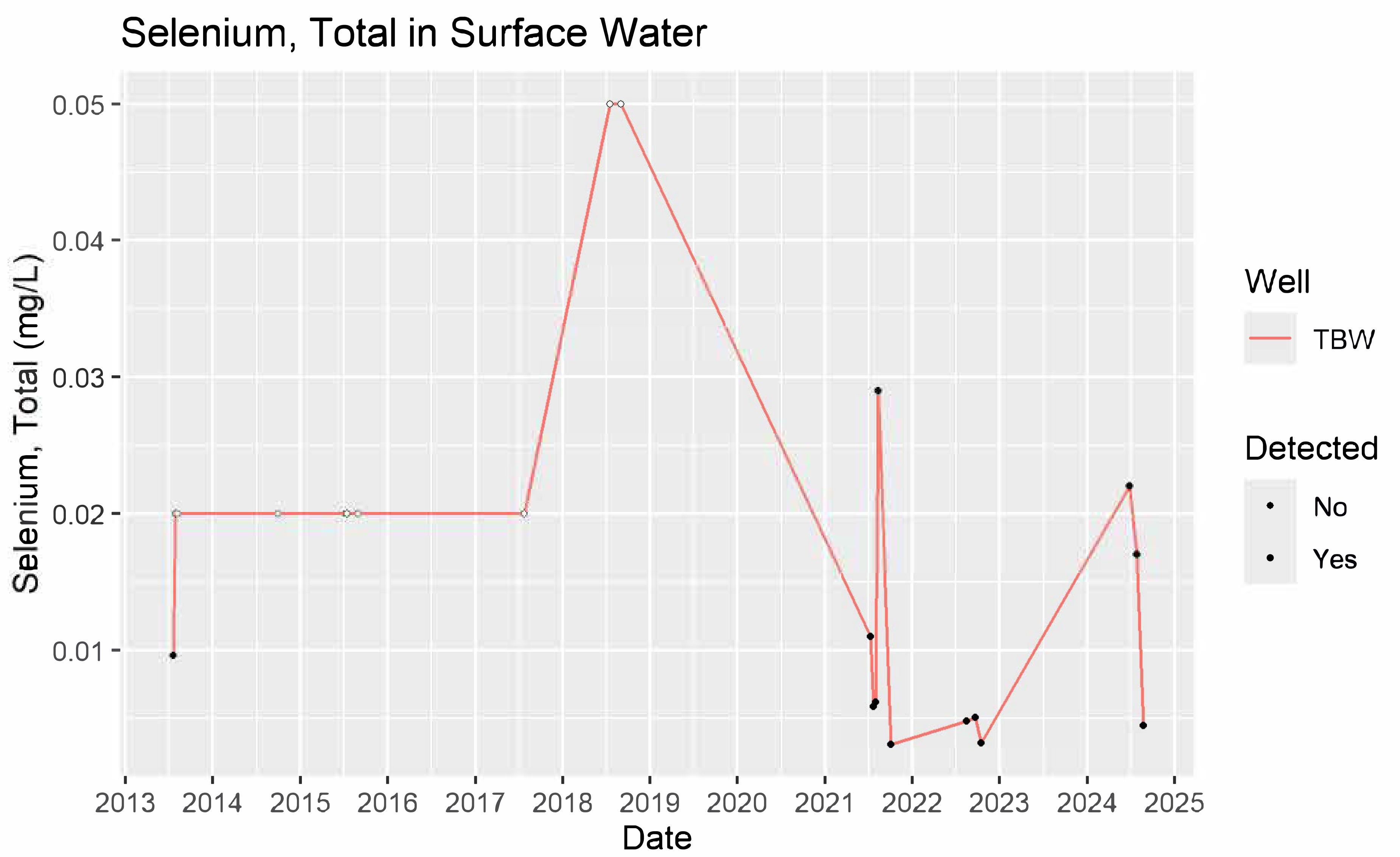
Phosphate in Surface Water
Phosphate (mg/L)
0
2
4
6
8
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
TBW
Detected
No
Yes

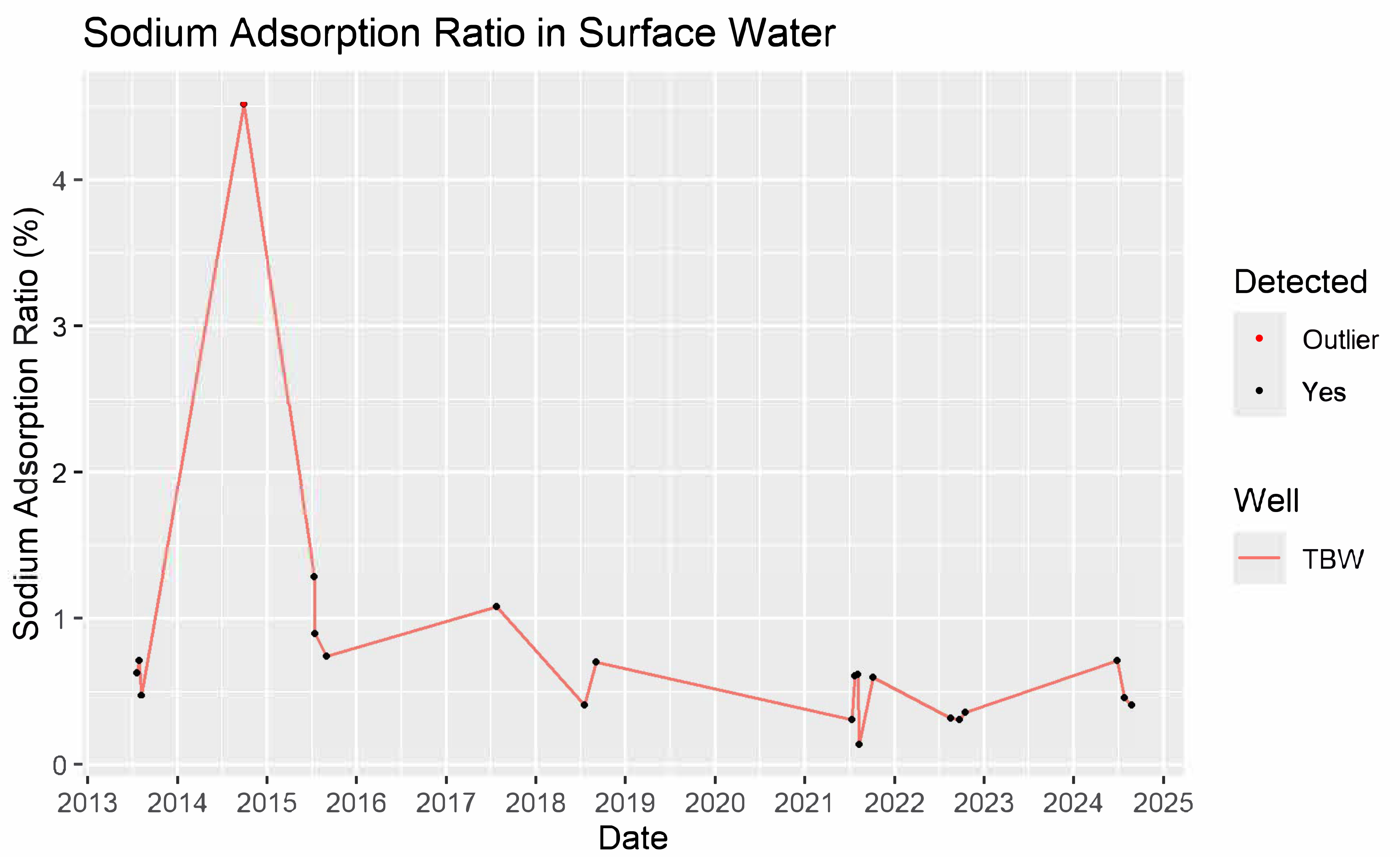


Phosphorus, Total in Surface Water
Phosphorus, Total (mg/L)
15
10
5
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Outlier
Yes
Well
TBW

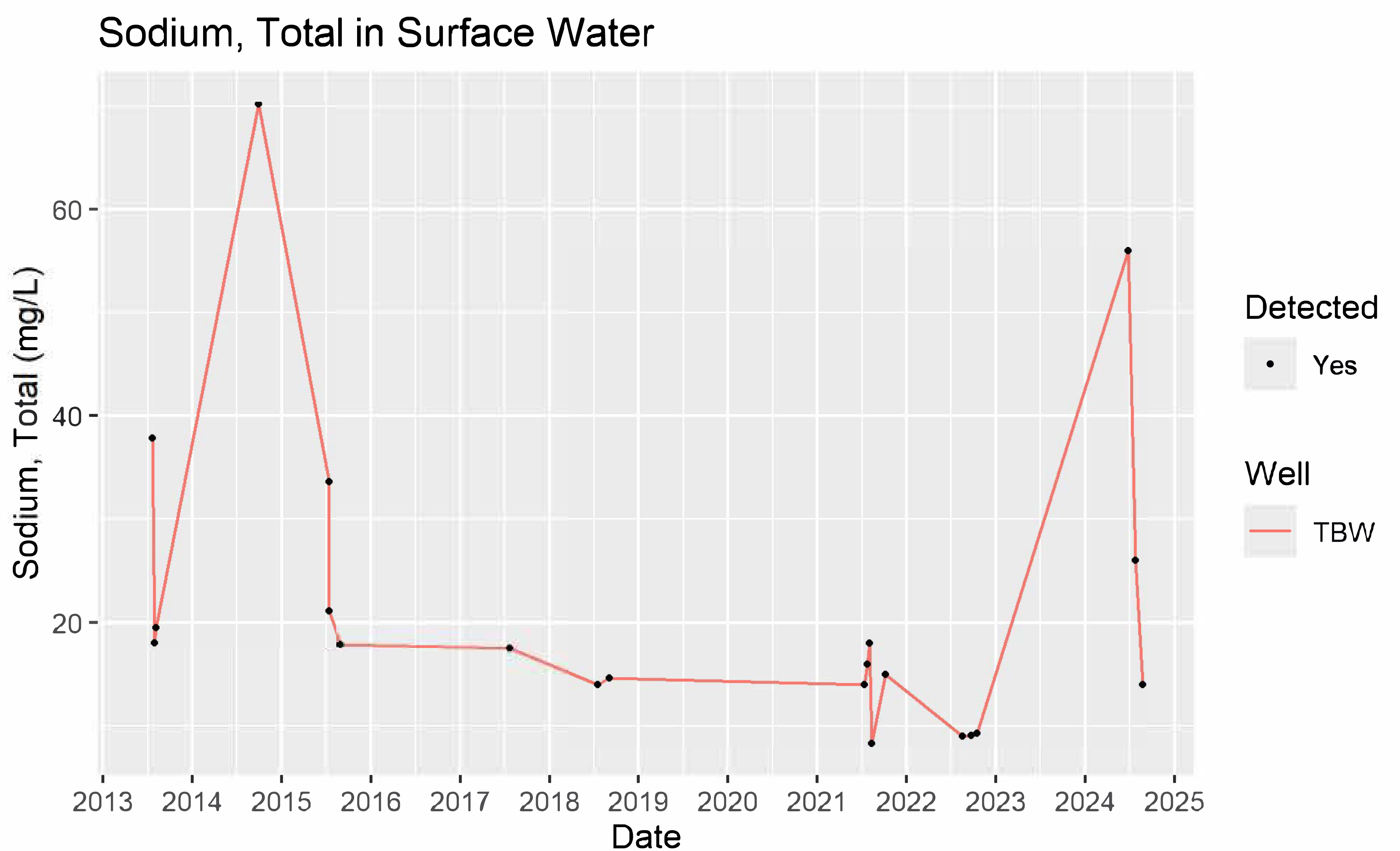


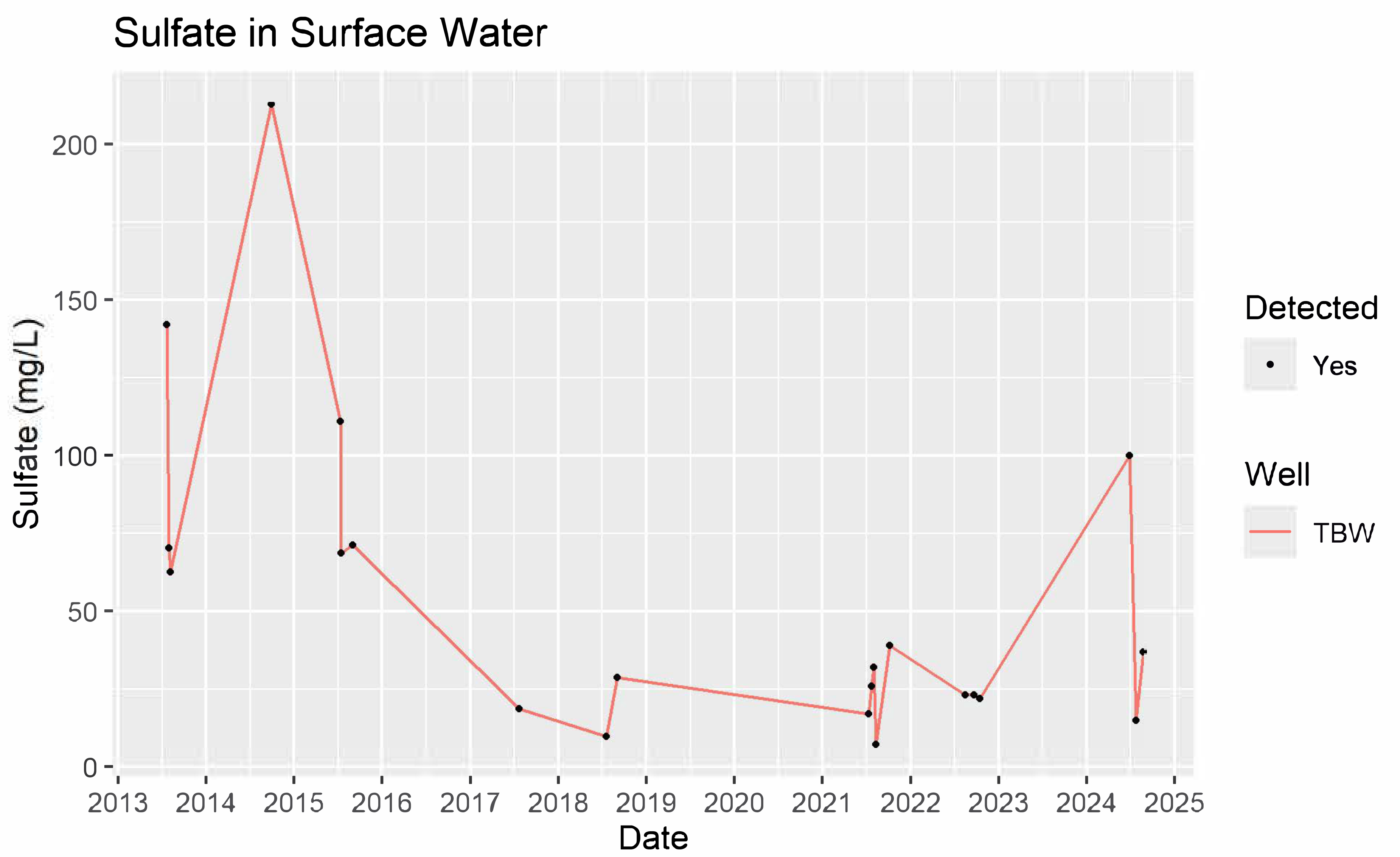
Potassium, Total in Surface Water
Potassium, Total (mg/L)
10
20
30
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

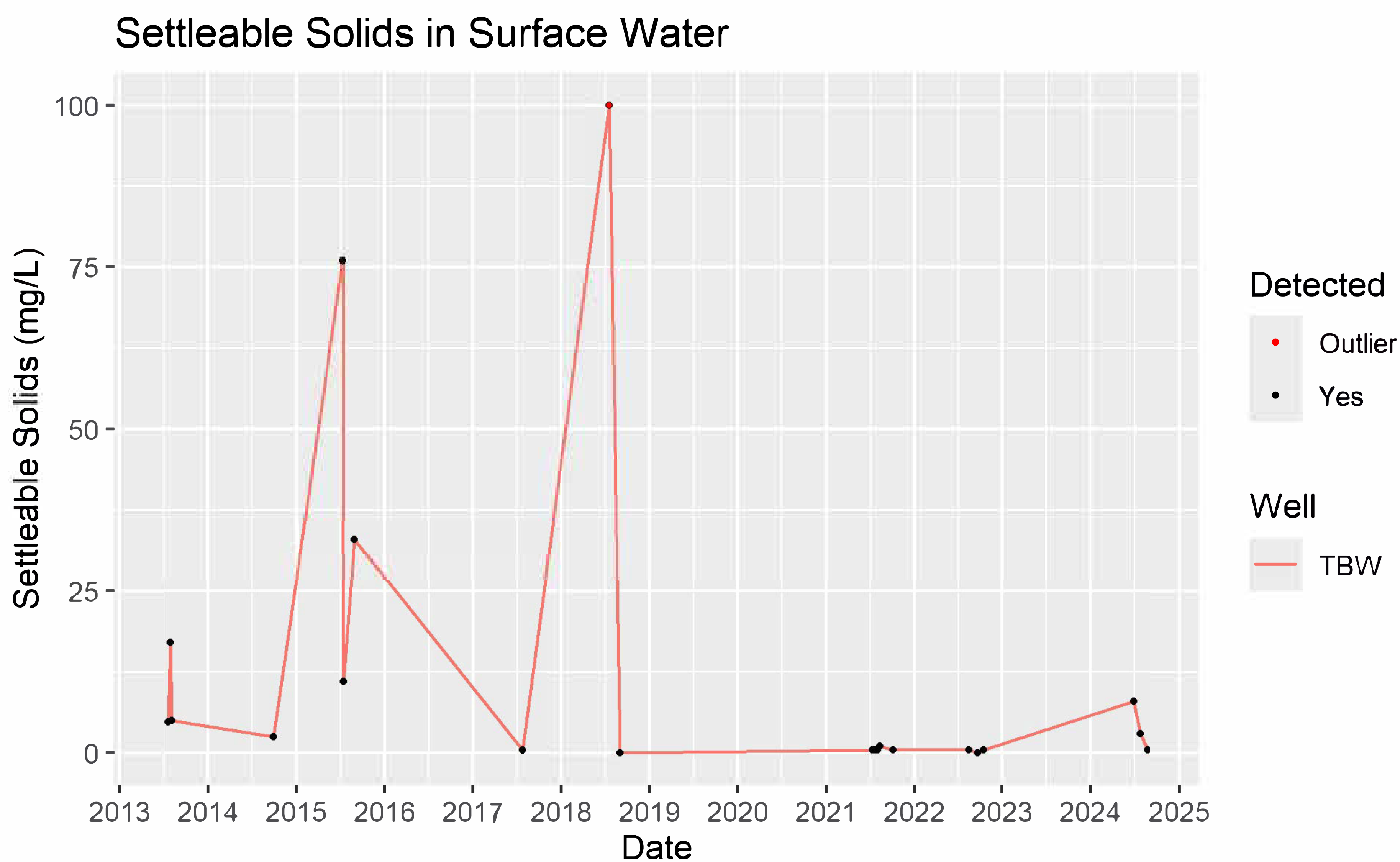

Selenium, Total in Surface Water
Selenium, Total (mg/L)
0.05
0.04
0.03
0.02
0.01
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
TBW
Detected
No
Yes



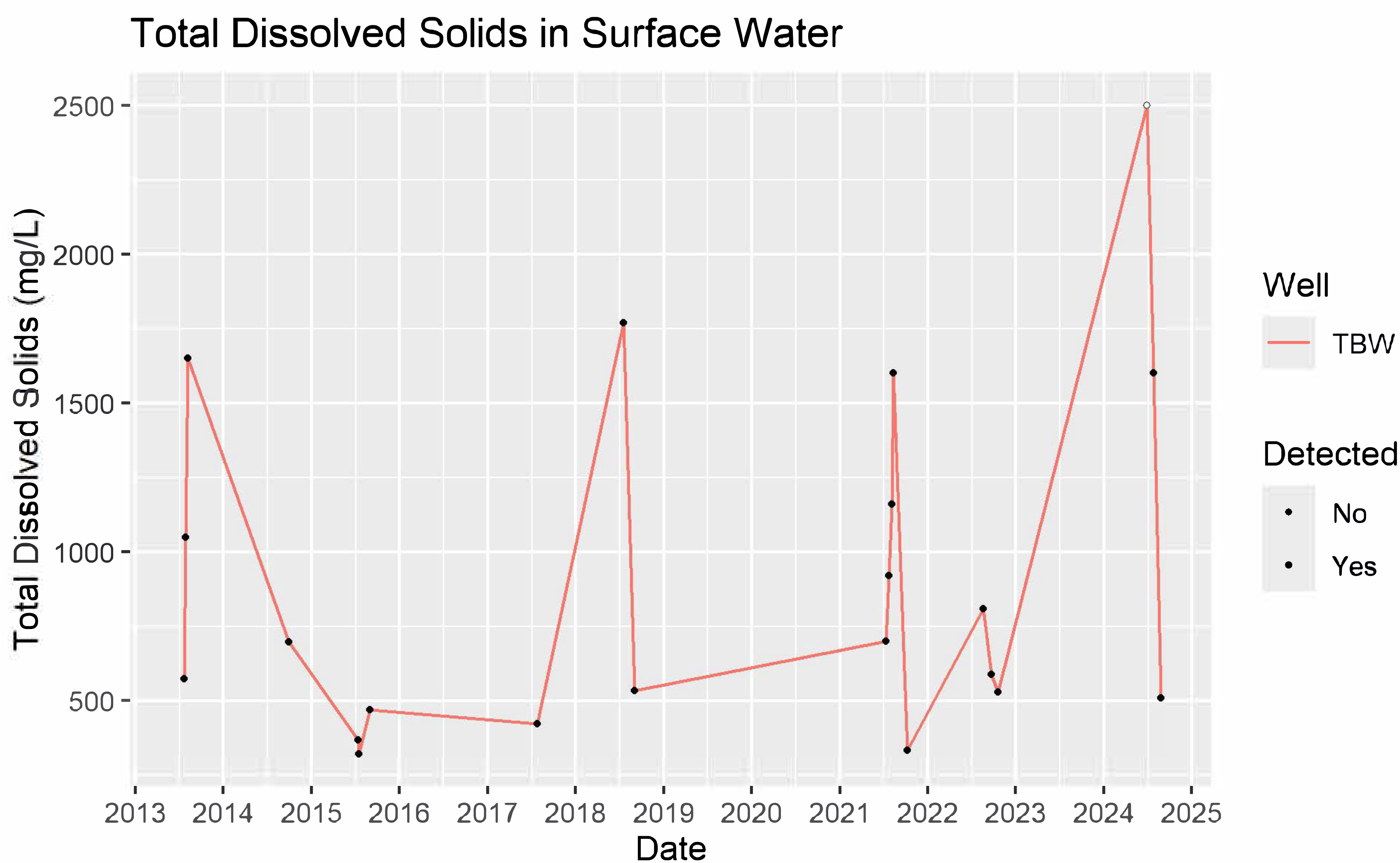
Sodium Adsorption Ratio in Surface Water
Sodium Adsorption Ratio (%)
0
1
2
3
4
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW


Sodium, Total in Surface Water
Sodium, Total (mg/L)
60
40
20
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW

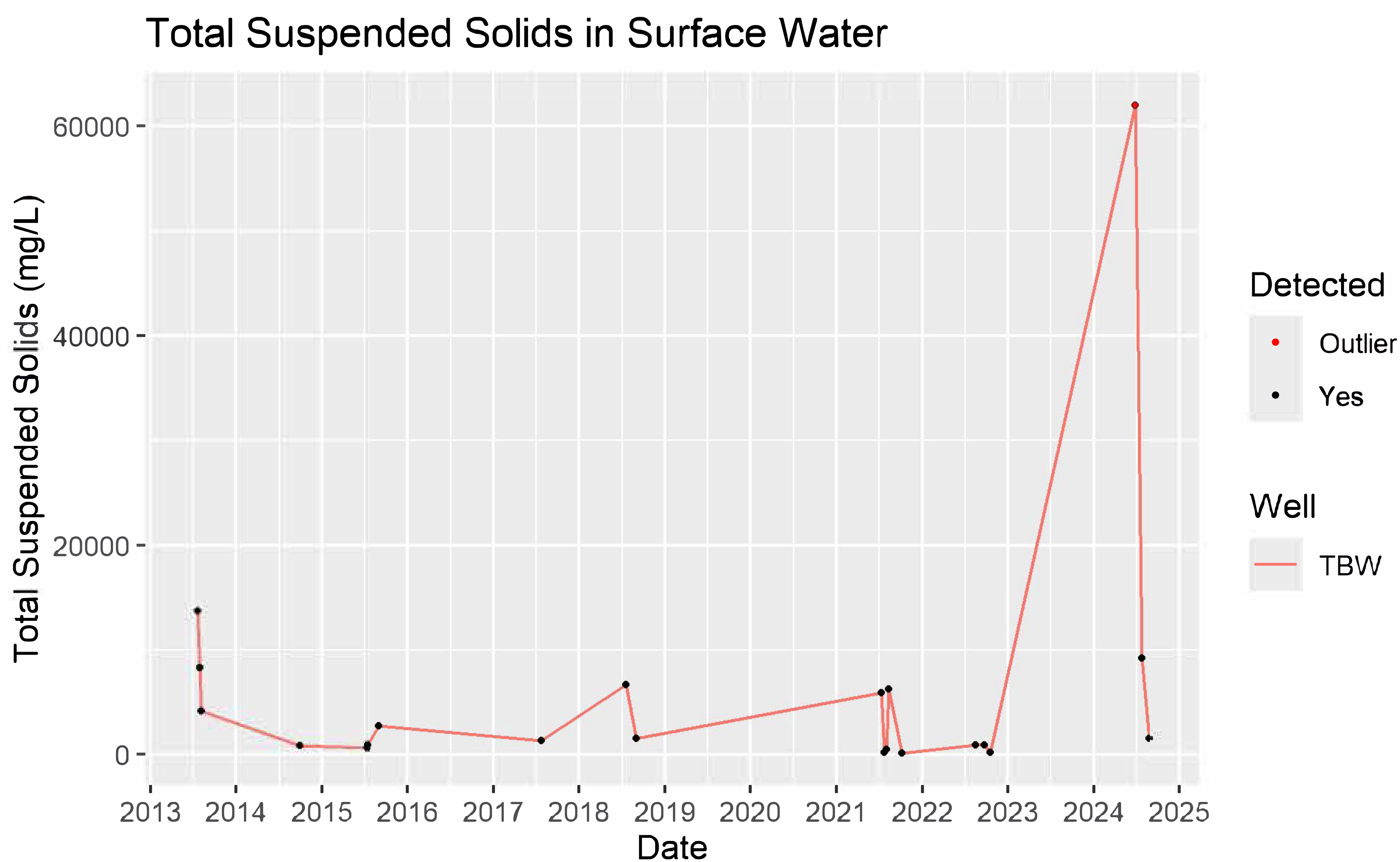

Sulfate in Surface Water
Sulfate (mg/L)
200
150
100
50
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Yes
Well
TBW



Settleable Solids in Surface Water
Settleable Solids (mg/L)
100
75
50
25
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW

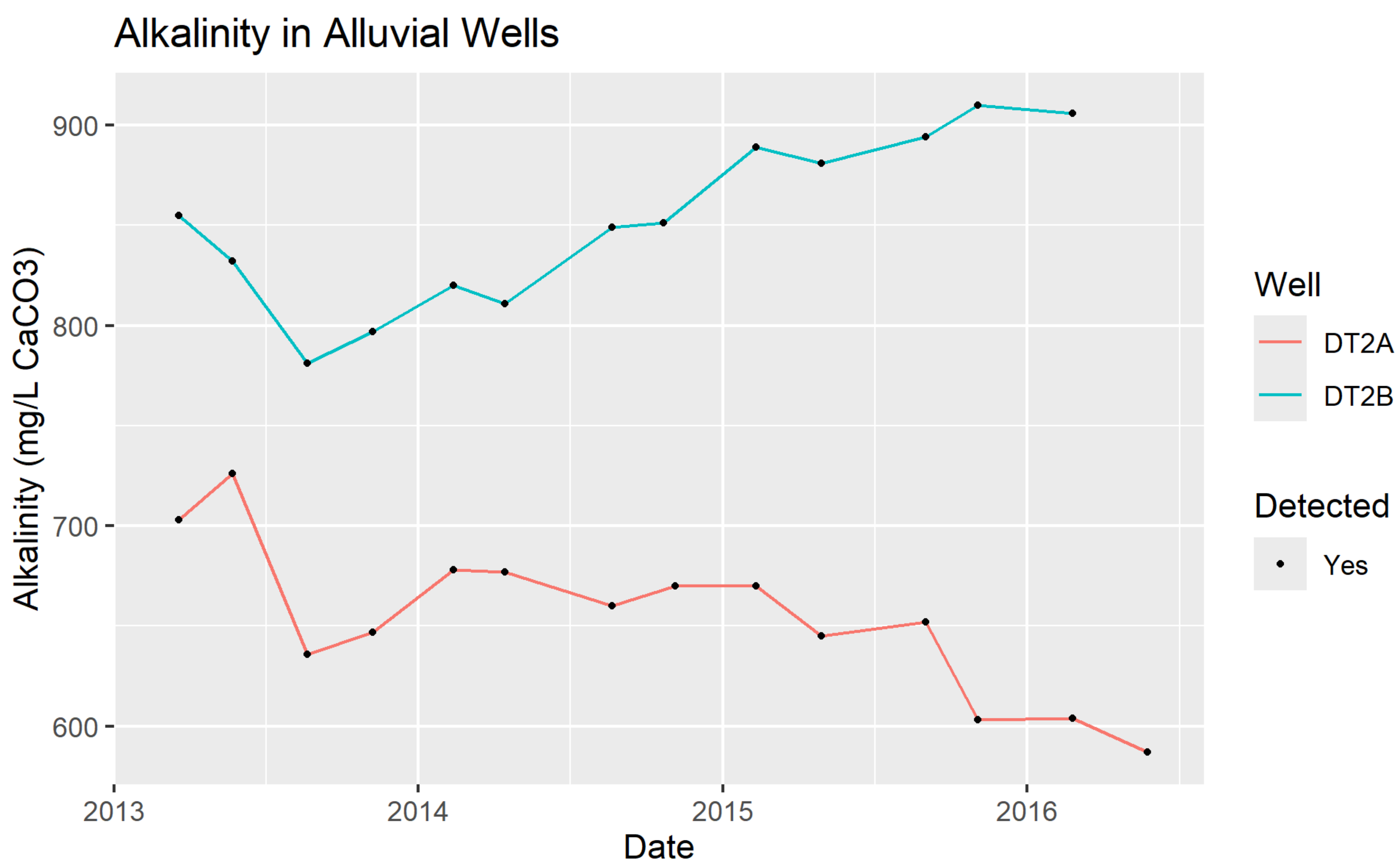


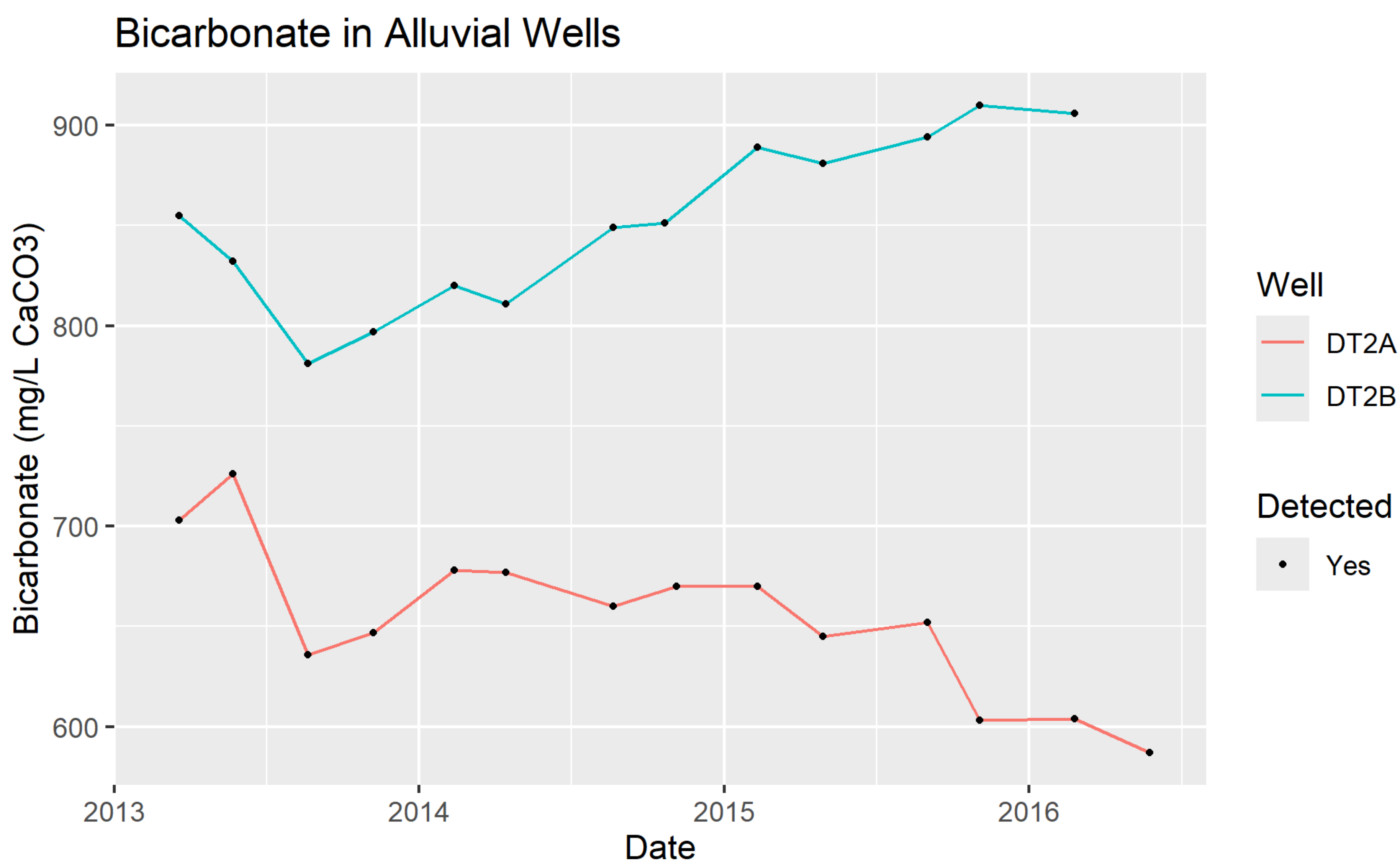
Total Dissolved Solids in Surface Water
Total Dissolved Solids (mg/L)
2500
2000
1500
1000
500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
TBW
Detected
No
Yes

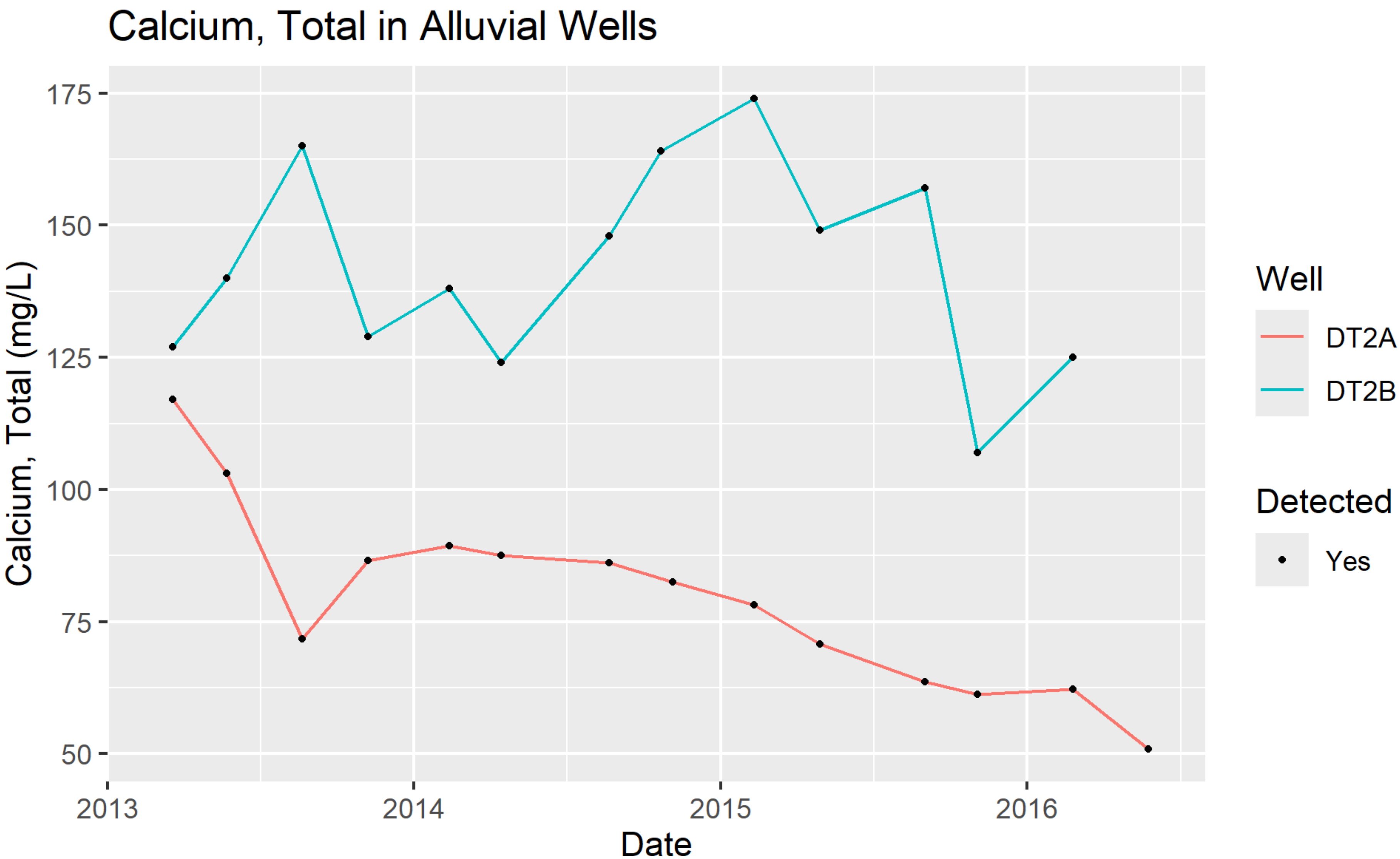

Total Suspended Solids in Surface Water
Total Suspended Solids (mg/L)
60000
40000
20000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
TBW

APPENDIX C

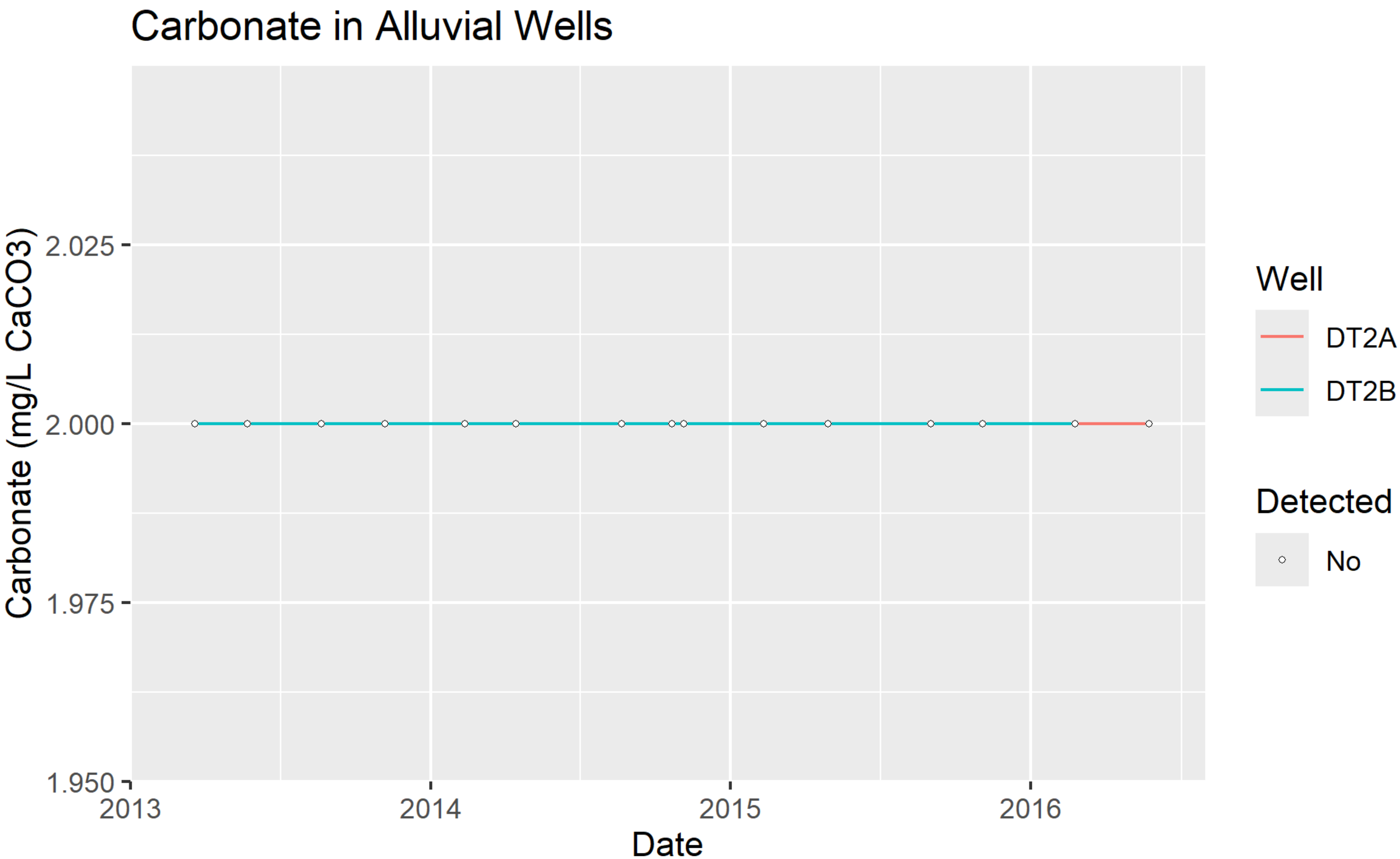
GROUNDWATER QUALITY – ALLUVIAL WELLS DT2A AND DT2B: TEMPORAL PLOTS

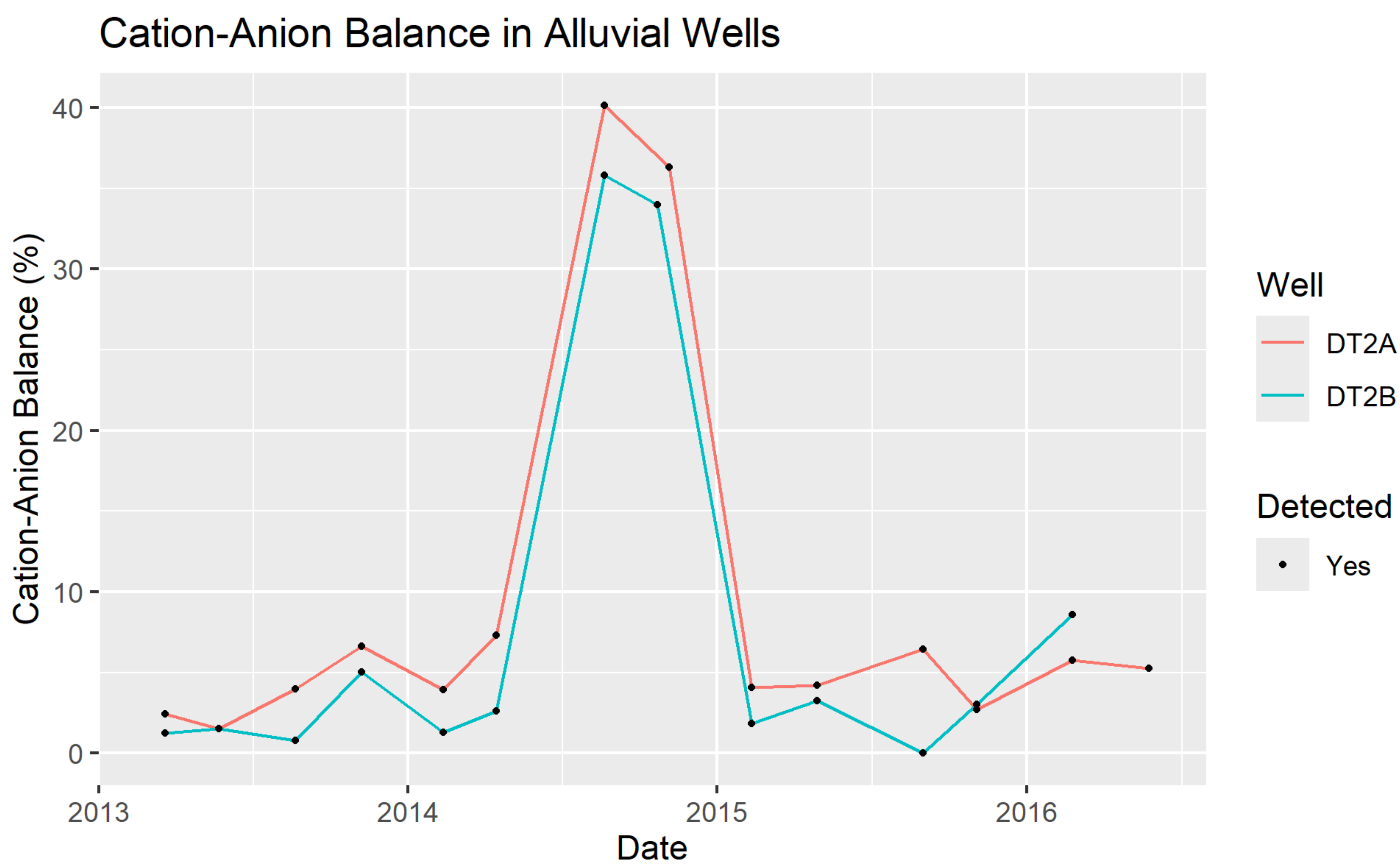

Alkalinity in Alluvial Wells
900
800
700
600
Alkalinity (mg/L CaCO3)
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

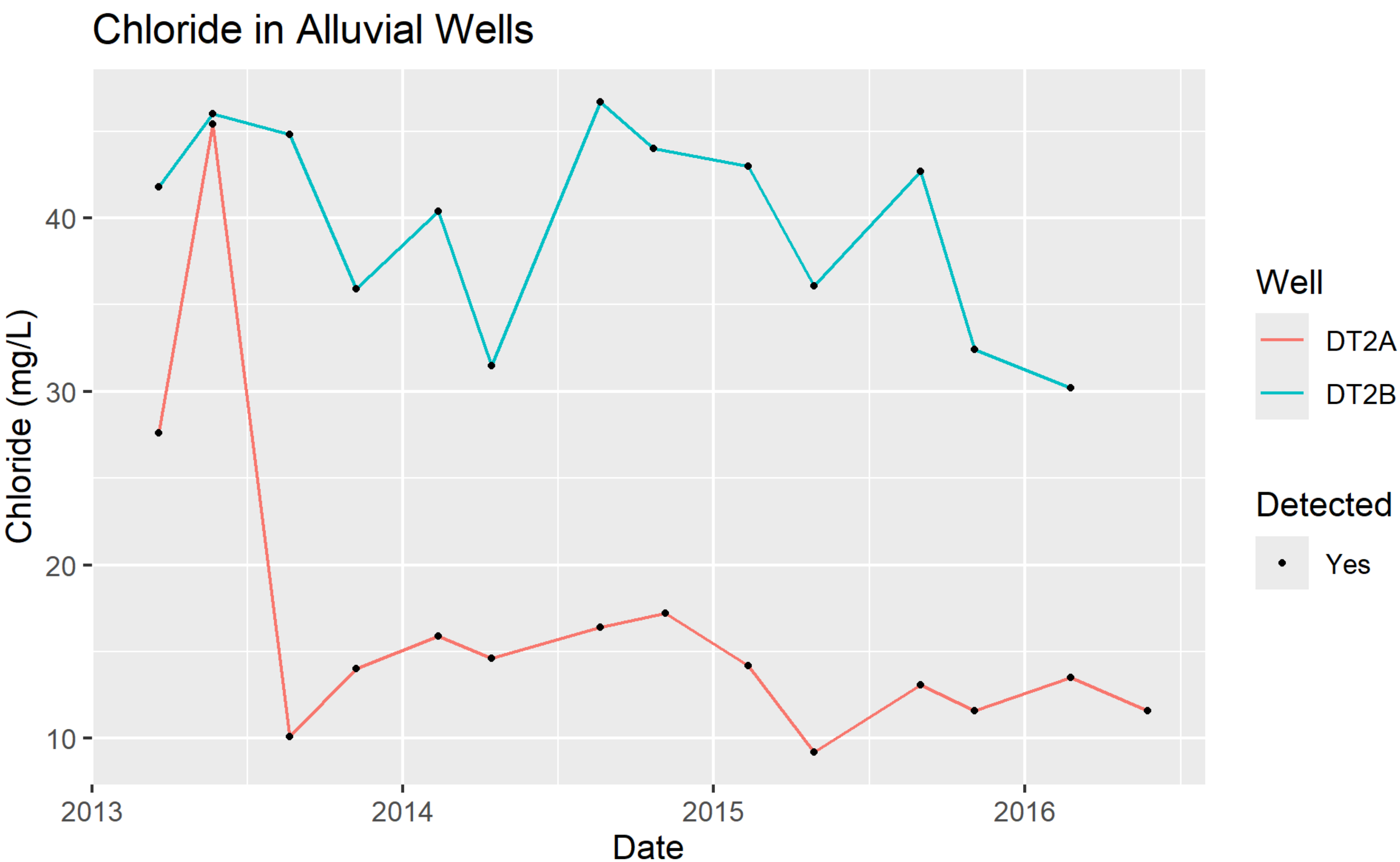

Bicarbonate in Alluvial Wells
900
800
700
600
Bicarbonate (mg/L CaCO3)
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

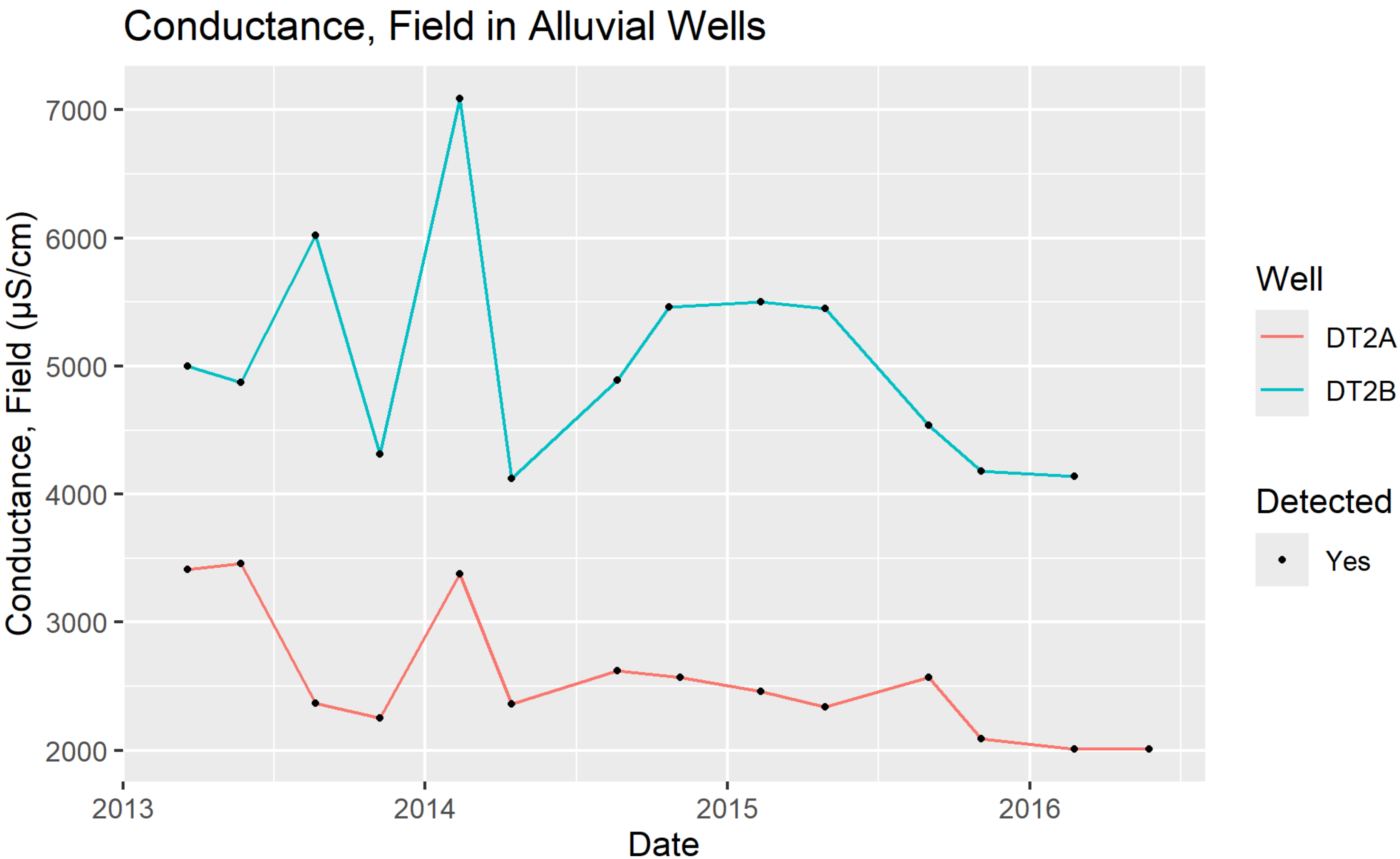


Calcium, Total in Alluvial Wells
175
150
125
100
75
50
Calcium, Total (mg/L)
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

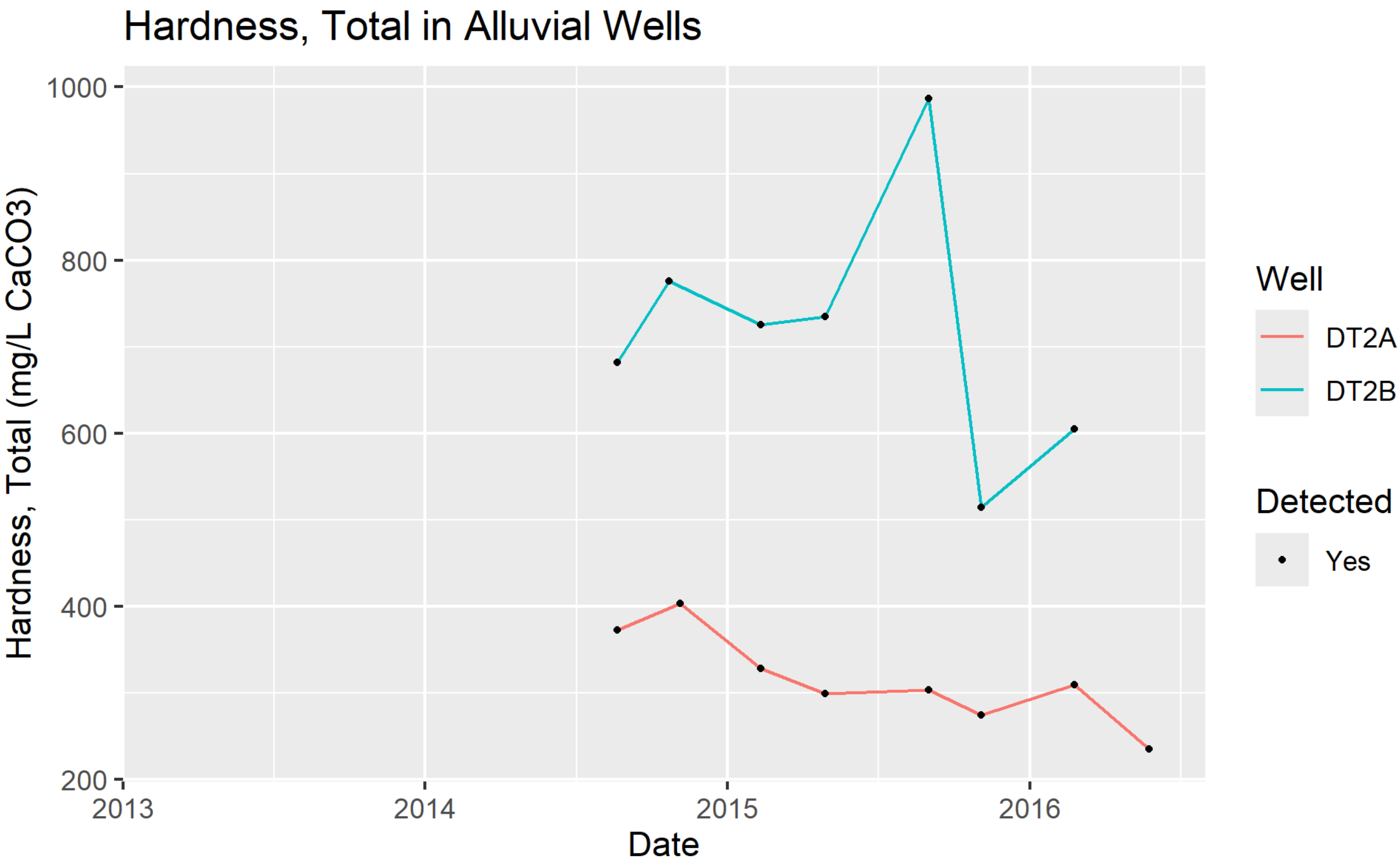

Carbonate in Alluvial Wells
Carbonate (mg/L CaCO3)
2.025
2.000
1.975
1.950
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No

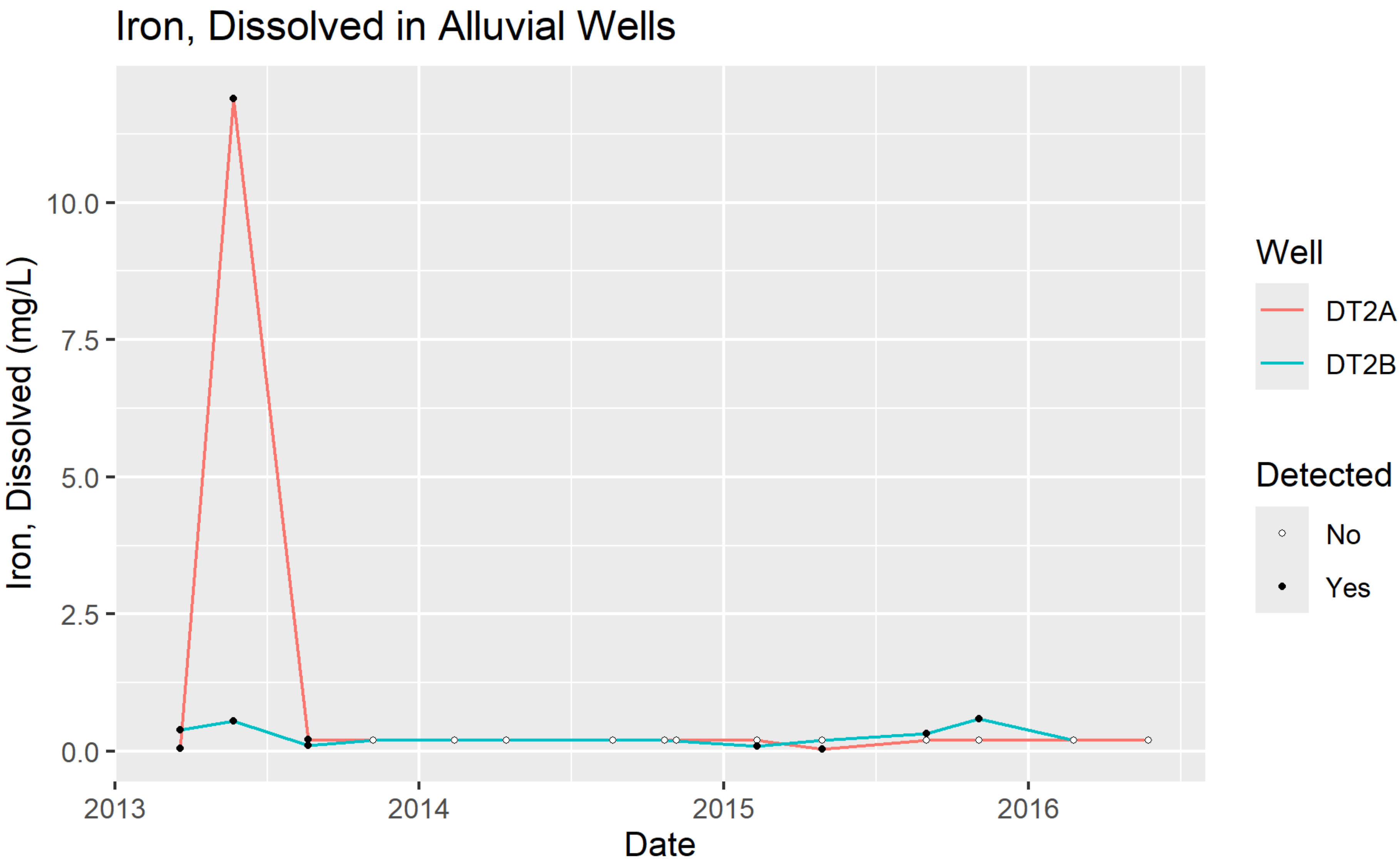

Cation-Anion Balance in Alluvial Wells
Cation-Anion Balance (%)
40
30
20
10
0
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

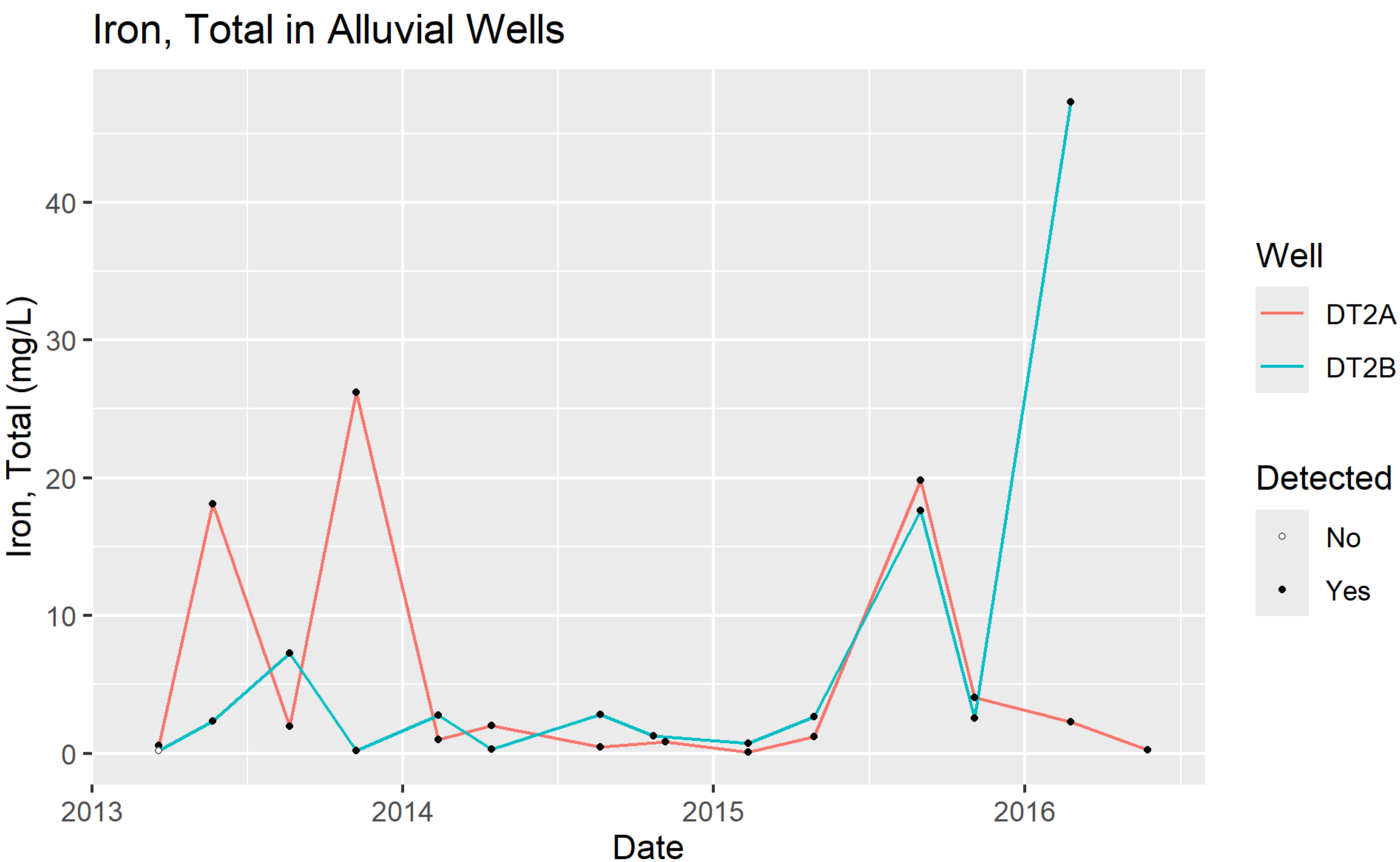

Chloride in Alluvial Wells
Chloride (mg/L)
40
30
20
10
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes



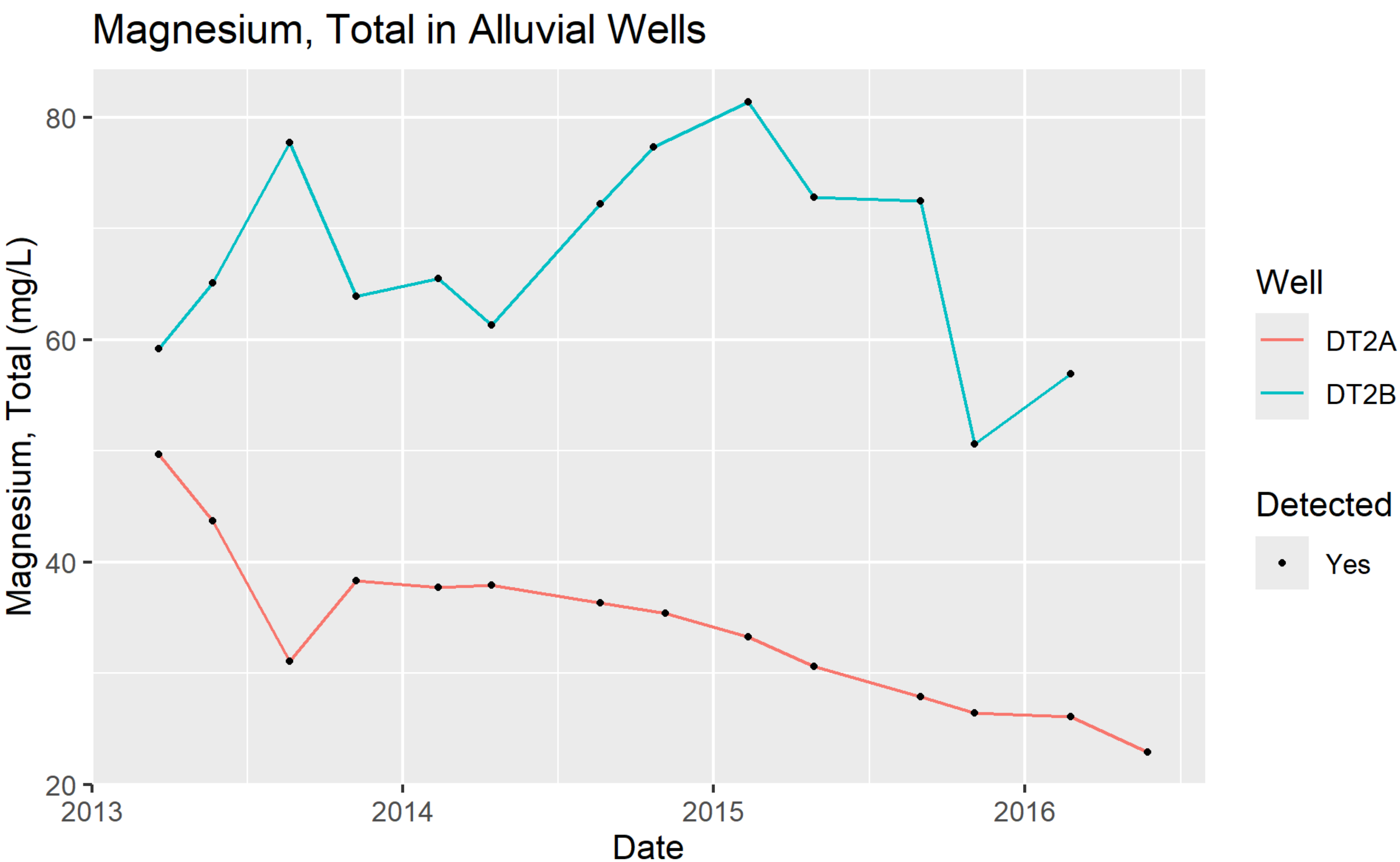
Conductance, Field in Alluvial Wells
Conductance, Field (µS/cm)
7000
6000
5000
4000
3000
2000
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes


Hardness, Total in Alluvial Wells
Hardness, Total (mg/L CaCO3)
1000
800
600
400
200
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

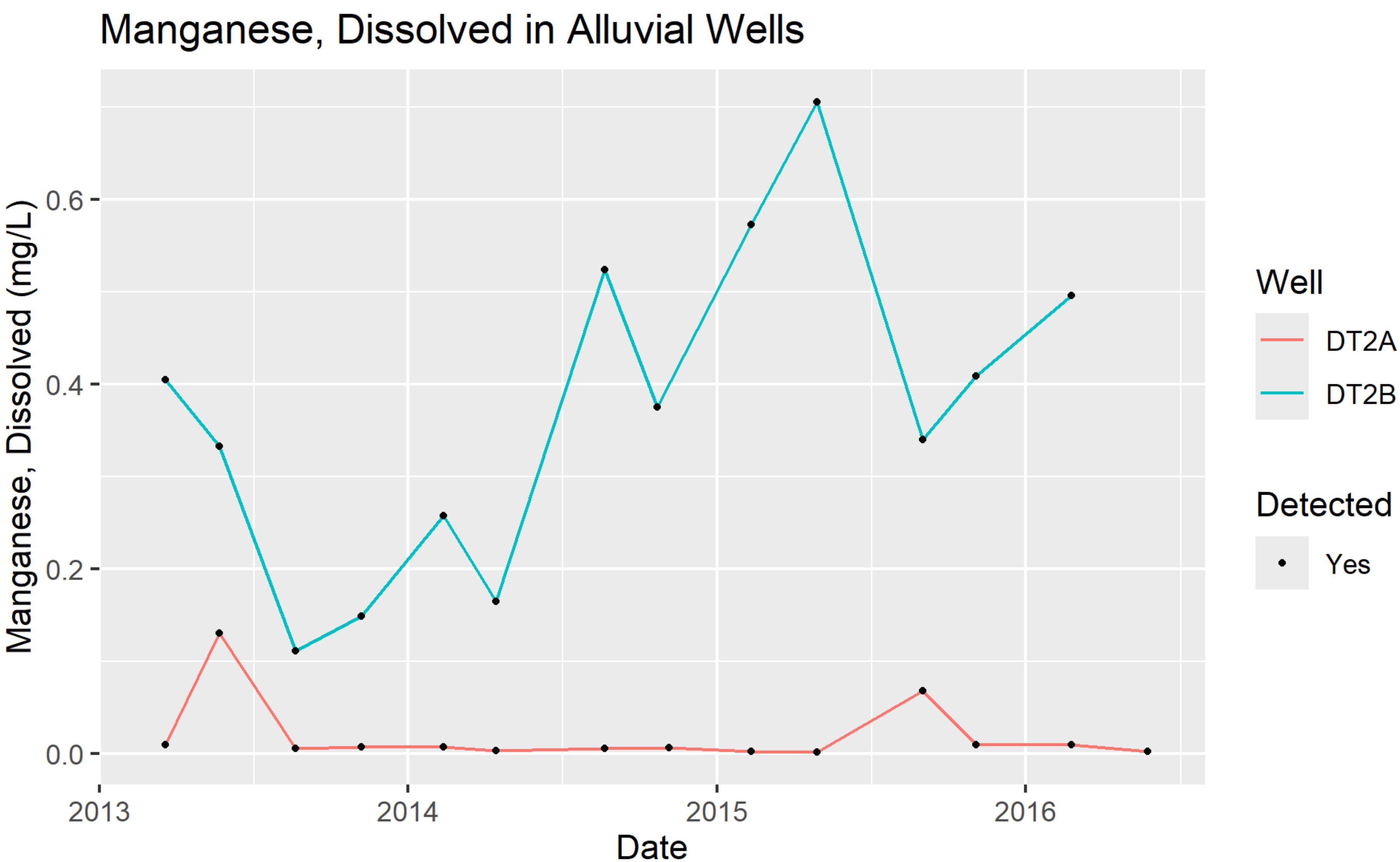

Iron, Dissolved in Alluvial Wells
Iron, Dissolved (mg/L)
10.0
7.5
5.0
2.5
0.0
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No
Yes



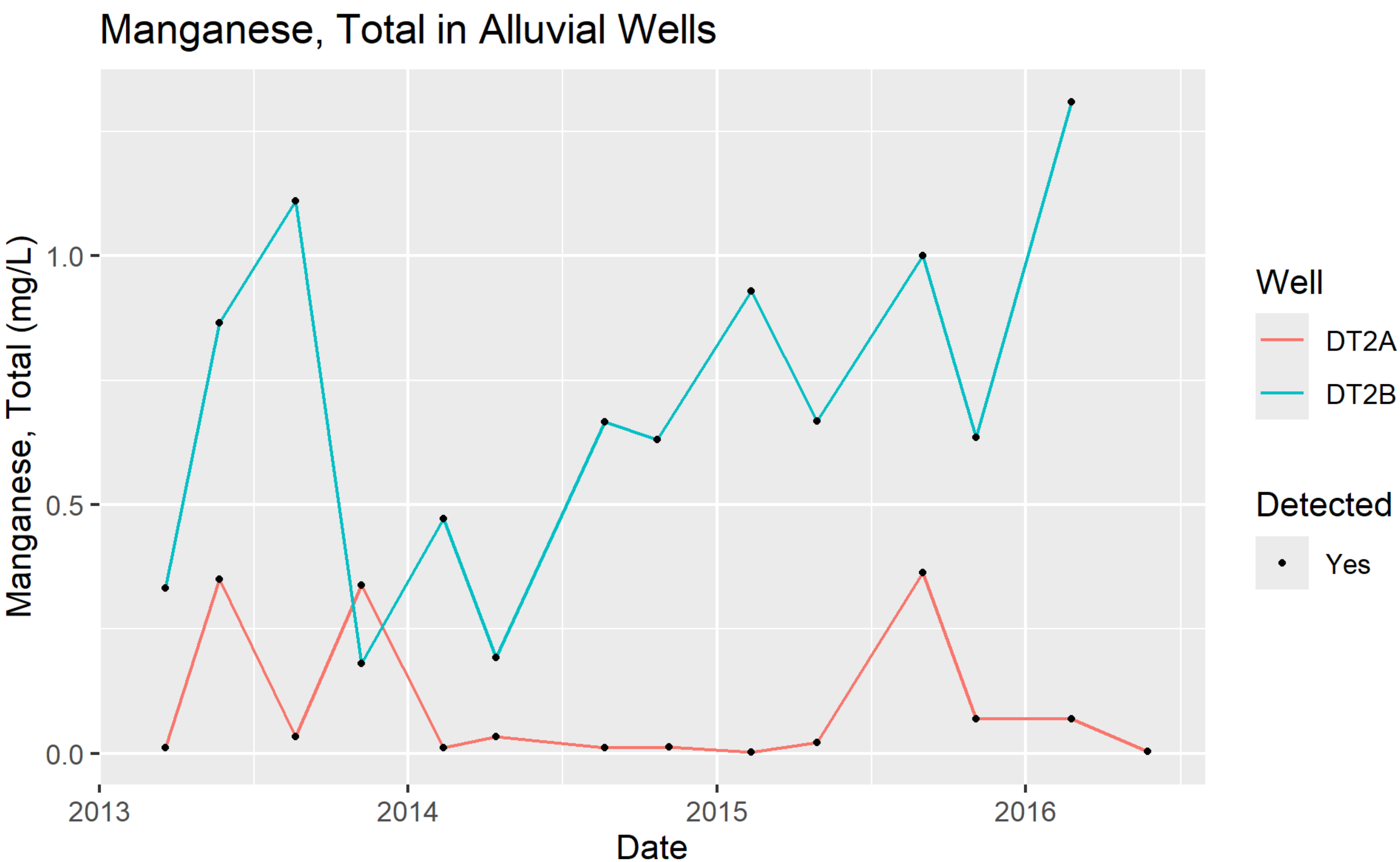
Iron, Total in Alluvial Wells
Iron, Total (mg/L)
0
10
20
30
40
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No
Yes



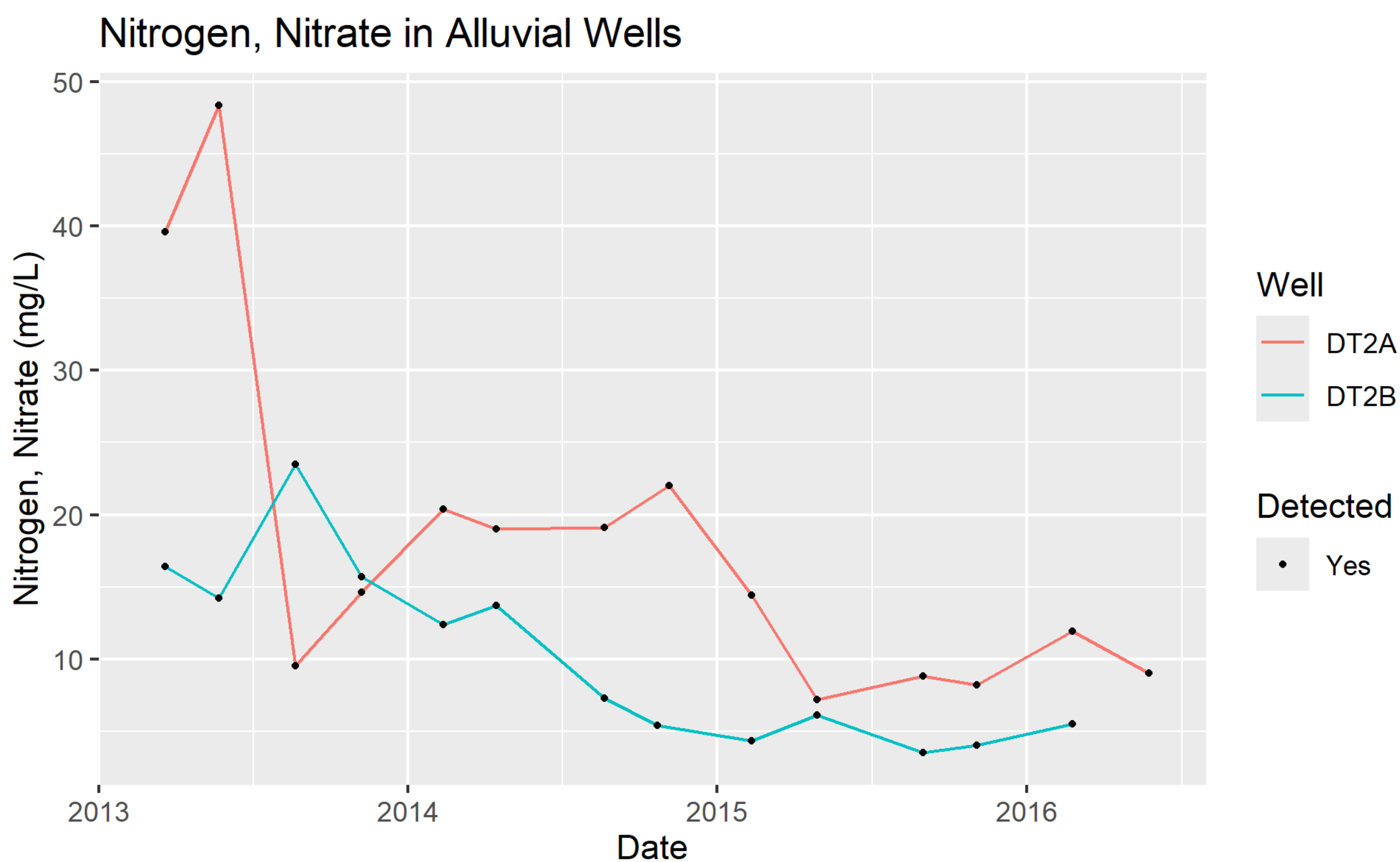
Magnesium, Total in Alluvial Wells
80
60
40
20
2013
2014
2015
2016
Date
Magnesium, Total (mg/L)
Well
DT2A
DT2B
Detected
Yes



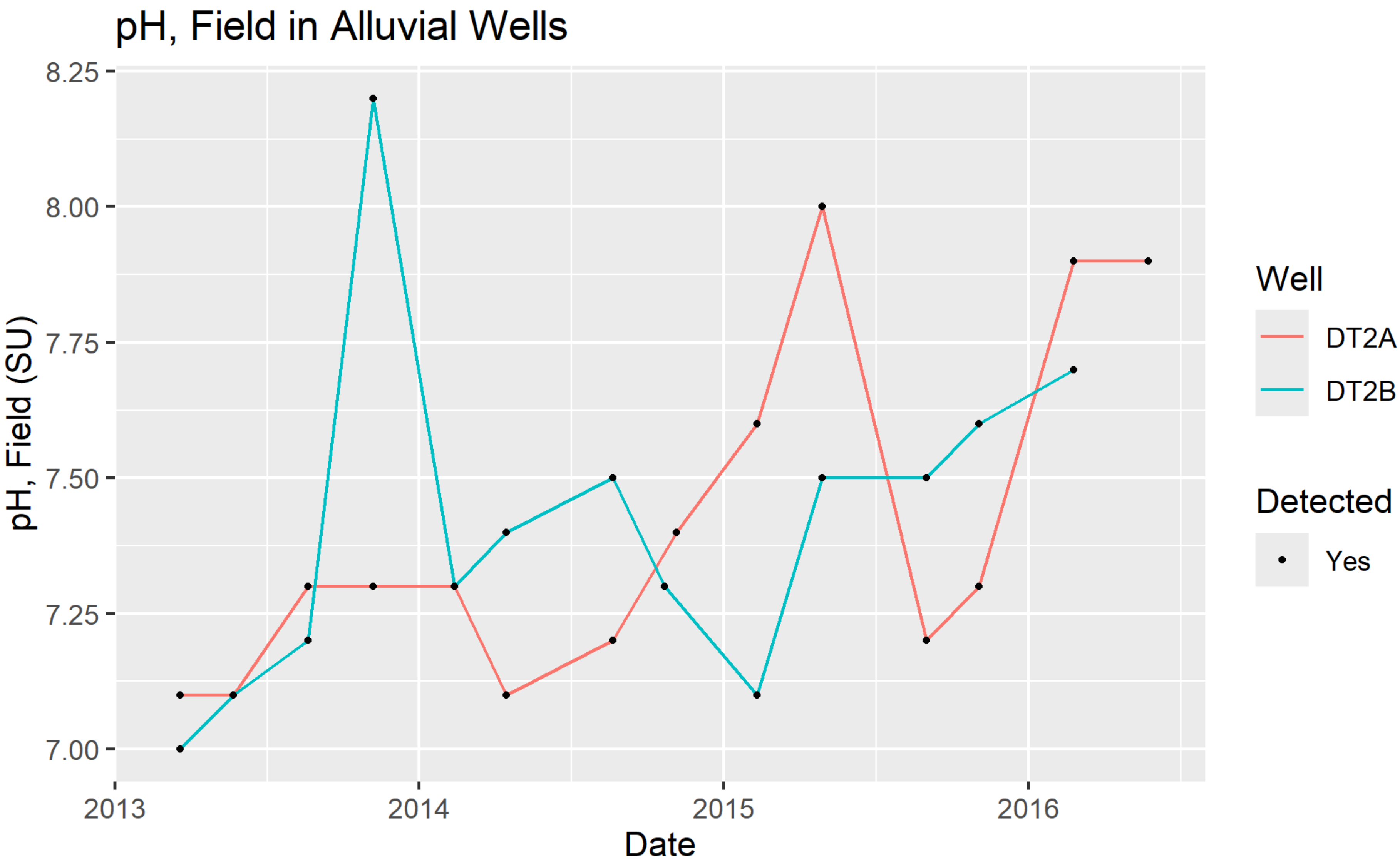
Manganese, Dissolved in Alluvial Wells
Manganese, Dissolved (mg/L)
0.0
0.2
0.4
0.6
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

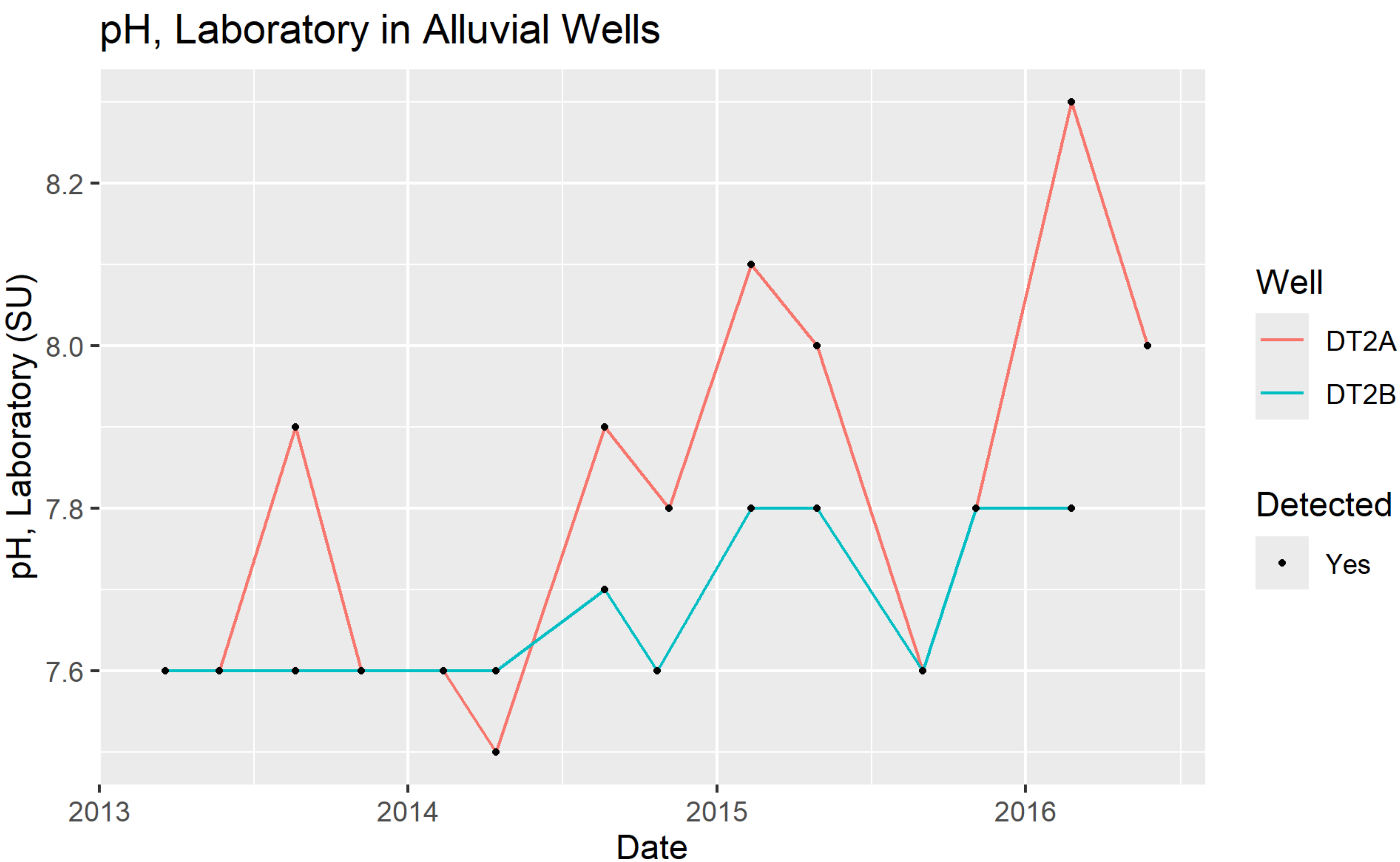


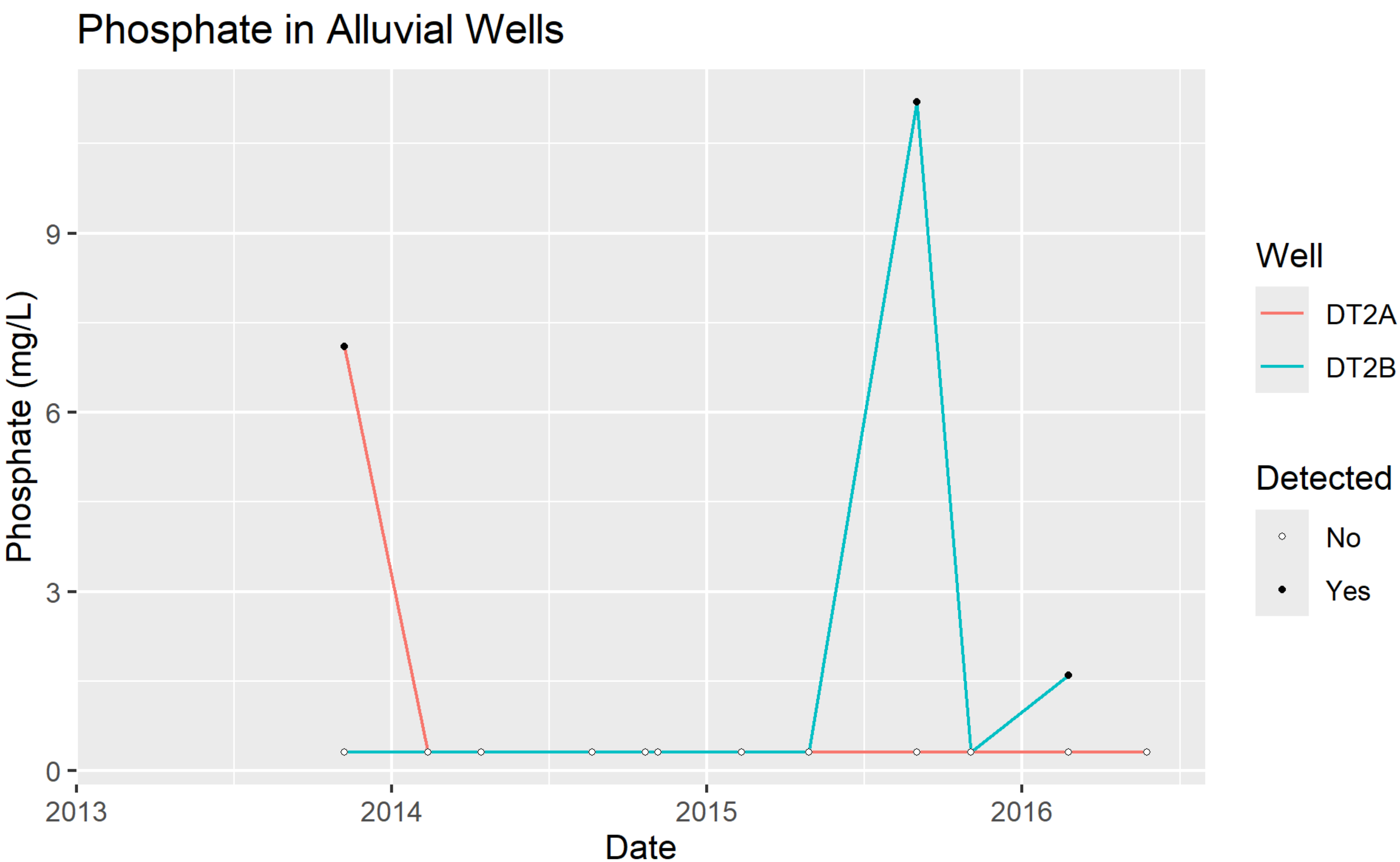
Manganese, Total in Alluvial Wells
Manganese, Total (mg/L)
1.0
0.5
0.0
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

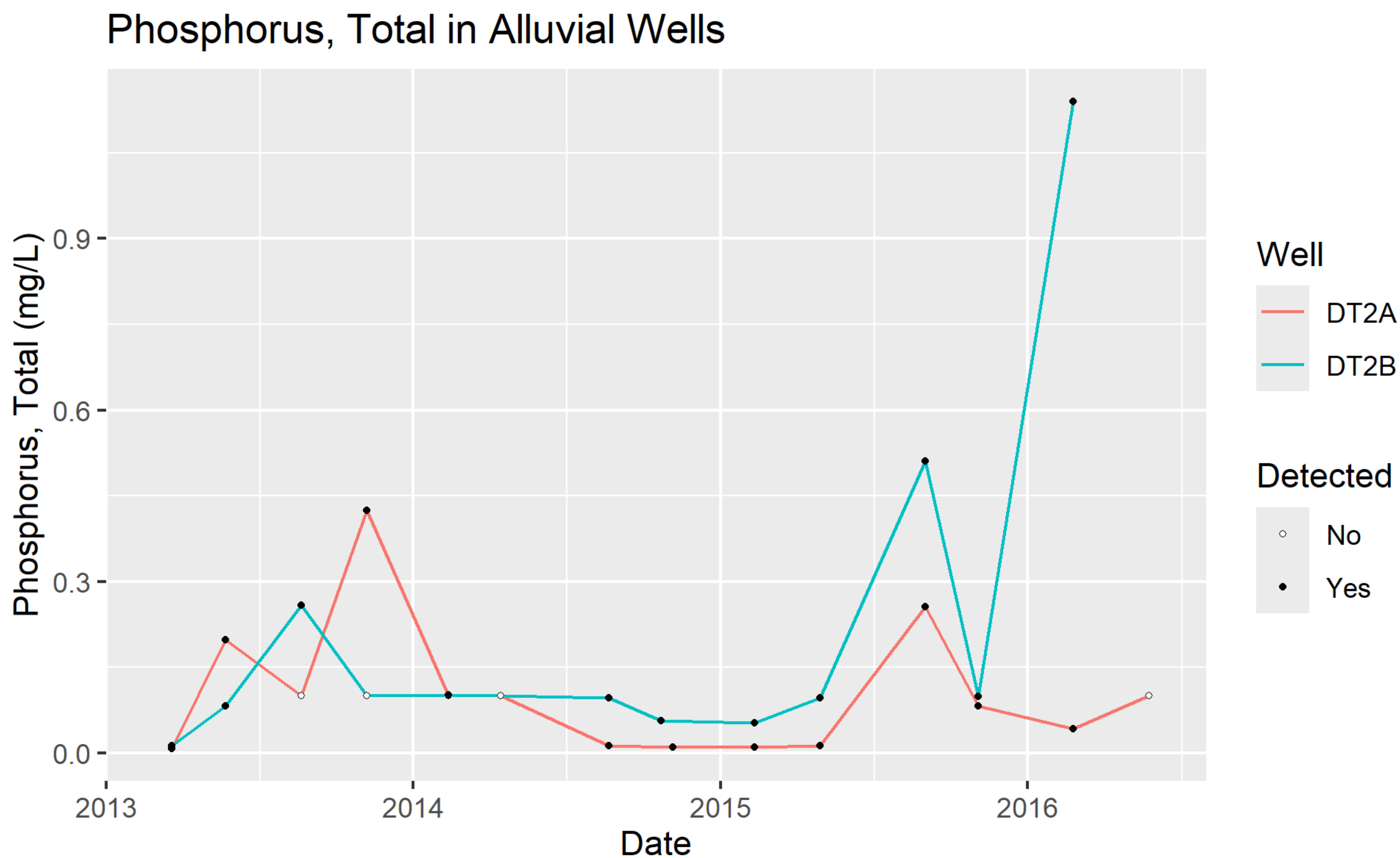


Nitrogen, Nitrate in Alluvial Wells
Nitrogen, Nitrate (mg/L)
50
40
30
20
10
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

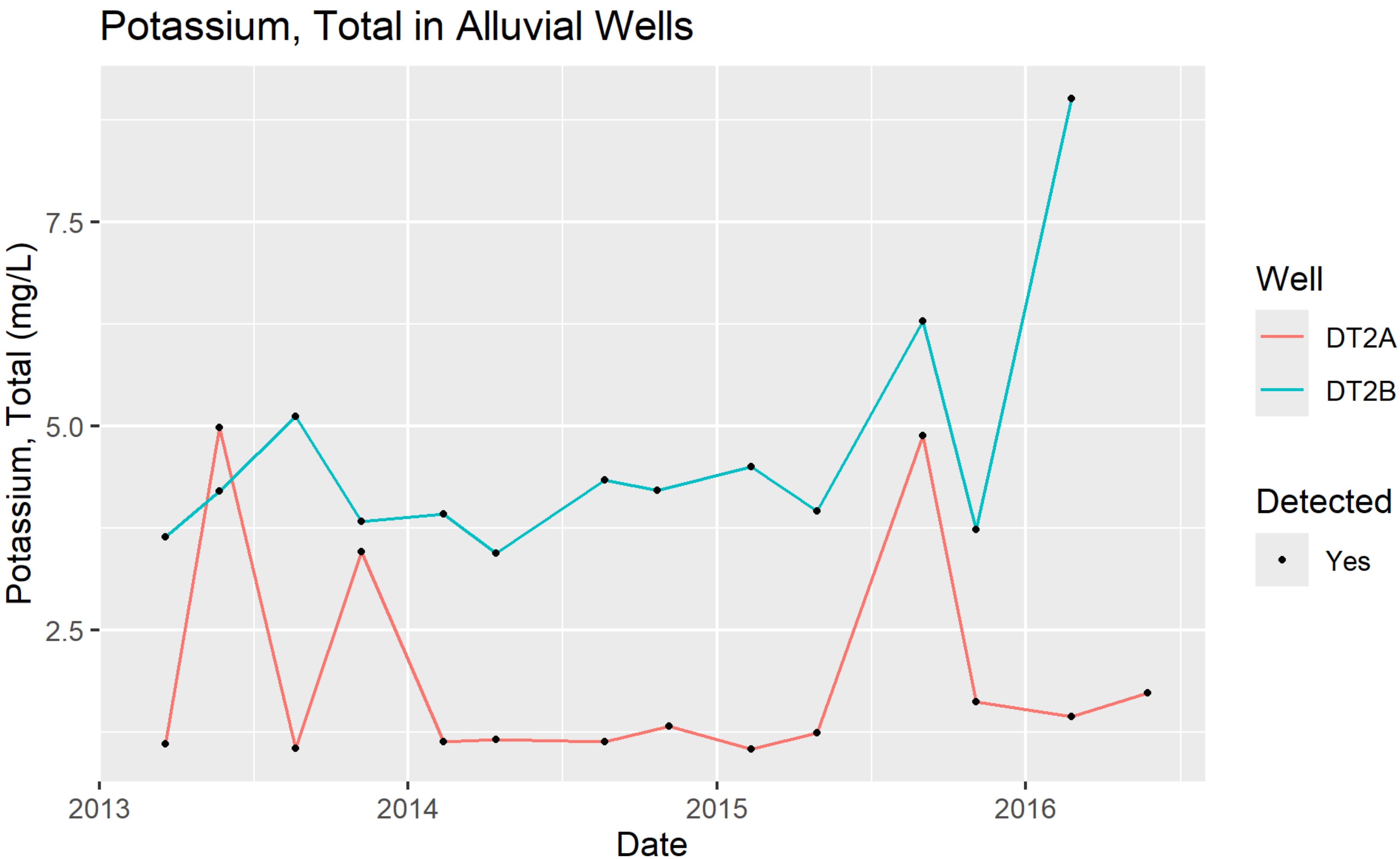

pH, Field in Alluvial Wells
8.25
8.00
7.75
7.50
7.25
7.00
pH, Field (SU)
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes


pH, Laboratory in Alluvial Wells
8.2
8.0
7.8
7.6
pH, Laboratory (SU)
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

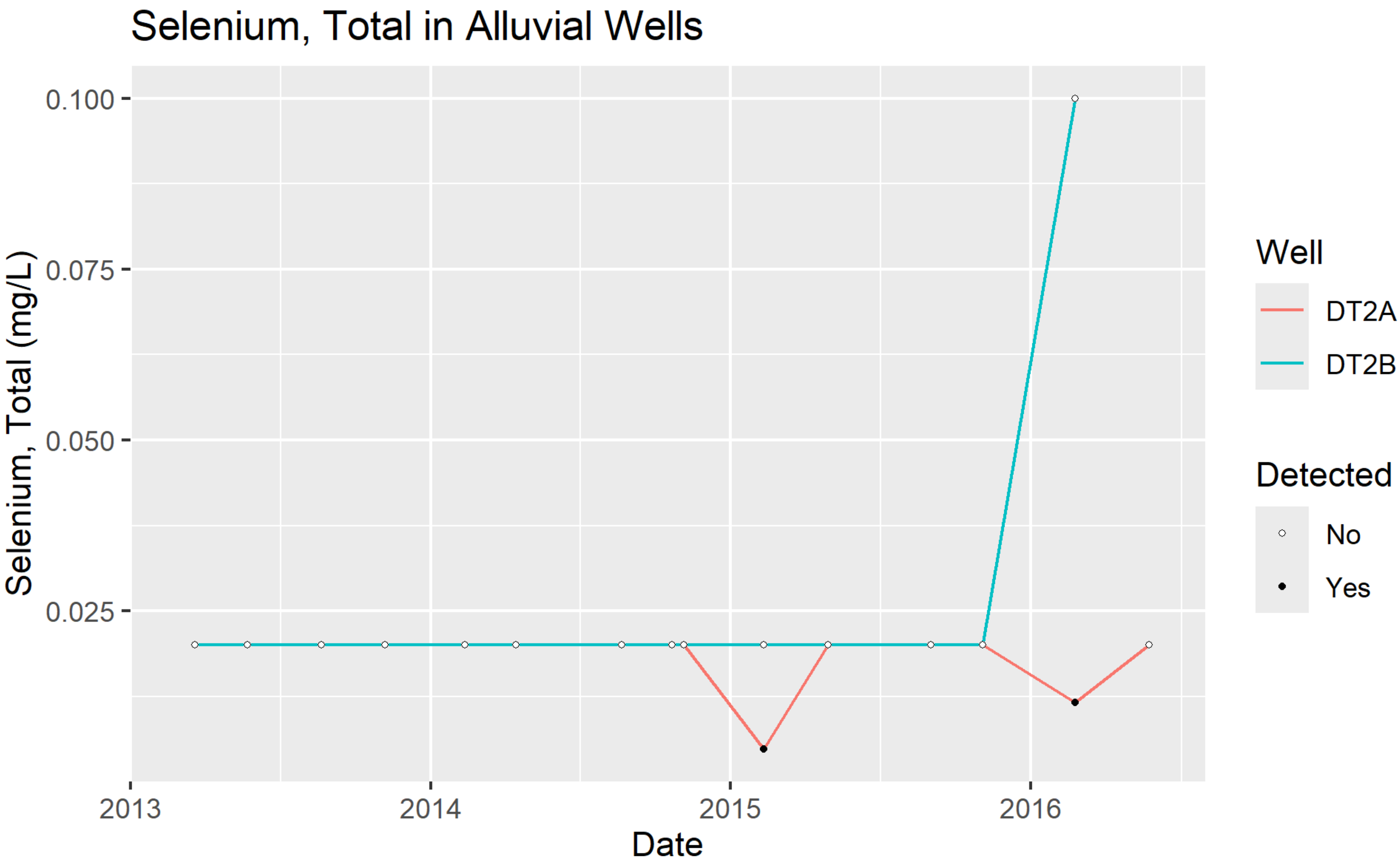

Phosphate in Alluvial Wells
Phosphate (mg/L)
0
3
6
9
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No
Yes

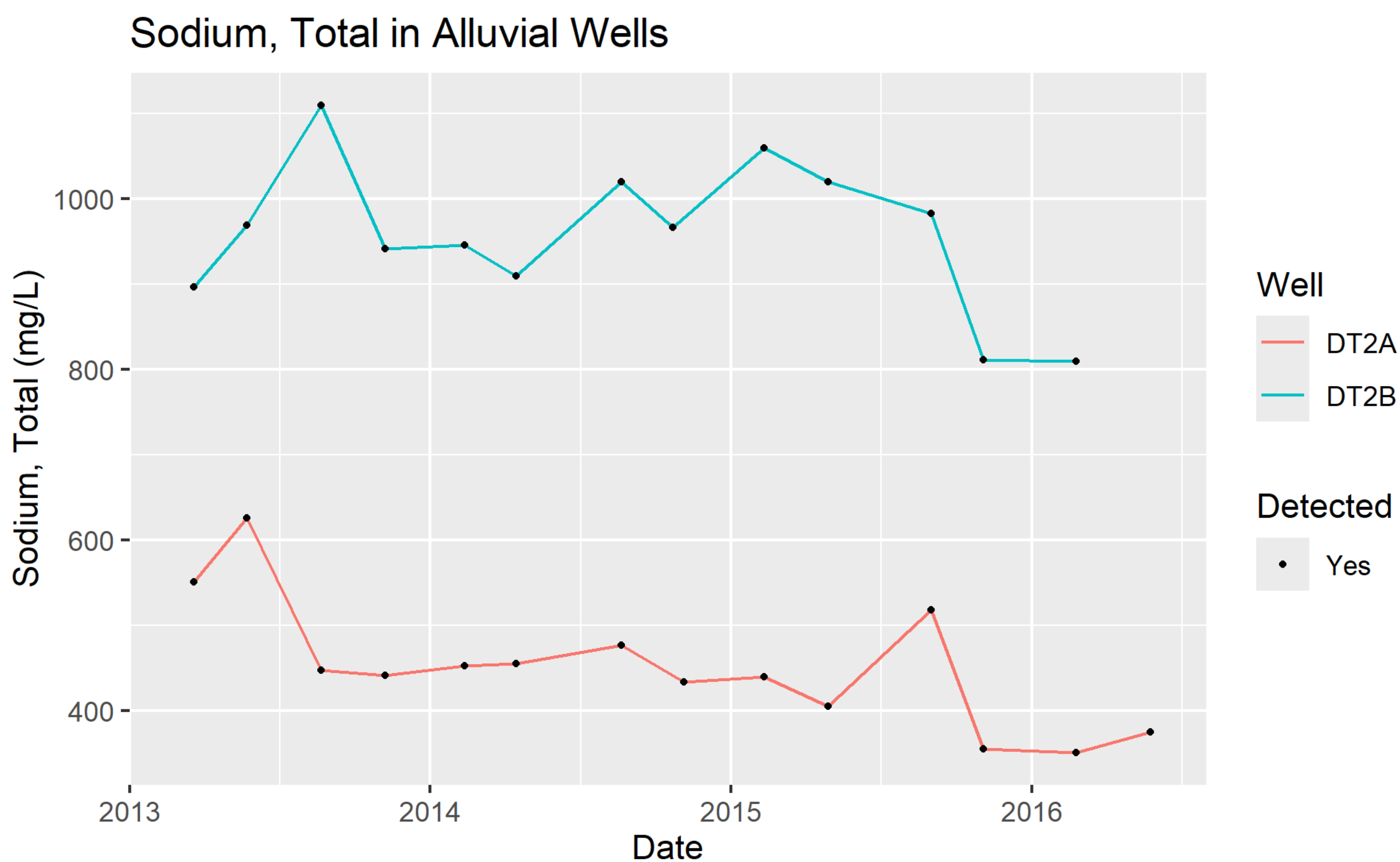


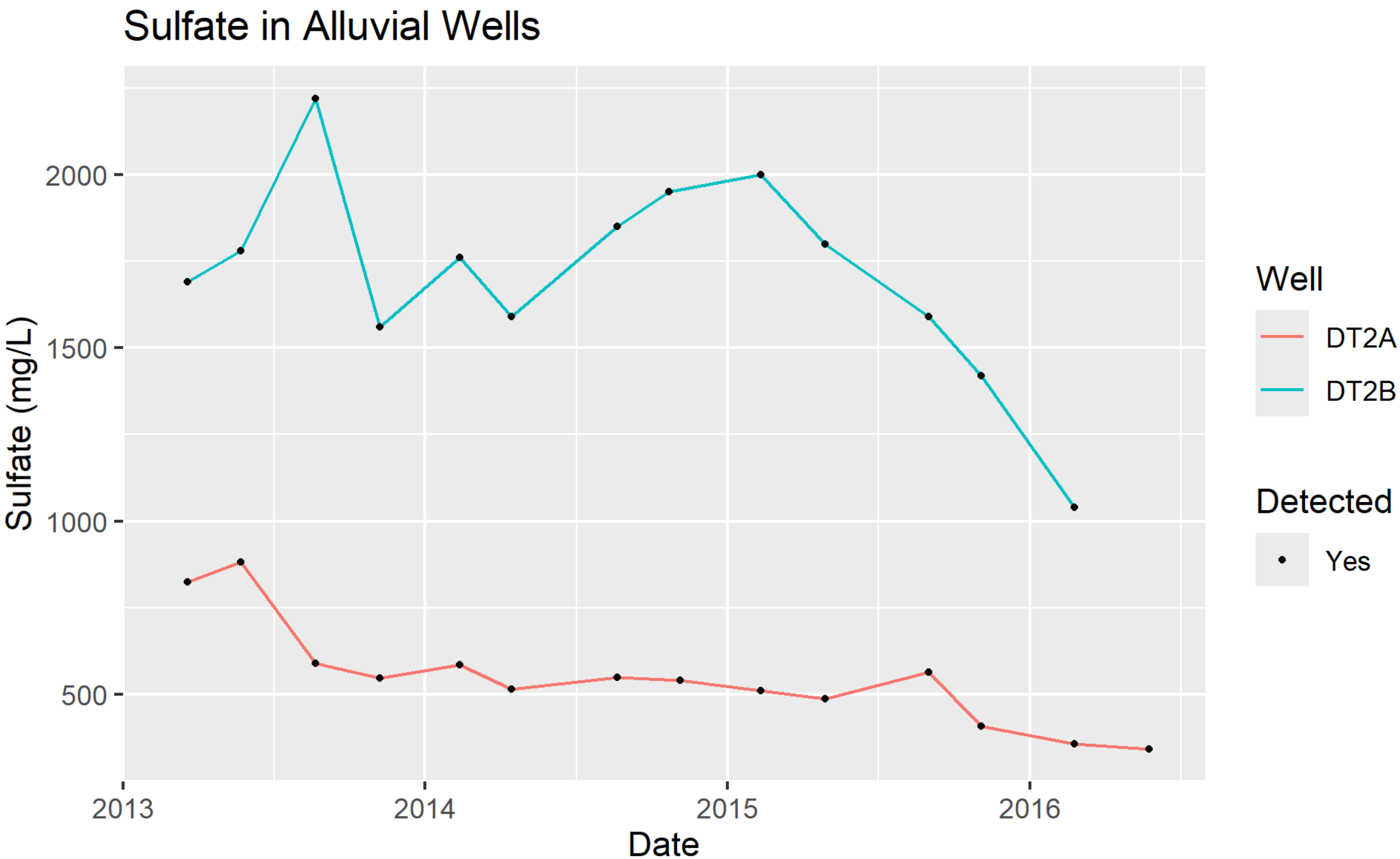
Phosphorus, Total in Alluvial Wells
Phosphorus, Total (mg/L)
0.0
0.3
0.6
0.9
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No
Yes

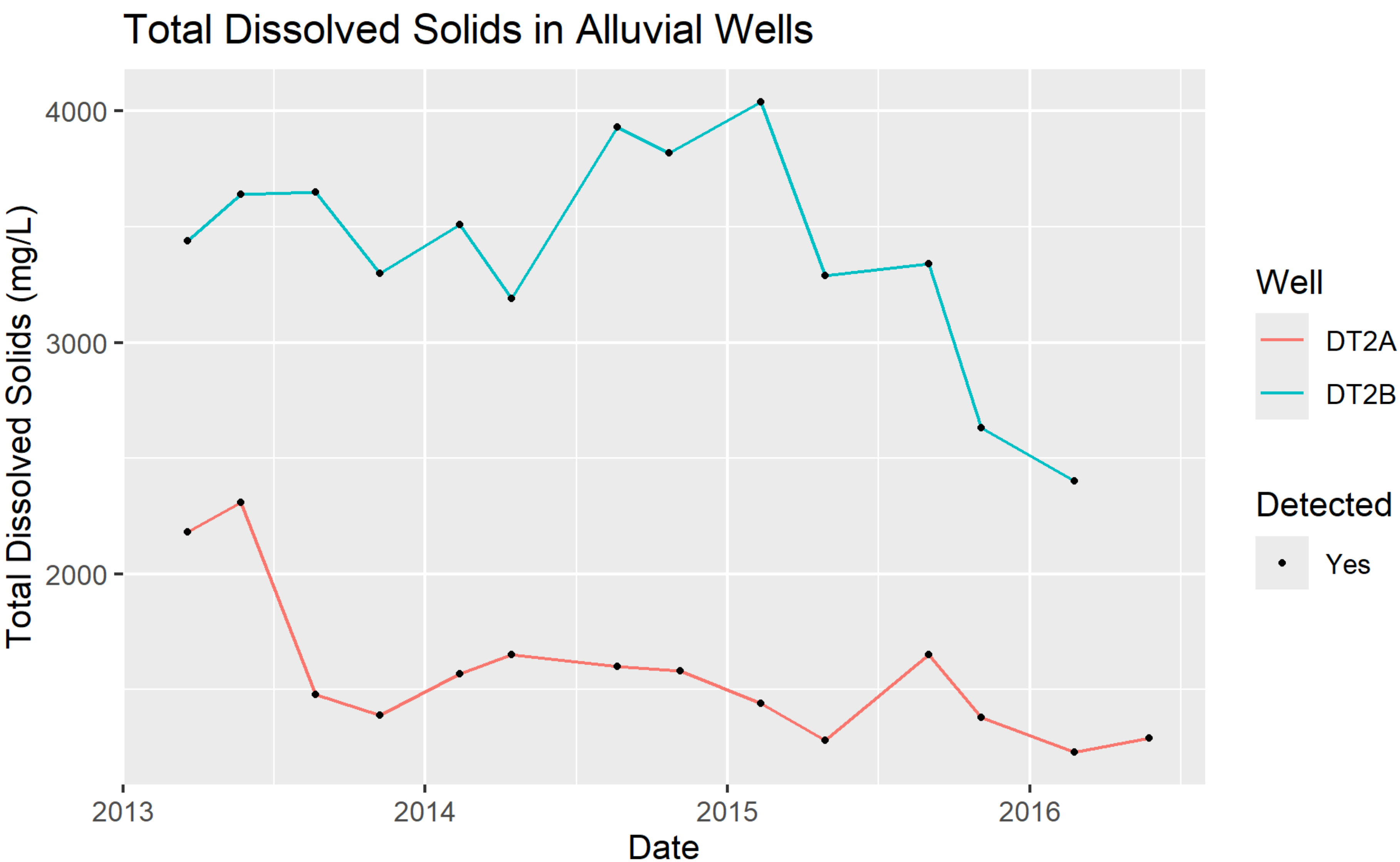


Potassium, Total in Alluvial Wells
Potassium, Total (mg/L)
7.5
5.0
2.5
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes


Selenium, Total in Alluvial Wells
Selenium, Total (mg/L)
0.100
0.075
0.050
0.025
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
No
Yes

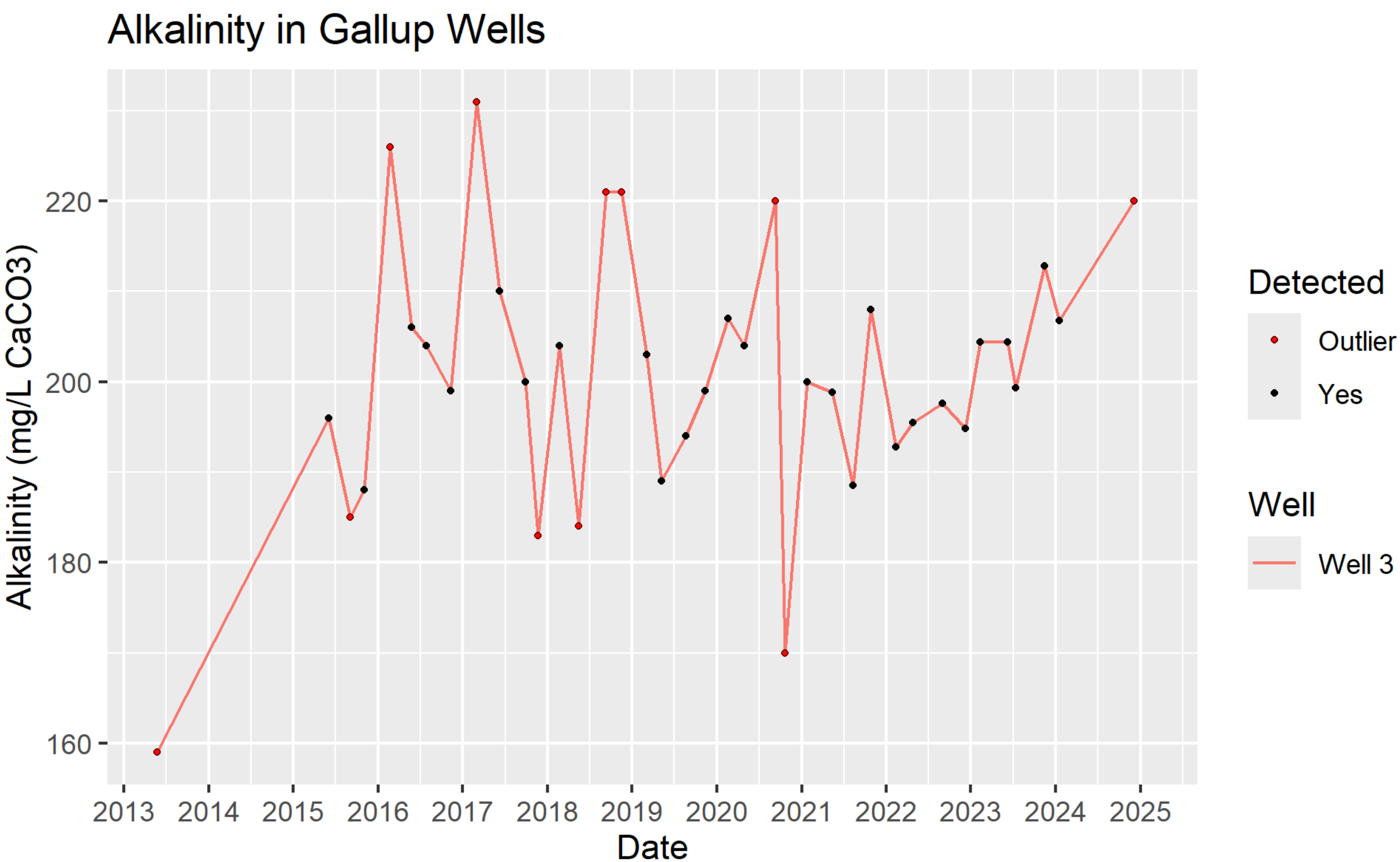

Sodium, Total in Alluvial Wells
Sodium, Total (mg/L)
1000
800
600
400
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes


Sulfate in Alluvial Wells
Sulfate (mg/L)
2000
1500
1000
500
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

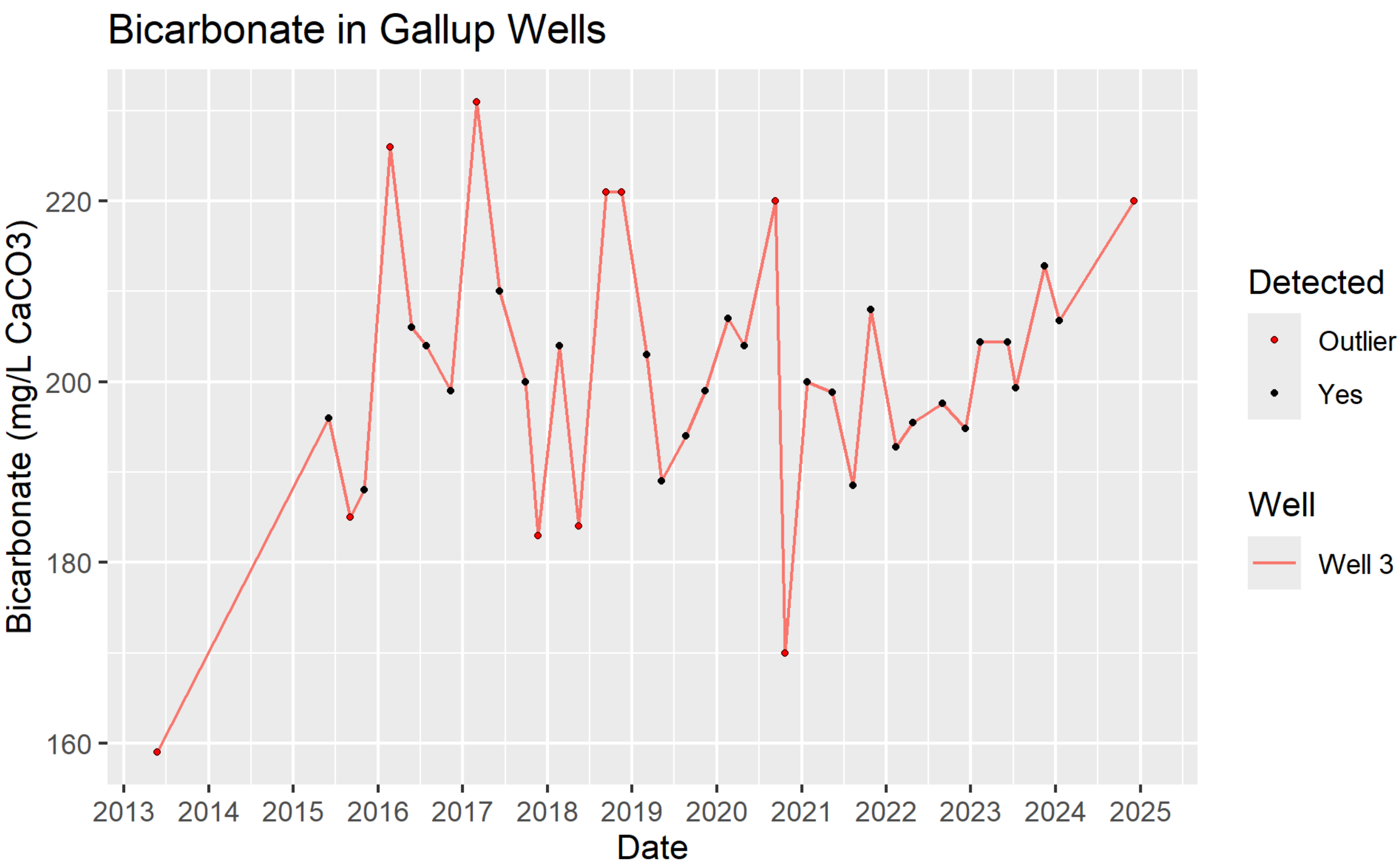

Total Dissolved Solids in Alluvial Wells
Total Dissolved Solids (mg/L)
4000
3000
2000
2013
2014
2015
2016
Date
Well
DT2A
DT2B
Detected
Yes

APPENDIX D

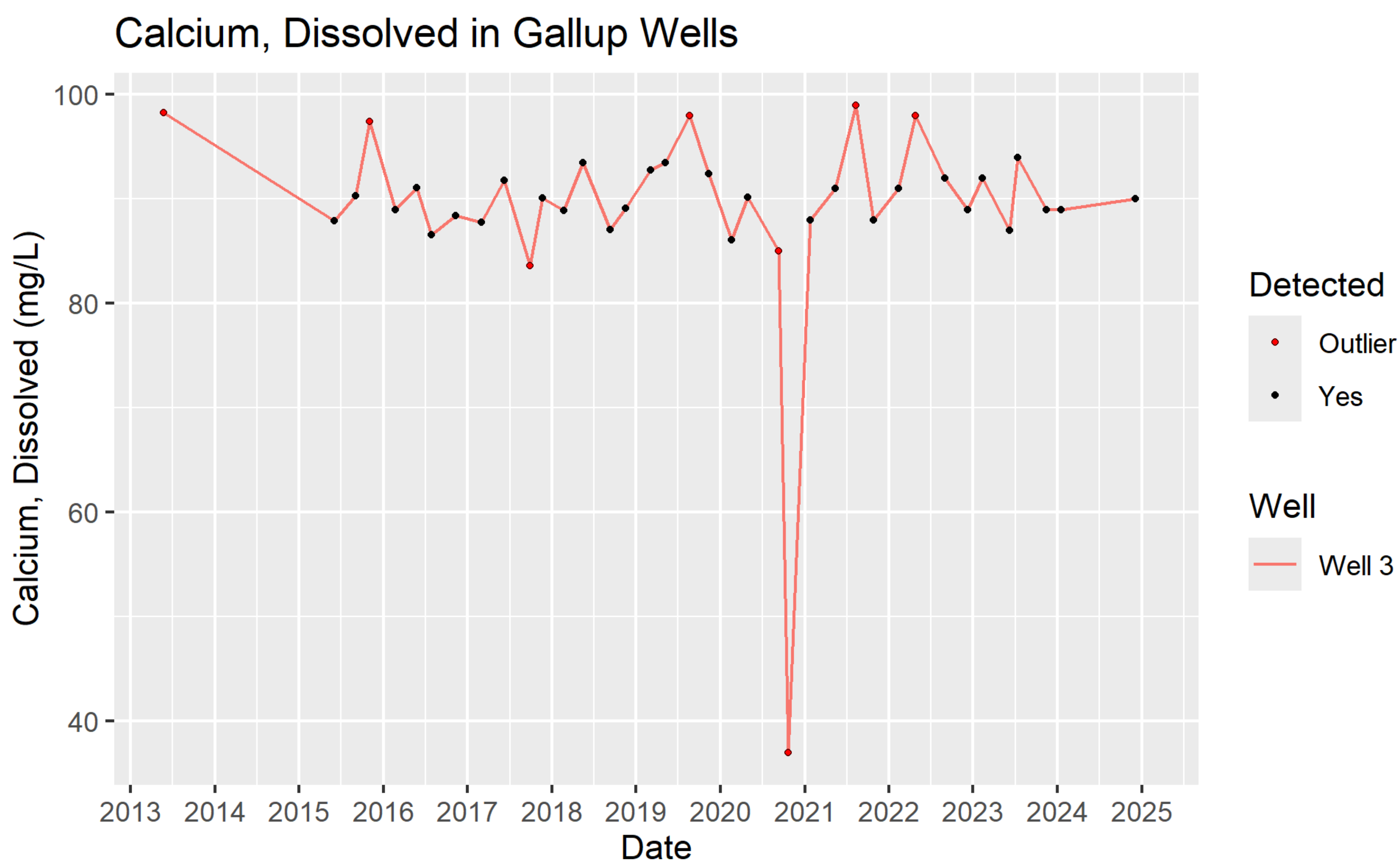
GROUNDWATER QUALITY – GSA WELL 3: TEMPORAL PLOTS

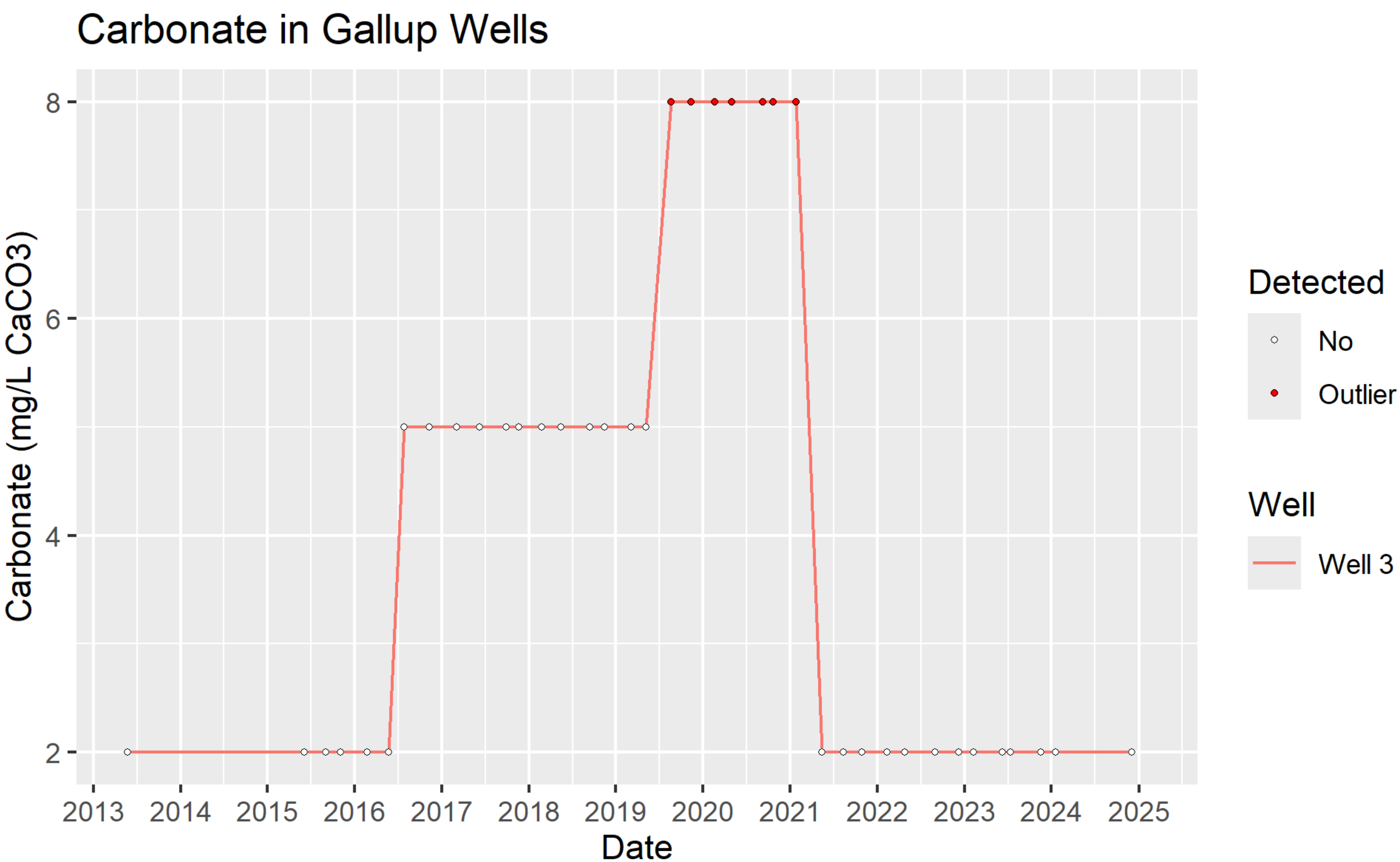


Alkalinity in Gallup Wells
Alkalinity (mg/L CaCO3)
220
200
180
160
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

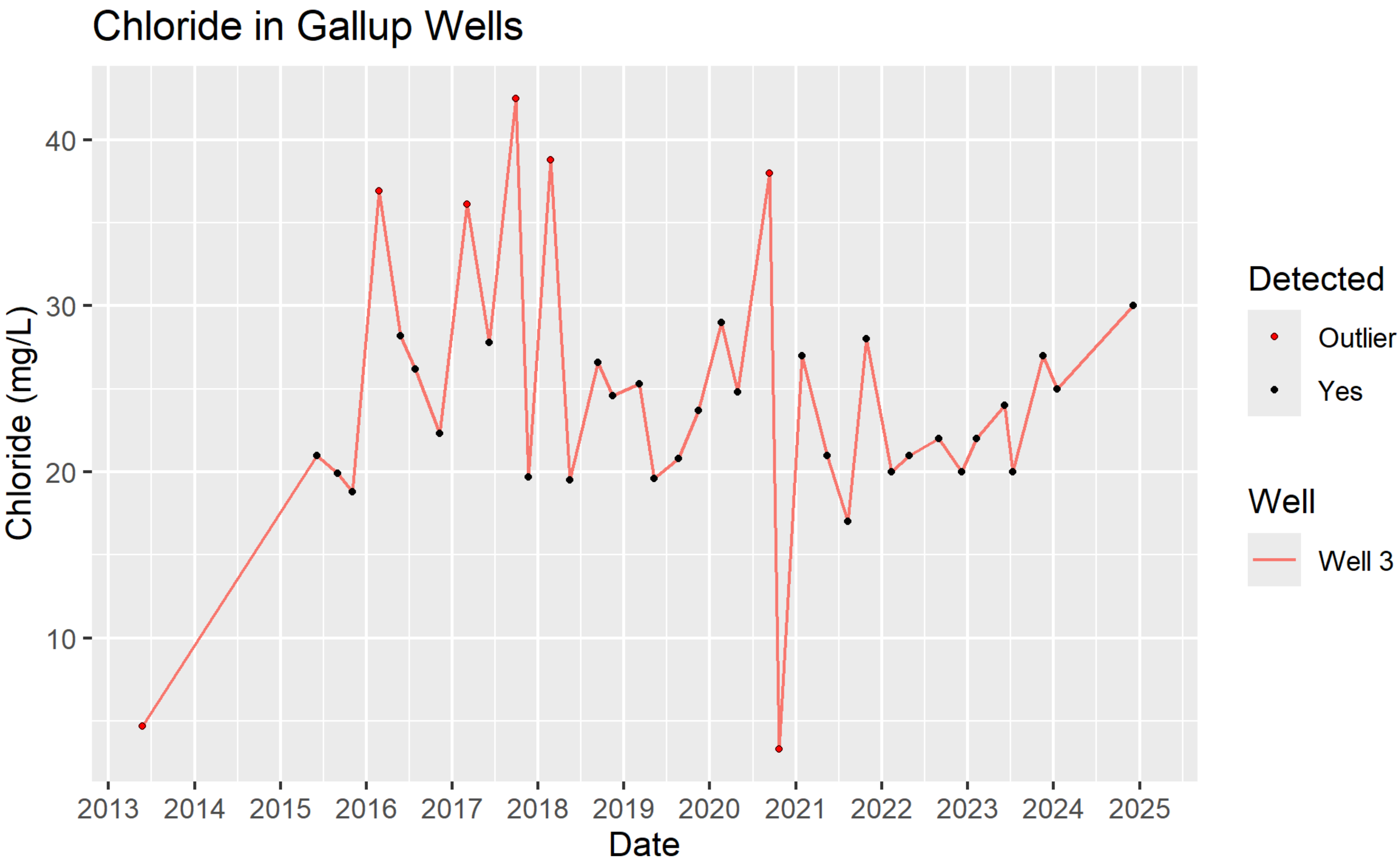


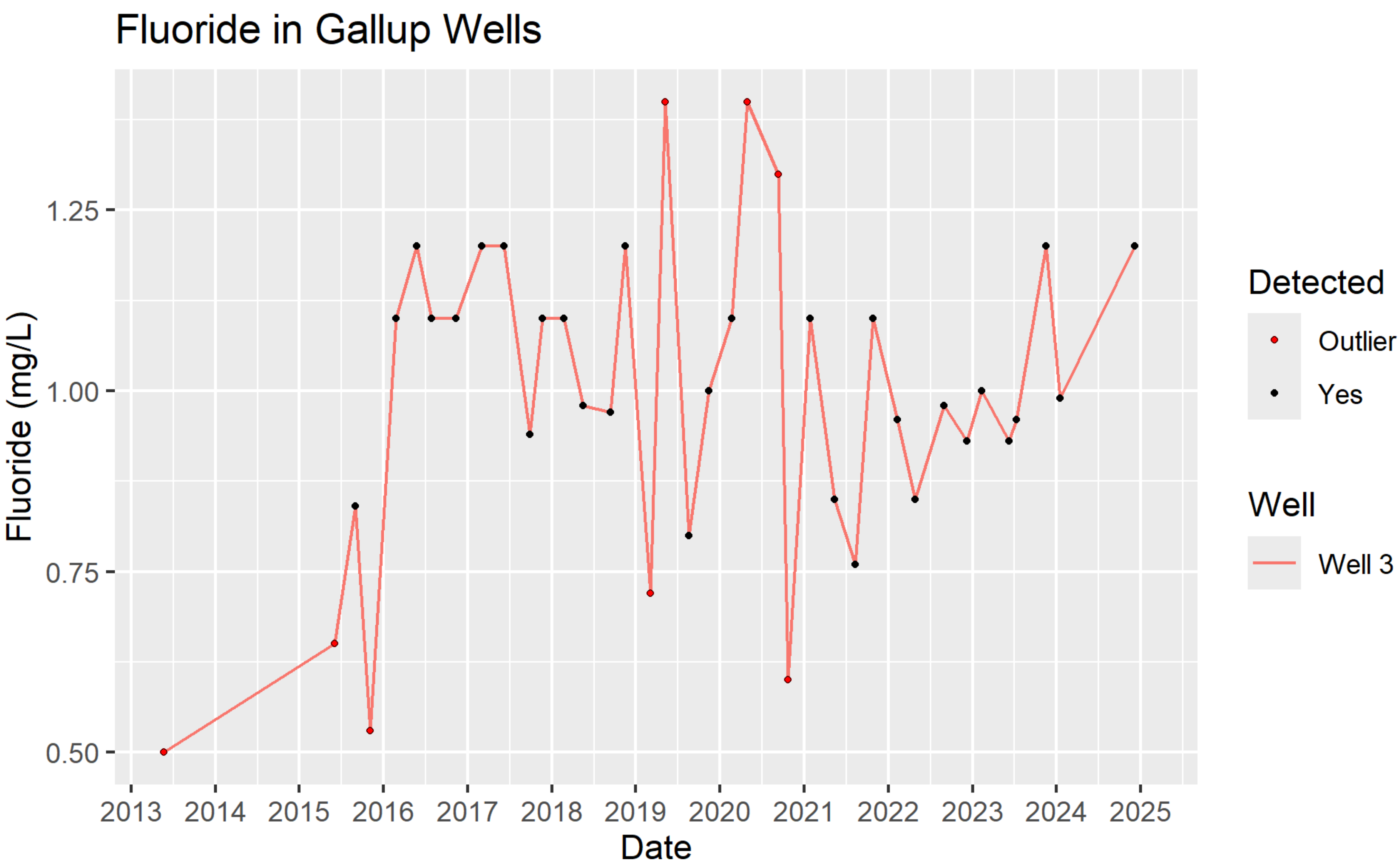
Bicarbonate in Gallup Wells
Bicarbonate (mg/L CaCO3)
220
200
180
160
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3


Calcium, Dissolved in Gallup Wells
Calcium, Dissolved (mg/L)
100
80
60
40
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

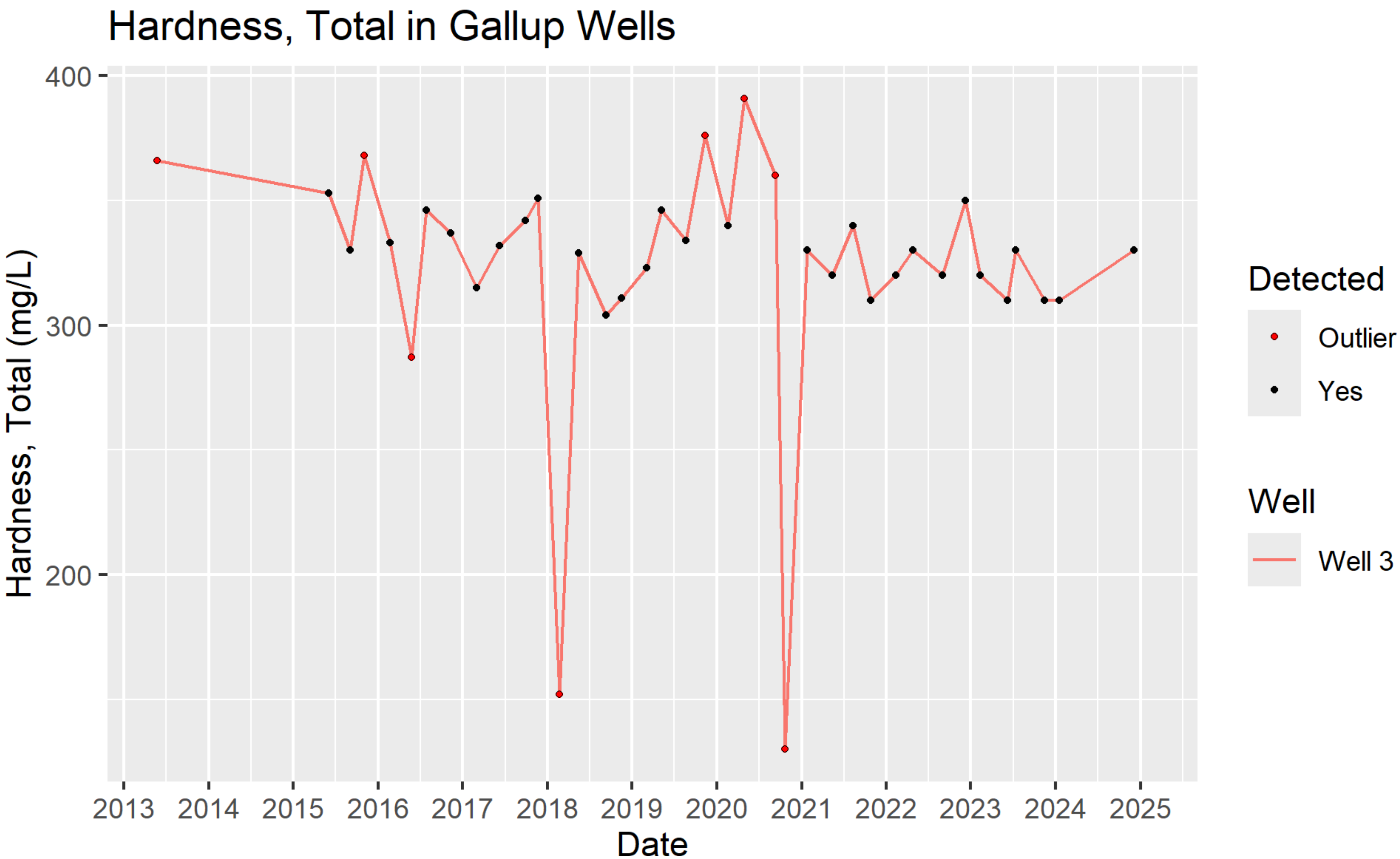


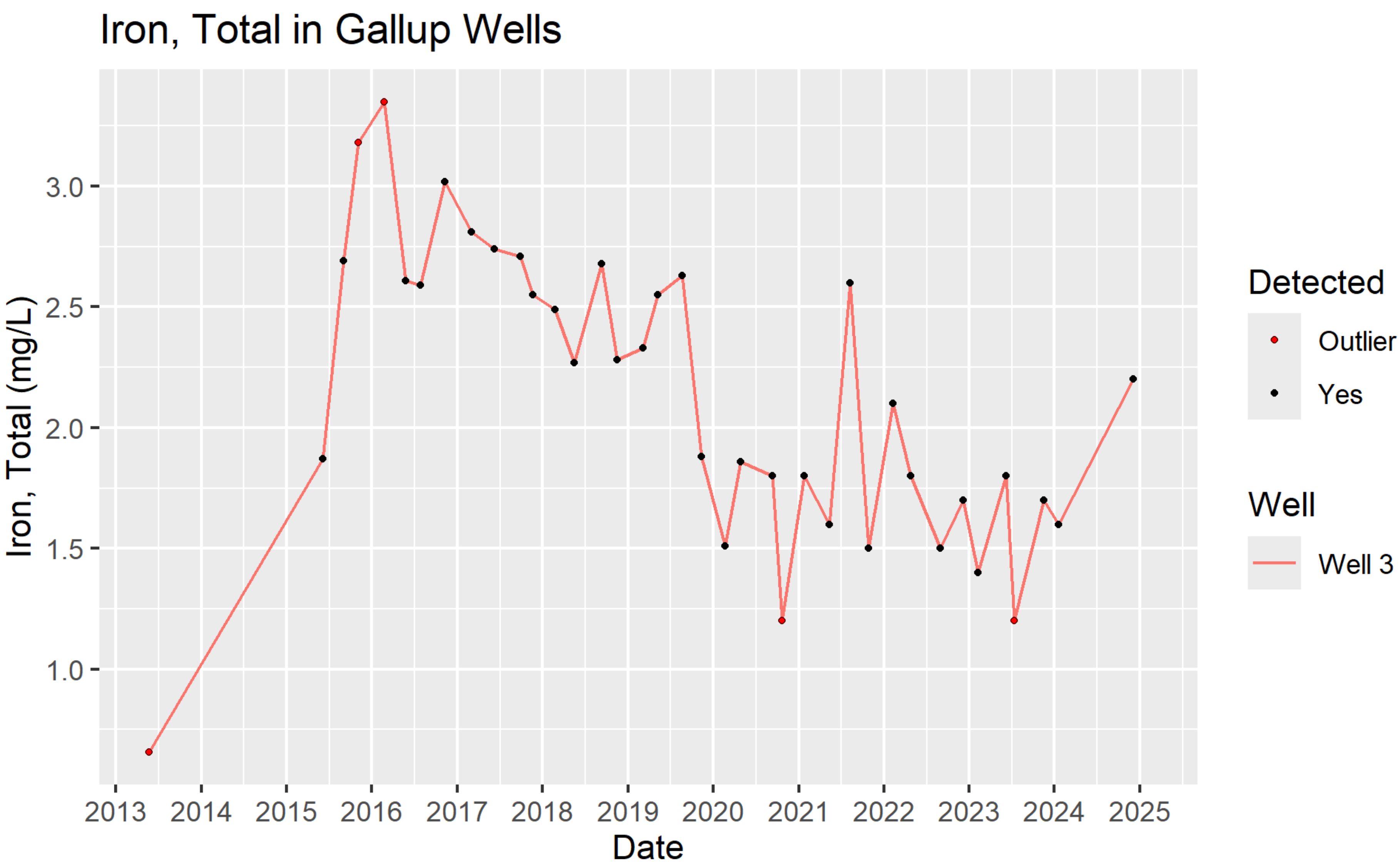
Carbonate in Gallup Wells
Carbonate (mg/L CaCO3)
8
6
4
2
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
No
Outlier
Well
Well 3

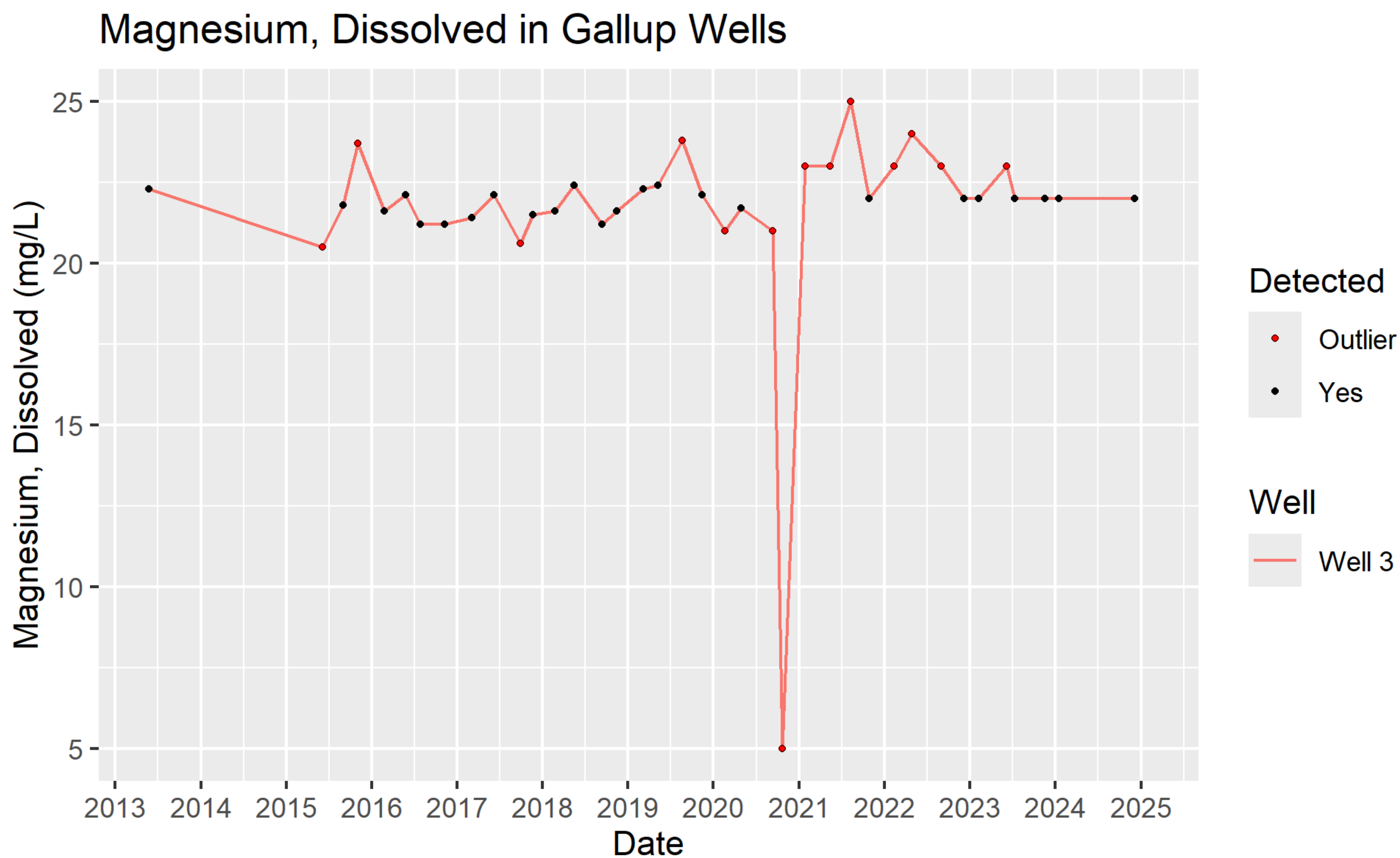

Chloride in Gallup Wells
Chloride (mg/L)
40
30
20
10
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

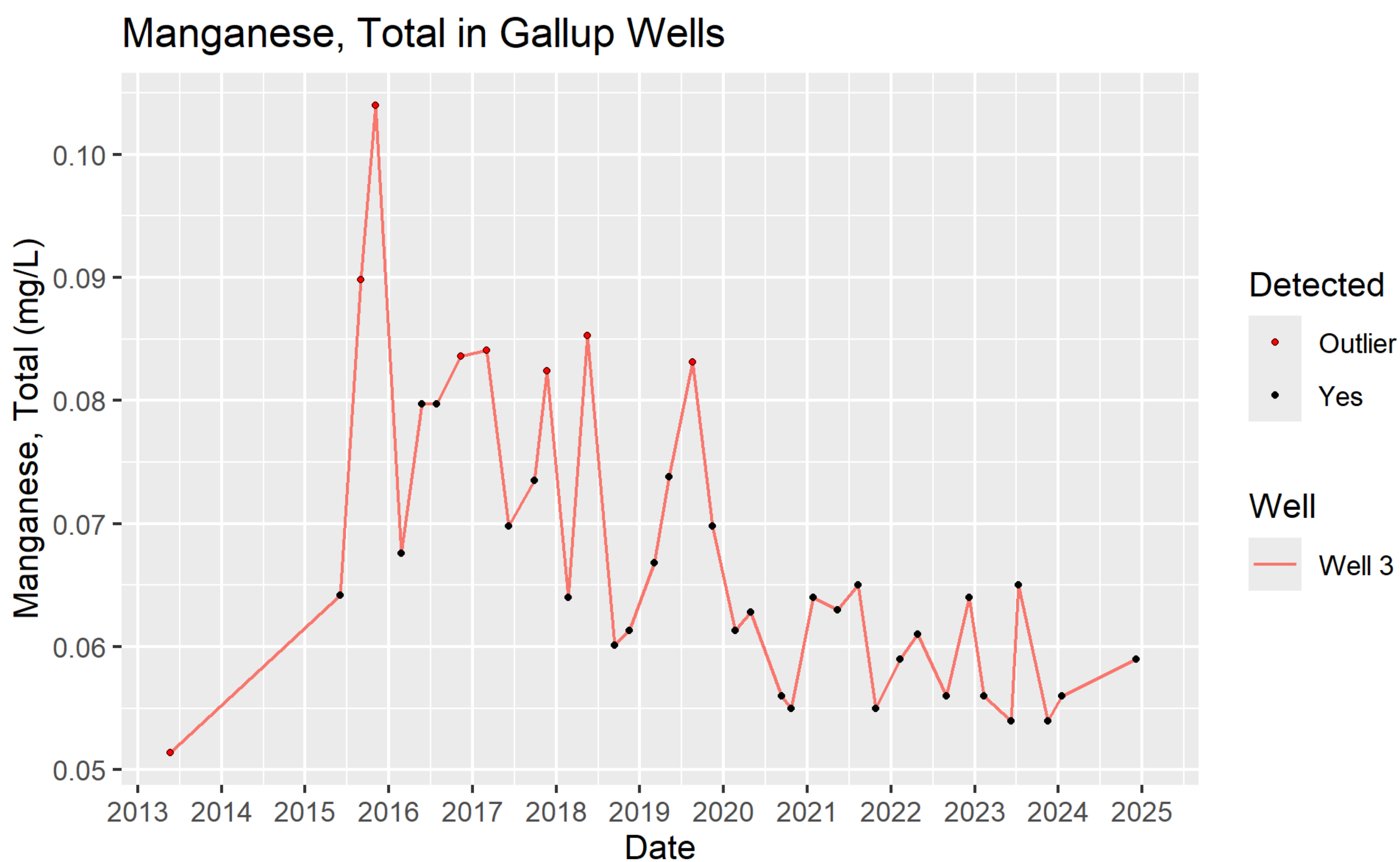


Fluoride in Gallup Wells
Fluoride (mg/L)
1.25
1.00
0.75
0.50
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

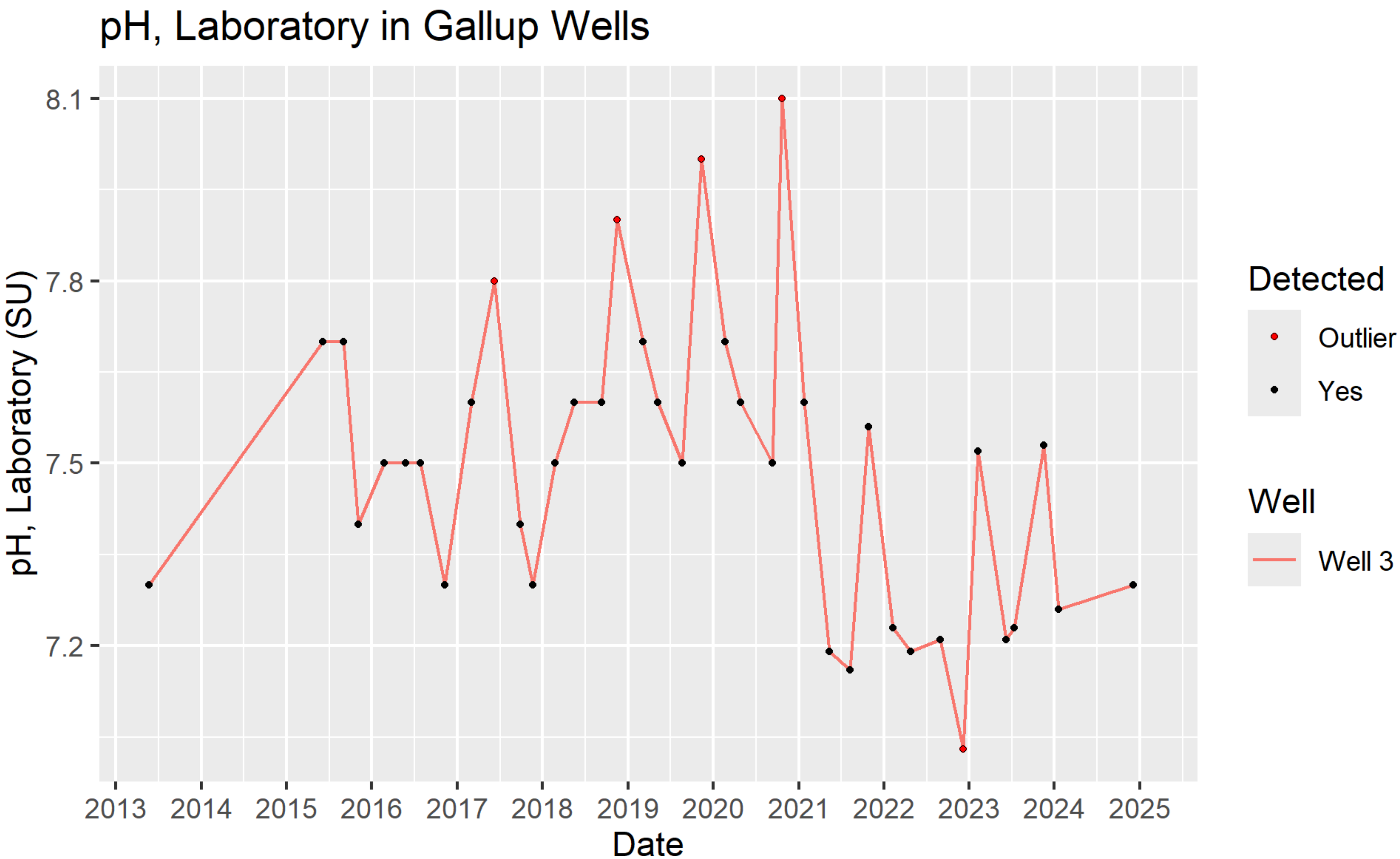

Hardness, Total in Gallup Wells
Hardness, Total (mg/L)
400
300
200
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

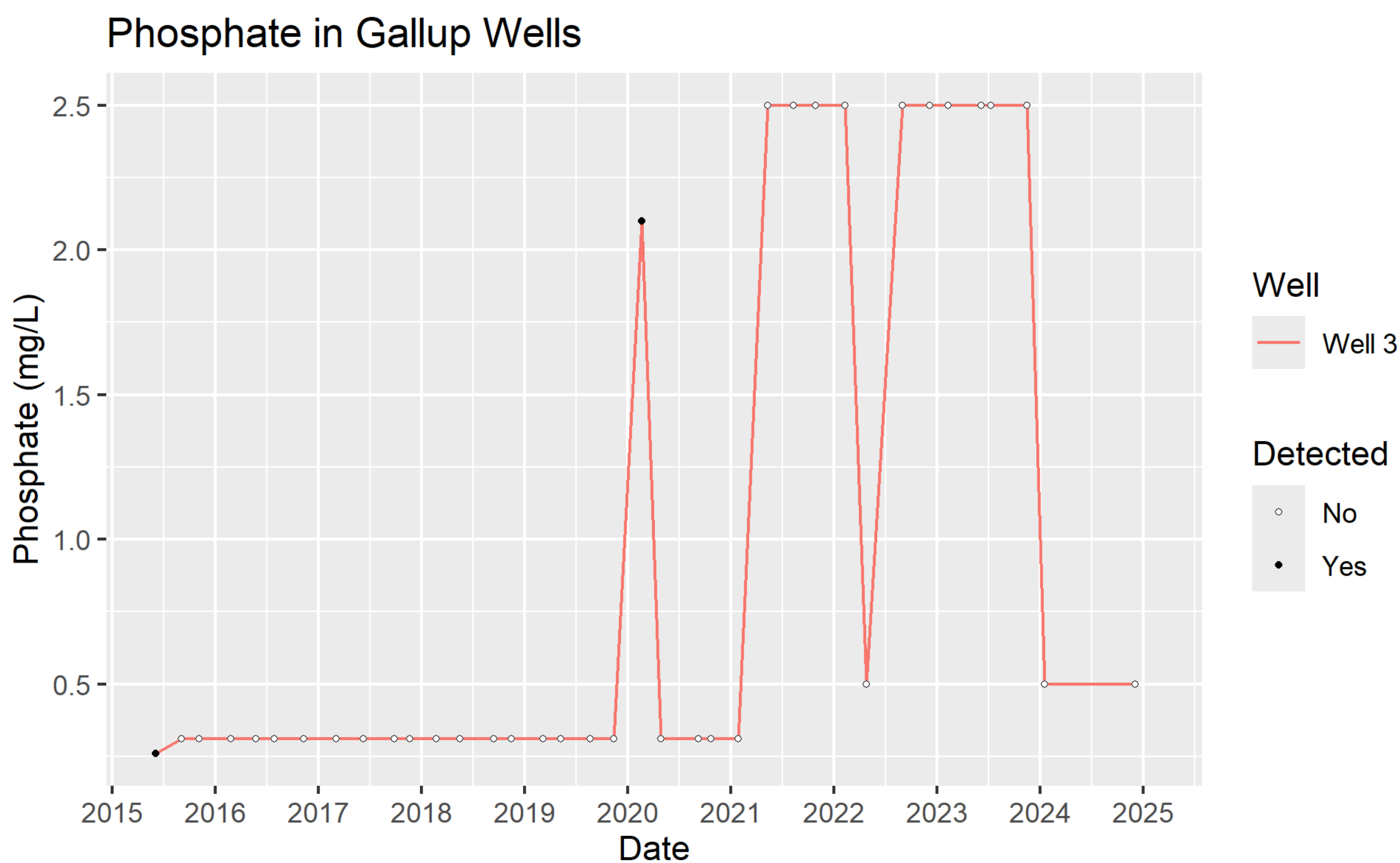

Iron, Total in Gallup Wells
Iron, Total (mg/L)
3.0
2.5
2.0
1.5
1.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

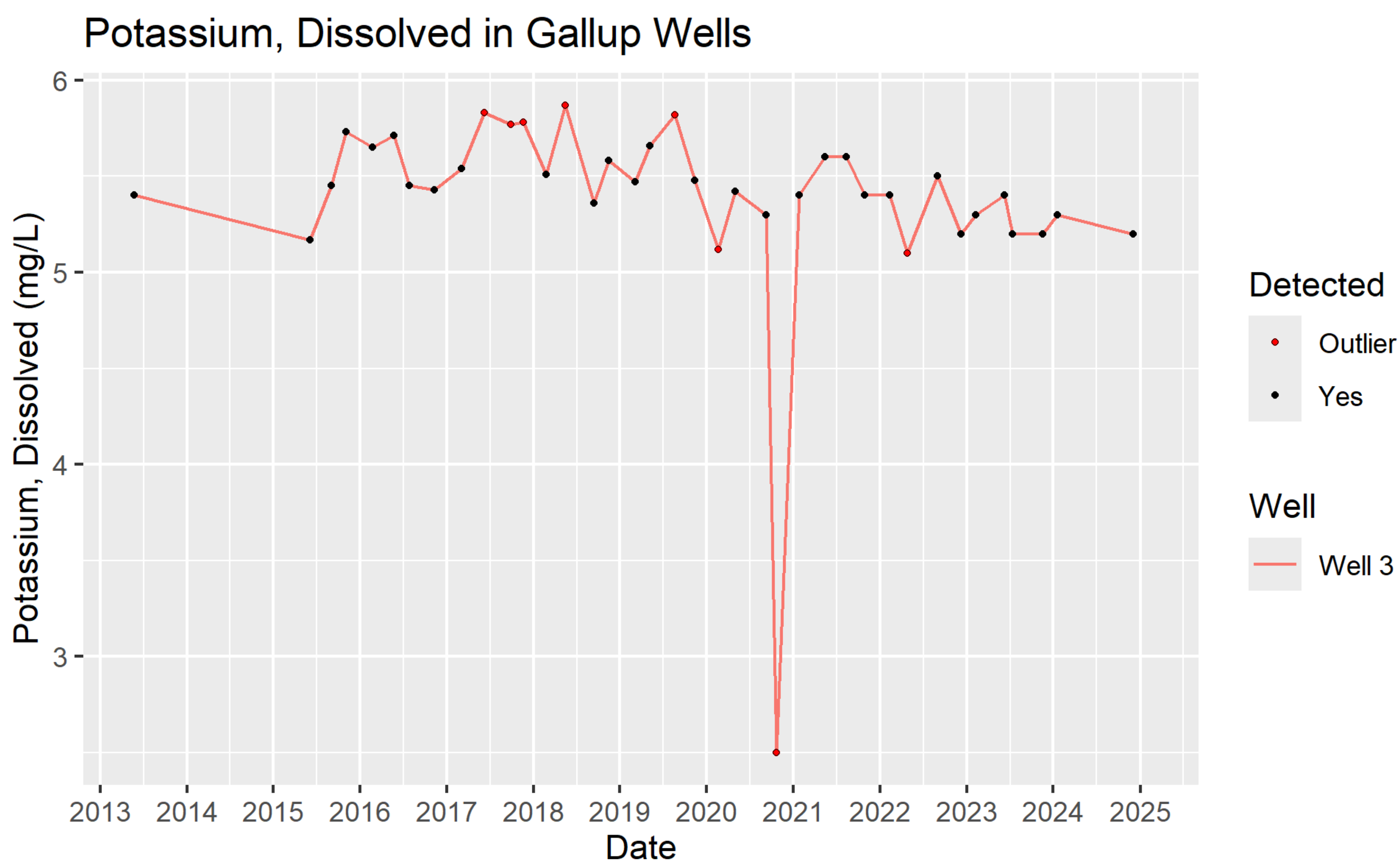

Magnesium, Dissolved in Gallup Wells
Magnesium, Dissolved (mg/L)
25
20
15
10
5
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

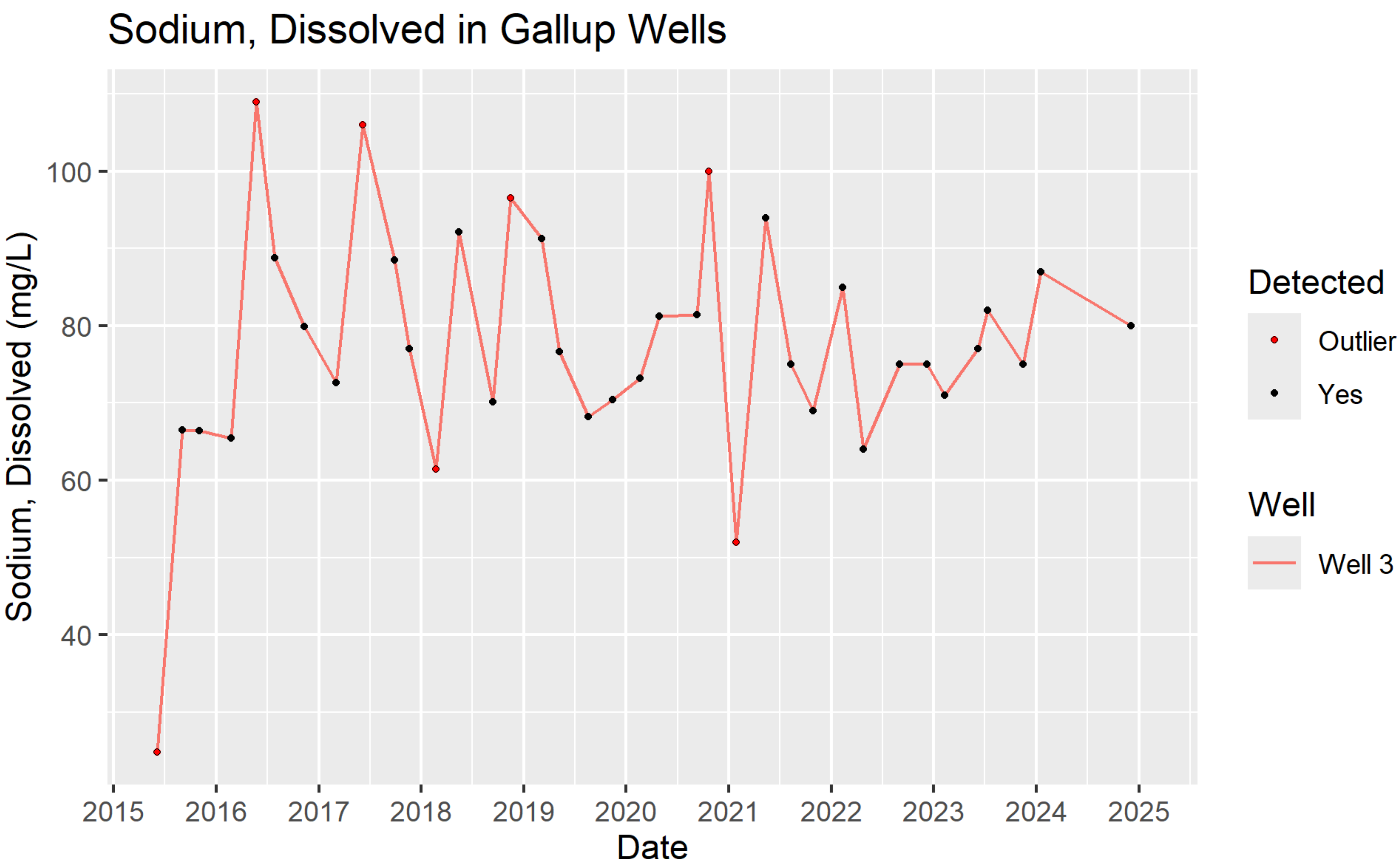


Manganese, Total in Gallup Wells
Manganese, Total (mg/L)
0.10
0.09
0.08
0.07
0.06
0.05
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

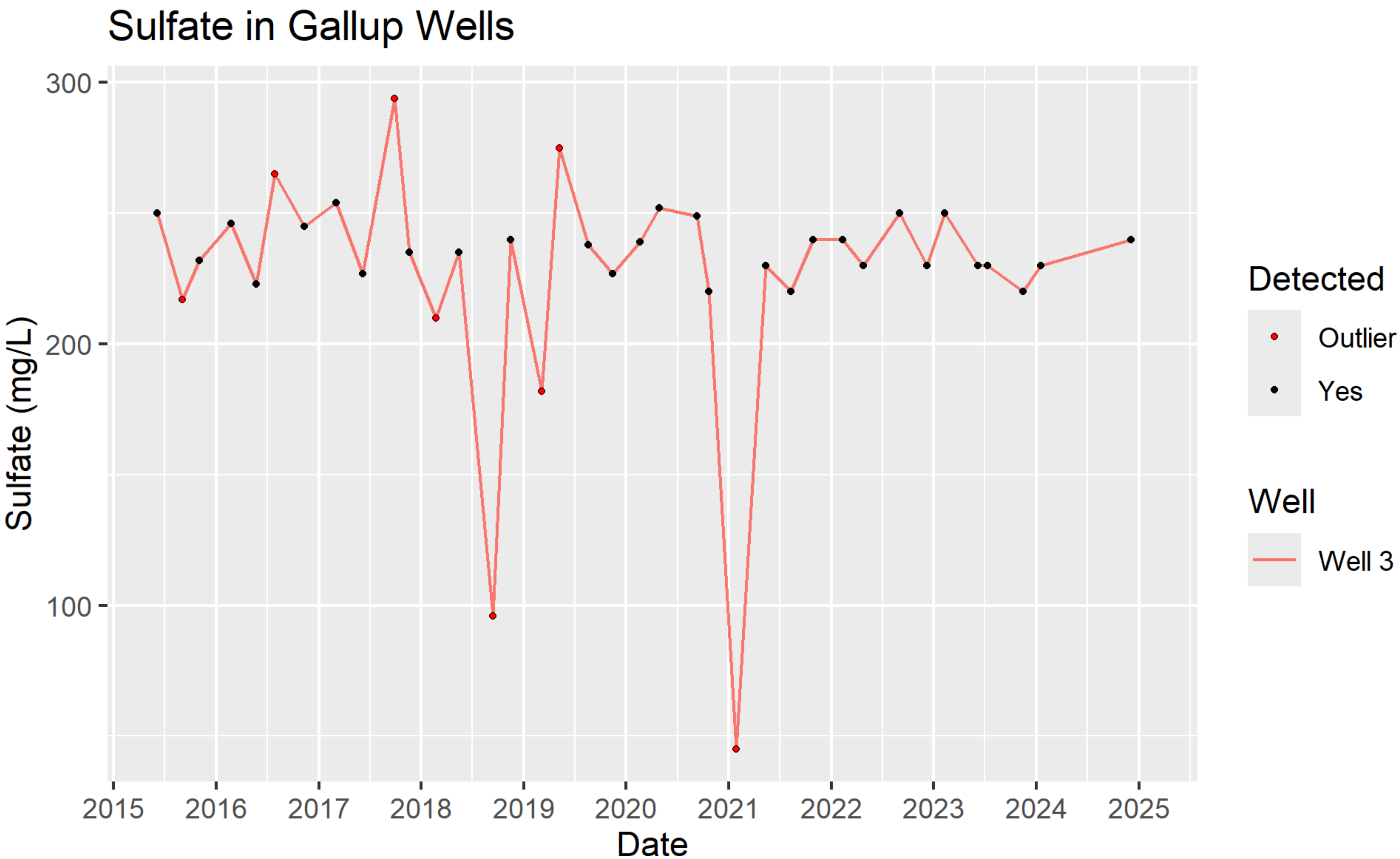

pH, Laboratory in Gallup Wells
pH, Laboratory (SU)
8.1
7.8
7.5
7.2
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3


Phosphate in Gallup Wells
Phosphate (mg/L)
2.5
2.0
1.5
1.0
0.5
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 3
Detected
No
Yes

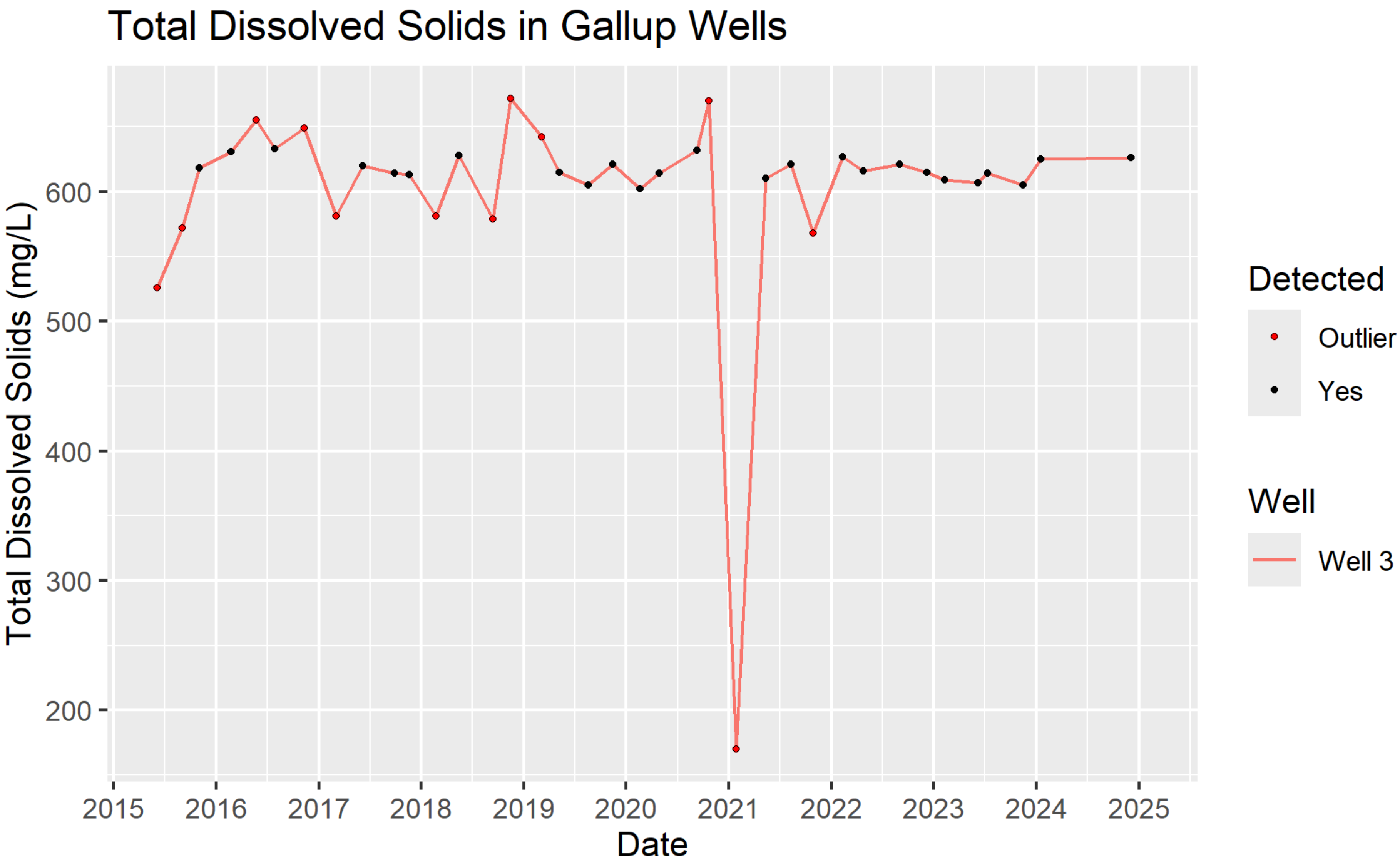

Potassium, Dissolved in Gallup Wells
6
5
4
3
Potassium, Dissolved (mg/L)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

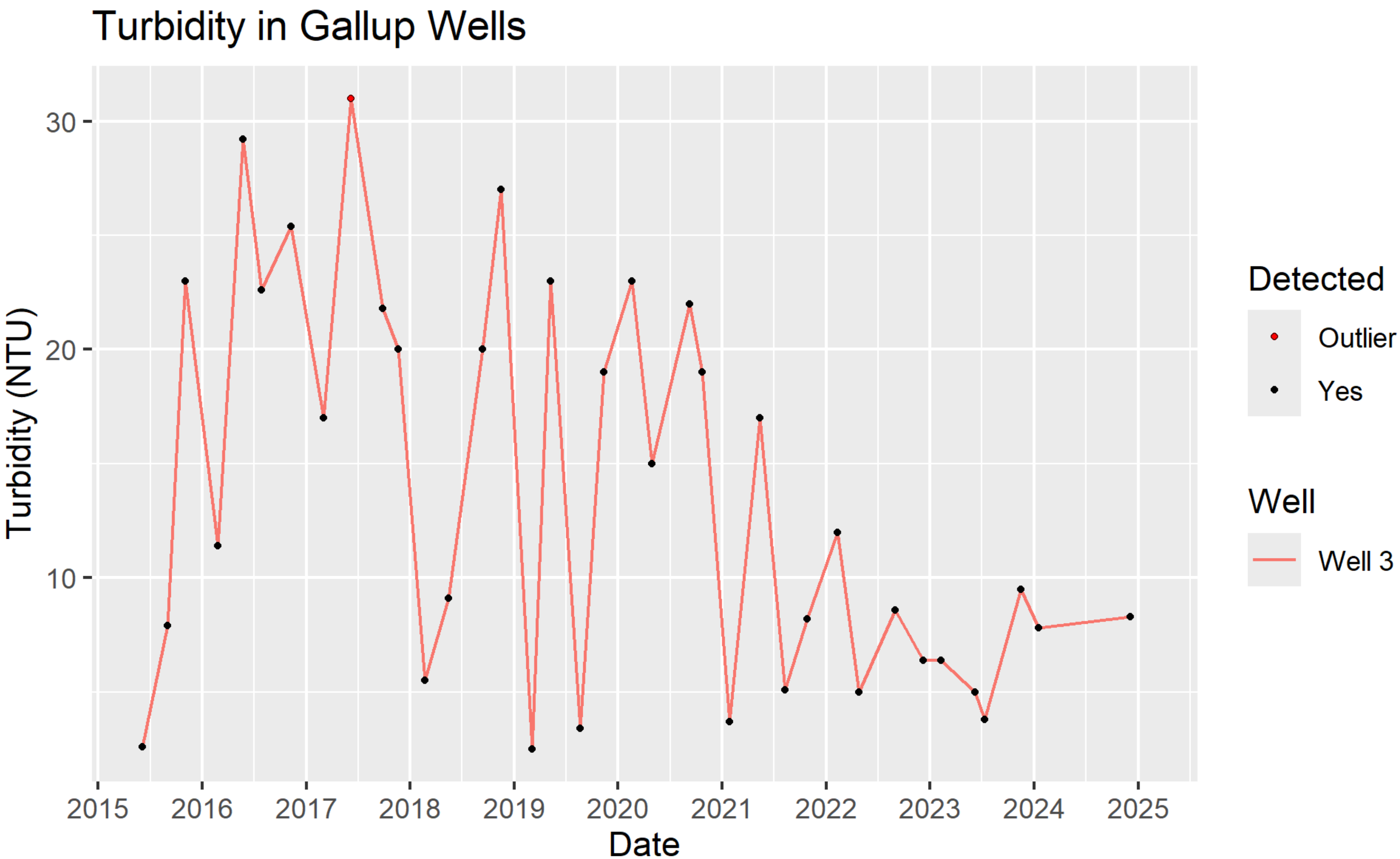


Sodium, Dissolved in Gallup Wells
Sodium, Dissolved (mg/L)
100
80
60
40
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3



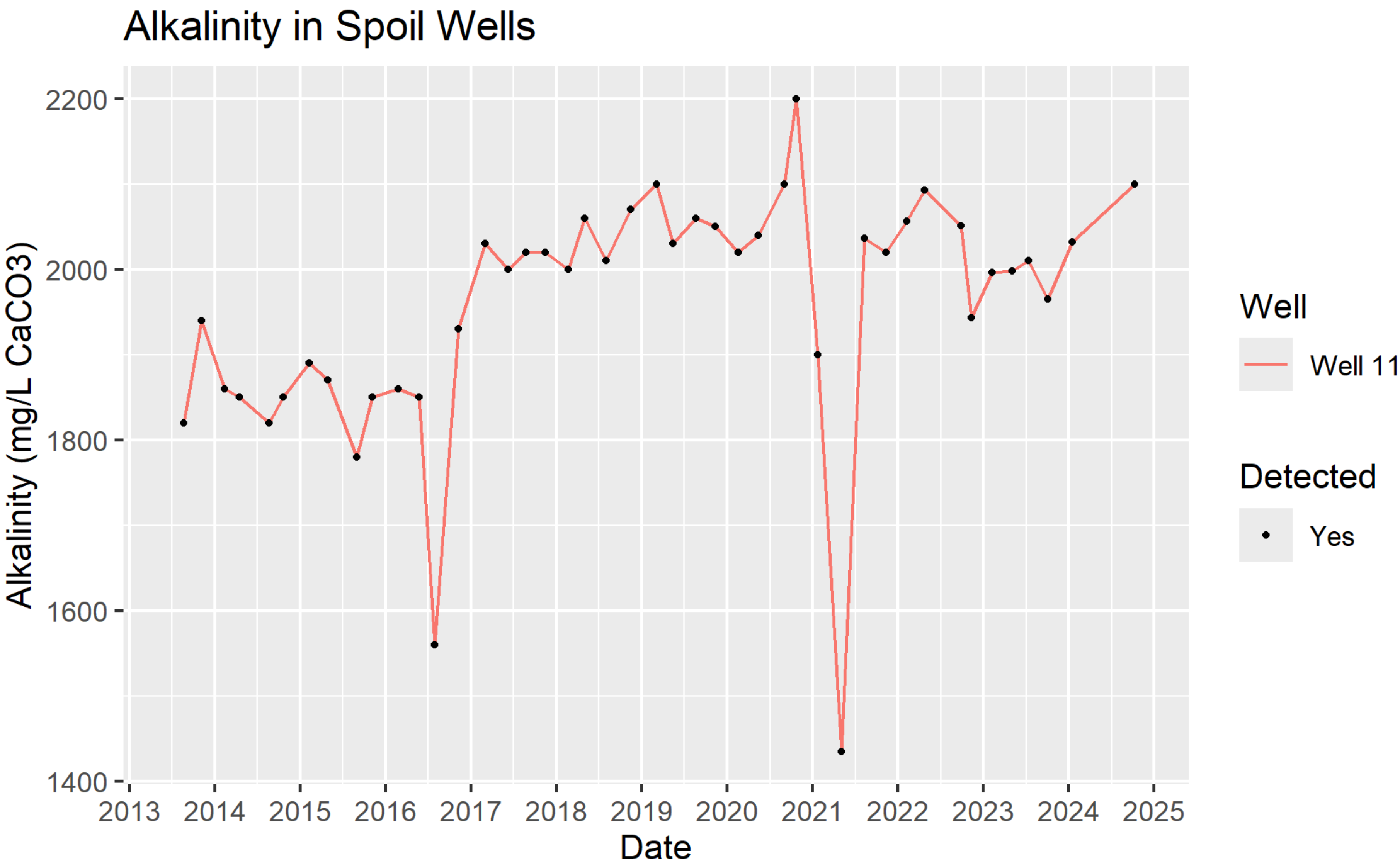
Sulfate in Gallup Wells
300
200
100
Sulfate (mg/L)
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3


Total Dissolved Solids in Gallup Wells
Total Dissolved Solids (mg/L)
200
300
400
500
600
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

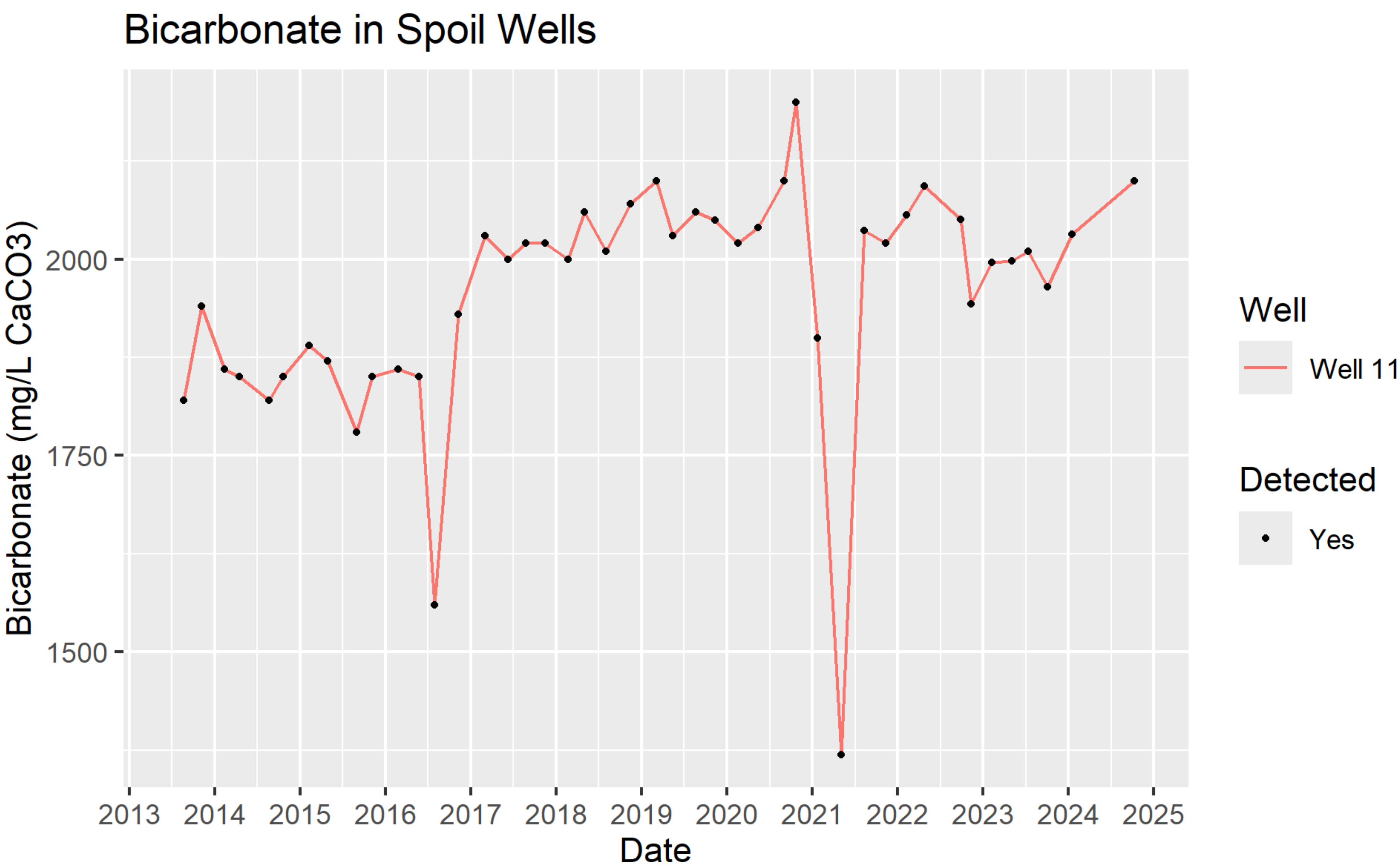

Turbidity in Gallup Wells
Turbidity (NTU)
30
20
10
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Detected
Outlier
Yes
Well
Well 3

APPENDIX E

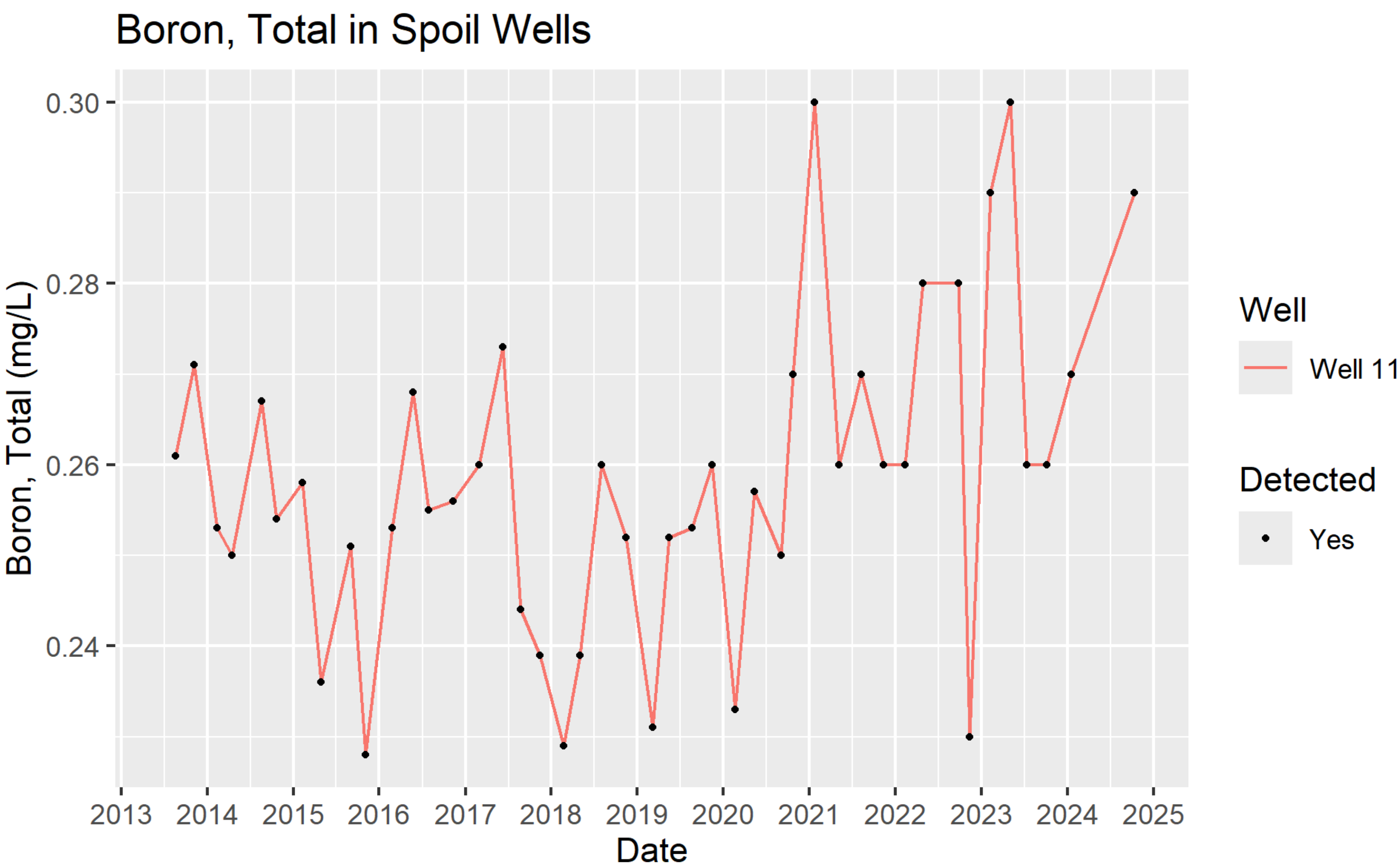
GROUNDWATER QUALITY – SPOIL WELL11: TEMPORAL PLOTS



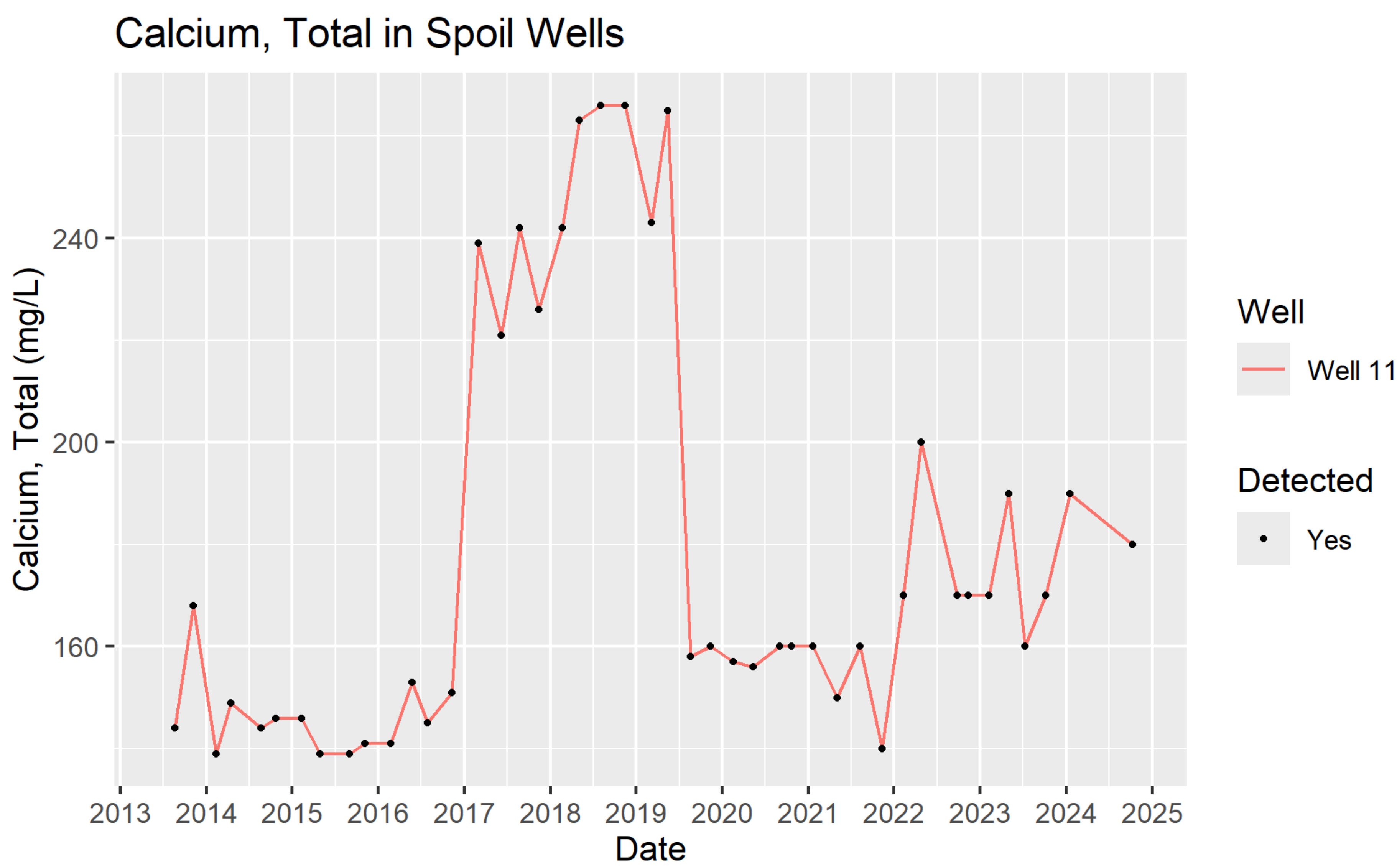
Alkalinity in Spoil Wells
Alkalinity (mg/L CaCO3)
2200
2000
1800
1600
1400
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



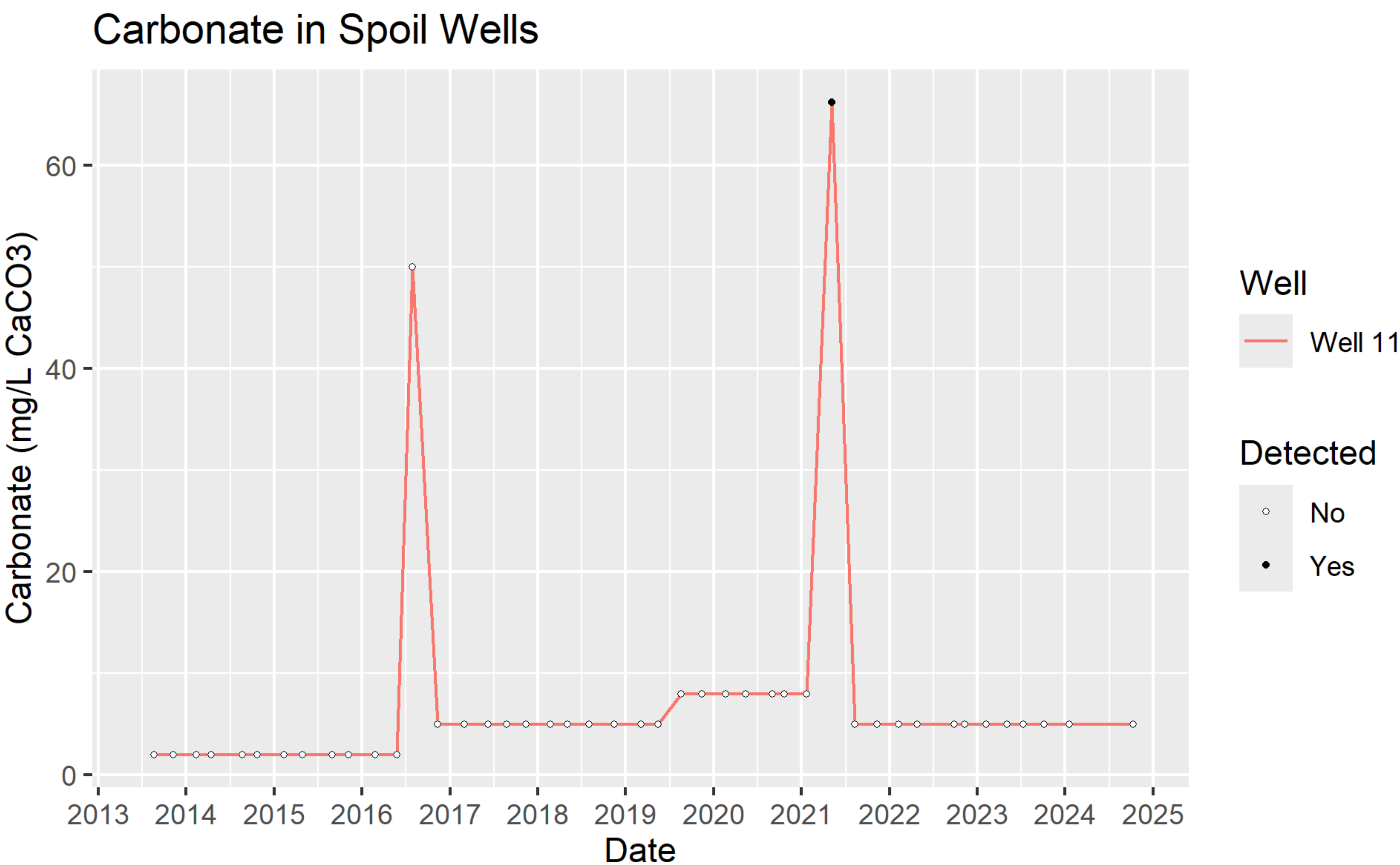
Bicarbonate in Spoil Wells
Bicarbonate (mg/L CaCO3)
2000
1750
1500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



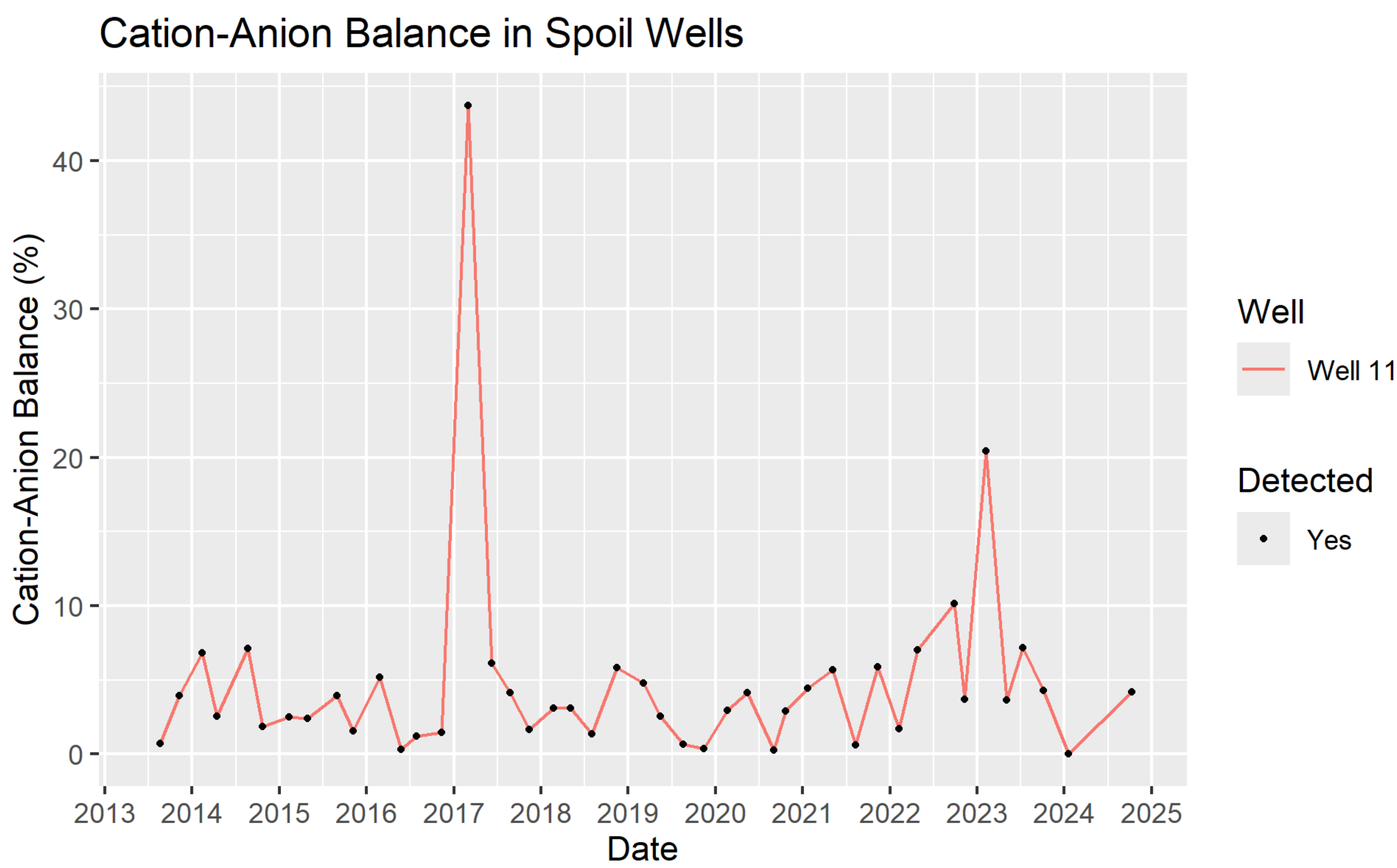
Boron, Total in Spoil Wells
Boron, Total (mg/L)
0.30
0.28
0.26
0.24
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



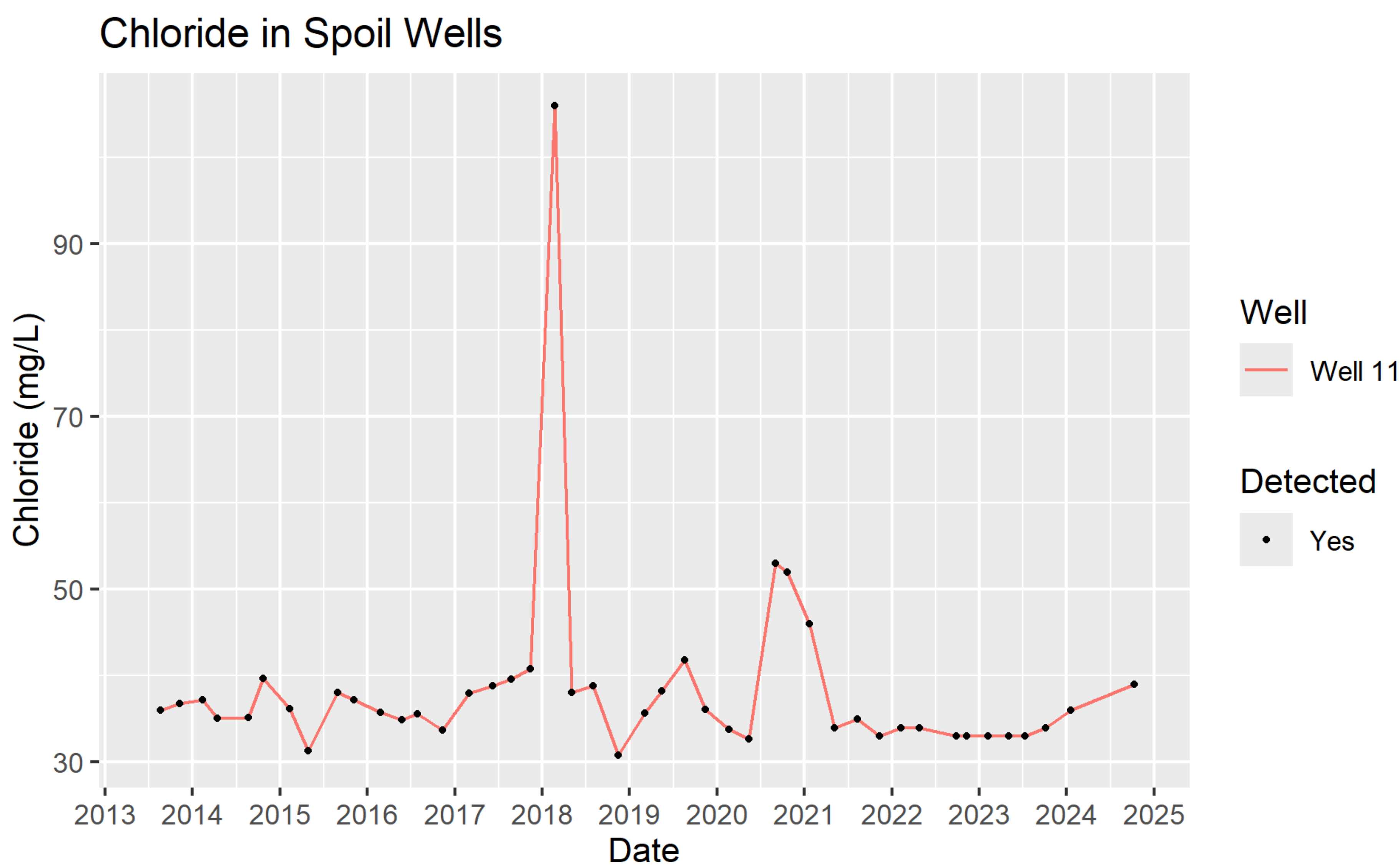
Calcium, Total in Spoil Wells
Calcium, Total (mg/L)
240
200
160
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



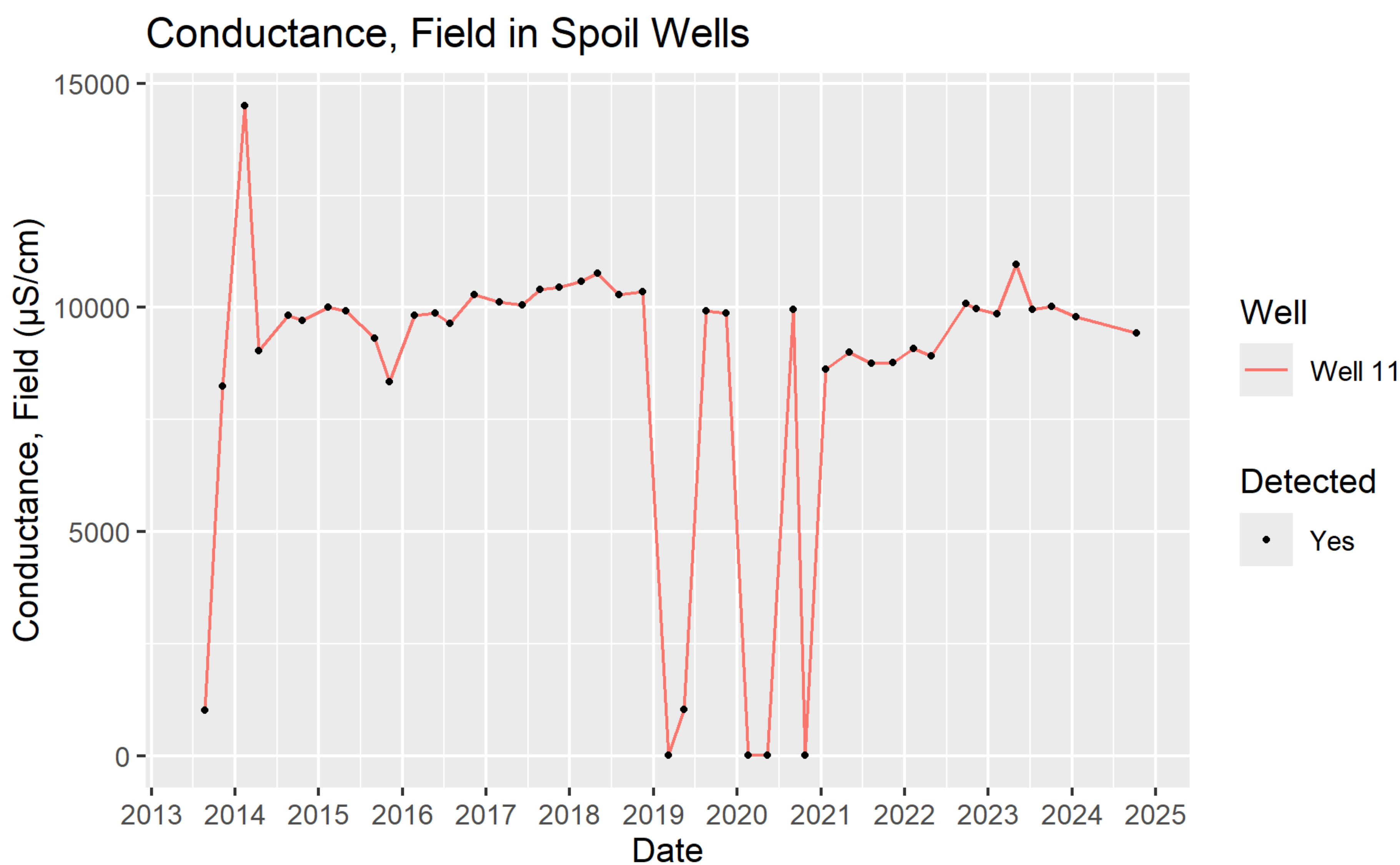
Carbonate in Spoil Wells
Carbonate (mg/L CaCO3)
0
20
40
60
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes



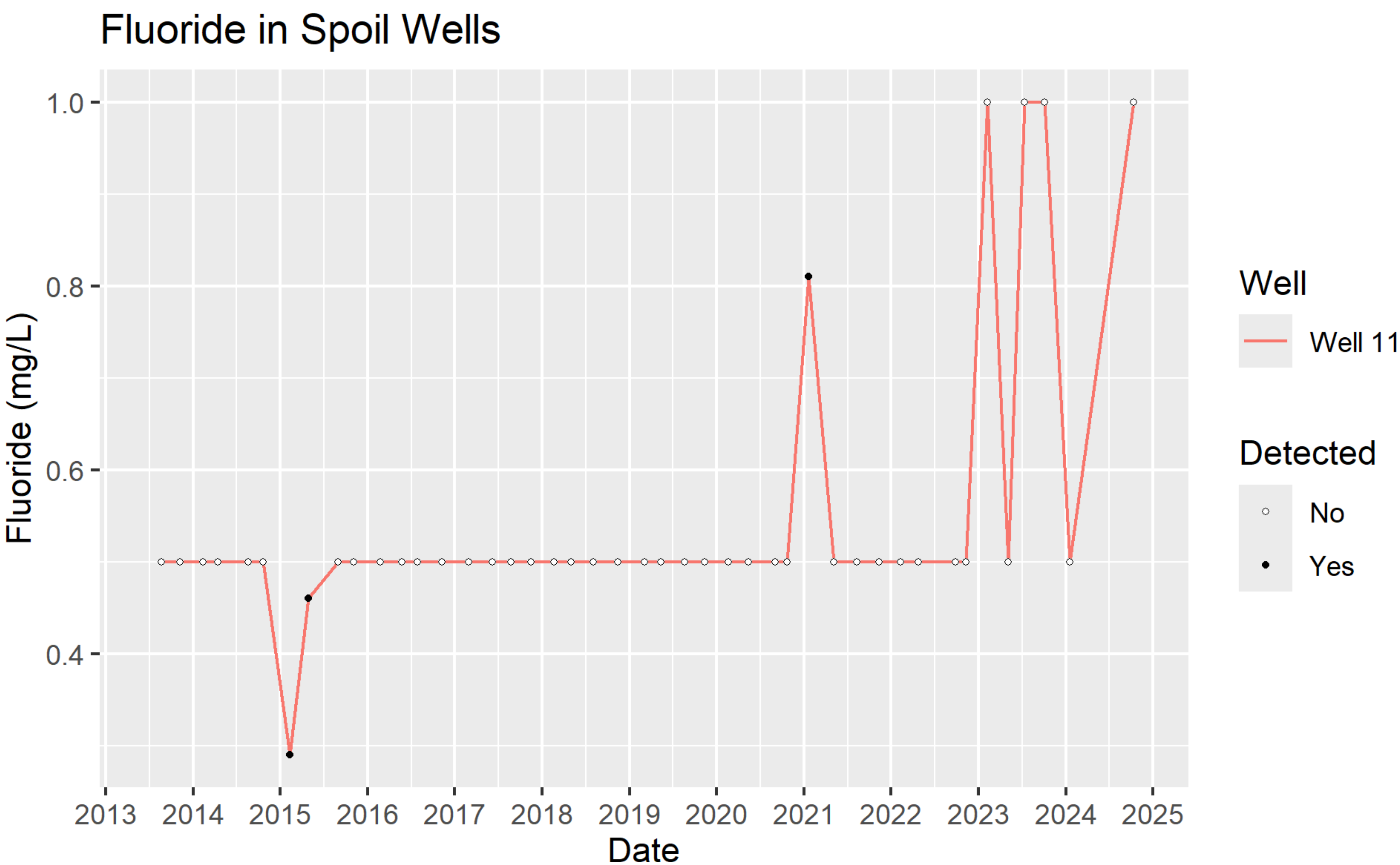
Cation-Anion Balance in Spoil Wells
Cation-Anion Balance (%)
0
10
20
30
40
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



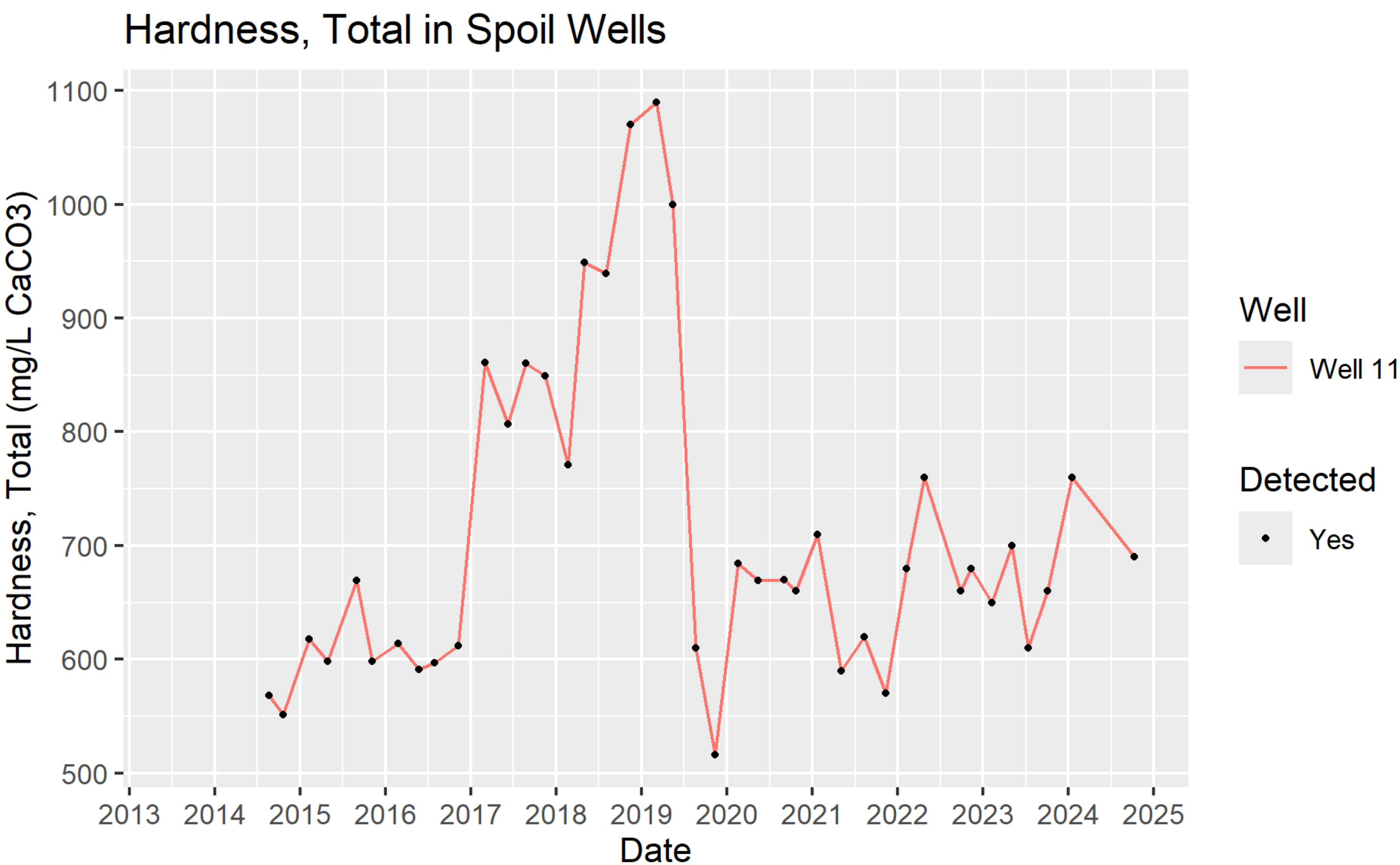
Chloride in Spoil Wells
Chloride (mg/L)
90
70
50
30
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

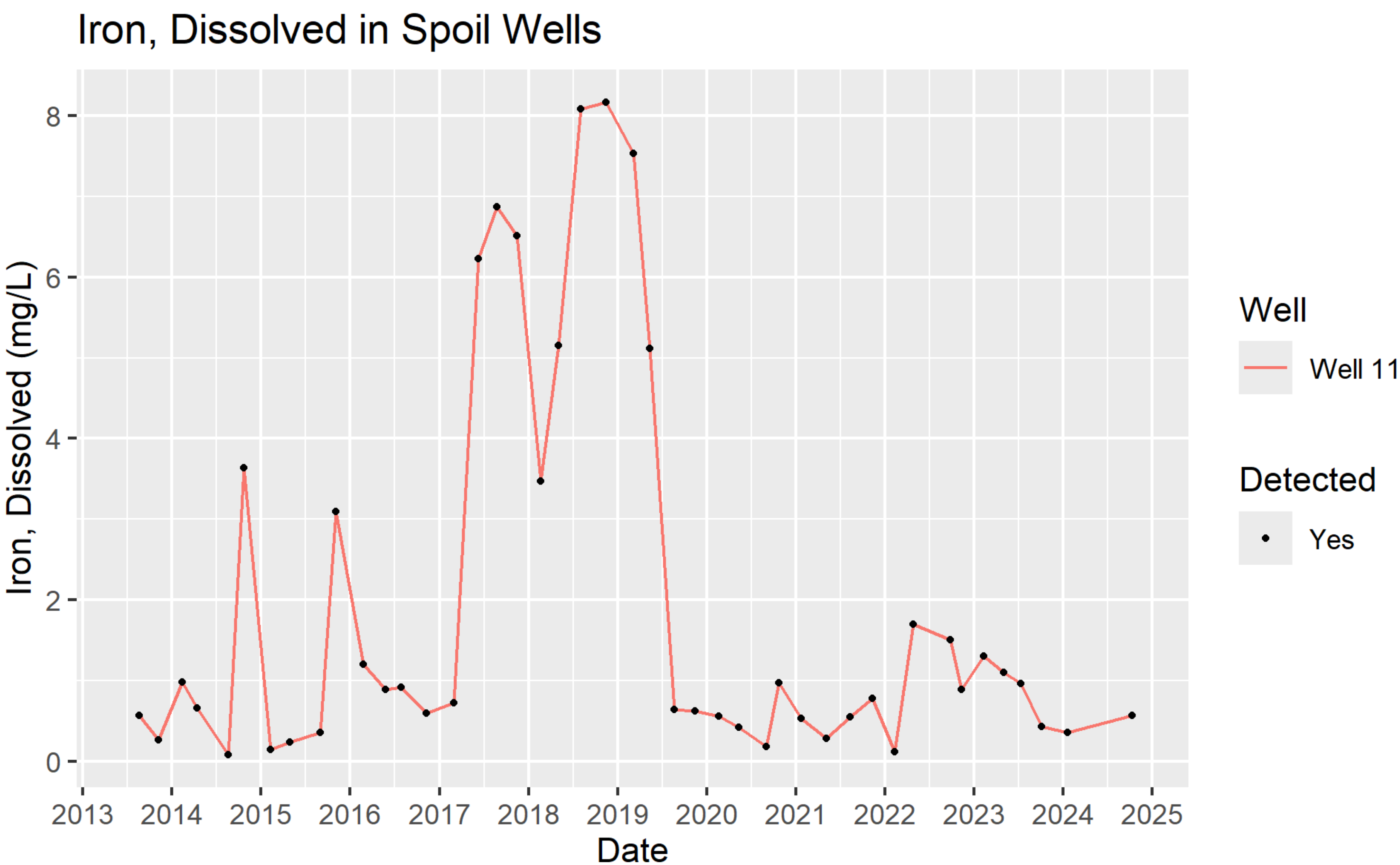


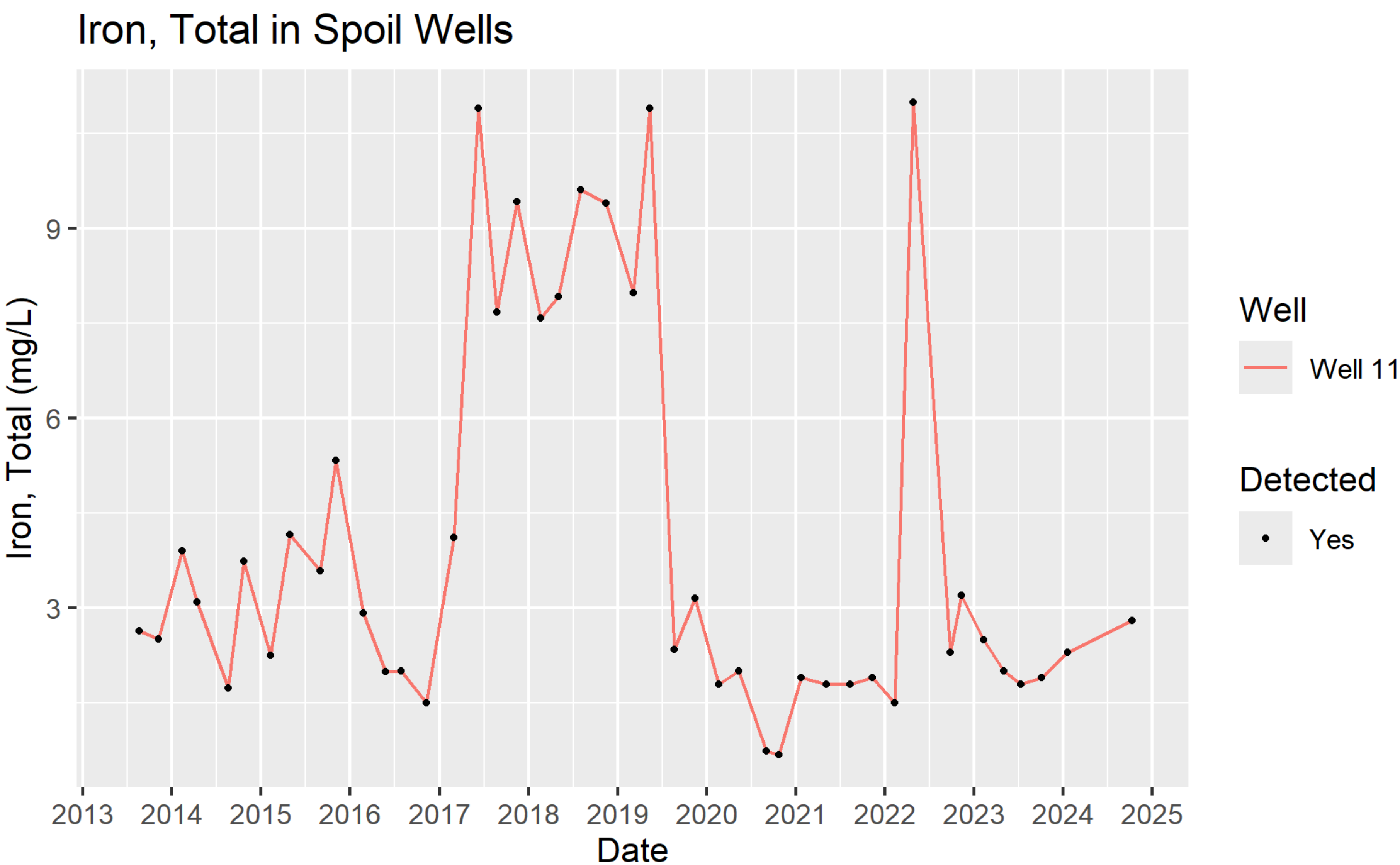
Conductance, Field in Spoil Wells
Conductance, Field (µS/cm)
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



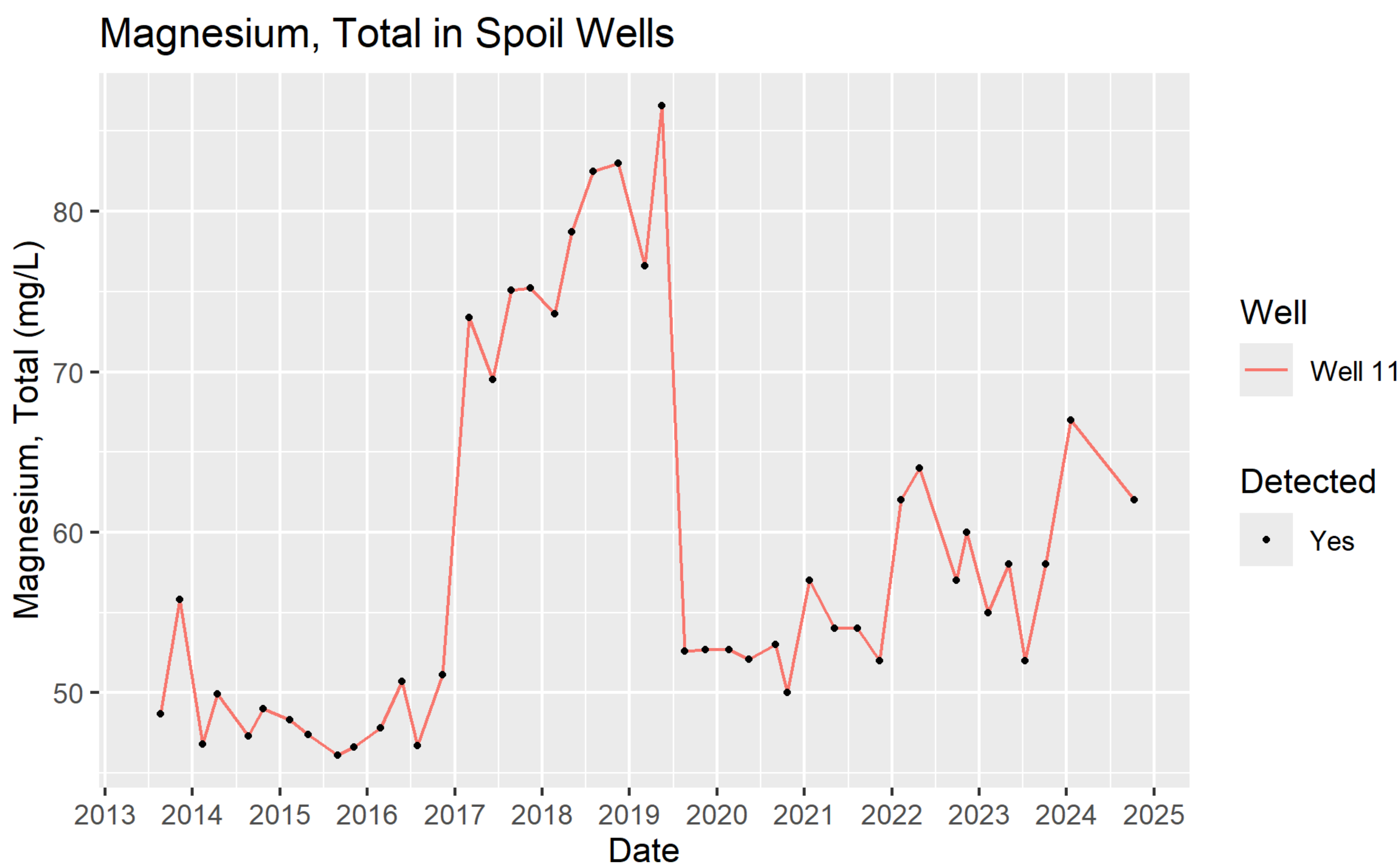
Fluoride in Spoil Wells
Fluoride (mg/L)
1.0
0.8
0.6
0.4
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes


Hardness, Total in Spoil Wells
Hardness, Total (mg/L CaCO3)
1100
1000
900
800
700
600
500
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

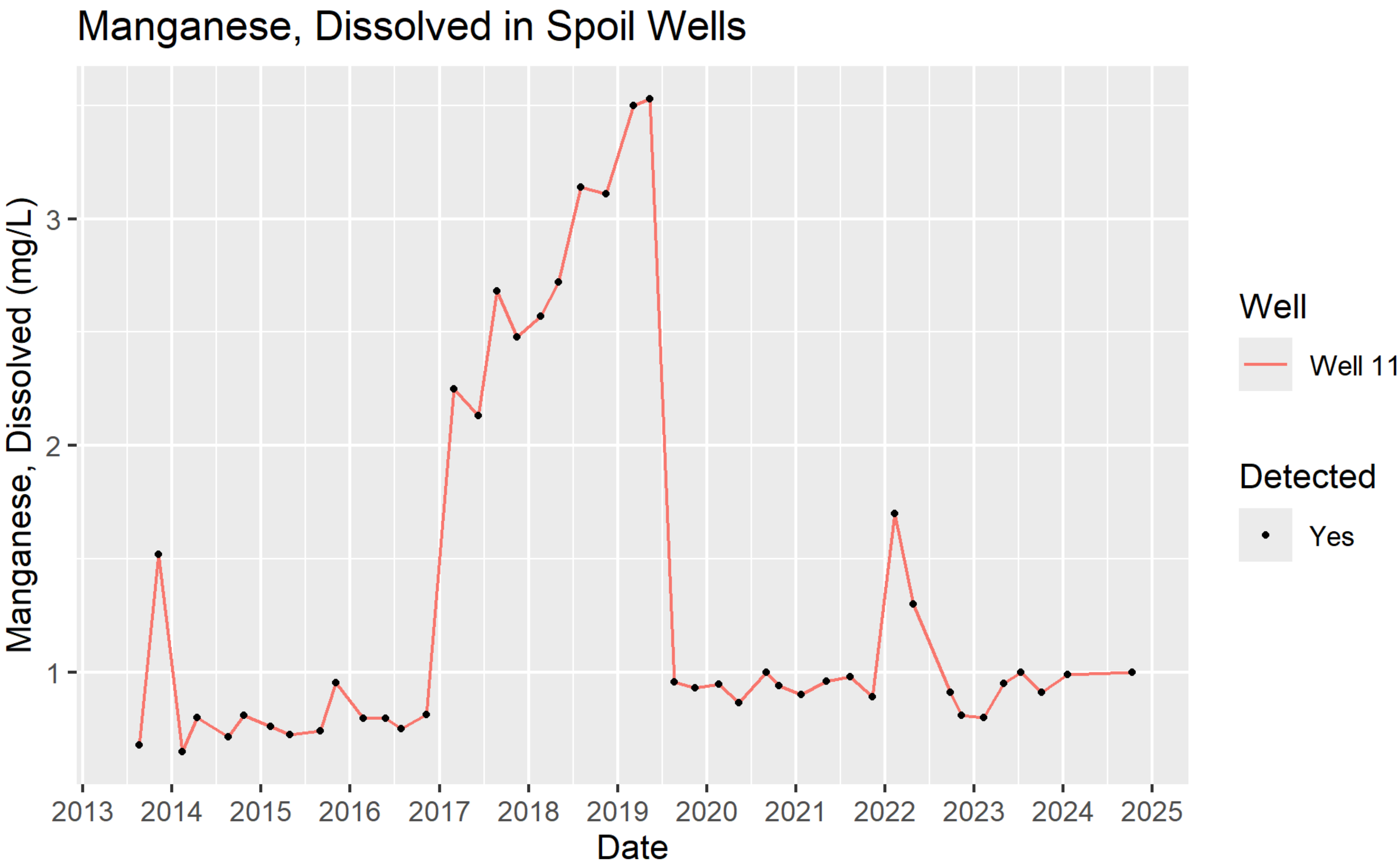

Iron, Dissolved in Spoil Wells
Iron, Dissolved (mg/L)
0
2
4
6
8
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

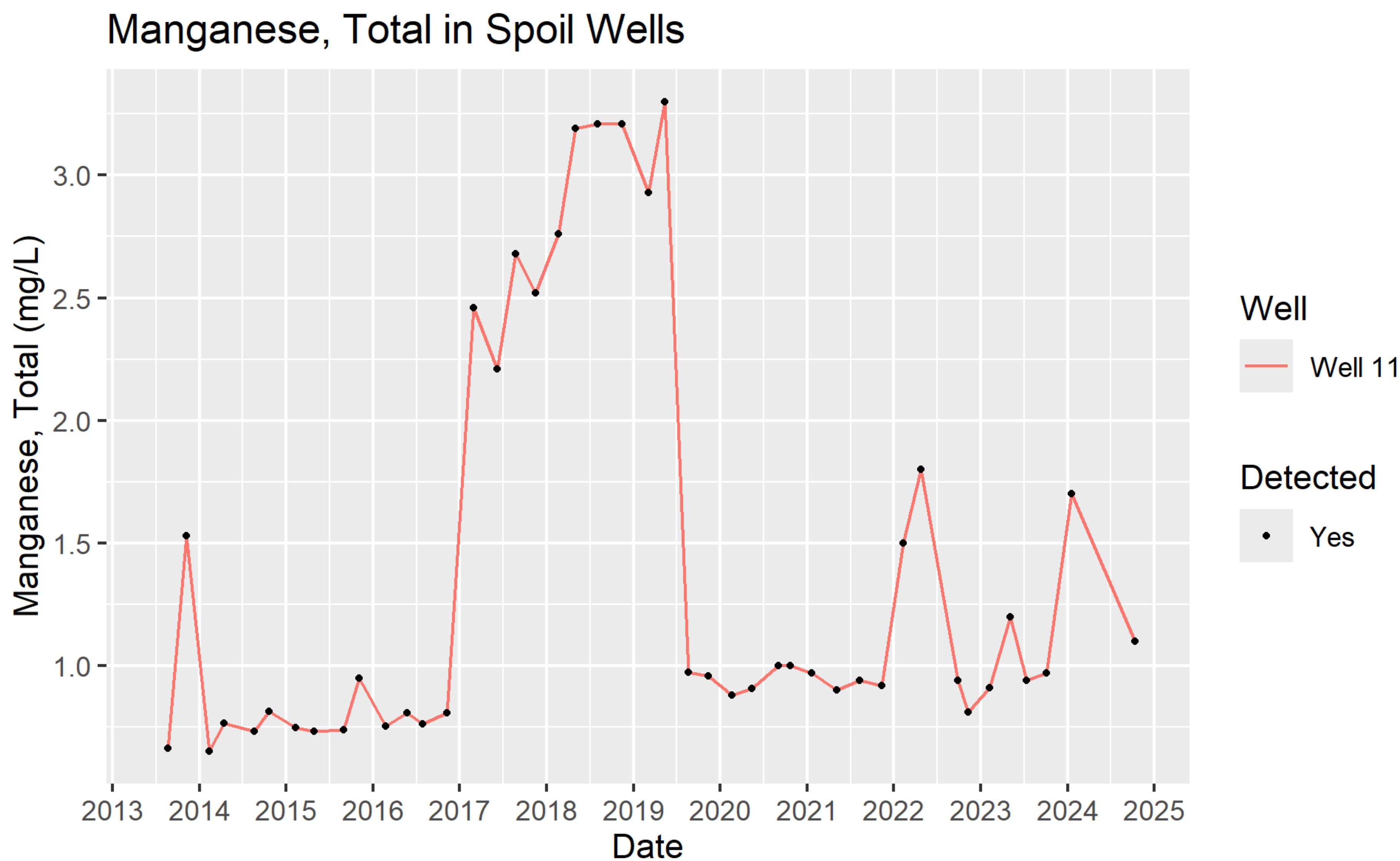


Iron, Total in Spoil Wells
Iron, Total (mg/L)
9
6
3
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

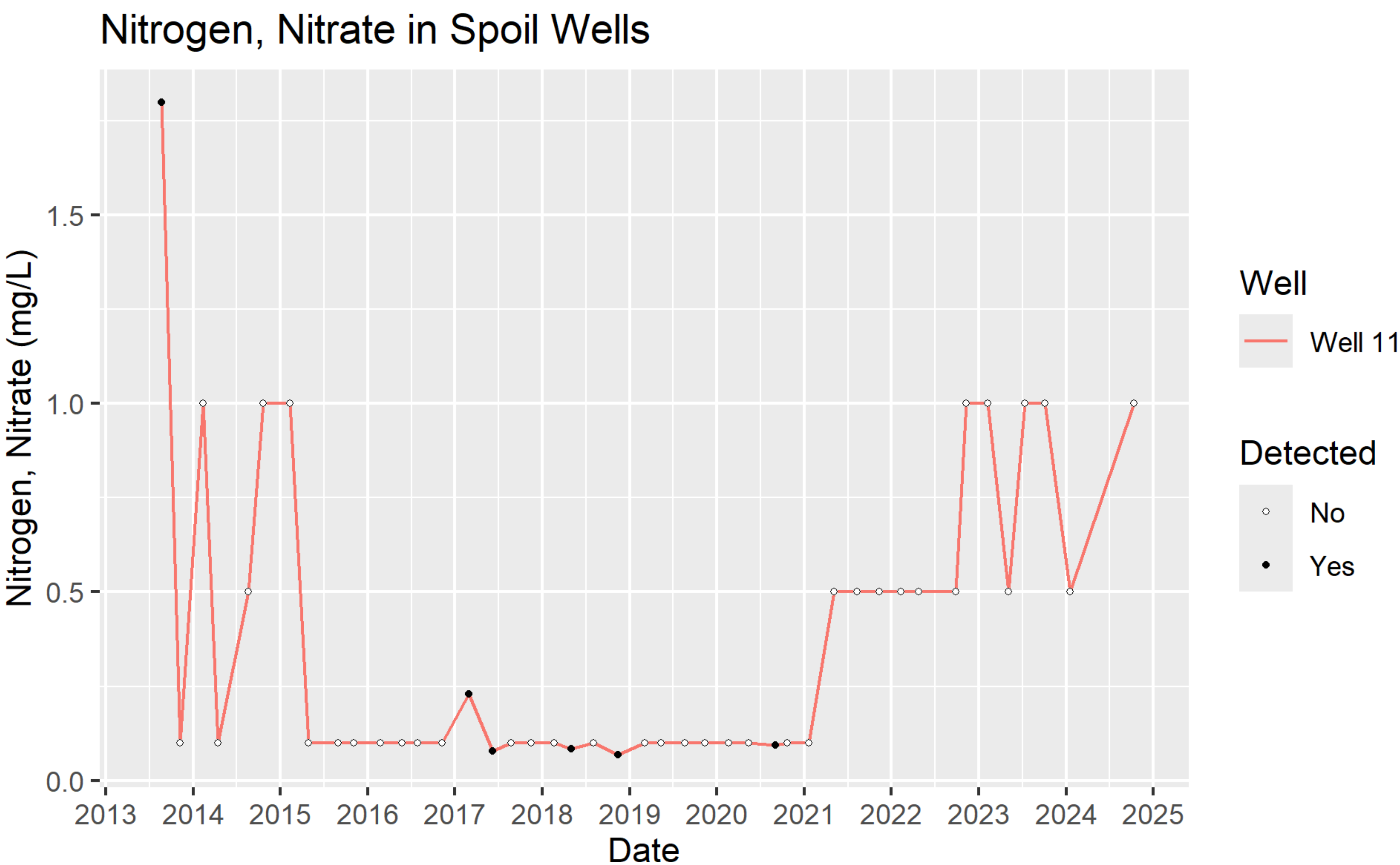


Magnesium, Total in Spoil Wells
Magnesium, Total (mg/L)
80
70
60
50
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

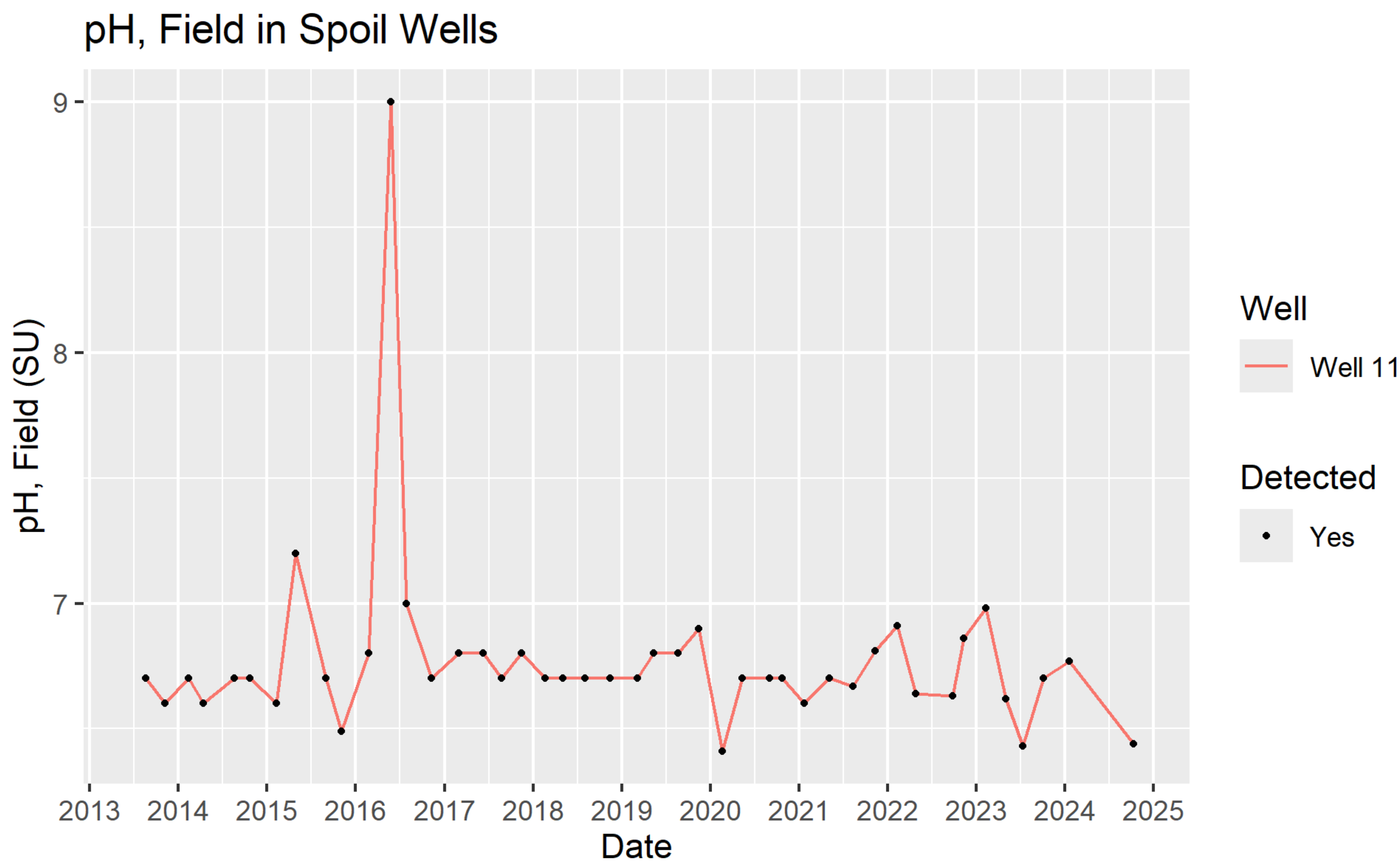

Manganese, Dissolved in Spoil Wells
Manganese, Dissolved (mg/L)
1
2
3
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

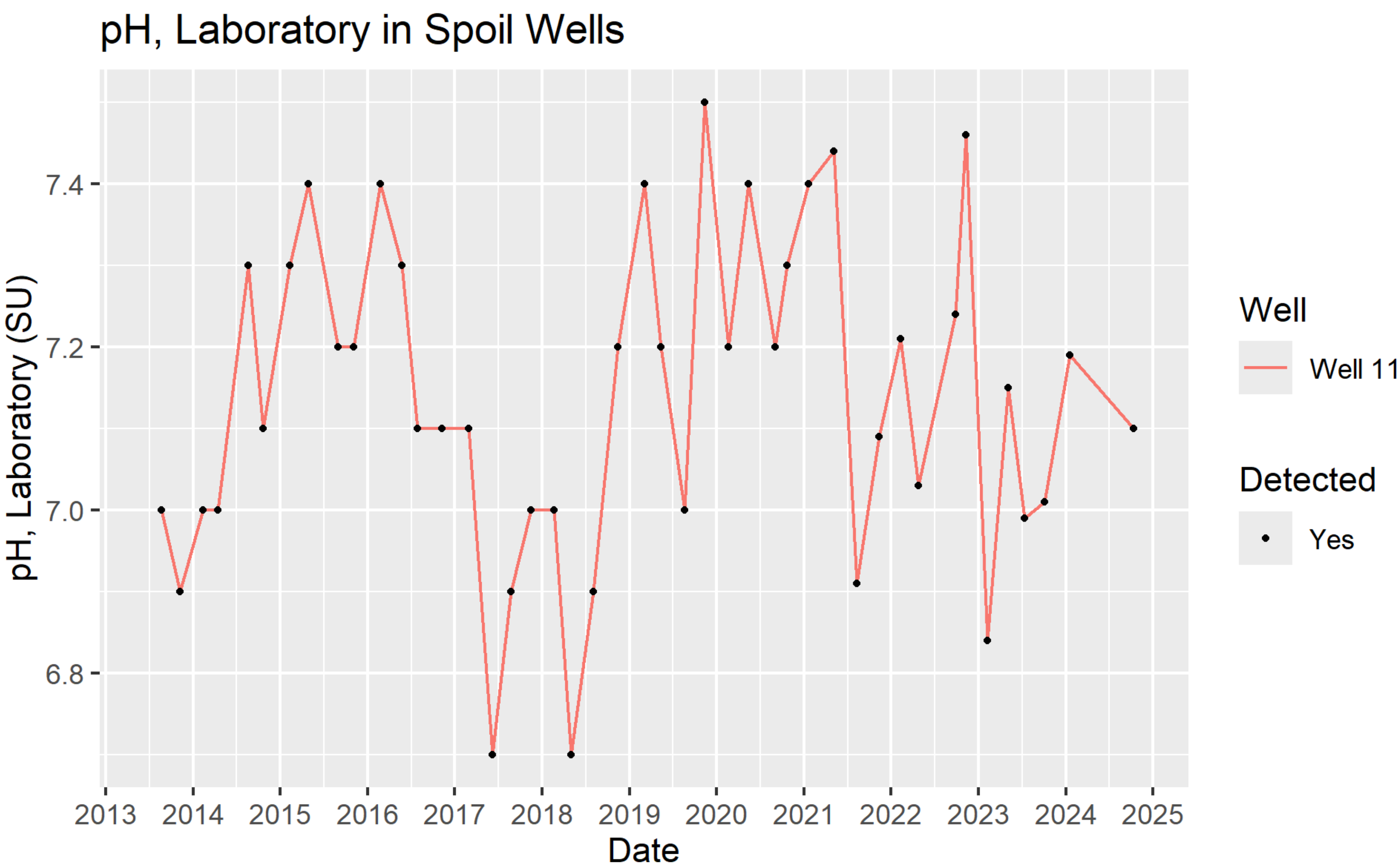


Manganese, Total in Spoil Wells
Manganese, Total (mg/L)
3.0
2.5
2.0
1.5
1.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

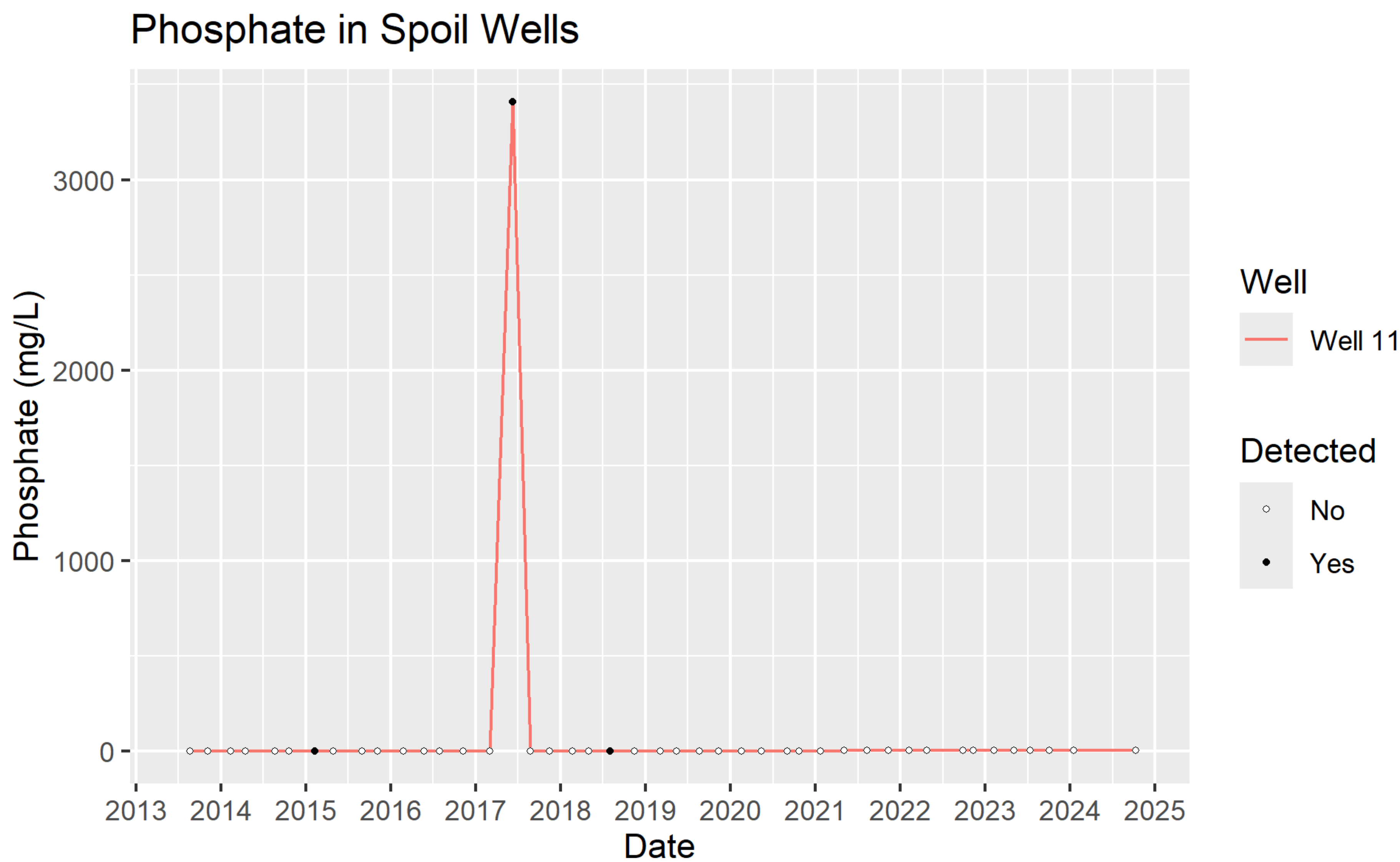


Nitrogen, Nitrate in Spoil Wells
Nitrogen, Nitrate (mg/L)
0.0
0.5
1.0
1.5
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes

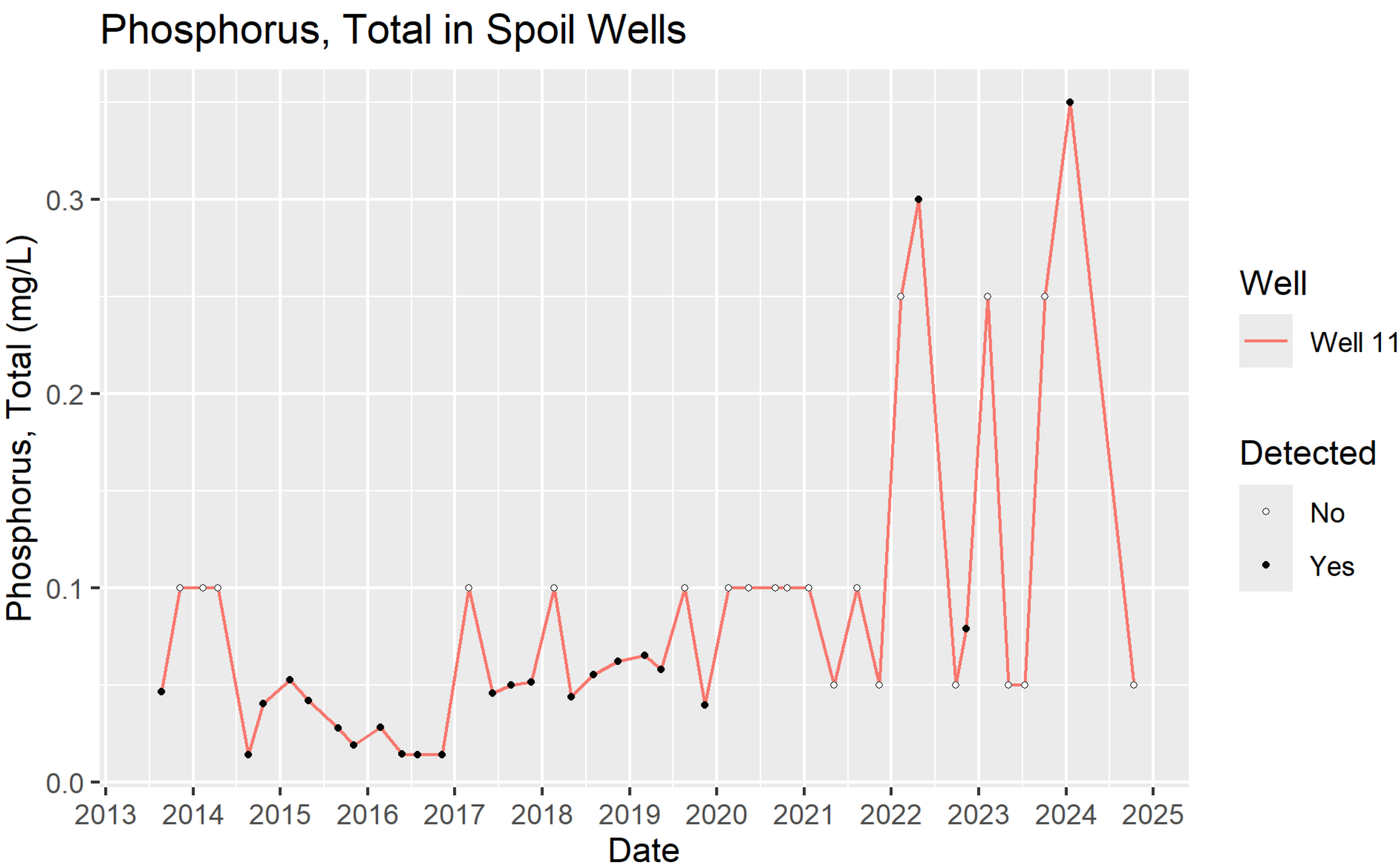

pH, Field in Spoil Wells
9
8
7
pH, Field (SU)
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes



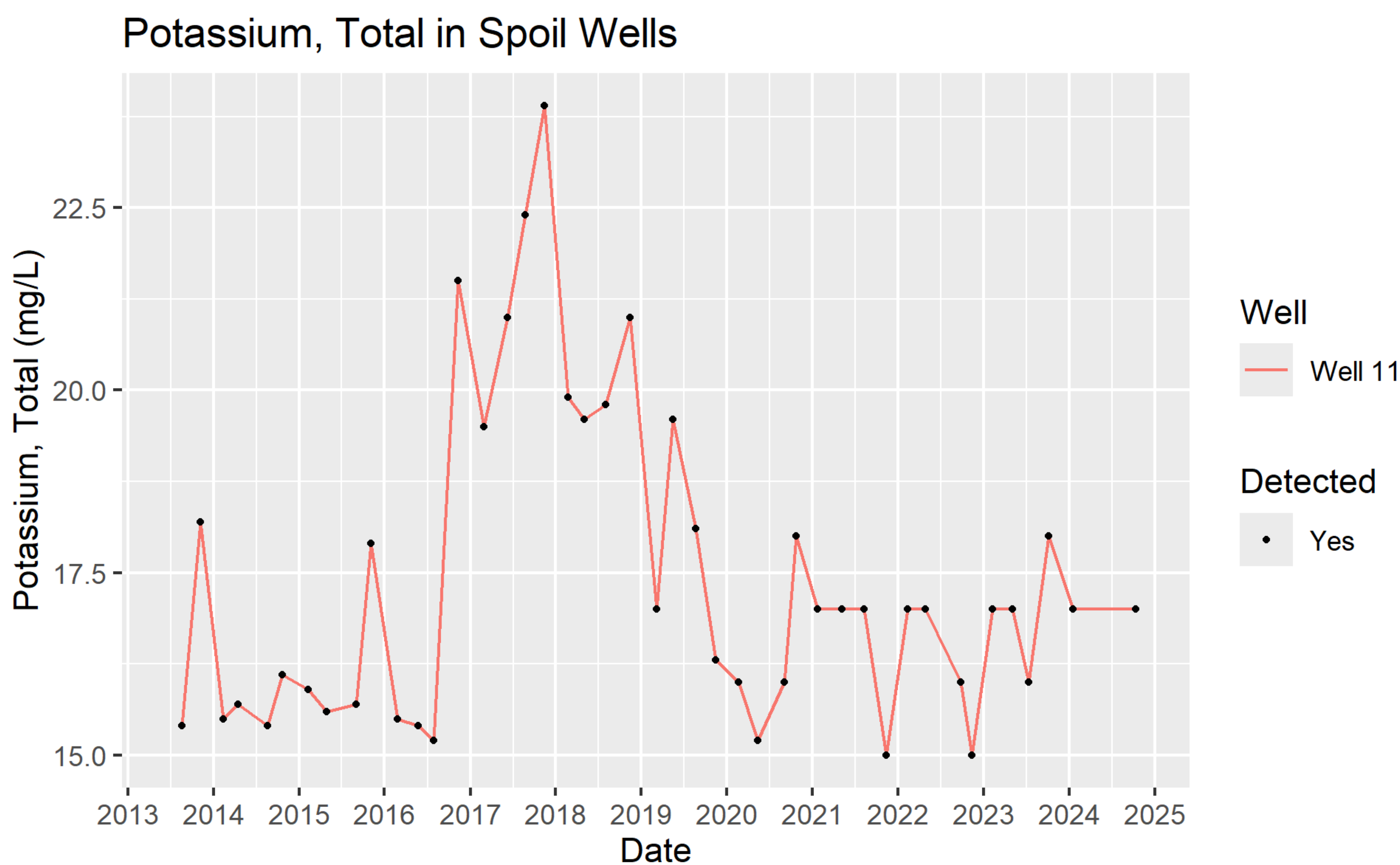
pH, Laboratory in Spoil Wells
pH, Laboratory (SU)
7.4
7.2
7.0
6.8
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

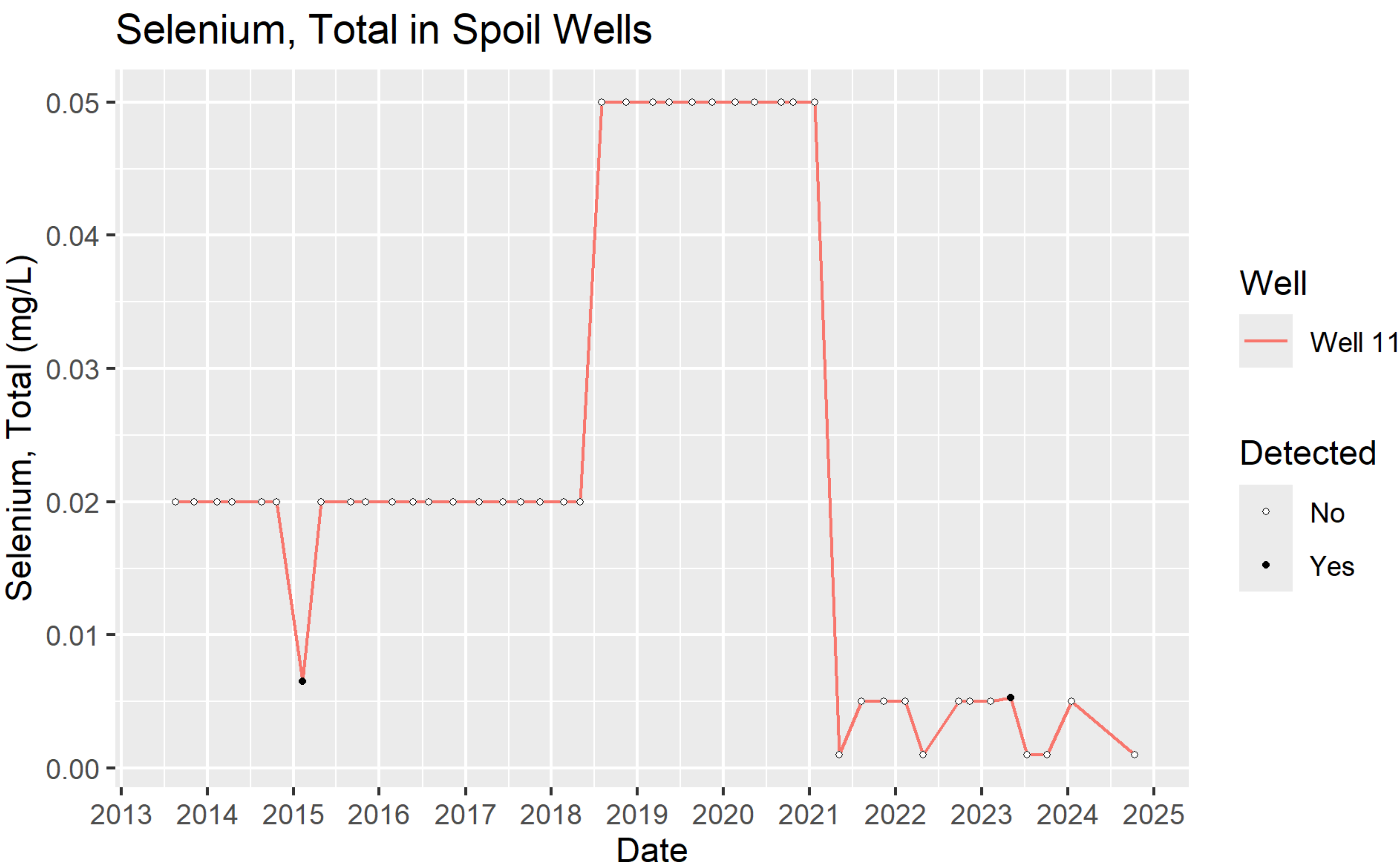


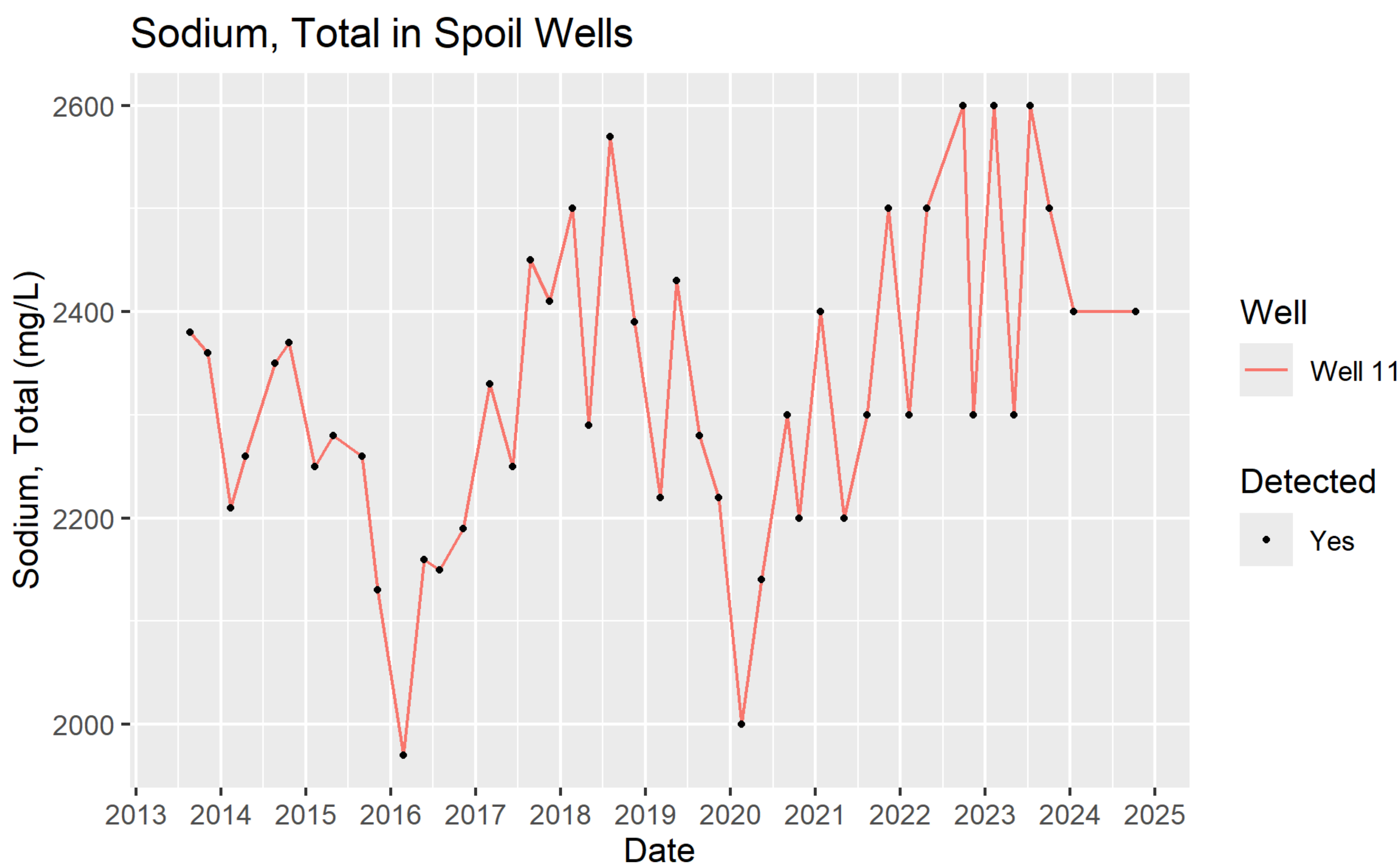
Phosphate in Spoil Wells
Phosphate (mg/L)
3000
2000
1000
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes



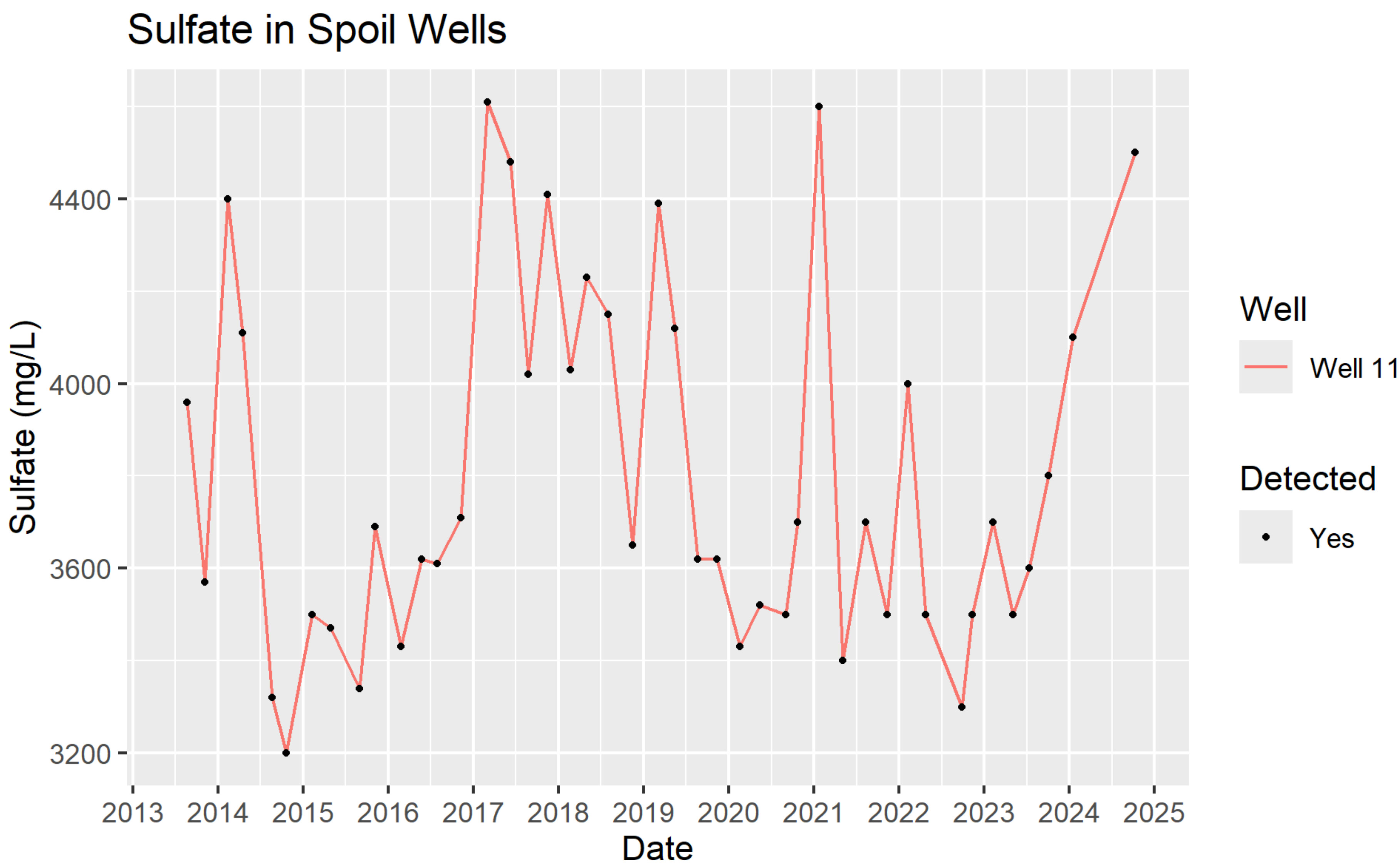
Phosphorus, Total in Spoil Wells
Phosphorus, Total (mg/L)
0.0
0.1
0.2
0.3
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes

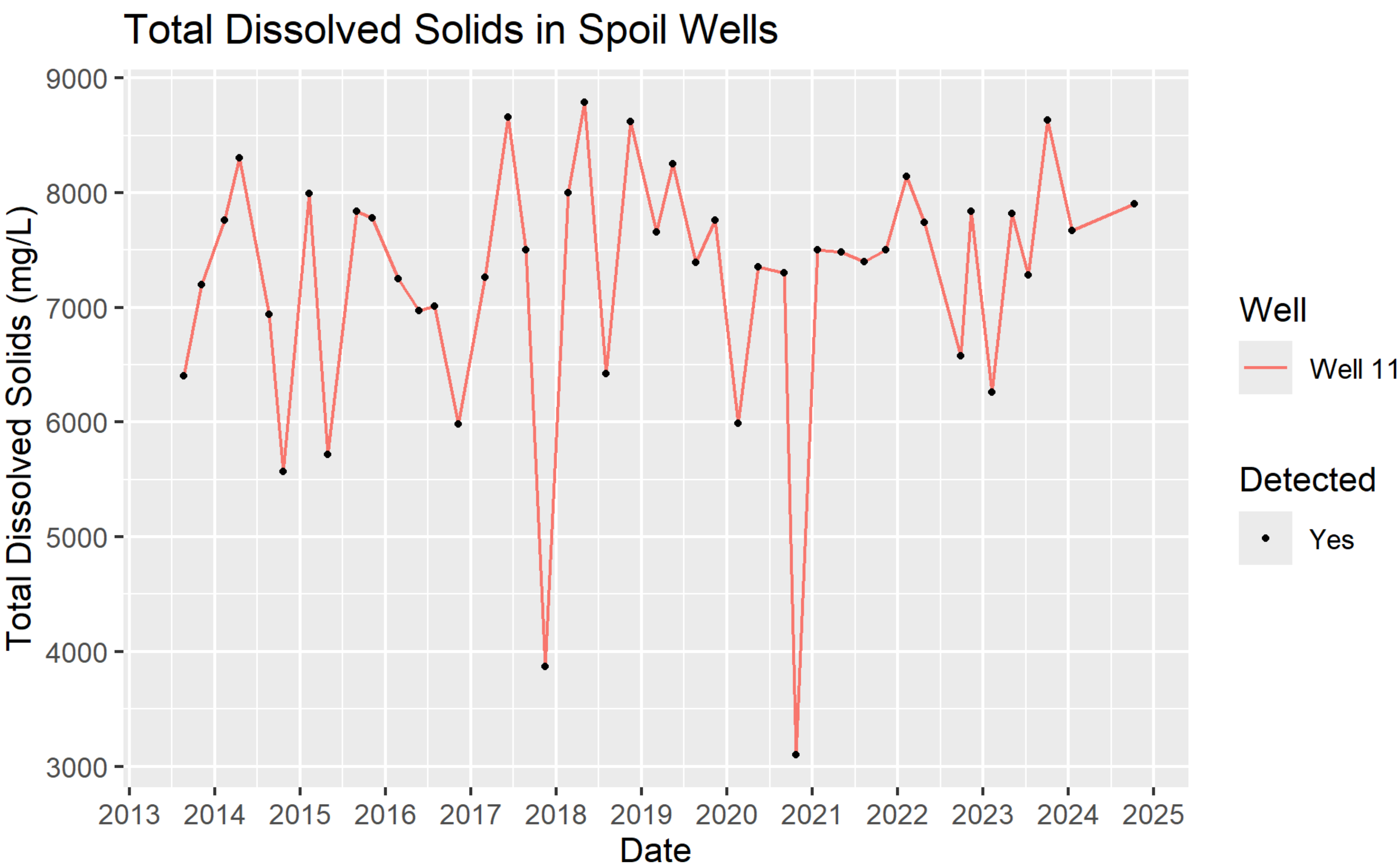

Potassium, Total in Spoil Wells
Potassium, Total (mg/L)
22.5
20.0
17.5
15.0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes


Selenium, Total in Spoil Wells
Selenium, Total (mg/L)
0.05
0.04
0.03
0.02
0.01
0.00
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes



Sodium, Total in Spoil Wells
Sodium, Total (mg/L)
2600
2400
2200
2000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes


Sulfate in Spoil Wells
Sulfate (mg/L)
4400
4000
3600
3200
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes


Total Dissolved Solids in Spoil Wells
Total Dissolved Solids (mg/L)
9000
8000
7000
6000
5000
4000
3000
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
Yes

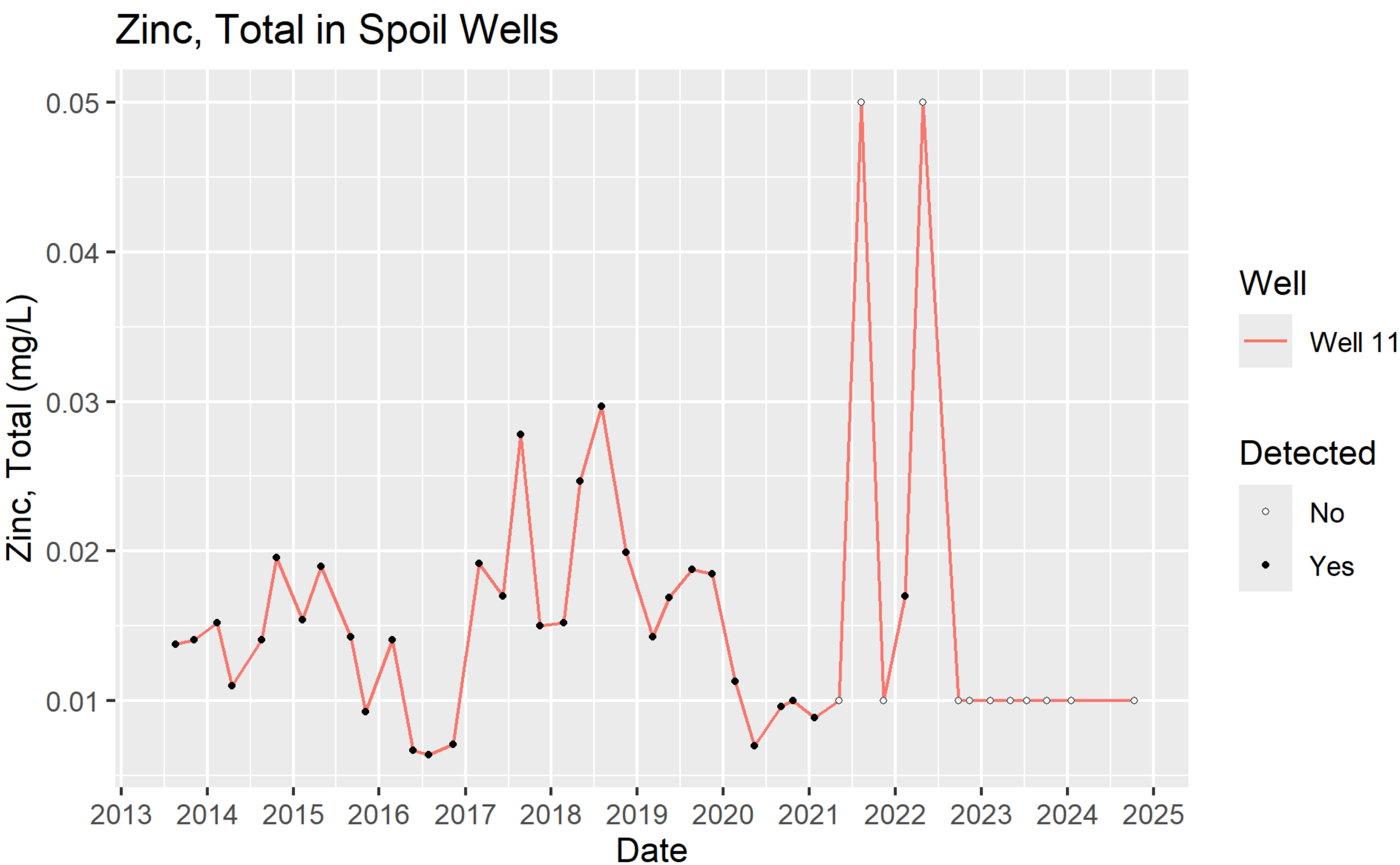
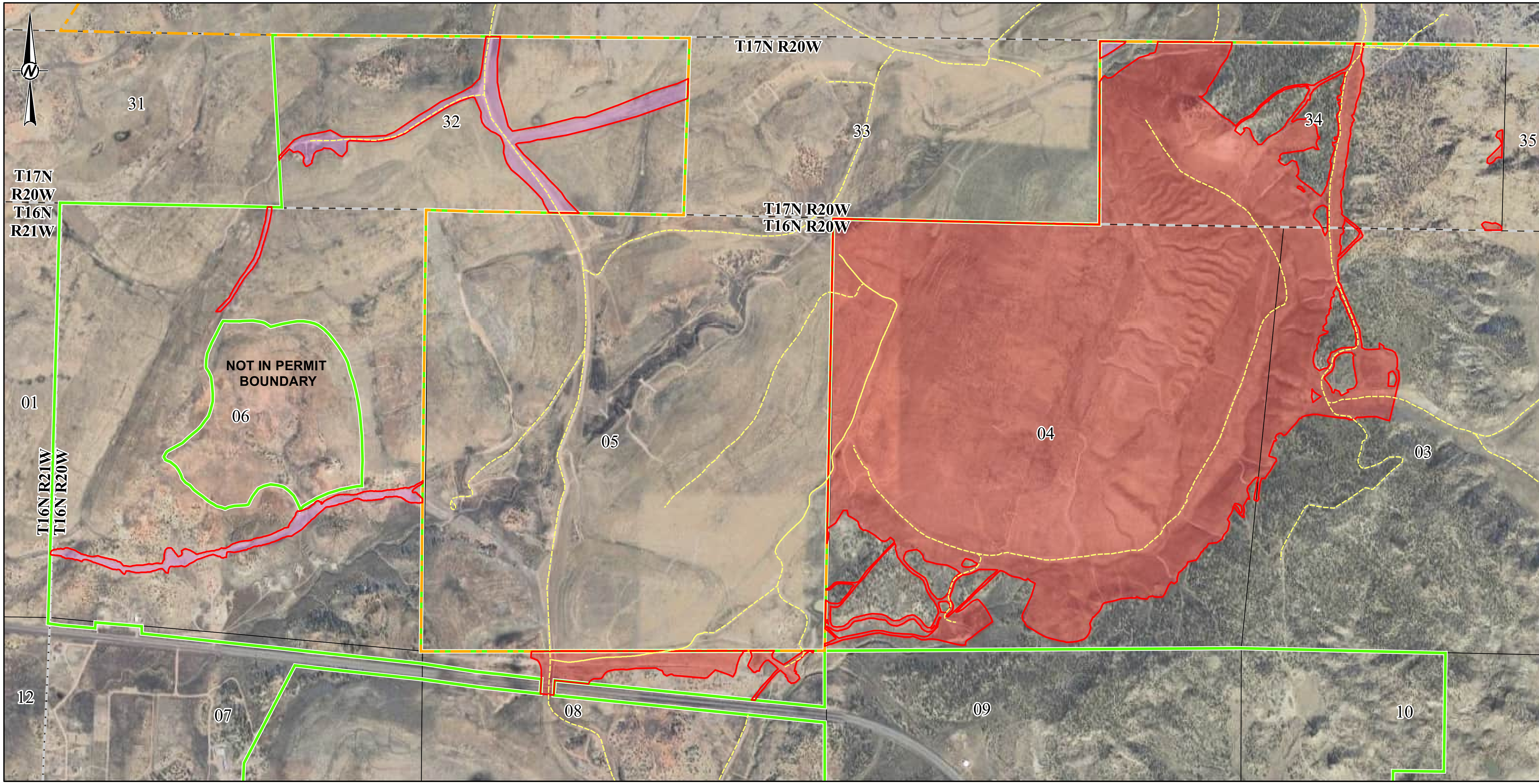

Zinc, Total in Spoil Wells
Zinc, Total (mg/L)
0.05
0.04
0.03
0.02
0.01
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Date
Well
Well 11
Detected
No
Yes

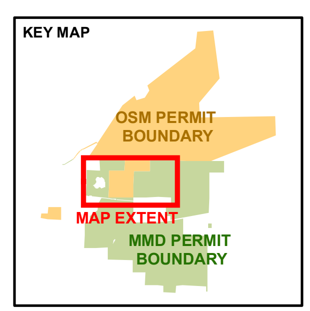
Exhibit A: VMU 1 Bond Release – Bond Release Location



LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- MMD Permit Boundary
- OSM Permit Boundary
- Post-Mining Two-Track Trails
- Township and Range
- Section

KEY MAP



0 2,000 4,000
Feet

NOTE(S)
1.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET

CLIENT
Chevron Mining Inc.
McKINLEY MINE

PROJECT
CHEVRON MCKINLEY MINE

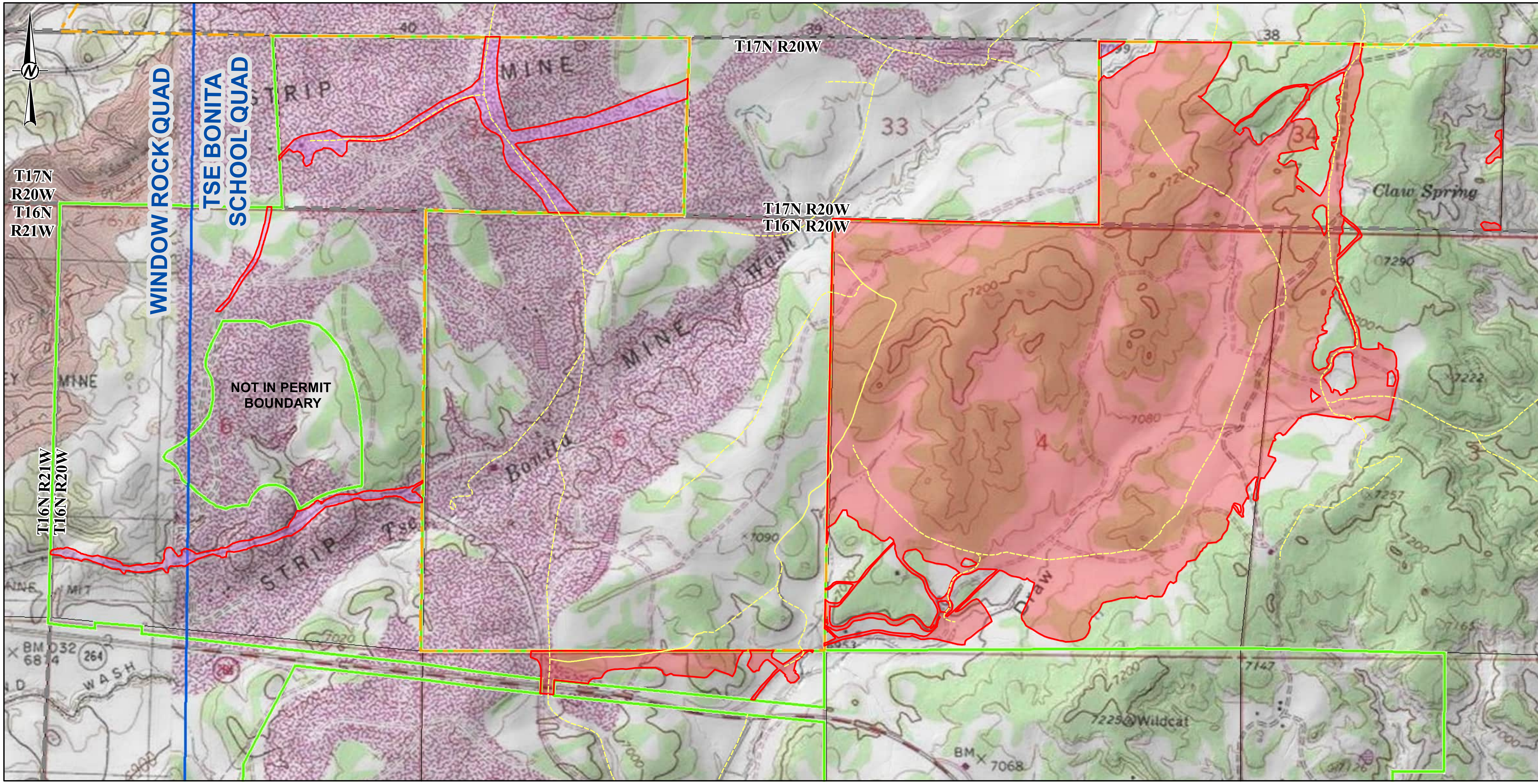
CONSULTANT
wsp

YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	KK
APPROVED	MS

TITLE
MMD VMU 1 BOND RELEASE – BOND RELEASE LOCATION

PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	**EXHIBIT A**

Exhibit B: VMU 1 Bond Release – USGS Quadrangle

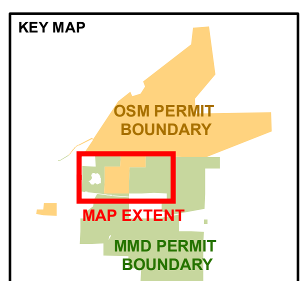


LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- MMD Permit Boundary
- OSM Permit Boundary
- Post-Mining Two-Track Trails
- Township and Range
- Section
- USGS 24k Topo Map Boundaries

NOTE: TOPOGRAPHY ON USGS BASEMAP DEPICTS PRE-MINING CONDITIONS

KEY MAP



0 2,000 4,000
Feet

NOTE(S)
1.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET
2. SERVICE LAYER CREDITS: USGS NATIONAL MAP 3D ELEVATION PROGRAM (3DEP). JANUARY 02, 2025.

CLIENT
Chevron Mining Inc.
McKINLEY MINE

PROJECT
CHEVRON MCKINLEY MINE

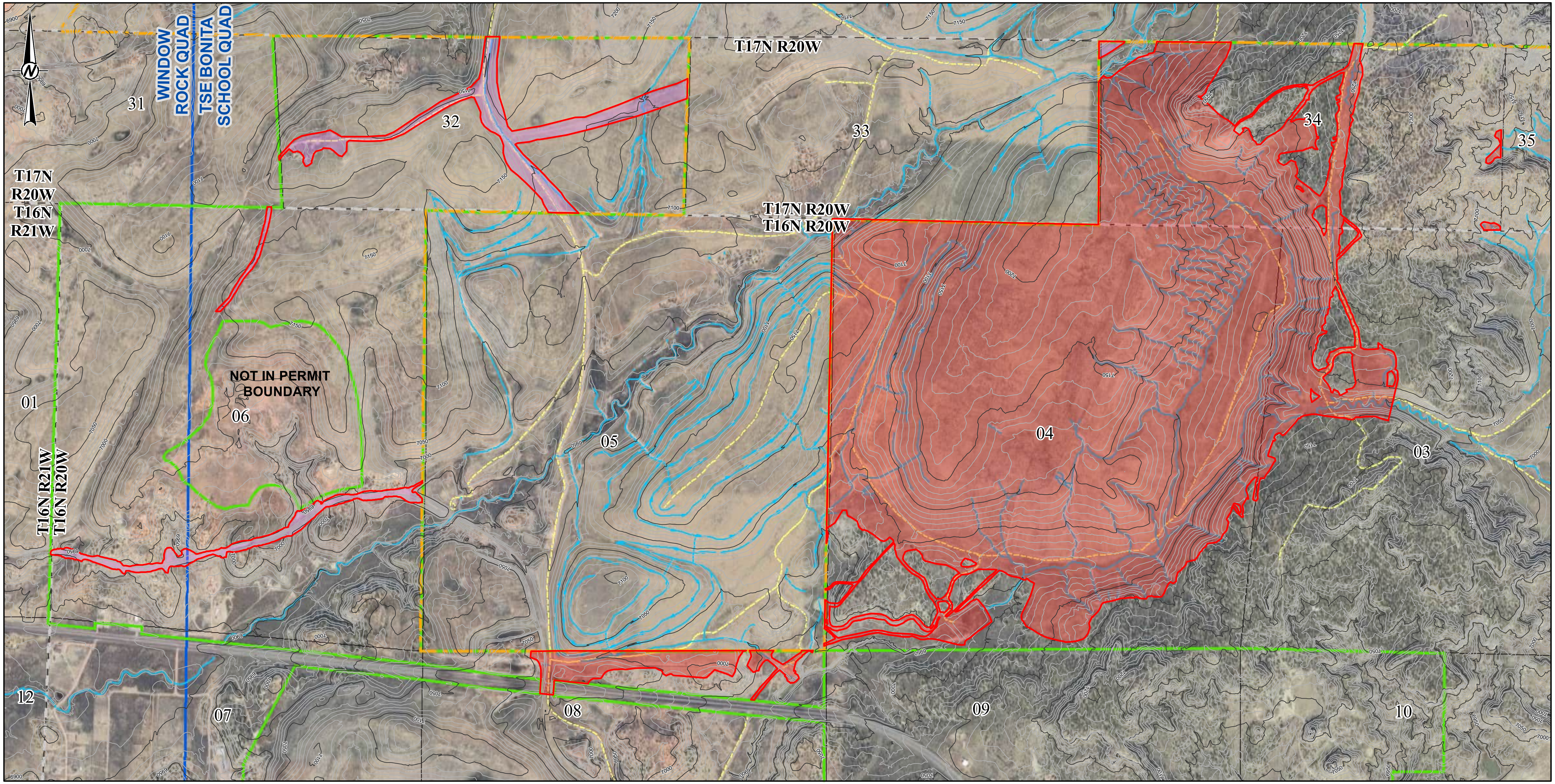
CONSULTANT

YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	KK
APPROVED	MS

TITLE
MMD VMU 1 BOND RELEASE –
USGS TOPOGRAPHIC MAP

PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	EXHIBIT B

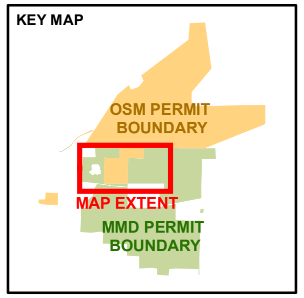
Exhibit C: VMU 1 Bond Release – Postmining Topography



LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- Major Surface Contour (25 ft. Interval)
- Minor Surface Contour (5 ft. Interval)
- Surface Drainage
- MMD Permit Boundary
- OSM Permit Boundary
- Post-Mining Two-Track Trails
- Township and Range
- Section
- USGS 24k Topo Map Boundaries

KEY MAP



0 2,000 4,000
Feet

NOTE(S)
1.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET

CLIENT
Chevron Mining Inc.
McKINLEY MINE

PROJECT
CHEVRON MCKINLEY MINE

CONSULTANT
wsp

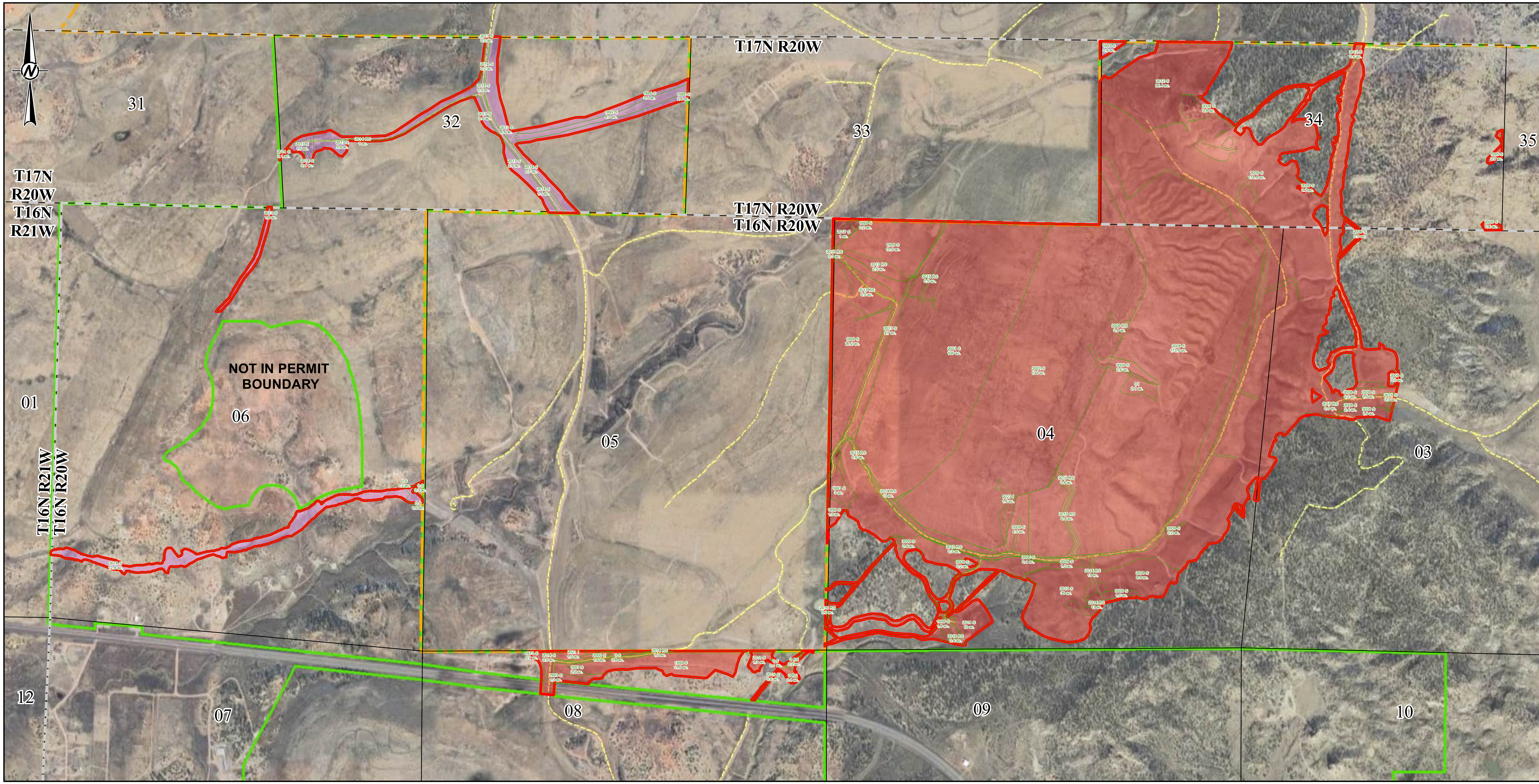
YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	KK
APPROVED	MS

TITLE
MMD VMU 1 BOND RELEASE – POST-MINING TOPOGRAPHY

PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	EXHIBIT C

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

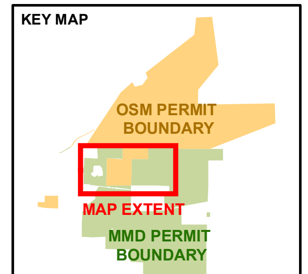
Exhibit D: VMU 1 Bond Release – Seeding Map



LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- Seeding Area (Year Seeded or Reseeded and Acreage)
- MMD Permit Boundary
- OSM Permit Boundary
- Post-Mining Two-Track Trails
- Township and Range
- Section

KEY MAP



0 2,000 4,000
Feet

CLIENT
Chevron Mining Inc.
McKINLEY MINE

CONSULTANT

YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	KK
APPROVED	MS

NOTE(S)
1.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET

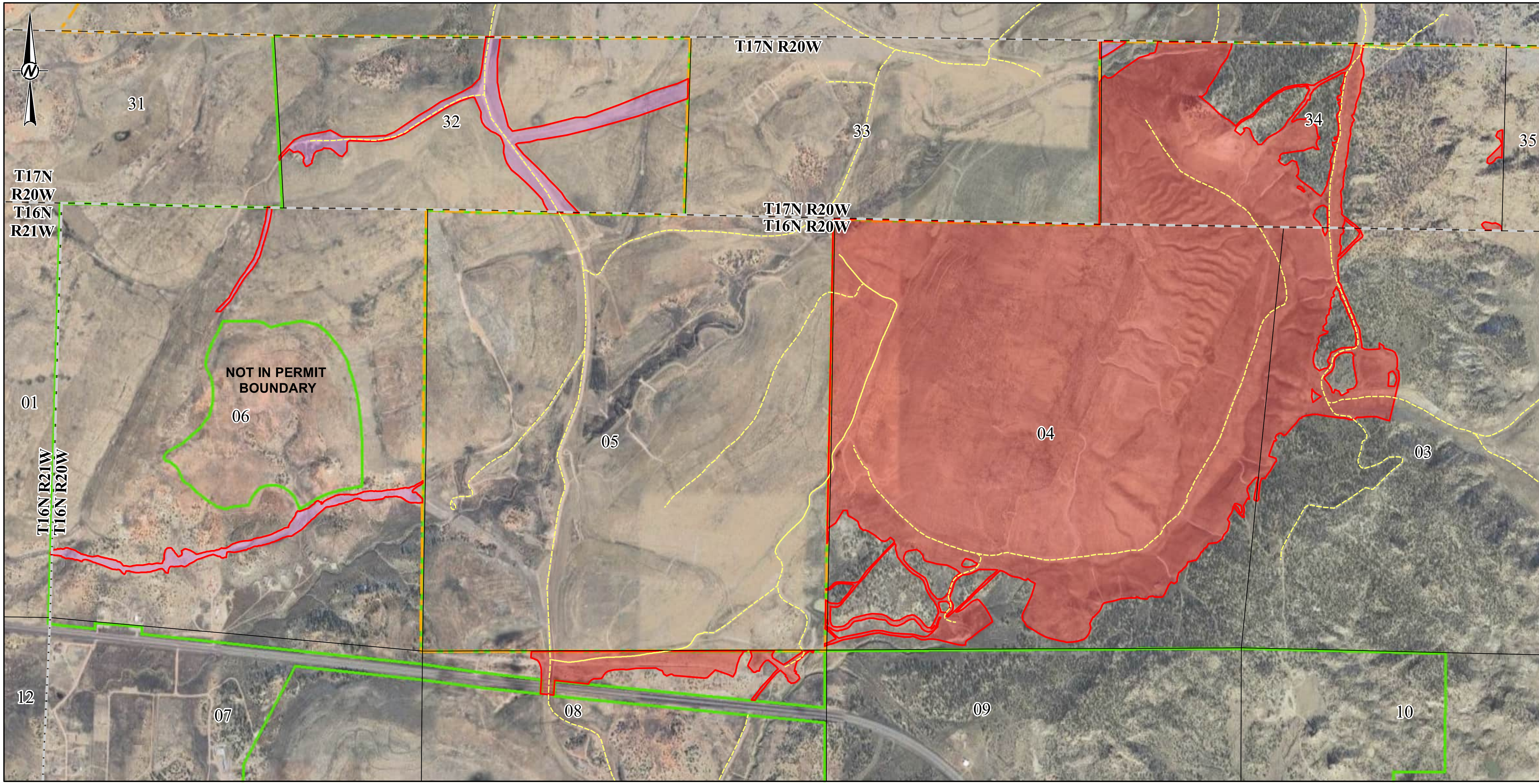
PROJECT
CHEVRON MCKINLEY MINE

TITLE
MMD VMU 1 BOND RELEASE – SEEDING MAP

PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	**EXHIBIT D**

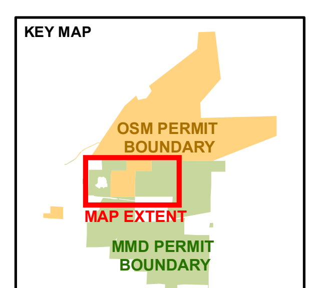
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Exhibit E: VMU 1 Bond Release – Aerial



LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- MMD Permit Boundary
- OSM Permit Boundary
- Post-Mining Two-Track Trails
- Township and Range
- Section



0 2,000 4,000
Feet

NOTE(S)
1.

REFERENCE(S)
1. AERIAL IMAGERY: NAIP 2020.
2. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET

CLIENT
Chevron Mining Inc.
McKINLEY MINE

PROJECT
CHEVRON MCKINLEY MINE

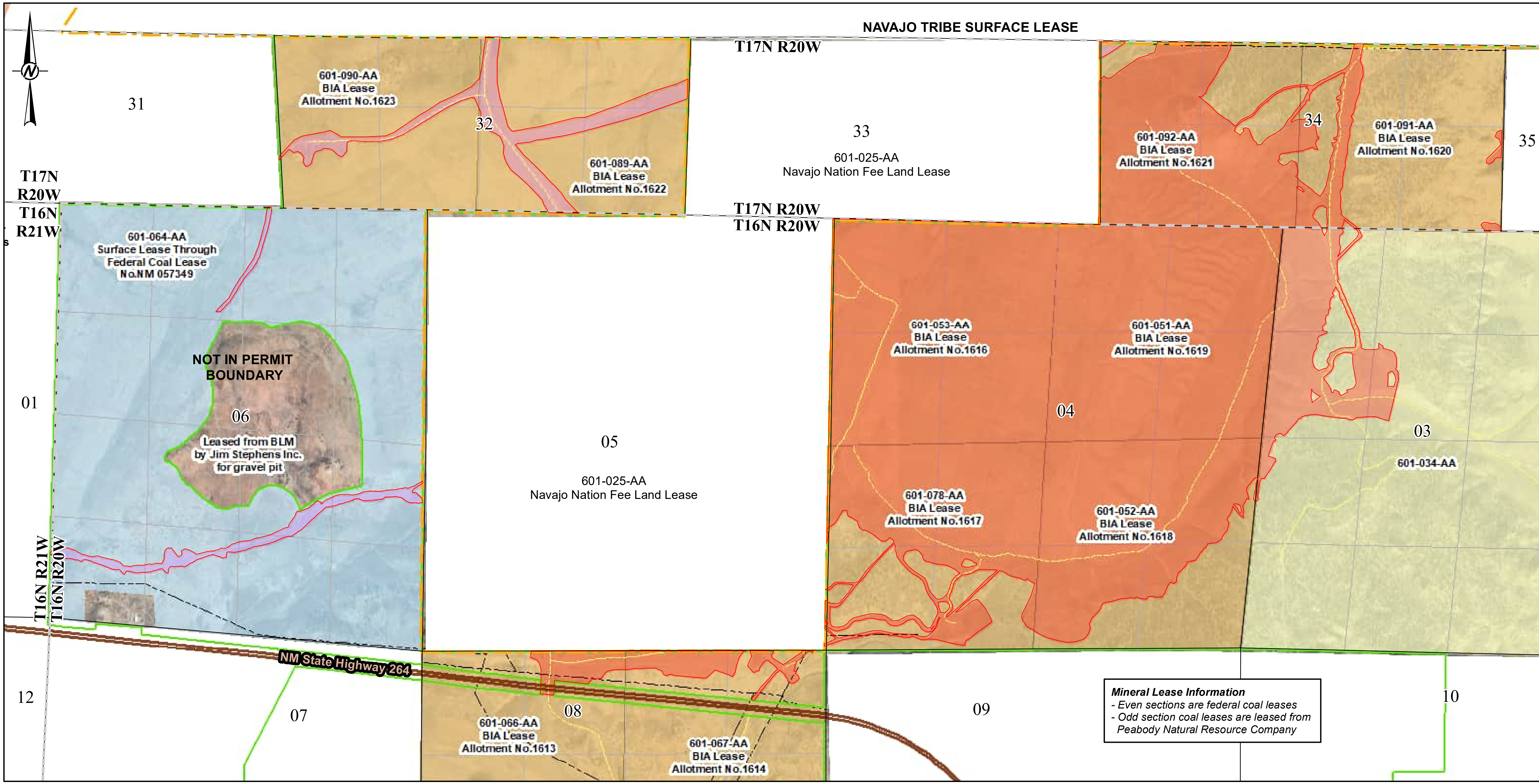
CONSULTANT
WSP

YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	KK
APPROVED	MS

TITLE
MMD VMU 1 BOND RELEASE – AERIAL

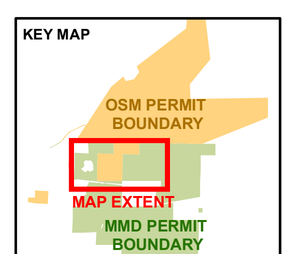
PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	**EXHIBIT E**

Exhibit F: VMU 1 Bond Release – Land Inventory - Surface & Coal



LEGEND

- Phase II and III VMU 1 Bond Release Boundary (789 acs)
- Phase I, II, and III VMU 1 Bond Release Boundary (48 acs)
- OSM Permit Boundary
- MMD Permit Boundary
- Post-mining two-track trails
- Section
- Township and Range
- BIA Allotment Lease
- Surface Lease Through Federal Coal Lease
- Chevron Fee Surface



0 2,000 4,000
Feet

NOTE(S)
1.

REFERENCE(S)
1. COORDINATE SYSTEM: NAD 1983 STATEPLANE NEW MEXICO WEST FIPS 3003 FEET

CLIENT
Chevron Mining Inc.
McKINLEY MINE

PROJECT
CHEVRON MCKINLEY MINE

CONSULTANT
wsp

YYYY-MM-DD	2025-07-31
DESIGNED	-
PREPARED	HJ
REVIEWED	FR
APPROVED	MS

TITLE
MMD VMU 1 BOND RELEASE – LAND INVENTORY - SURFACE & COAL

PROJECT NO.	PHASE	REV.	FIGURE
1338105302	0003	A	F