Cuyama Valley
Groundwater Basin

Draft Groundwater Sustainability Plan:
Minimum Thresholds, Measurable Objectives, and Interim Milestones

Prepared by:

April 2019

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Acronyms

Basin	Cuyama Groundwater Basin
CBGSA	Cuyama Basin Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IM	Interim Milestone
MCL	Maximum Contaminant Levels
mg/L	milligrams per liter
MO	Measurable Objective
MT	Minimum Threshold
SGMA	Sustainable Groundwater Management Act
TDS	Total Dissolved Solids

Chapter 5 Minimum Thresholds, Measurable Objectives, and Interim Milestones

This chapter of the Cuyama Groundwater Basin (Basin) *Groundwater Sustainability Plan* (GSP) defines the sustainability criteria used to avoid undesirable results during GSP implementation. The Sustainable Groundwater Management Act (SGMA) requires the application of minimum thresholds (MTs), measurable objectives (MOs), and interim milestones (IMs) to all representative monitoring sites identified in the GSP. These values, or thresholds, will help the Cuyama Basin Groundwater Sustainability Agency (CBGSA) and other groundwater users in the Basin identify sustainable values for the established SGMA sustainability indicators, and will help identify progress indicators over the 20-year GSP implementation period.

5.1 Useful Terms

There are several terms used in this chapter that describe Basin conditions and the values calculated for the representative sites. These terms are intended as a guide for readers, and are not a definitive definition of any term.

- **Sustainability Goals** – Sustainability goals are the culmination of conditions in the absence of undesirable results within 20 years of the applicable statutory deadline.
- **Undesirable Results** – Undesirable results are the significant and unreasonable occurrence of conditions that adversely affect groundwater use in the Basin, as defined in Chapter 3.
- **Measurable Objectives** – MOs are specific, quantifiable goals for maintaining or improving specified groundwater conditions that are included in the adopted GSP to achieve the Basin's sustainability goal.
- **Minimum Thresholds** – MTs are a numeric value for each sustainability indicator, which are used to define when undesirable results occur if minimum thresholds are exceeded in a percentage of sites in the monitoring network.
- **Interim Milestones** – IMs are a target value representing measurable conditions, set in increments of five years. They are set by the CBGSA as part of the GSP; IMs will help the Basin reach sustainability by 2040.

- **Sustainability Indicators** – These indicators refer to any of the effects caused by groundwater conditions occurring throughout the Basin that, when significant and unreasonable, cause undesirable results, as described in Water Code Section 10721(x). These include the following:
  - — Lowering groundwater levels
  - — Reduction of groundwater storage
  - — Seawater intrusion
  - — Degraded water quality
  - — Land subsidence
  - — Depletion of interconnected surface water

Both MOs and MTs are applied to all sustainability indicator representative sites. Sites in the Basin's monitoring networks that are not classified as representative sites are not required to have MOs or MTs. All of the Basin's representative sites will also have IMs calculated for 2025, 2030, and 2035 to help guide the CBGSA toward its 2040 sustainability goals. All wells meeting the representative well criteria outlined in this GSP are included in the Basin's monitoring network, although participation in the SGMA monitoring program is dependent upon agreements between the CBGSA and the well owners.

The following subsections describe the process of establishing MOs, MTs, and IMs for each of the sustainability indicators described above. They also discuss the results of this process.

5.2 Chronic Lowering of Groundwater Levels

The undesirable result for the chronic lowering of groundwater levels is a result that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Groundwater conditions, as discussed in Chapter 2, Section 2.2, vary across the Basin. Groundwater conditions are influenced by geographic attributes, geologic attributes, and overlying land uses in the Basin. Because of the variety of conditions, six threshold regions were established in the Basin so appropriate sustainability criteria could be set more precisely for each region.

5.2.1 Threshold Regions

The six threshold regions were defined to allow areas with similar conditions to be grouped together for calculation of MOs, MTs, and IMs. These threshold regions are shown in Figure 5-1. The following subsections discuss threshold region characteristics and boundaries.

Southeastern Threshold Region

The Southeastern Threshold Region lies on the southeastern edge of the Basin, and is characterized as having moderate agricultural land use with steep geographic features surrounding the valley. Groundwater is generally high in this area, with recent historical data showing levels around 50 feet or less below ground surface, which indicates that this region is likely currently in a full condition. Groundwater levels in this region are subject to declines during drought periods, but have typically recovered back to previous levels during historically wet periods. The northern boundary of this region is the narrows at the Cuyama River, and the eastern boundary is the extent of alluvium. The southern and western extent of this region is defined by the groundwater basin boundary.

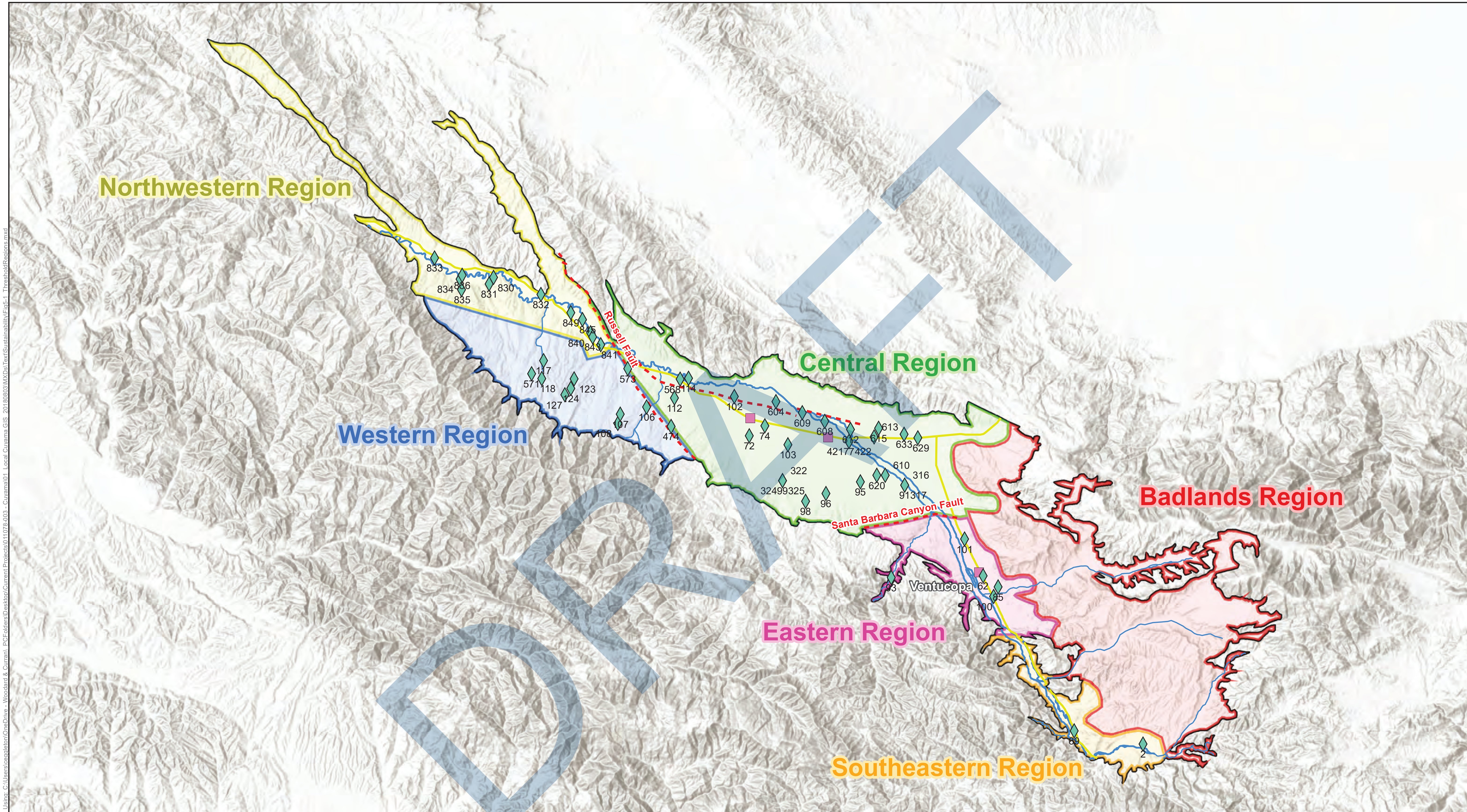

Figure 5-1: Cuyama GW Basin Groundwater Level Representative Wells & Threshold Regions

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Towns
- Representative Wells
- Faults
- Highways
- Cuyama River
- Streams

Threshold Regions

- Badlands Region
- Central Region
- Eastern Region
- Northwestern Region
- Southeastern Region
- Western Region

N

0 2.75 5.5 11 Miles

Eastern Threshold Region

The Eastern Threshold Region lies southeast of the central part of the Basin and encompasses Ventucopa and much of the surrounding agricultural property. This part of the Basin has agricultural pumping. Hydrographs in this region indicate that groundwater levels have historically ranged widely and repeatedly over the last 50 years, and in general, are declining over the past 20 years. However, these levels are generally higher than those in the Central Threshold Region. The northern boundary of this region is the Santa Barbara Canyon Fault, and the southern boundary is where the Cuyama Valley significantly narrows due to geographic changes. The eastern boundary is the extent of the boundary, and the western boundary is defined by the groundwater basin boundary.

Central Threshold Region

The Central Threshold Region incorporates the majority of agricultural land use in the Basin, as well as the towns of Cuyama and New Cuyama. The greatest depths to groundwater are also found in the Central Threshold Region, and groundwater levels have generally been declining in this region since the 1950s. The southeastern boundary is defined by the Santa Barbara Canyon fault, and the western boundary by the Russell Fault. The northern and southern boundary of this region is defined by the Basin boundary.

Western Threshold Region

The Western Threshold Region is characterized by shallow depth to water, and recent historical data and hydrographs in this region indicate that it is likely this portion of the Basin is currently in a full condition. Land uses in this area generally include livestock and small agricultural operations. It lies primarily on the north facing slope of the lower Cuyama Valley. The eastern boundary is defined by the Russell Fault, and the northern boundary was drawn to differentiate distinct land uses. The southwestern boundary is defined by the groundwater basin boundary.

Northwestern Threshold Region

The Northwestern Threshold Region is the bottom of the Cuyama Basin and has undergone changes in land use from small production agricultural and grazing to irrigated crops over the last four years. Recent historical data and hydrographs in this portion of the Basin indicate that this portion is likely currently in a full condition. The southern border was drawn to differentiate between the land uses of the Western and Northwestern Threshold regions, resulting in different kinds of agricultural practices. The rest of the region is defined by the Basin boundary.

Badlands Threshold Region

The Badlands Threshold Region includes the areas east of the Central, East, and Southeast Threshold regions on the west facing slope of the Cuyama Valley. There are no active wells and there is little groundwater use in this area. There is no monitoring in this region, and no sustainability criteria were developed for this region.

5.2.2 Minimum Thresholds, Measurable Objectives, and Interim Milestones

This section describes how MTs, MOs, and IMs were established by threshold region, and explains the rationale behind each selected methodology.

Southeastern Threshold Region

Monitoring in this threshold region indicates groundwater levels are static except during drought conditions from 2013 to 2018. Static groundwater levels indicate this area of the Basin is generally at capacity; therefore, the MT is protective of domestic, private, public, and environmental uses.

The MO for the Southeastern Threshold Region's wells was calculated by finding the measurement taken closest to (but not before) January 1, 2015 and not after April 30, 2015. If no measurement was taken during this four-month period, then a linear trendline was applied to the data and the value for January 1, 2015 was extrapolated.

To provide an operational flexibility range, the MT was calculated by subtracting five years of groundwater storage from the MO. Five years of storage was calculated by finding the decline in groundwater levels from 2013 to 2018, which was considered a period of drought. If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value decline value.

IMs were set to equal the MT in all incremental years between 2020 and 2040. This reflects a policy goal of minimizing the exceedance of MTs between now and 2040. As a result, IMs will a way to measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

Eastern Threshold Region

Monitoring in this threshold region indicates a downward trend in groundwater levels. The MT for wells in this region intends to protect domestic, private, public and environmental uses of the groundwater by allowing for managed extraction in areas that have beneficial uses and protecting those with at risk infrastructure.

Stakeholders reported concern about the dewatering of domestic wells in this region, and groundwater levels have been declining in monitoring wells. Both the MT and MO consider the sustainability of water levels in regard to both domestic and agricultural users.

The MT was calculated by taking the total historical range of recorded groundwater levels and used 35 percent of the range. This 35 percent was then added below the value closest to January 1, 2015 (as described above).

MOs were calculated by subtracting five years of groundwater storage from the MT. Five years of storage was found by calculating the decline in groundwater levels from 2013 to 2018 (a drought period). If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value.

IMs were set to equal the MT in all incremental years between 2020 and 2040. This reflects a policy goal of minimizing the exceedance of MTs between now and 2040. As a result, IMs will a way to measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

Central Threshold Region

Monitoring in this threshold region indicates a decline in groundwater levels, indicating an extraction rate that exceeds recharge rates. The MT for this region is set to allow current beneficial uses of groundwater while reducing extraction rates over the planning horizon to meet sustainable yield. The MO is intended to allow sufficient operational flexibility for future drought conditions.

The MT for representative wells in the Central Threshold Region was calculated by finding the maximum and minimum groundwater levels for each representative well, and calculating 20 percent of the historical range. This 20 percent was then added to the depth to water measurement closest to, but not before, January 1, 2015, and no later than April 30, 2015. If no measurement was taken during this four-month period, then a linear trendline was applied to the wells data, and the value for January 1, 2015 was extrapolated.

The MO was calculated by subtracting five years of groundwater storage from the MT. Five years of storage was found by calculating the decline in groundwater levels from 2013 to 2018 (a drought period). If measurements were insufficient for this time period, a linear trendline was used to extrapolate the value.

For Opti Wells 74, 103, 114, 568, 609, and 615, a modified MO calculation was used where the MO used the linear trendline of the full range of measurements to extrapolate a January 1, 2015 value.

IMs were set to equal the MT in all incremental years between 2020 and 2040. This reflects a policy goal of minimizing the exceedance of MTs between now and 2040. As a result, IMs will a way to measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

Western Threshold Region

Monitoring in this threshold region indicates groundwater levels are stable, and levels varied significantly depending on where representative wells were in the region. The most common use of groundwater in this region is for domestic use. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses of the groundwater and protection of current well infrastructure. The MT was calculated by taking the difference between the total well depth and the value closest to mid-February, 2018, and calculating 15 percent of that depth. Values from 2018 are used because data collected during this time represent a full basin condition. That value was then subtracted from the mid-February, 2018 measurement to calculate the MT. This allows users in this region to use their groundwater supply without increasing the risk of running a well beyond acceptable limits, and this methodology is responsive to the variety of conditions and well depths in this region.

The MO was then calculated by finding the measurement closest to mid-February, 2018, which monitoring indicates is likely a full condition.

Opti Well 474 uses a modified MO calculation where the historical high elevation measurement was used as the MO. This was done to allow for a sufficient operational flexibility based on historical data for the well.

IMs were set to equal the MT in all incremental years between 2020 and 2040. This reflects a policy goal of minimizing the exceedance of MTs between now and 2040. As a result, IMs will a way to measure progress toward sustainability over the GSP’s planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4’s Appendix A.

Northwestern Threshold Region

Monitoring in this threshold region indicates levels are stable, with some declines in the area where new agriculture is established. Due to these hydrologic conditions, the MT was set to protect the water levels from declining significantly, while allowing beneficial land surface uses and using the storage capacity of this region. The MT for the this region was found by determining the region’s total average saturated thickness for the primary storage area, and calculating 15 percent of that depth. This value was then set as the MT.

The MO for this region was calculated using 5 years of storage. Because historical data reflecting new operations in this region are limited, 50 feet was used as 5 years of storage based on local landowner input.

There are several representative wells in this region that were reclassified as far-west northwestern wells, and include Opti Wells 830, 831, 832, 833, 834, 835, and 836. These wells have total depths that is shallower, and they use the same strategies as the Western Threshold Region for their MOs and MTs.

IMs were set to equal the MT in all incremental years between 2020 and 2040. This reflects a policy goal of minimizing the exceedance of MTs between now and 2040. As a result, IMs will a way to measure progress toward sustainability over the GSP's planning horizon.

Groundwater levels will be measured using the protocols documented in Chapter 4's Appendix A.

Badlands Threshold Region

This threshold region has no groundwater use or active wells. As a result, no MO, MT, or IM was calculated.

5.2.3 Selected MT, MO, and IM Graphs, Figures, and Tables

Figure 5-2 shows an example hydrograph with indicators for the MT, MO, and IM over the hydrograph. The left axis shows elevation above mean sea level, the right axis shows depth to water below ground surface. The brown line shows the ground surface elevation, and time in years is shown on the bottom axis. Each measurement taken at the monitoring well is shown as a blue dot, with blue lines connecting between the blue dots indicating the interpolated groundwater level between measurements. The MT and IM are shown as a red line, and the MO is shown as a green line. Appendix A includes hydrographs with MT, MO and IM for each representative monitoring well.

Table 5-1 shows the representative monitoring network and the numerical values for the MT, MO, and IM.

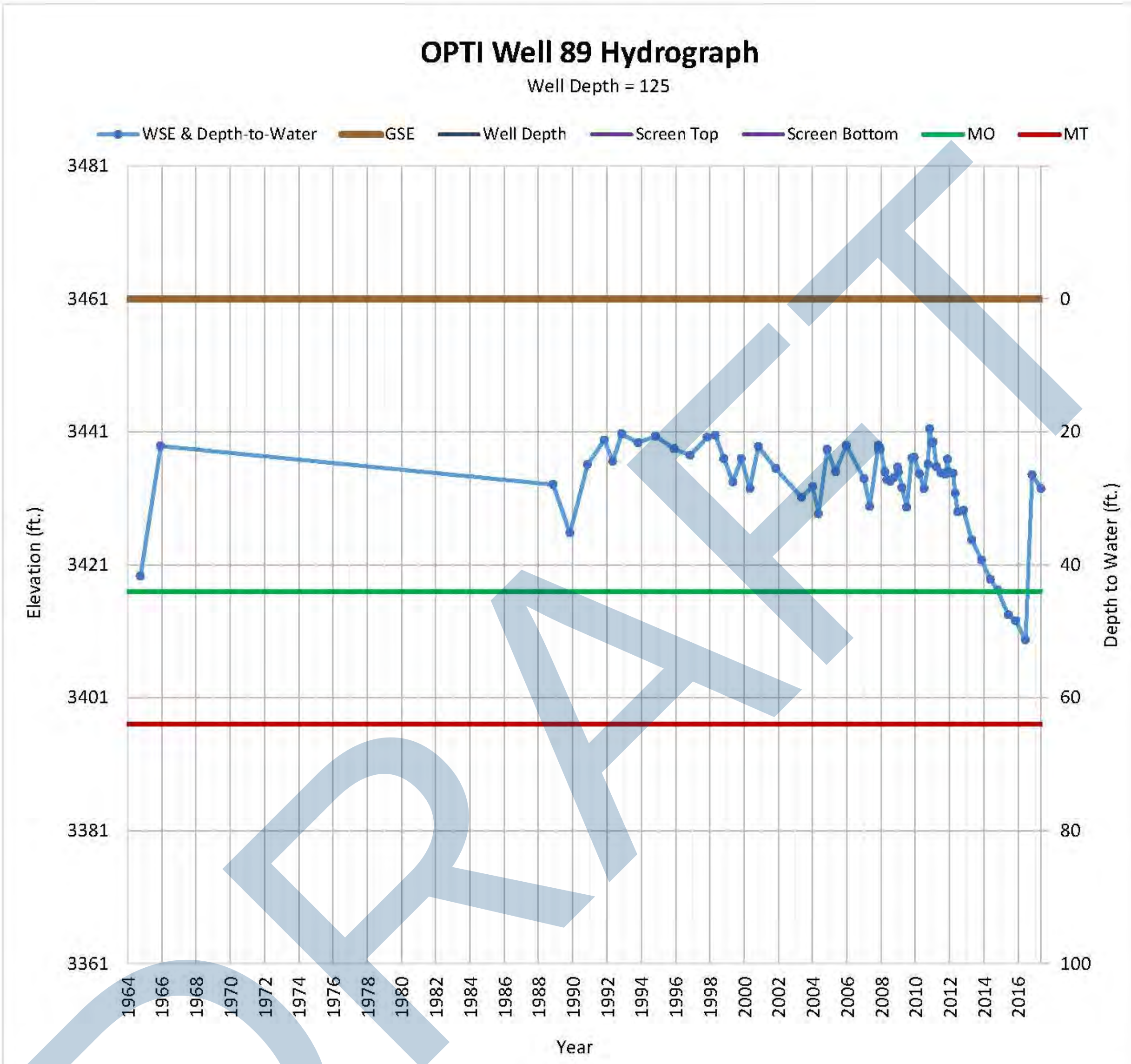

Figure 5-2: Example Hydrograph

Table 5-1: Representative Monitoring Network and Sustainability Criteria										
OPTI Well	**Region**	**Final MT**	**Final MO**	**2025 IM**	**2030 IM**	**2035 IM**	**Well Depth (feet)**	**Screen Top (feet)**	**Screen Bottom (feet)**	**GSE (feet)**
72	Central	169	124	169	169	169	790	340	770	2,171
74	Central	256	243	256	256	256	--	--	--	2,193
77	Central	450	400	450	450	450	980	960	980	2,286
91	Central	625	576	625	625	625	980	960	980	2,474
95	Central	573	538	573	573	573	805	--	--	2,449
96	Central	333	325	333	333	333	500	--	--	2,606
98	Central	450	439	450	450	450	750	--	--	2,688
99	Central	311	300	311	311	311	750	730	750	2,513
102	Central	235	197	235	235	235	--	--	--	2,046
103	Central	290	235	290	290	290	1,030	--	--	2,289
112	Central	87	85	87	87	87	441	--	--	2,139
114	Central	47	45	47	47	47	58	--	--	1,925
316	Central	623	574	623	623	623	830	--	--	2,474
317	Central	623	573	623	623	623	700	--	--	2,474
322	Central	307	298	307	307	307	850	--	--	2,513
324	Central	311	299	311	311	311	560	--	--	2,513
325	Central	300	292	300	300	300	380	--	--	2,513
420	Central	450	400	450	450	450	780	--	--	2,286

Table 5-1: Representative Monitoring Network and Sustainability Criteria

OPTI Well	Region	Final MT	Final MO	2025 IM	2030 IM	2035 IM	Well Depth (feet)	Screen Top (feet)	Screen Bottom (feet)	GSE (feet)
421	Central	446	398	446	446	446	620	--	--	2,286
422	Central	444	397	444	444	444	460	--	--	2,286
474	Central	188	169	188	188	188	213	--	--	2,369
568	Central	37	36	37	37	37	188	--	--	1,905
604	Central	526	487	526	526	526	924	454	924	2,125
608	Central	436	407	436	436	436	745	440	745	2,224
609	Central	458	421	458	458	458	970	476	970	2,167
610	Central	621	591	621	621	621	780	428	780	2,442
612	Central	463	440	463	463	463	1,070	657	1070	2,266
613	Central	503	475	503	503	503	830	330	830	2,330
615	Central	500	468	500	500	500	865	480	865	2,327
620	Central	606	566	606	606	606	1,035	550	1035	2,432
629	Central	559	527	559	559	559	1,000	500	1000	2,379
633	Central	547	493	547	547	547	1,000	500	1000	2,364
62	Eastern	182	157	182	182	182	212	--	--	2,921
85	Eastern	233	209	233	233	233	233	--	--	3,047
100	Eastern	181	152	181	181	181	284	--	--	3,004
101	Eastern	111	88	111	111	111	200	--	--	2,741

Table 5-1: Representative Monitoring Network and Sustainability Criteria

OPTI Well	Region	Final MT	Final MO	2025 IM	2030 IM	2035 IM	Well Depth (feet)	Screen Top (feet)	Screen Bottom (feet)	GSE (feet)
840	Northwestern	203	153	203	203	203	900	200	880	1,713
841	Northwestern	203	153	203	203	203	600	170	580	1,761
843	Northwestern	203	153	203	203	203	620	60	600	1,761
845	Northwestern	203	153	203	203	203	380	100	360	1,712
849	Northwestern	203	153	203	203	203	570	150	550	1,713
2	Southeastern	72	55	72	72	72	73	--	--	3,720
89	Southeastern	64	44	64	64	64	125	--	--	3,461
106	Western	154	141.4	154	154	154	227.5	--	--	2,327
107	Western	91	72.23	91	91	91	200	--	--	2,482
108	Western	165	135.62	165	165	165	328.75	--	--	2,629
117	Western	160	150.82	160	160	160	212	--	--	2,098
118	Western	124	57.22	124	124	124	500	--	--	2,270
123	Western	31	12.59	31	31	31	138	--	--	2,165
124	Western	73	57.12	73	73	73	160.55	--	--	2,287
127	Western	42	31.74	42	42	42	100.25	--	--	2,364
571	Western	144	120.5	144	144	144	280	--	--	2,307
573	Western	118	67.5	118	118	118	404	--	--	2,084
830	Far-West Northwestern	59	56	59	59	59	77.2	--	--	1,571

Table 5-1: Representative Monitoring Network and Sustainability Criteria

OPTI Well	Region	Final MT	Final MO	2025 IM	2030 IM	2035 IM	Well Depth (feet)	Screen Top (feet)	Screen Bottom (feet)	GSE (feet)
831	Far-West Northwestern	77	52	77	77	77	213.75	--	--	1,557
832	Far-West Northwestern	45	30	45	45	45	131.8	--	--	1,630
833	Far-West Northwestern	96	24	96	96	96	503.55	--	--	1,457
834	Far-West Northwestern	84	42	84	84	84	320	--	--	1,508
835	Far-West Northwestern	55	36	55	55	55	162.2	--	--	1,555
836	Far-West Northwestern	79	36	79	79	79	325	--	--	1,486

5.3 Reduction of Groundwater Storage

The undesirable result for the reduction in groundwater storage is a result that causes significant and unreasonable reduction in the viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

Direct measurement of the reduction of groundwater storage in the Basin is not needed because monitoring in several areas of the Basin (i.e., the western, eastern, and portions of the north facing slope of the Cuyama Valley near the center of the Basin) indicate that those regions are likely near, or at full conditions. Additionally, the Basin's primary aquifer is not confined and storage closely matches groundwater levels.

SGMA regulations define the MT for reduction of groundwater storage as "…the total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results."

Undesirable results for groundwater storage volumes in this GSP will use groundwater levels as a proxy, as the groundwater level sustainability criteria are protective of groundwater in storage.

5.3.1 Threshold Regions

Groundwater storage is measured by proxy using groundwater level thresholds, and thus uses the same methodology and threshold regions as groundwater levels.

5.3.2 Proxy Monitoring

Reduction of groundwater storage in the Basin uses groundwater levels as a proxy for determining sustainability, as permitted by Title 23 of the California Code of Regulations in Section 354.26 (d), Chapter 1.5.2.5. Additionally, there are currently no state, federal, or local standards that regulate groundwater storage. As described above, any benefits to groundwater storage are expected to coincide with groundwater level management.

5.4 Seawater Intrusion

Due to the geographic location of the Basin, seawater intrusion is not a concern, and thus is not required to establish criteria for undesirable results for seawater intrusion, as supported by Title 23 of the California Code of Regulations in Section 354.26 (d), Chapter 1.5.2.5

5.5 Degraded Water Quality

The undesirable result for degraded water quality is a result stemming from a causal nexus between SGMA-related groundwater quantity management activities and groundwater quality that causes significant and unreasonable reduction in the long-term viability of domestic, agricultural, municipal, or environmental uses over the planning and implementation horizon of this GSP.

The SGMA regulations specify that, “minimum thresholds for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results.”

Salinity (measured as total dissolved solids [TDS]), arsenic, and nitrates have all been identified as potentially being of concern for water quality in the Basin. However, as noted in the Groundwater Conditions section, there have only been two nitrate measurements and three arsenic measurements in recent years that exceeded MCLs. In the case of arsenic, all of the high concentration measurements have been taken at groundwater depths of greater than 700 feet, outside of the range of pumping. Furthermore, unlike with salinity, there is no evidence to suggest a causal nexus between potential GSP actions and arsenic or salinity. Therefore, the groundwater quality network has been established to monitor for salinity (measured as TDS) but does not include arsenic or nitrates at this time.

TDS is being monitored by the GSA for several reasons. Local stakeholders identified TDS as one of the constituents of concerns in the GSP development processes, and TDS has had several exceedance measurements near domestic and public supply wells. Although high TDS concentrations are naturally occurring within the Basin, it is believed that management of groundwater levels may help improve TDS concentration levels towards levels reflective of the natural condition.

5.5.1 Threshold Regions

Groundwater quality monitoring does not use threshold regions. because the same approach is used for all wells in the Basin. Figure 5-3 shows groundwater quality representative well locations in the Basin.

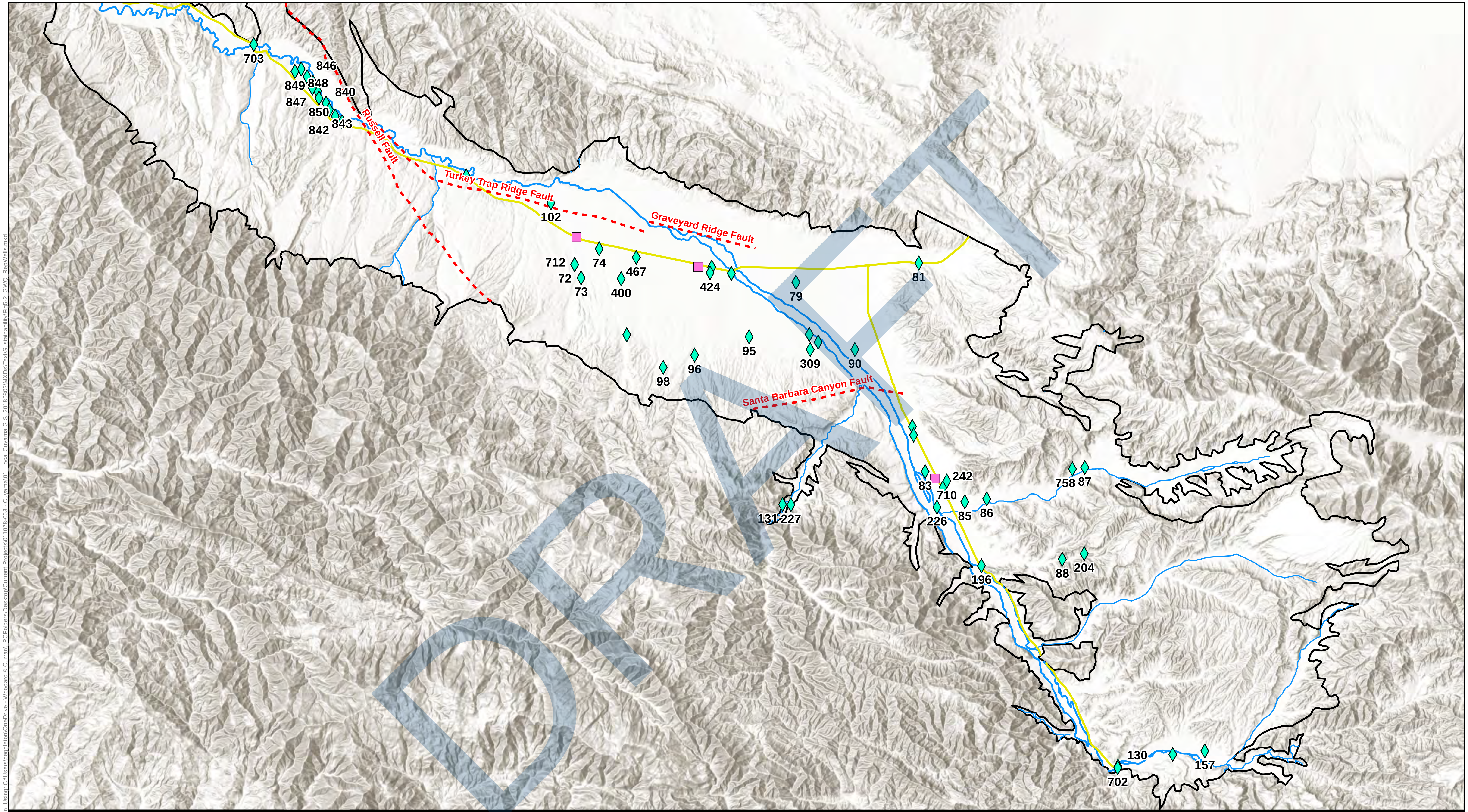

Figure 5-3: Cuyama GW Basin Groundwater Quality Representative Wells

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

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Legend

- Cuyama Basin
- Towns
- Faults
- Highways
- Cuyama River
- Streams
- Representative Groundwater Quality Wells

N

0 1.75 3.5 7 Miles

5.5.2 Proxy Monitoring

Proxy monitoring is not used for groundwater quality monitoring in the Basin.

5.5.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

The CBGSA has decided to address TDS within the Basin by setting MTs, MOs, and IMs as shown in Table 5-2. TDS does not have a primary maximum contaminant level (MCL), but does have both a California Division of Drinking Water and U.S. Environmental Protection Agency. Secondary standard of 500 milligrams per liter (mg/L), and a short-term standard of 1,500 mg/L. Current levels in the Basin range from 84 to 4,400 mg/L. This is due to saline conditions in the portions of the watershed where rainfall percolates through marine sediments that contain large amounts of salt.

Due to this natural condition, additional data will be collected during GSP implementation to increase the CBGSA's understanding of TDS sources in the Basin. It should be noted however, that TDS levels in groundwater do not detrimentally impact the agricultural economy of the Basin. Much of the crops grown in the Basin, including carrots, are not significantly affected by the kinds of salts in the Basin.

Due to these factors, the MT for representative well sites was set to be the 20 percent of the total range of each representative monitoring site above the 90th percentile of measurements for each site. For example, Opti Well 72 has a minimum recorded TDS value of 955 mg/L and a maximum of 1,020 mg/L. This is a range of 65 mg/L, and 20 percent of that range is 13 mg/L. The 90th percentile for Opti Well 72 is 1,010 mg/L. The MT is then calculated by taking the 90th percentile of 1,010 mg/L and adding 13mg/L to reach a final MT of 1,023 mg/L.

To provide for an acceptable margin of operational flexibility, the MO for TDS levels in the Basin have been set to the temporary MCL of 1,500 mg/L for each representative well where the latest measurements as of 2018 are greater than 1,500 mg/L. For wells with recent measurements of less than 1,500 mg/L, the MO was set to the most recent measurement as of 2018.

GSP regulations require GSAs to avoid undesirable results by 2040, which means they must meet or exceed the MTs. The CBGSA also recognizes that reaching an MO is a priority, but meeting or exceeding the MT is required by SGMA. For this reason, the IMs for 2025, 2030, and 2035 have been set as the same value as the MT.

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS

Opti Well	Well Depth (feet below GSE)	Screen Interval (feet below GSE)	Well Elevation (feet above MSL)	Most Recent Measurement (feet)	Minimum Value (mg/L)	Maximum Measurement Value (mg/L)	20% of Range (mg/L)	90th Percentile (mg/L)	MO (mg/L)	MT (mg/L)	2025 IM (mg/L)	2030 IM (mg/L)	2035 IM (mg/L)
61	357	Unknown	3,681	585	468	602	26.8	588.4	585	615.2	615.2	615.2	615.2
72	790	340 – 350	2,171	996	955	1020	13	1010	996	1,023	1023	1023	1023
73	880	Unknown	2,252	805	777	844	13.4	842.5	805	855.9	855.9	855.9	855.9
74	--	Unknown	2,193	1,550	1,530	1,820	58	1775	1,500	1,833	1833	1833	1833
76	720	Unknown	2,277	1,700	1,280	2,190	182	2,124.9	1,500	2,306.9	2,306.9	2306.9	2306.9
77	980	960 – 980	2,286	1,520	1,520	1,580	12	1580	1,500	1,592	1592	1592	1592
79	600	Unknown	2,374	2,140	1,810	2,280	94	2226	1,500	2,320	2320	2320	2320
81	155	Unknown	2,698	2,620	2,620	2,760	28	2760	1,500	2,788	2788	2788	2788
83	198	Unknown	2,858	1,660	1,660	1,720	12	1714	1,500	1,726	1726	1726	1726
85	233	Unknown	3,047	618	491	1,500	201.8	1,189.4	618	1,391.2	1,391.2	1391.2	1391.2
86	230	Unknown	3,141	969	912	969	11.4	963.3	969	974.7	974.7	974.7	974.7
87	232	Unknown	3,546	1,090	891	1,160	53.8	1,111	1,090	1,164.8	1,164.8	1164.8	1164.8
88	400	Unknown	3,549	302	302	302	0	302	302	302	302	302	302
90	800	Unknown	2,552	1,530	1,440	1,580	28	1,565	1,500	1,593	1,593	1593	1593
91	980	960 – 980	2,474	1,410	1,410	1,480	14	1,473	1,410	1,487	1,487	1487	1487
94	550	Unknown	2,456	1,050	1,050	1,230	36	1,209	1,050	1,245	1,245	1245	1245
95	805	Unknown	2,449	1,710	1,710	1,840	26	1,840	1,500	1,866	1,866	1866	1866
96	500	Unknown	2,606	1,500	1,500	1,620	24	1,608	1,500	1,632	1,632	1632	1632
98	750	Unknown	2,688	2,220	2,220	2,370	30	2,370	1,500	2,400	2,400	2400	2400
99	750	730 – 750	2,513	1,490	1,490	1,550	12	1,550	1,490	1,562	1,562	1562	1562
101	200	Unknown	2,741	1,550	1,550	1,680	26	1,667	1,500	1,693	1,693	1693	1693
102	--	Unknown	2,046	1,970	1,920	2,290	74	2,277	1,500	2,351	2,351	2351	2351
130	--	Unknown	3,536	1,800	1,800	1,850	10	1,845	1,500	1,855	1,855	1855	1855
131	--	Unknown	2,990	1,850	1,850	1,970	24	1,958	1,500	1,982	1,982	1982	1982
157	71	Unknown	3,755	1,930	1,910	2,320	82	2,278	1,500	2,360	2,360	2360	2360
196	741	Unknown	3,117	851	682	868	37.2	866.5	851	903.7	903.7	903.7	903.7
204	--	Unknown	3,693	253	253	266	2.6	266	253	268.6	268.6	268.6	268.6
226	--	Unknown	2,945	1,760	1,760	1,830	14	1,830	1,500	1,844	1,844	1,844	1,844

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS

Opti Well	Well Depth (feet below GSE)	Screen Interval (feet below GSE)	Well Elevation (feet above MSL)	Most Recent Measurement (feet)	Minimum Value (mg/L)	Maximum Measurement Value (mg/L)	20% of Range (mg/L)	90th Percentile (mg/L)	MO (mg/L)	MT (mg/L)	2025 IM (mg/L)	2030 IM (mg/L)	2035 IM (mg/L)
227	--	Unknown	3,002	1,780	1,780	2,200	84	2,146	1,500	2,230	2,230	2,230	2,230
242	155	Unknown	2,933	1,470	1,470	1,510	8	1,510	1,470	1,518	1,518	1,518	1,518
269	--	Unknown	2,756	1,570	1,570	1,690	24	1,678	1,500	1,702	1,702	1,702	1,702
309	1,100	Unknown	2,513	1,410	1,410	1,500	18	1,491	1,410	1,509	1,509	1,509	1,509
316	830	Unknown	2,474	1,380	1,380	1,460	16	1,452	1,380	1,468	1,468	1,468	1,468
317	700	Unknown	2,474	1,260	1,260	1,330	14	1,323	1,260	1,337	1,337	1,337	1,337
318	610	Unknown	2,474	1,080	1,080	1,140	12	1,140	1,080	1,152	1,152	1,152	1,152
322	850	Unknown	2,513	1,350	1,350	1,380	6	1,380	1,350	1,386	1,386	1,386	1,386
324	560	Unknown	2,513	746	746	772	5.2	772	746	777.2	777.2	777.2	777.2
325	380	Unknown	2,513	1,470	1,470	1,560	18	1,551	1,470	1,569	1,569	1,569	1,569
400	2,120	Unknown	2,298	918	680	948	53.6	922	918	975.6	975.6	975.6	975.6
420	780	Unknown	2,286	1,430	1,430	1,480	10	1,480	1,430	1,490	1,490	1,490	1,490
421	620	Unknown	2,286	1,520	1,520	1,600	16	1,600	1,500	1,616	1,616	1,616	1,616
422	460	Unknown	2,286	1,810	1,810	1,930	24	1,918	1,500	1,942	1,942	1,942	1,942
424	1,000	Unknown	2,291	1,540	1,540	1,580	8	1,580	1,500	1,588	1,588	1,588	1,588
467	1,140	Unknown	2,224	1,630	1,530	1,730	40	1,724	1,500	1,764	1,764	1,764	1,764
568	188	Unknown	1,905	871	871	1,180	61.8	1,129.6	871	1,191.4	1,191.4	1,191.4	1,191.4
702	--	Unknown	3,539	110	48	1,900	370.4	1,704	110	2,074.4	2,074.4	2,074.4	2,074.4
703	--	Unknown	1,613	400	16	4,500	896.8	3,200	400	4,096.8	4,096.8	4,096.8	4,096.8
710	--	Unknown	2,942	1,040	1,040	1,040	0	1,040	1,040	1,040	1,040	1,040	1,040
711	--	Unknown	1,905	928	928	928	0	928	928	928	928	928	928
712	--	Unknown	2,171	977	972	977	1	9,76.5	977	977.5	977.5	977.5	977.5
713	--	Unknown	2,456	1,200	1,200	1,200	0	1,200	1,200	1,200	1,200	1,200	1,200
721	--	Unknown	2,374	2,170	2,170	2,170	0	2,170	1,500	2,170	2,170	2,170	2,170
758	--	Unknown	3,537	900	760	923	32.6	9,21.7	900	954.3	954.3	954.3	954.3
840	900	200 – 880	1,713	559	559	559	0	559	559	559	559	559	559
841	600	170 – 580	1,761	561	561	561	0	561	561	561	561	561	561
842	450	60 – 430	1,759	547	547	547	0	547	547	547	547	547	547

Table 5-2: MOs, MTs, and Interim Milestones for Groundwater Quality Representative Sites - TDS

Opti Well	Well Depth (feet below GSE)	Screen Interval (feet below GSE)	Well Elevation (feet above MSL)	Most Recent Measurement (feet)	Minimum Value (mg/L)	Maximum Measurement Value (mg/L)	20% of Range (mg/L)	90th Percentile (mg/L)	MO (mg/L)	MT (mg/L)	2025 IM (mg/L)	2030 IM (mg/L)	2035 IM (mg/L)
843	620	60 – 600	1,761	569	569	569	0	569	569	569	569	569	569
844	730	100 – 720	1,713	481	481	481	0	481	481	481	481	481	481
845	380	100 – 360	1,712	1,250	1,250	1,250	0	1,250	1,250	1,250	1,250	1,250	1,250
846	610	130 – 590	1,715	918	918	918	0	918	918	918	918	918	918
847	600	180 – 580	1,733	480	480	480	0	480	480	480	480	480	480
848	390	110 – 370	1,694	674	674	674	0	674	674	674	674	674	674
849	570	150 – 550	1,713	1,780	1,780	1,780	0	1,780	1,500	1,780	1,780	1,780	1,780
850	790	180 – 780	1,759	472	472	472	0	472	472	472	472	472	472

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5.6 Subsidence

The undesirable result for land subsidence is a result that causes significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

5.6.1 Threshold Regions

Subsidence monitoring does not use threshold regions. because the same approach is used for all wells in the Basin. Figure 5-4 shows representative locations of subsidence in the Basin.

5.6.2 Representative Monitoring

As discussed in Chapter 4, Section 4.9, all monitoring network subsidence monitoring stations in the Basin, and three additional sites outside of the Basin are designated as representative monitoring sites (Figure 5-4). Detrimental impacts of subsidence include groundwater storage reductions and potential damage to infrastructure, such as large pipelines, roads, bridges and canals. However, the Basin does not currently have infrastructure of this type, and storage losses are small enough they may be considered superficial.

Subsidence in the central portion of the Basin is approximately 0.5 inches per year, as shown in Chapter 2, Section 2.2. Currently, there are no state, federal, or local standards that regulate subsidence rates.

5.6.3 Minimum Thresholds, Measurable Objectives, and Interim Milestones

Although several factors may affect subsidence rates, including natural geologic processes, oil pumping, and groundwater pumping, the primary influence within the Basin is due to groundwater pumping. Because current subsidence rates (approximately 0.8 inches per year) are not significant and unreasonable, the MT rate for subsidence was set at 2 inches per year to allow for flexibility as the Basin works toward sustainability in 2040. This rate is applied primarily to the two stations in the Basin (CUHS and VCST), as the other stations in the monitoring network represent ambient changes in vertical displacement, primarily due to geological influences. This level of subsidence is considered unlikely to cause a significant and unreasonable reduction in the viability of the use of infrastructure over the planning and implementation horizon of this GSP.

Subsidence is expected to be influenced through the management of groundwater pumping through the groundwater level MOs, MTs, and IMs. Thus, the MO for subsidence is set for zero lowering of ground surface elevations.

IMs are not needed for the subsidence sustainability indicator because the current rate of subsidence is above the MT.

Subsidence rates will be measured in the frequency of measurement and monitoring protocols documented in Section 4’s Appendix A..

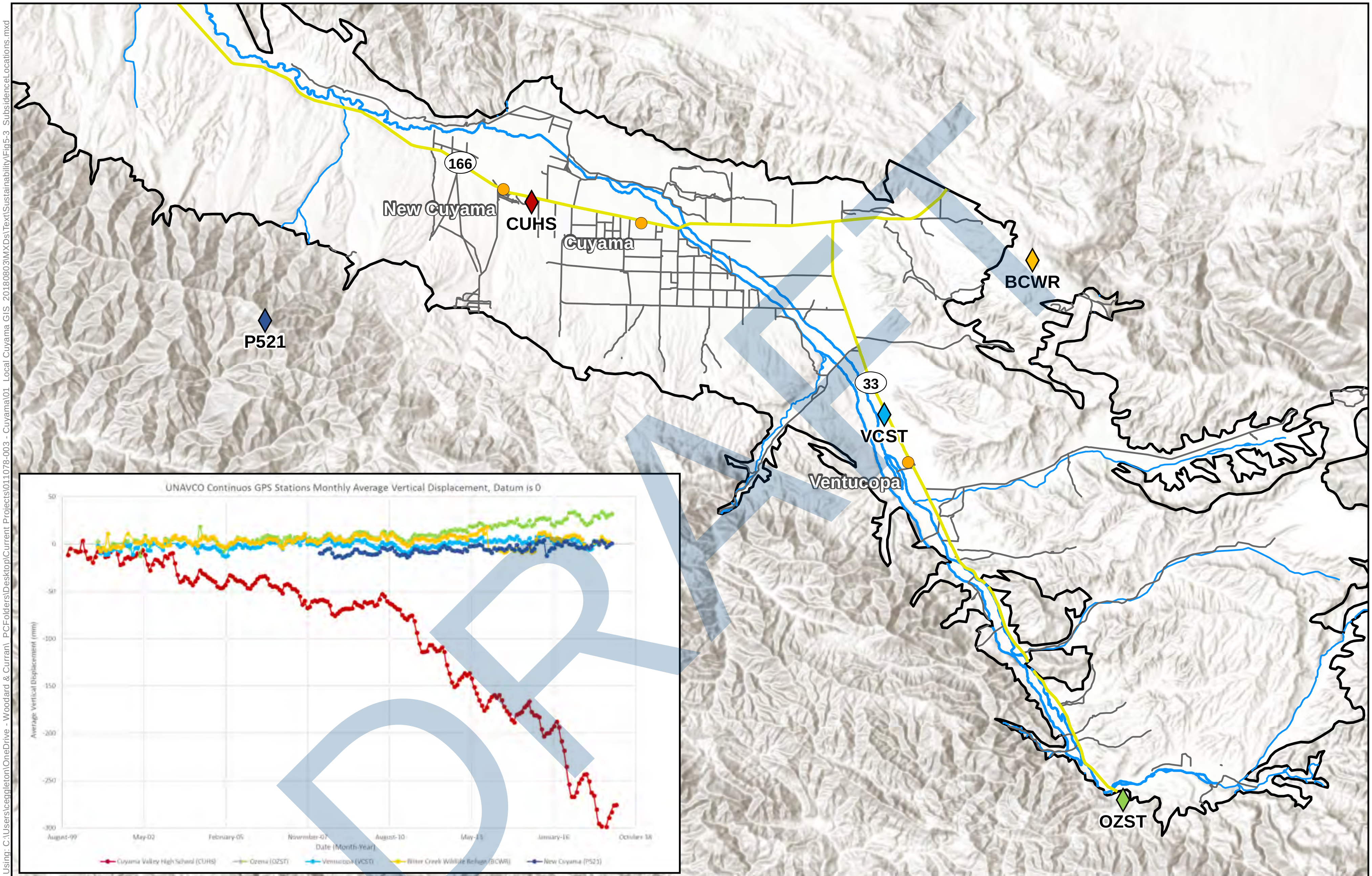

Figure 5-4: Cuyama GW Basin Subsidence Monitoring Locations

Cuyama Basin Groundwater Sustainability Agency

Cuyama Valley Groundwater Basin Groundwater Sustainability Plan

April 2019

WOODARD & CURRAN

Legend

- Cuyama Basin
- Towns
- Highways
- Local Roads
- Cuyama River
- Streams

0 2 4 8 Miles

N

5.7 Depletions of Interconnected Surface Water

The undesirable result for depletions of interconnected surface water is a result that causes significant and unreasonable reductions in the viability of agriculture or riparian habitat in the Basin over the planning and implementation horizon of this GSP.

SGMA regulations define the MT for interconnected surface water as "…the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on the beneficial uses of the surface water and may lead to undesirable results." Under normal surface water conditions in the Basin as of January 1, 2015, surface flows infiltrate into the groundwater system and are used by phreatophytes, except in the most extreme flash flood events, when surface water flows out of the Basin. Historically, these flash flood events flow for less than one week of the year. Conditions have not changed since January 1, 2015, and surface flows continue to infiltrate into the groundwater system for use by local phreatophytes.

Because current Basin conditions have not varied from January 1, 2015 conditions, the groundwater level thresholds established in Section 5.2 will act to maintain depletions of interconnected surface water at similar levels to those that existed in January 1, 2015. Therefore, groundwater level thresholds are used by proxy to protect the Basin from undesirable results related to depletion of interconnected surface water.

5.8 References

California Water Boards Irrigated Land Regulatory Program (ILRP) website. https://www.waterboards.ca.gov/centralvalley/water_issues/irrigated_lands/. Accessed January 11, 2019.

Appendix A

Hydrographs Showing Minimum Thresholds,
Measurable Objectives and Interim Milestones

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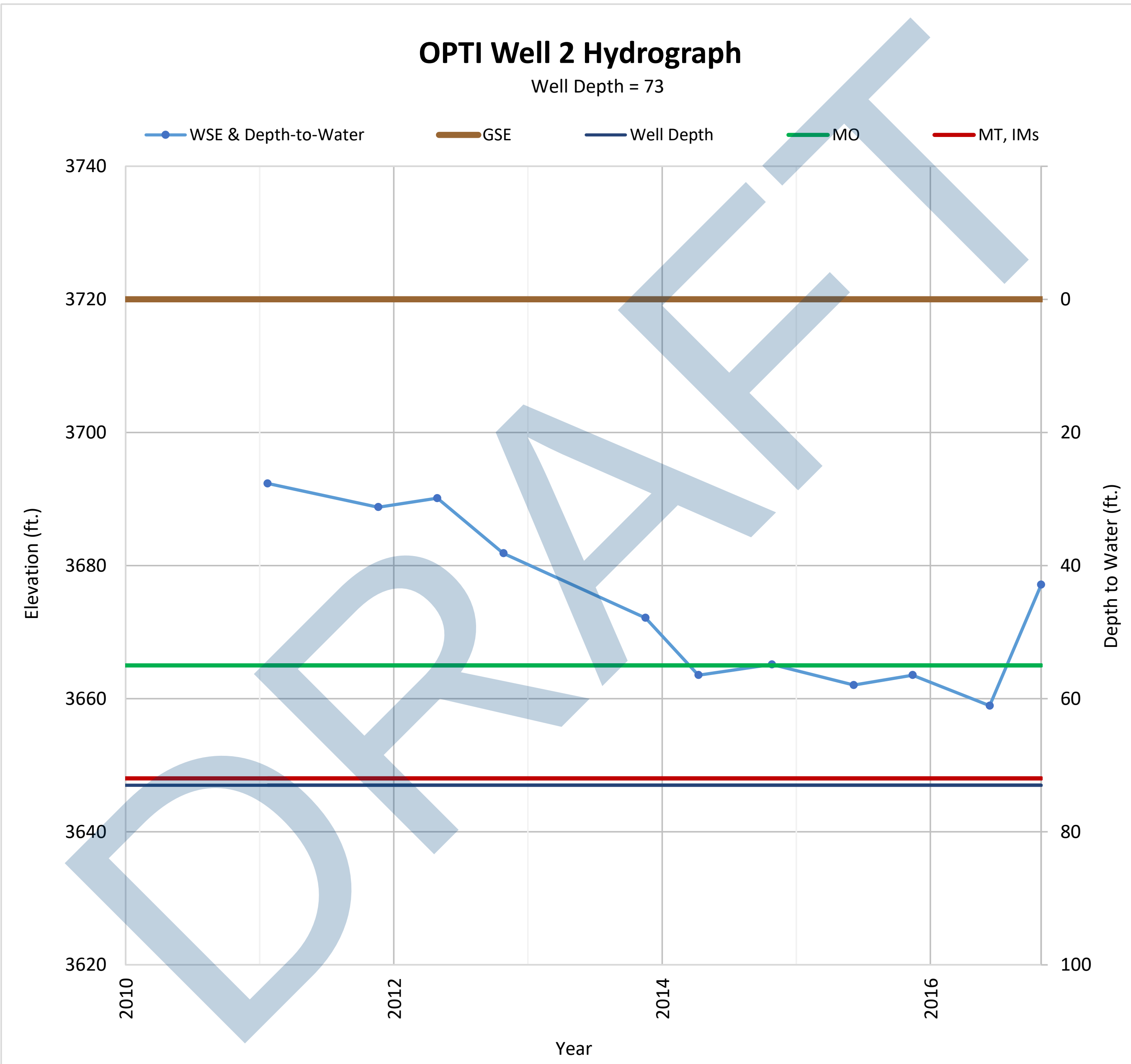
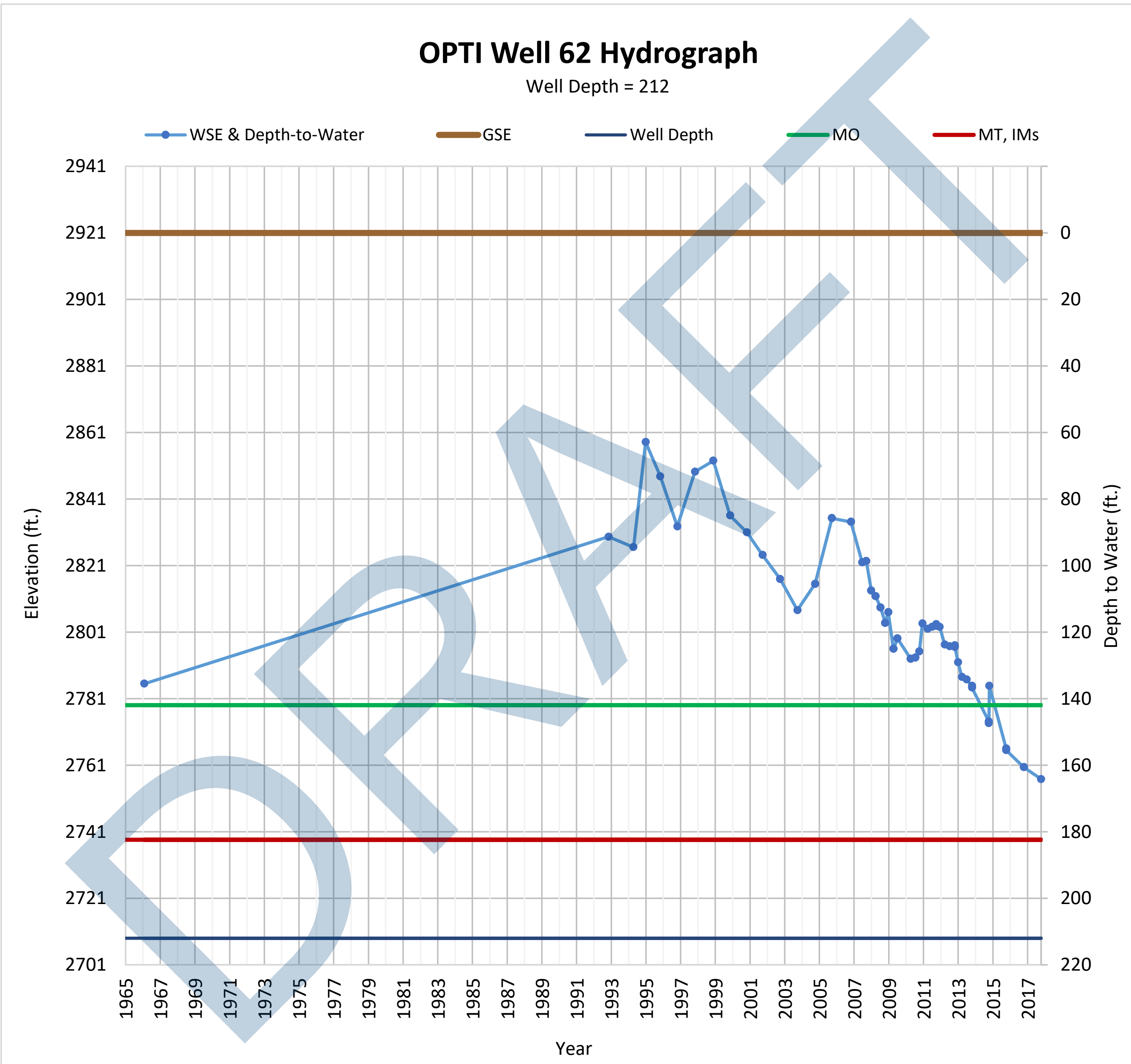
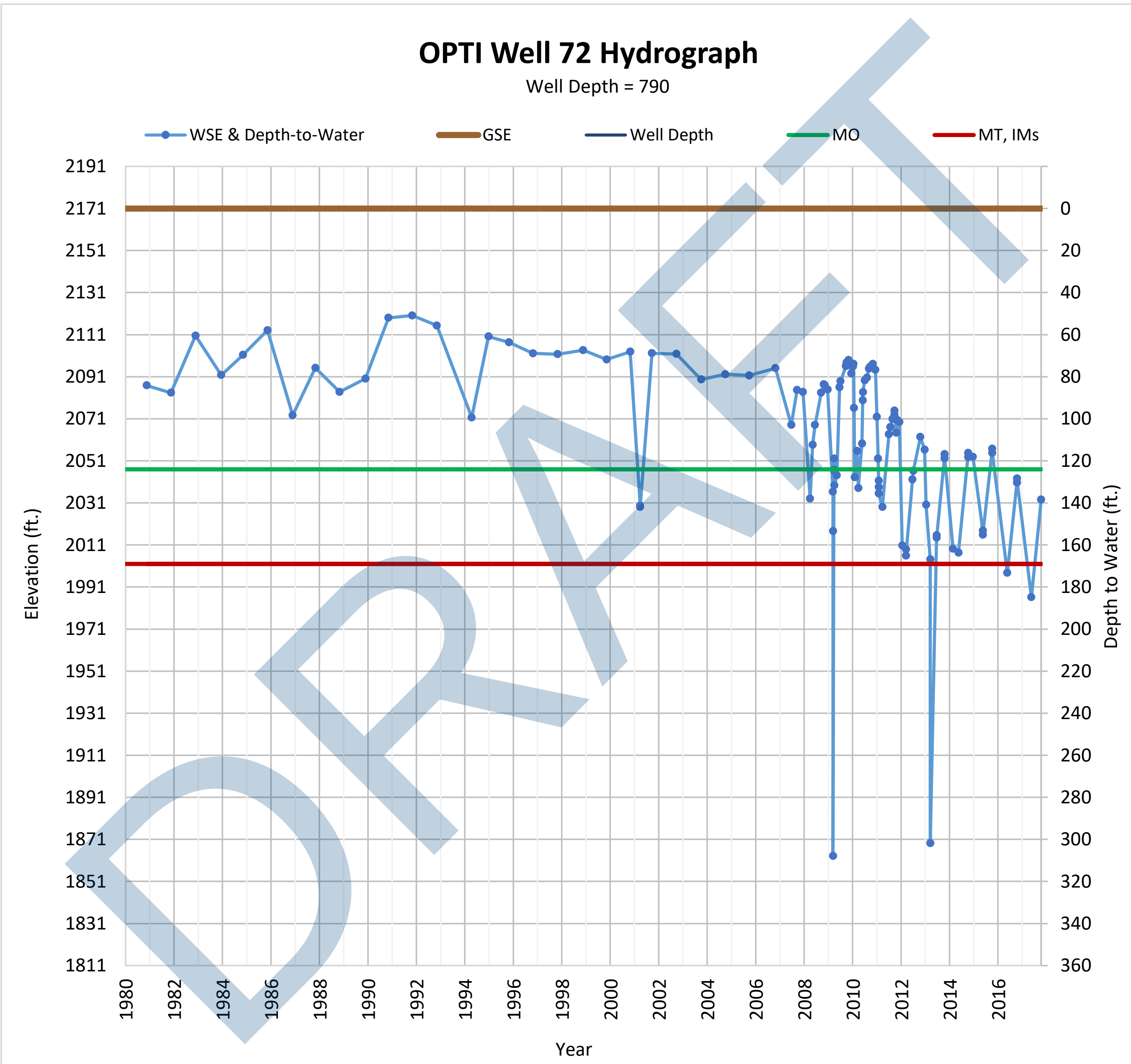
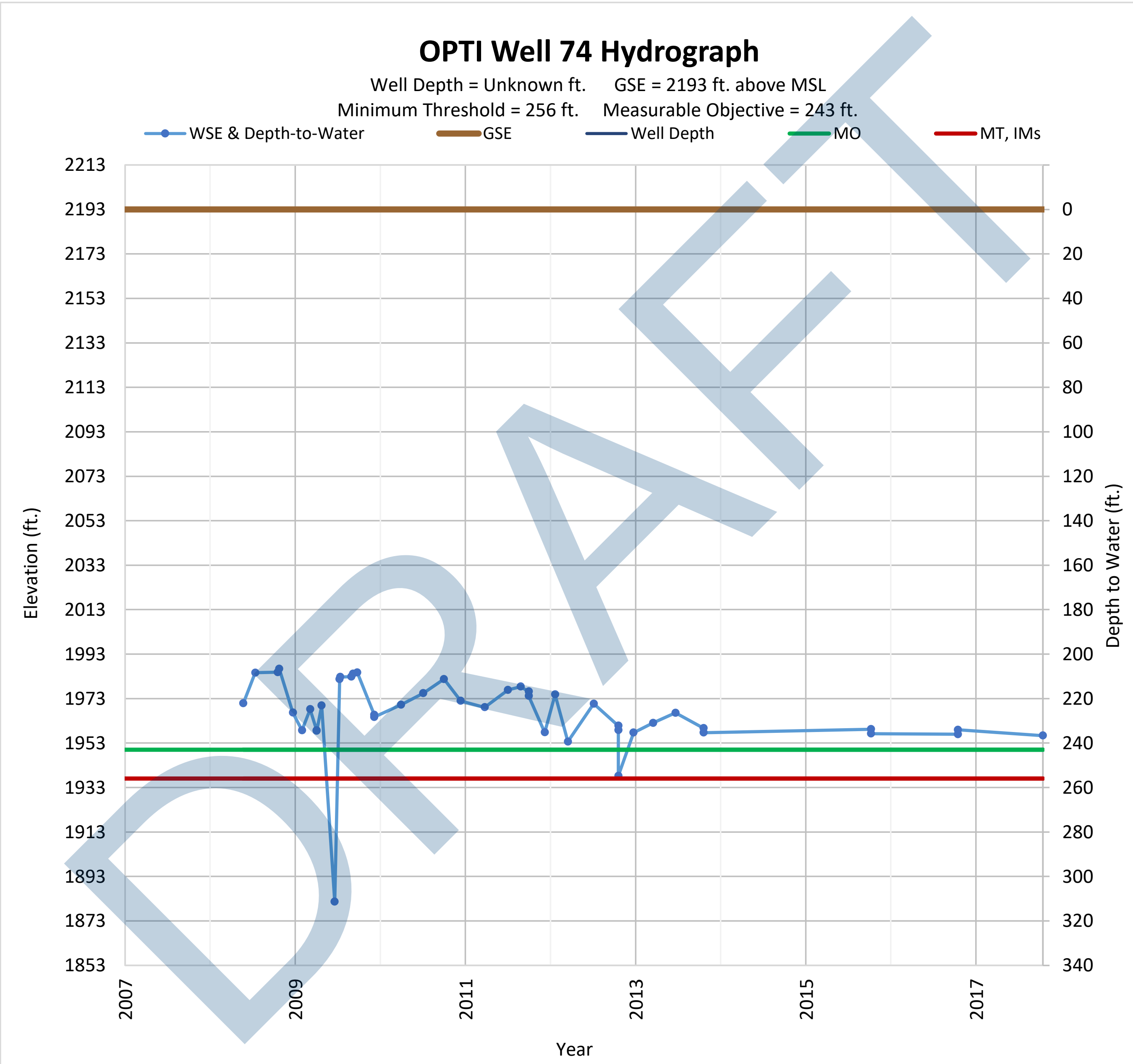


OPTI Well 2 Hydrograph
Well Depth = 73
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
3740
3720
3700
3680
3660
3640
3620
Elevation (ft.)
0
20
40
60
80
100
Depth to Water (ft.)
2010
2012
2014
2016
Year
DRAFT

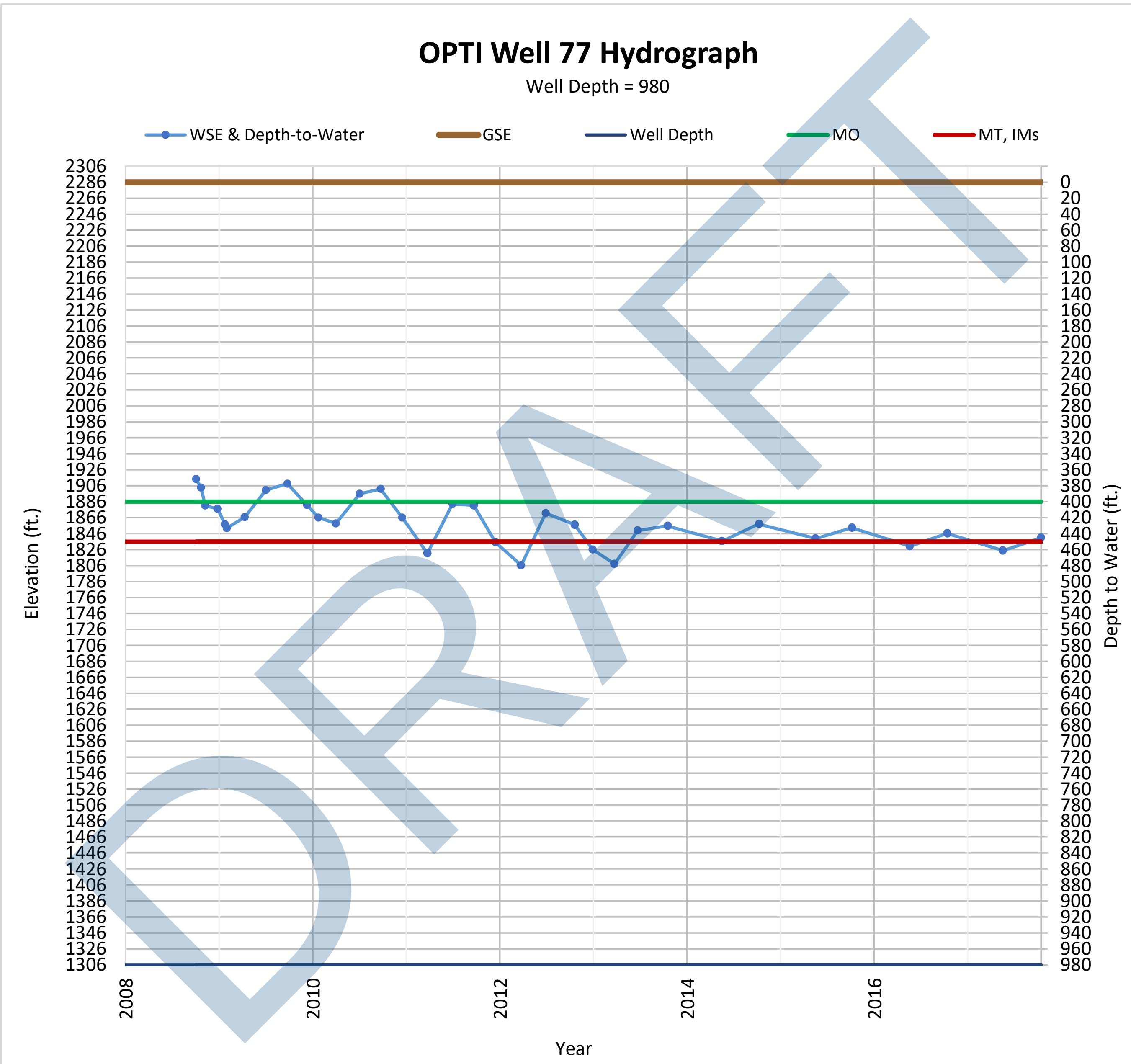


OPTI Well 62 Hydrograph
Well Depth = 212
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT

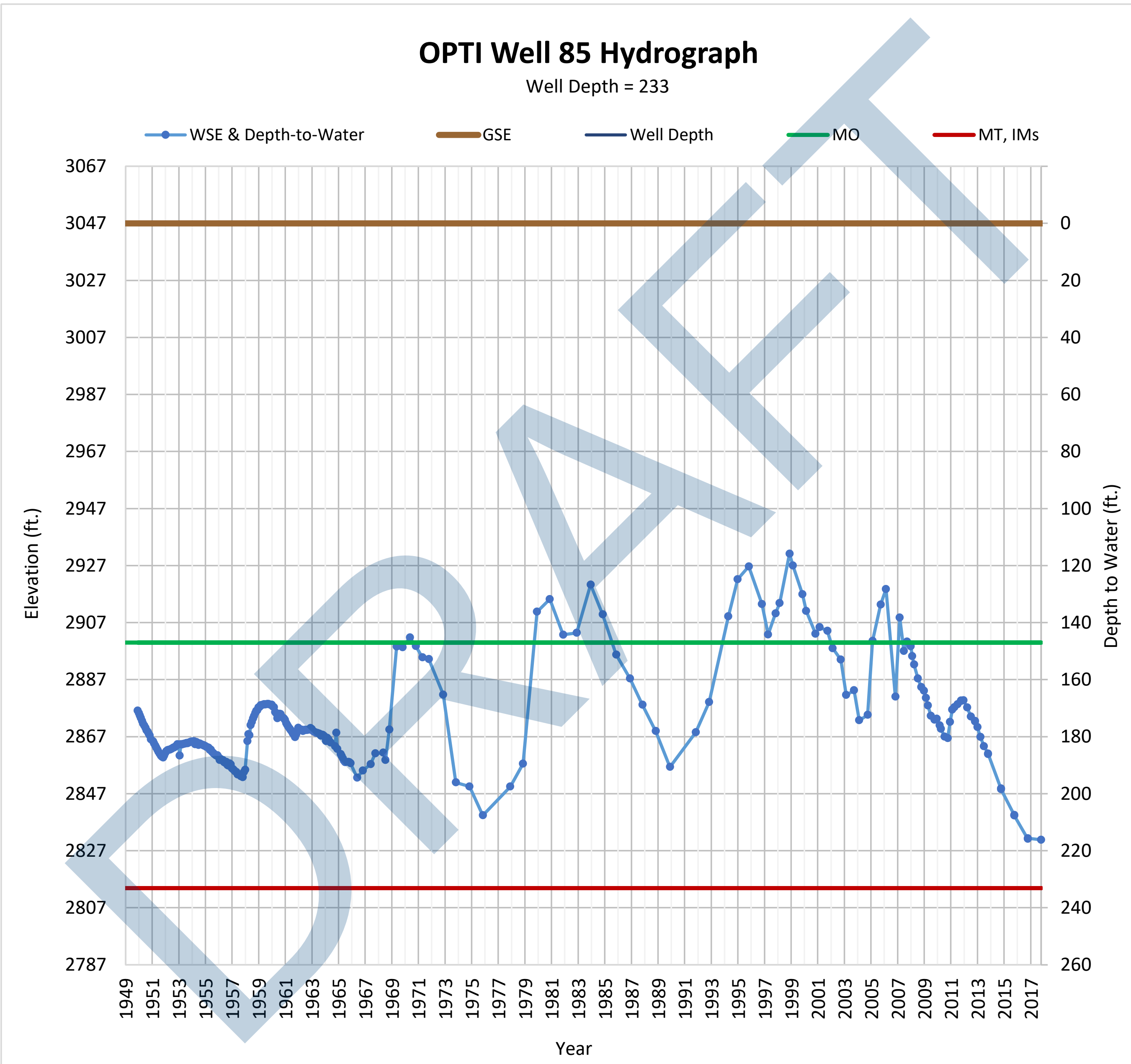

OPTI Well 72 Hydrograph
Well Depth = 790
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT



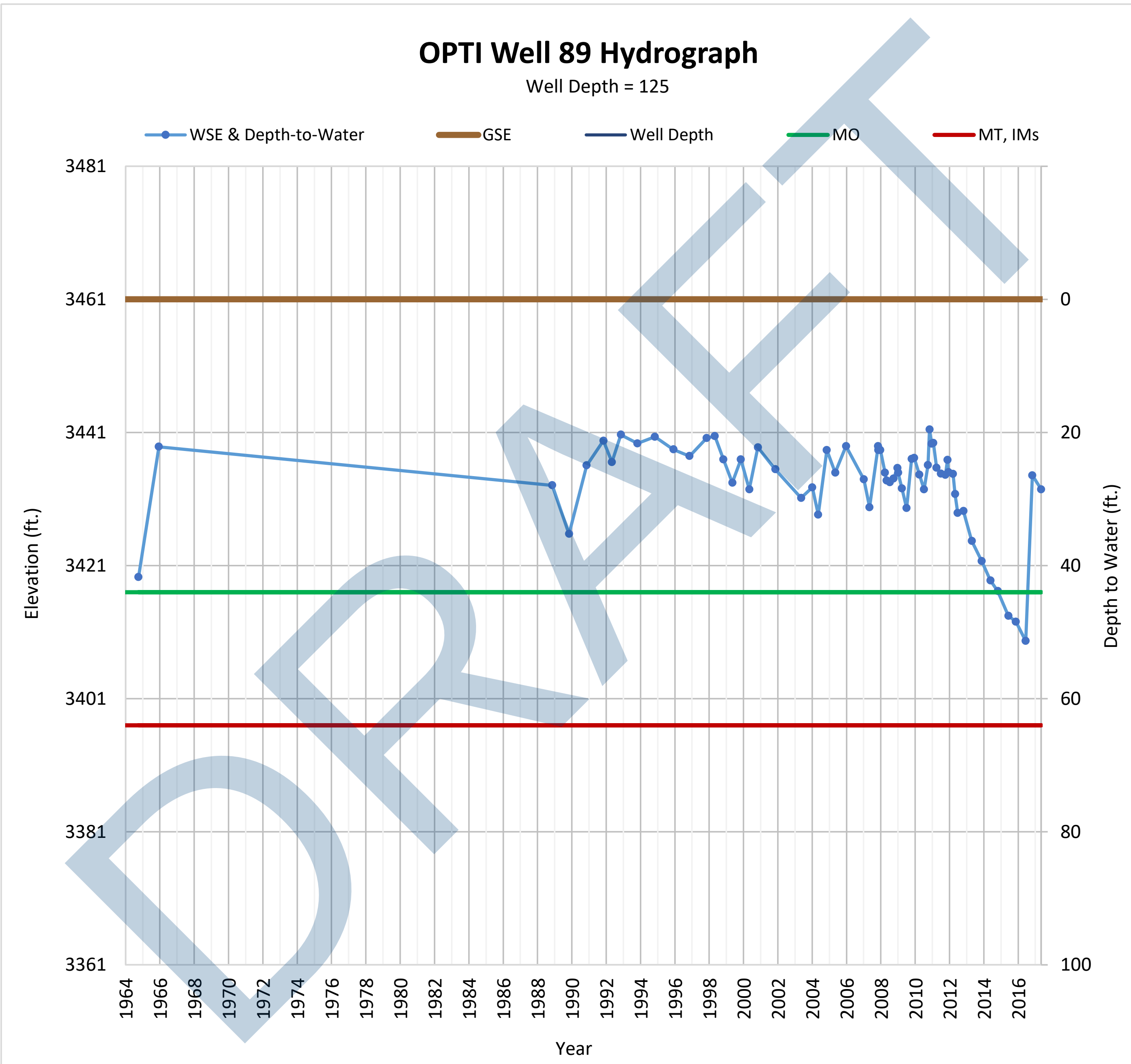
OPTI Well 74 Hydrograph
Well Depth = Unknown ft. GSE = 2193 ft. above MSL
Minimum Threshold = 256 ft. Measurable Objective = 243 ft.
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2213
2193
2173
2153
2133
2113
2093
2073
2053
2033
2013
1993
1973
1953
1933
1913
1893
1873
1853
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
2007
2009
2011
2013
2015
2017
DRAFT



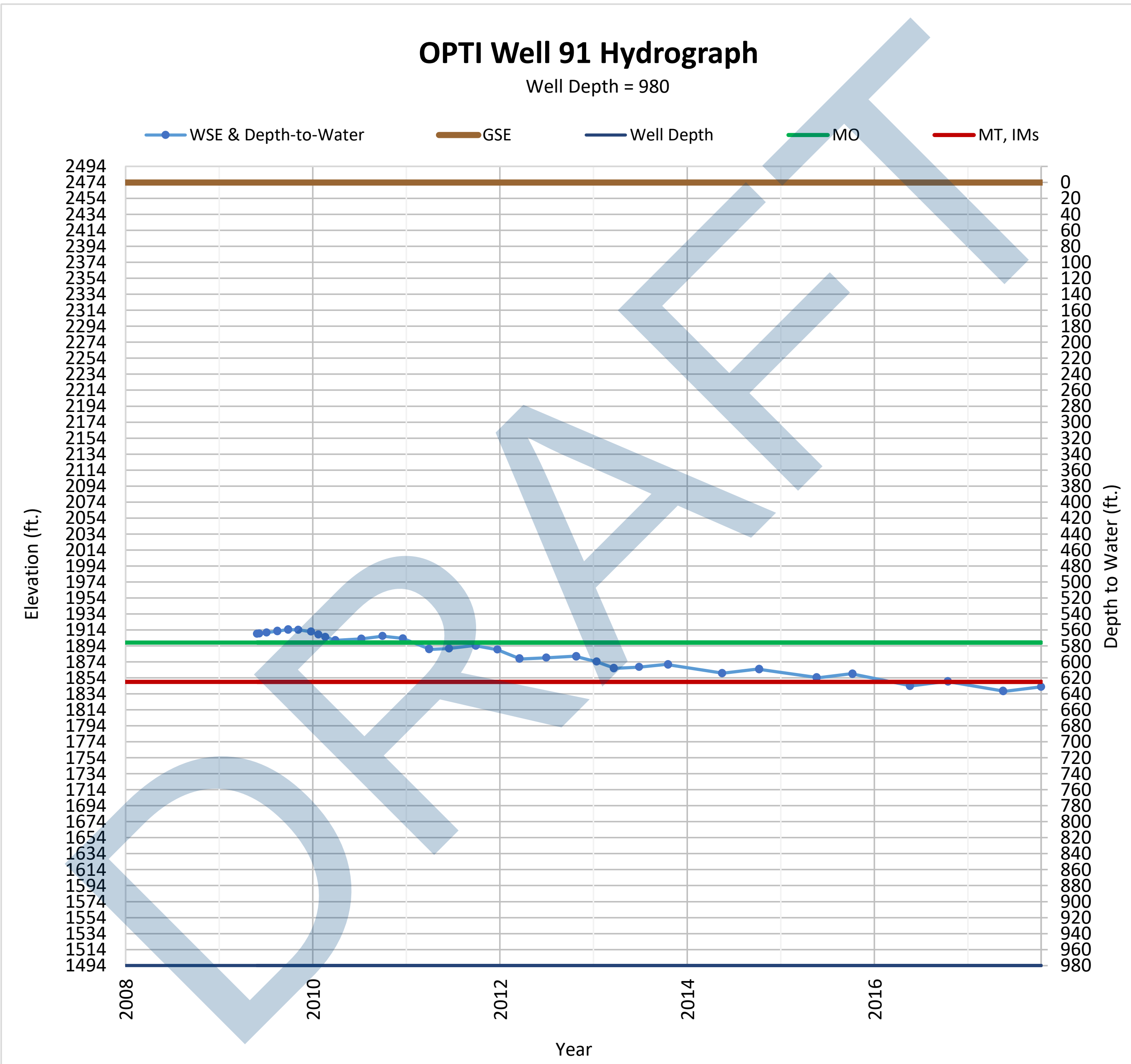
OPTI Well 77 Hydrograph
Well Depth = 980
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2008
2010
2012
2014
2016
DRAFT

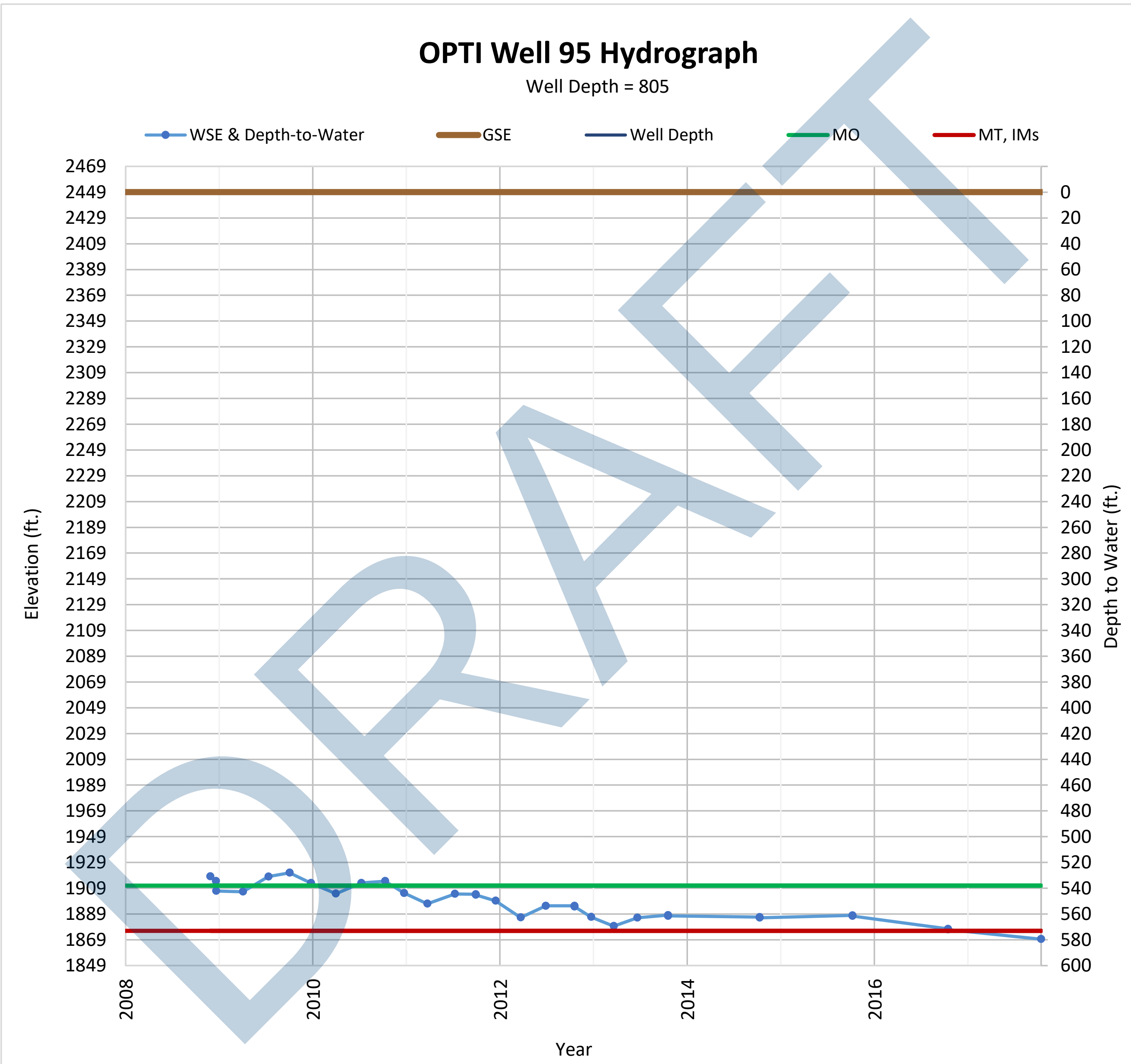


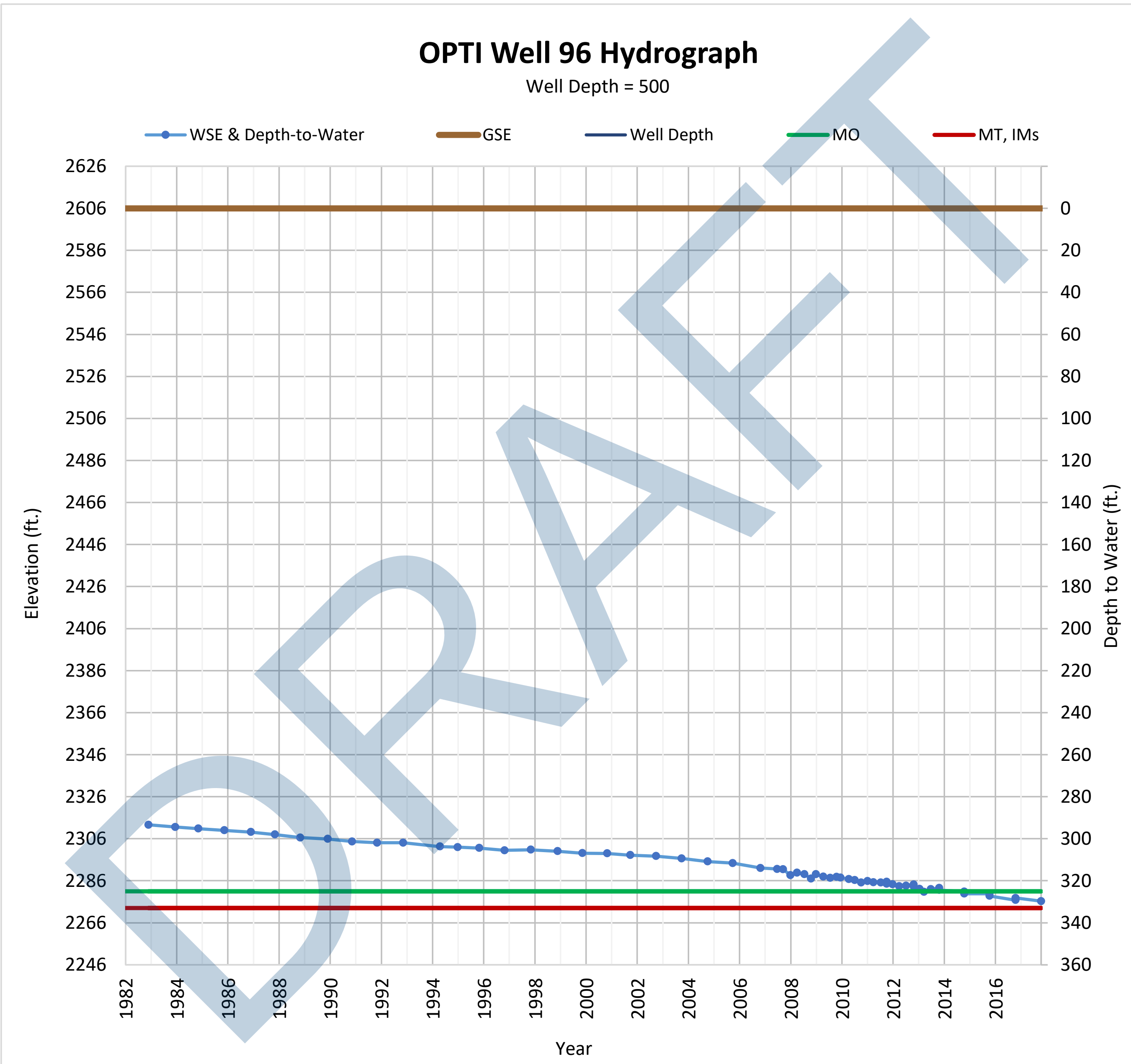
OPTI Well 85 Hydrograph
Well Depth = 233
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
3067
3047
3027
3007
2987
2967
2947
2927
2907
2887
2867
2847
2827
2807
2787
0
20
40
60
80
100
120
140
160
180
200
220
240
260
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
DRAFT

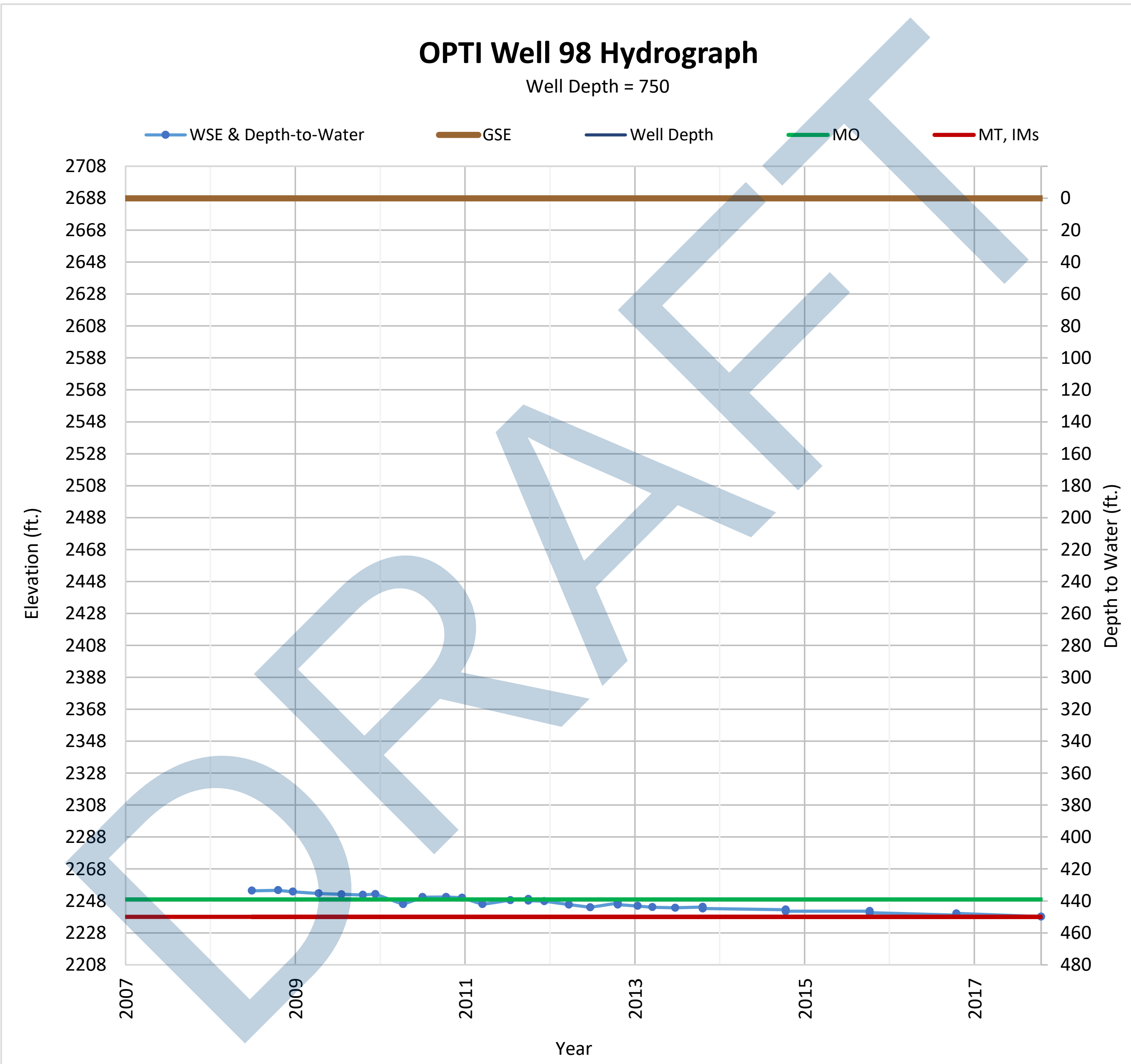


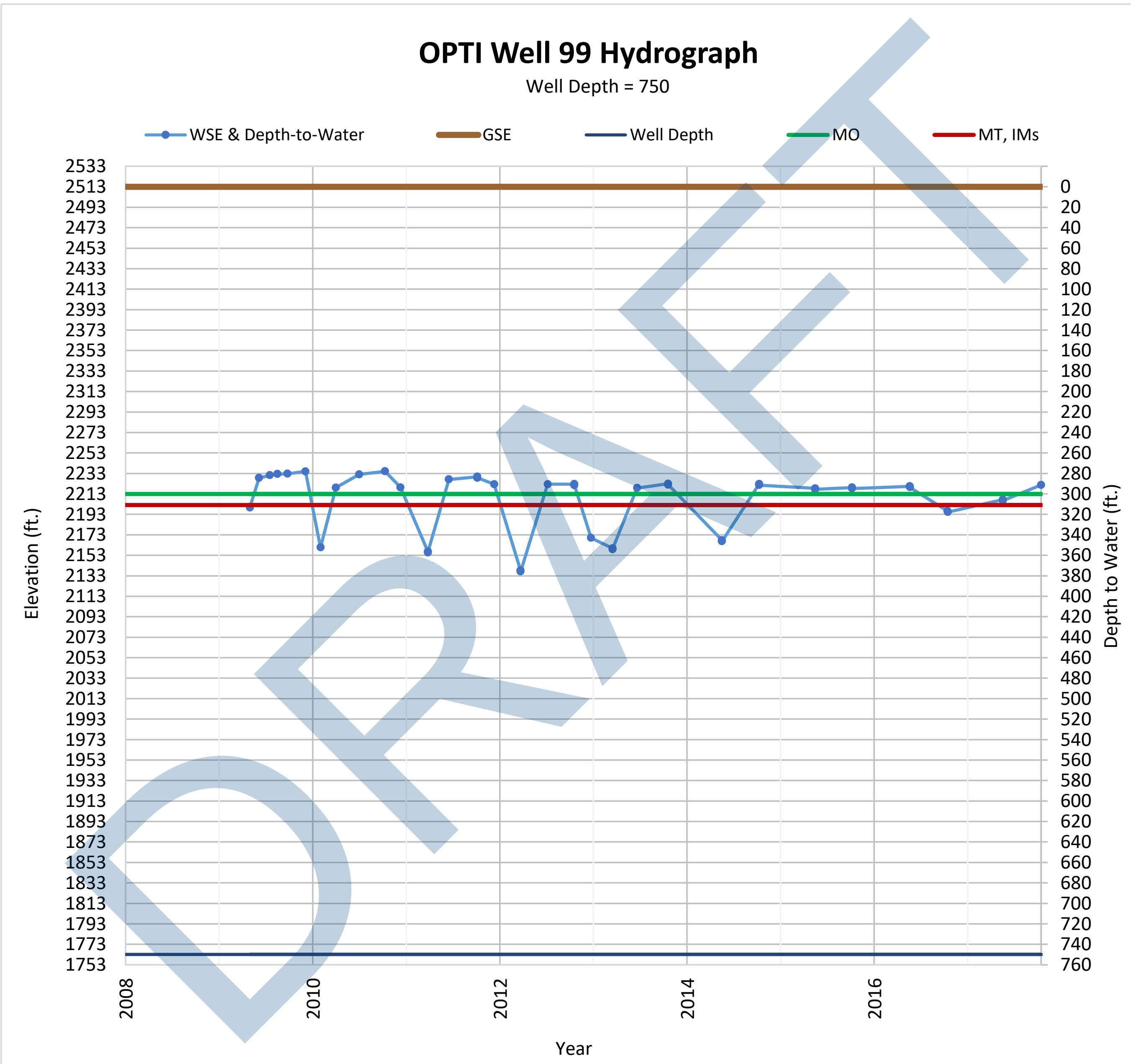
OPTI Well 89 Hydrograph
Well Depth = 125
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
3481
3461
3441
3421
3401
3381
3361
0
20
40
60
80
100
Elevation (ft.)
Depth to Water (ft.)
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Year
DRAFT


OPTI Well 91 Hydrograph
Well Depth = 980
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2008
2010
2012
2014
2016
DRAFT

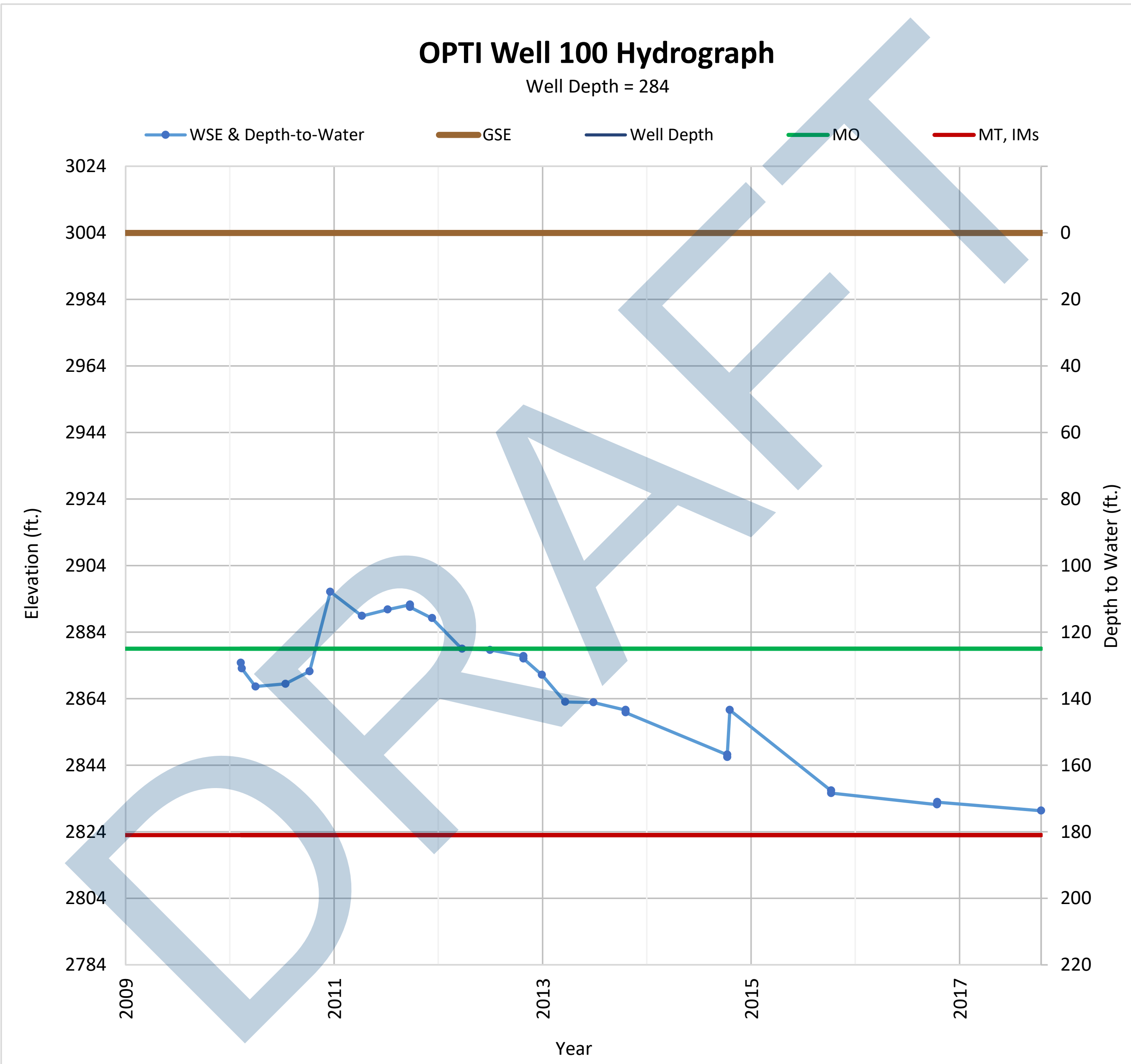

OPTI Well 95 Hydrograph
Well Depth = 805
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2008
2010
2012
2014
2016
DRAFT

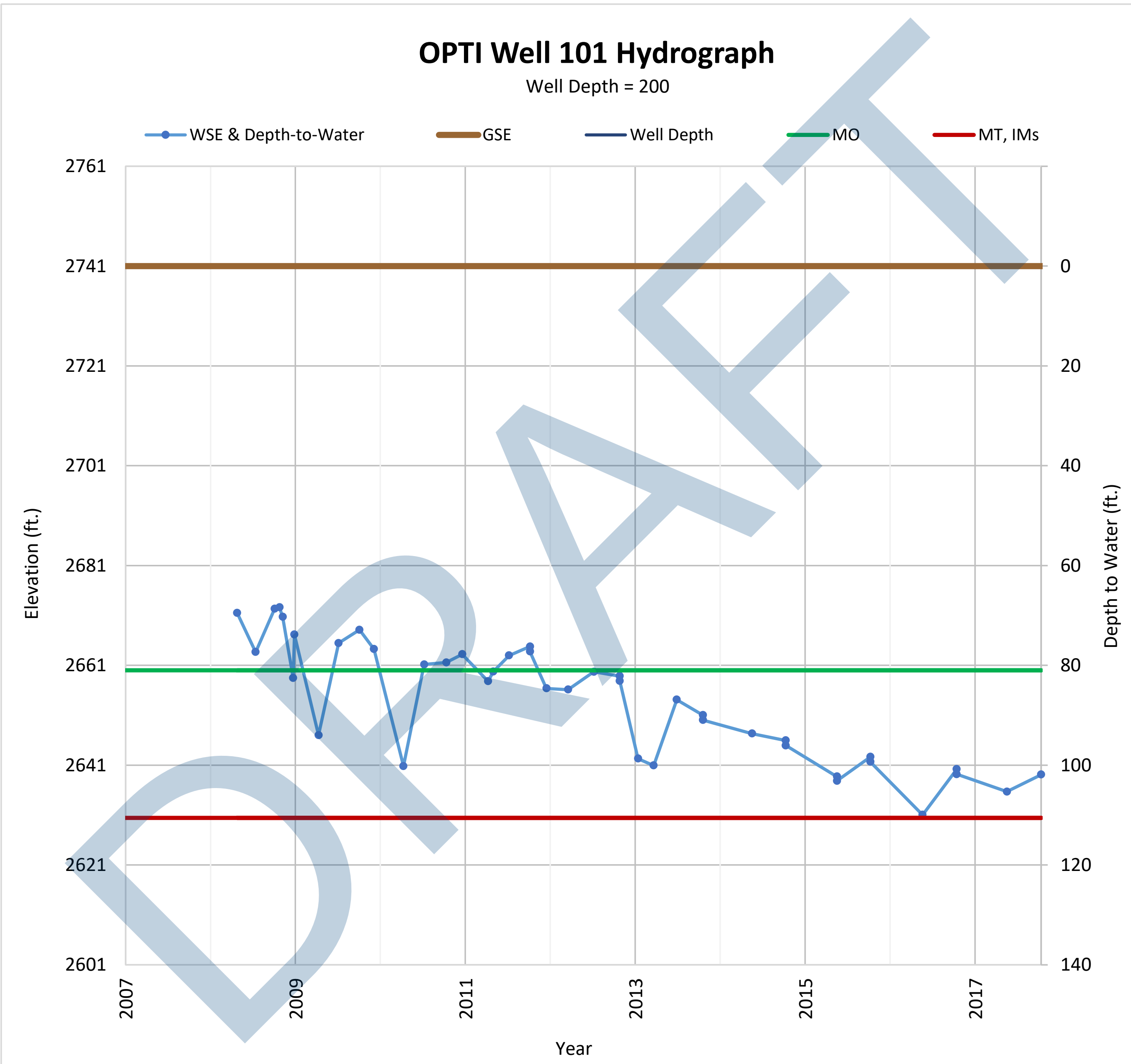

OPTI Well 96 Hydrograph
Well Depth = 500
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT


OPTI Well 98 Hydrograph
Well Depth = 750
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2708
2688
2668
2648
2628
2608
2588
2568
2548
2528
2508
2488
2468
2448
2428
2408
2388
2368
2348
2328
2308
2288
2268
2248
2228
2208
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
2007
2009
2011
2013
2015
2017
DRAFT

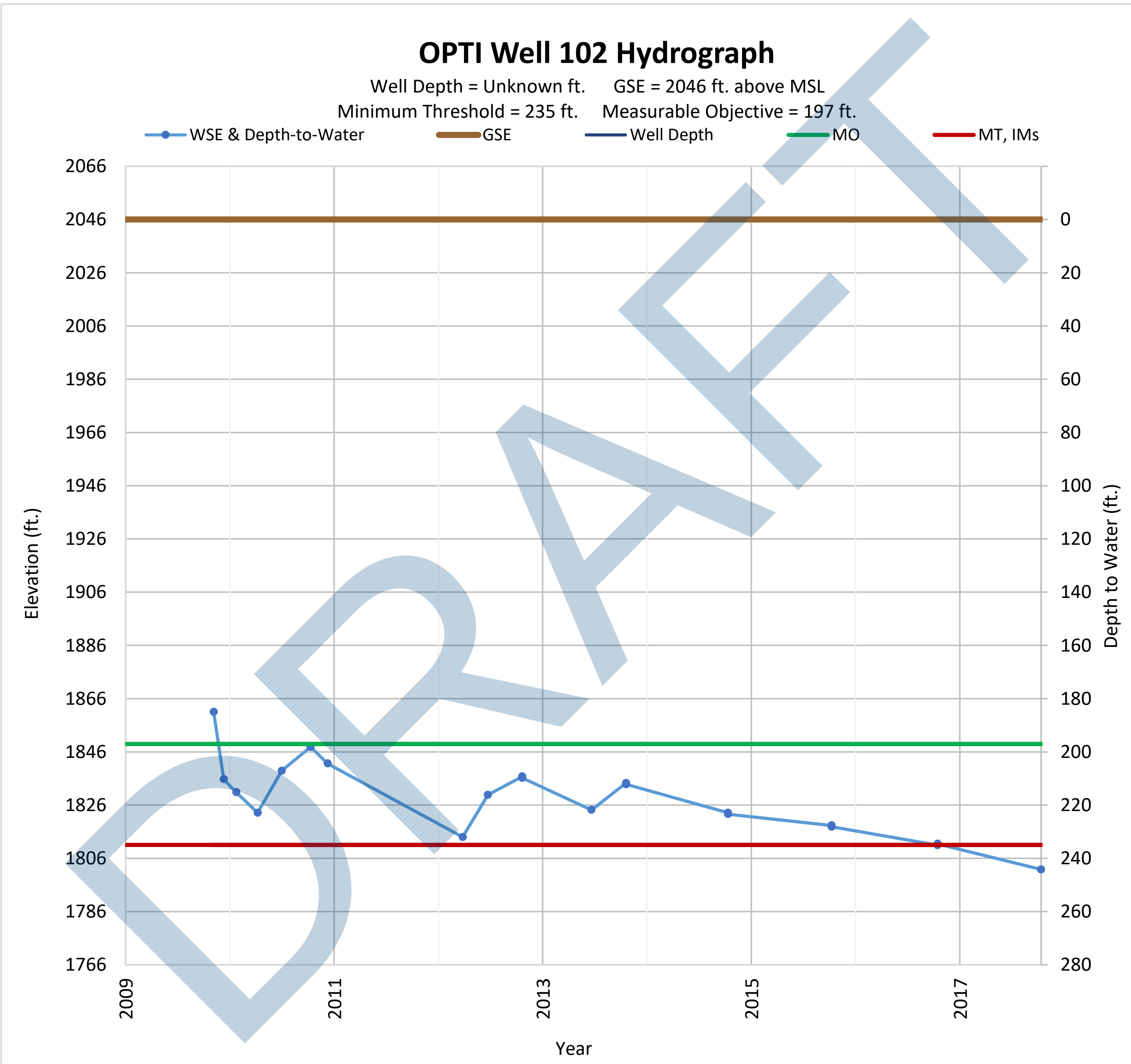


OPTI Well 99 Hydrograph
Well Depth = 750
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2533
2513
2493
2473
2453
2433
2413
2393
2373
2353
2333
2313
2293
2273
2253
2233
2213
2193
2173
2153
2133
2113
2093
2073
2053
2033
2013
1993
1973
1953
1933
1913
1893
1873
1853
1833
1813
1793
1773
1753
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
660
680
700
720
740
760
2008
2010
2012
2014
2016
DRAFT

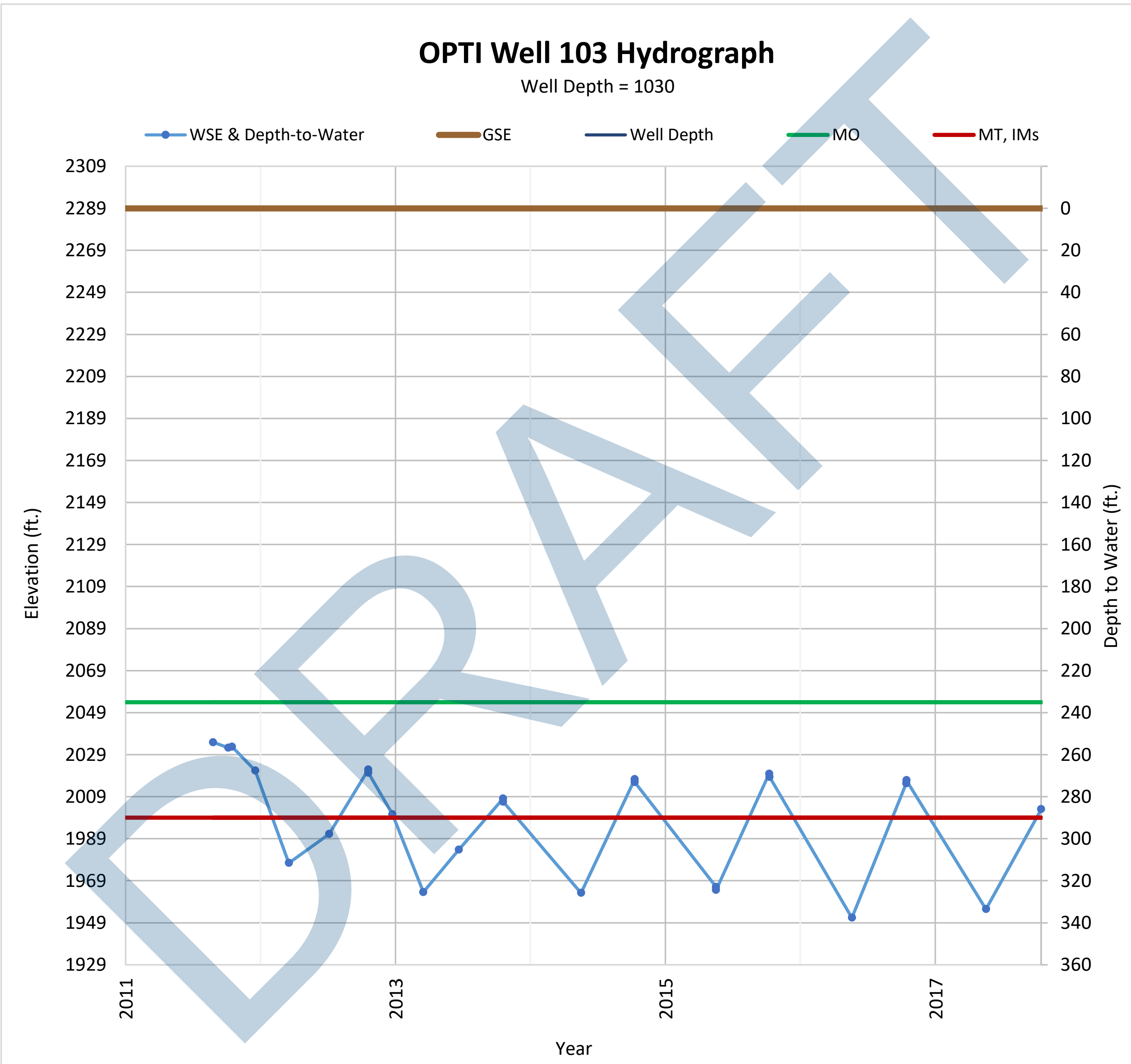

OPTI Well 100 Hydrograph
Well Depth = 284
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
3024
3004
2984
2964
2944
2924
2904
2884
2864
2844
2824
2804
2784
0
20
40
60
80
100
120
140
160
180
200
220
2009
2011
2013
2015
2017
DRAFT



OPTI Well 101 Hydrograph
Well Depth = 200
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2761
2741
2721
2701
2681
2661
2641
2621
2601
0
20
40
60
80
100
120
140
Elevation (ft.)
Depth to Water (ft.)
2007
2009
2011
2013
2015
2017
Year



OPTI Well 102 Hydrograph
Well Depth = Unknown ft.
GSE = 2046 ft. above MSL
Minimum Threshold = 235 ft.
Measurable Objective = 197 ft.
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2066
2046
2026
2006
1986
1966
1946
1926
1906
1886
1866
1846
1826
1806
1786
1766
Elevation (ft.)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
Depth to Water (ft.)
2009
2011
2013
2015
2017
Year
DRAFT


OPTI Well 103 Hydrograph
Well Depth = 1030
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2309
2289
2269
2249
2229
2209
2189
2169
2149
2129
2109
2089
2069
2049
2029
2009
1989
1969
1949
1929
0
20
40
60
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120
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160
180
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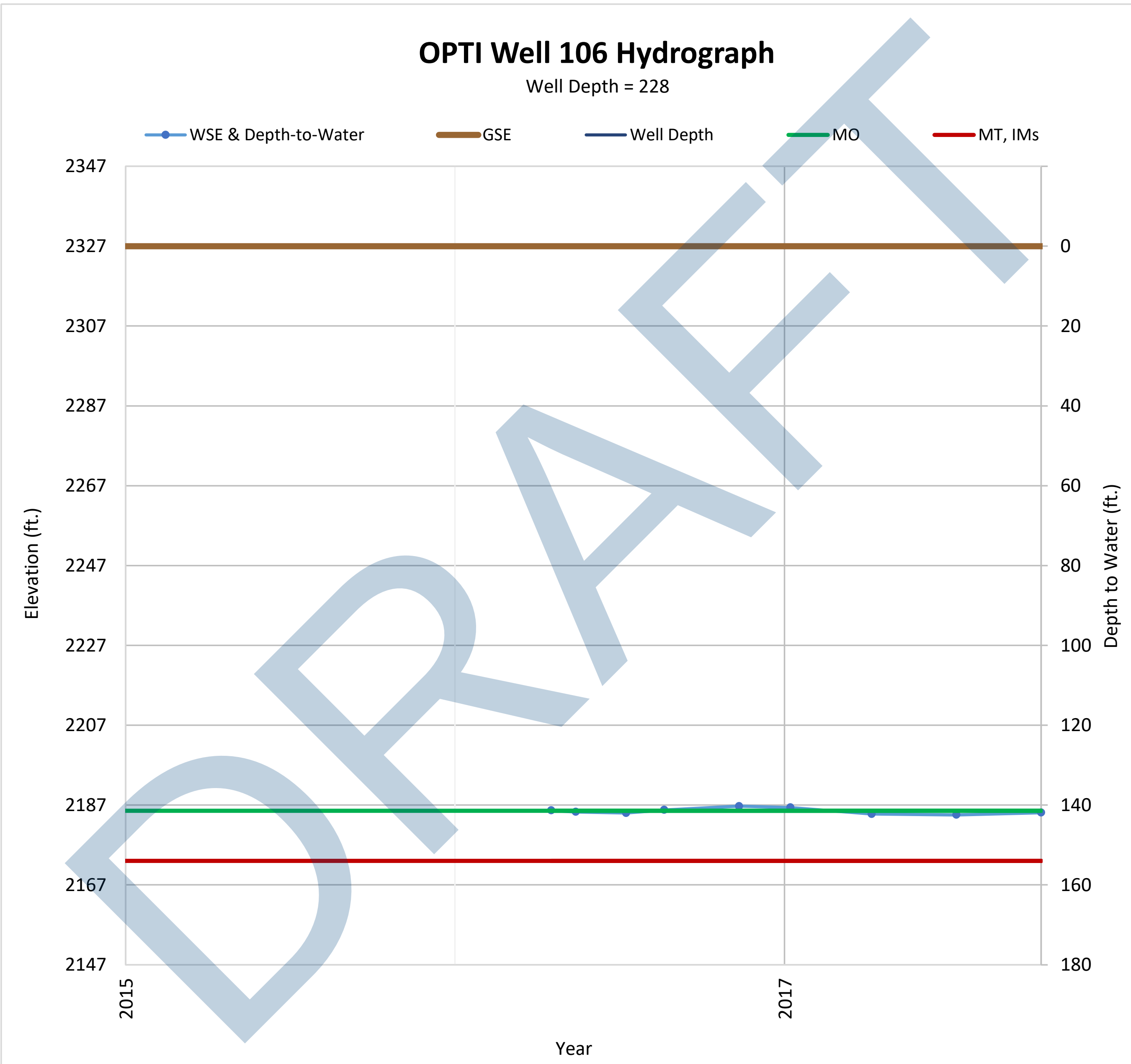
240
260
280
300
320
340
360
2011
2013
2015
2017
DRAFT



OPTI Well 106 Hydrograph
Well Depth = 228
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
2347
2327
2307
2287
2267
2247
2227
2207
2187
2167
2147
Depth to Water (ft.)
0
20
40
60
80
100
120
140
160
180
2015
2017
Year
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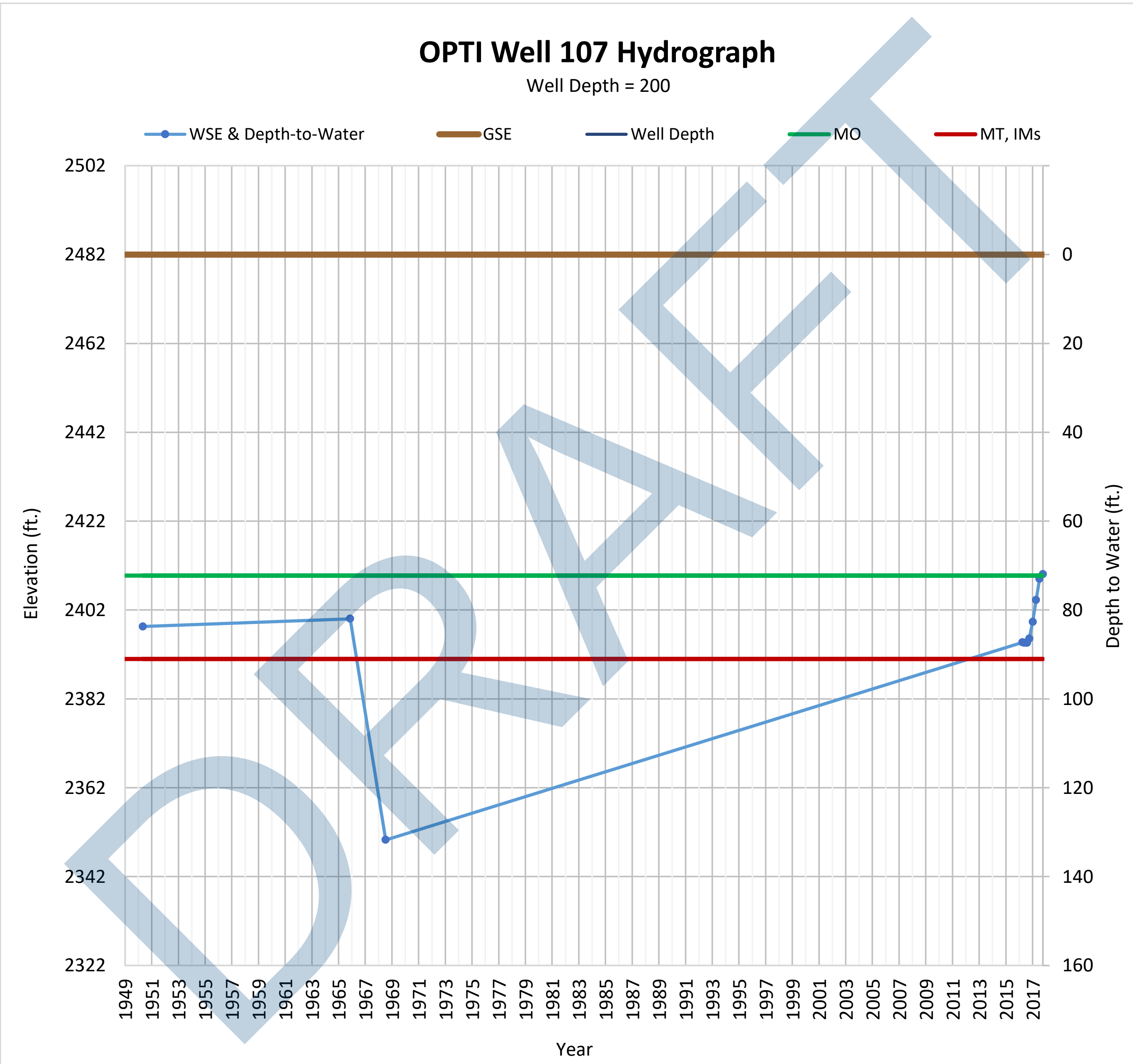
OPTI Well 107 Hydrograph
Well Depth = 200
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2502
2482
2462
2442
2422
2402
2382
2362
2342
2322
0
20
40
60
80
100
120
140
160
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
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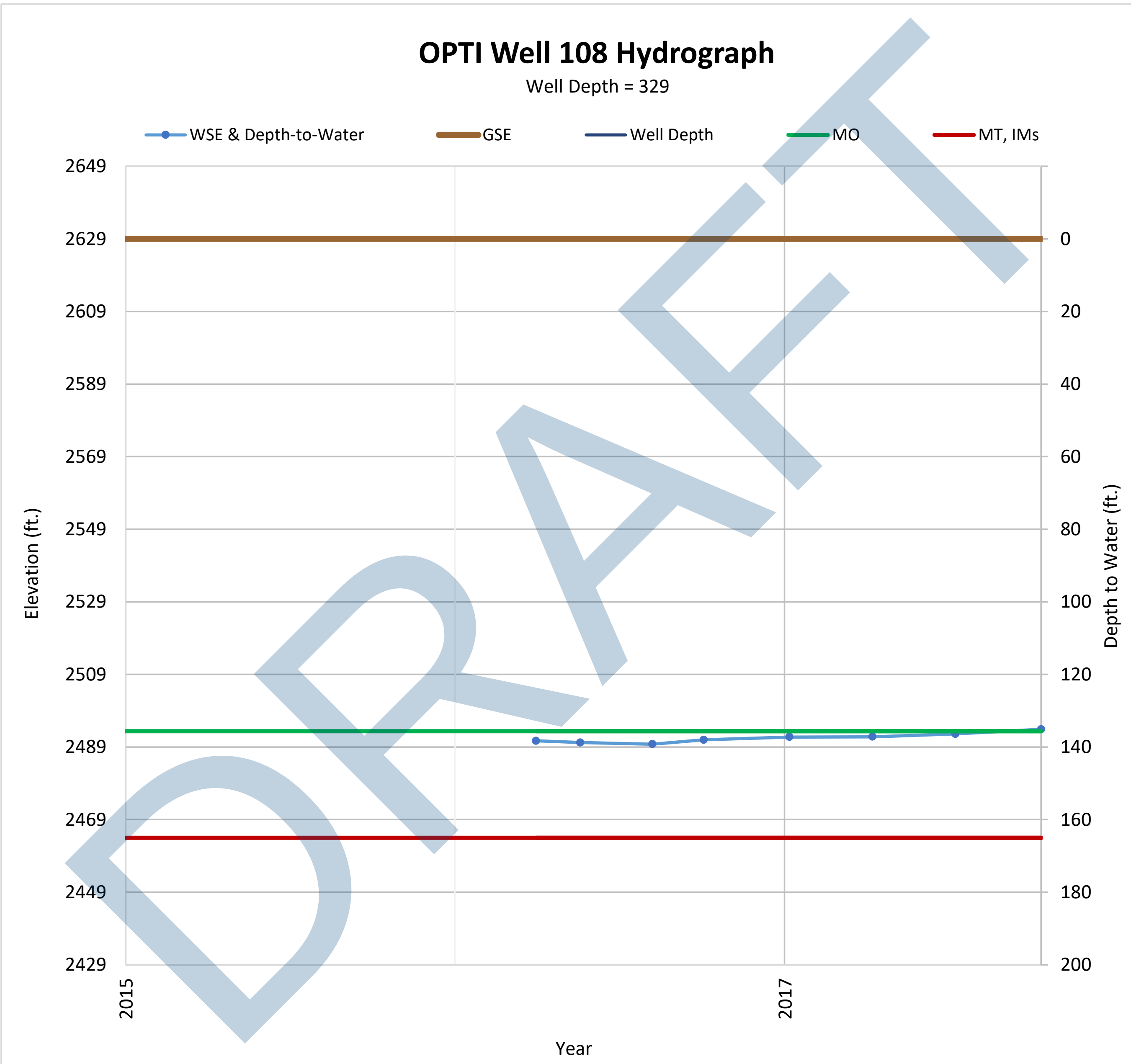
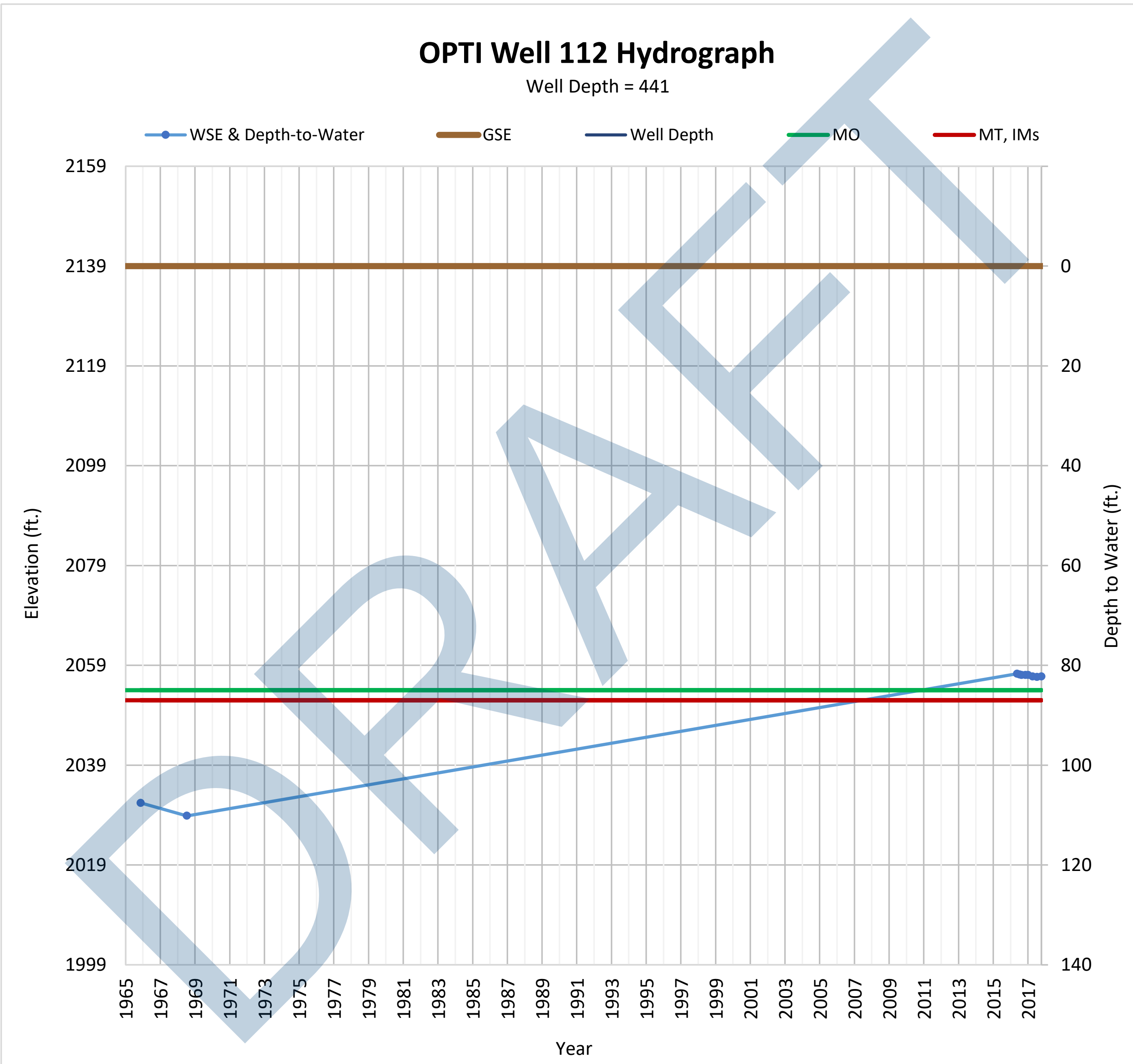
2007
2009
2011
2013
2015
2017
DRAFT



OPTI Well 108 Hydrograph
Well Depth = 329
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2649
2629
2609
2589
2569
2549
2529
2509
2489
2469
2449
2429
Elevation (ft.)
0
20
40
60
80
100
120
140
160
180
200
Depth to Water (ft.)
2015
2017
Year
DRAFT



OPTI Well 112 Hydrograph
Well Depth = 441
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2159
2139
2119
2099
2079
2059
2039
2019
1999
0
20
40
60
80
100
120
140
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
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2011
2013
2015
2017
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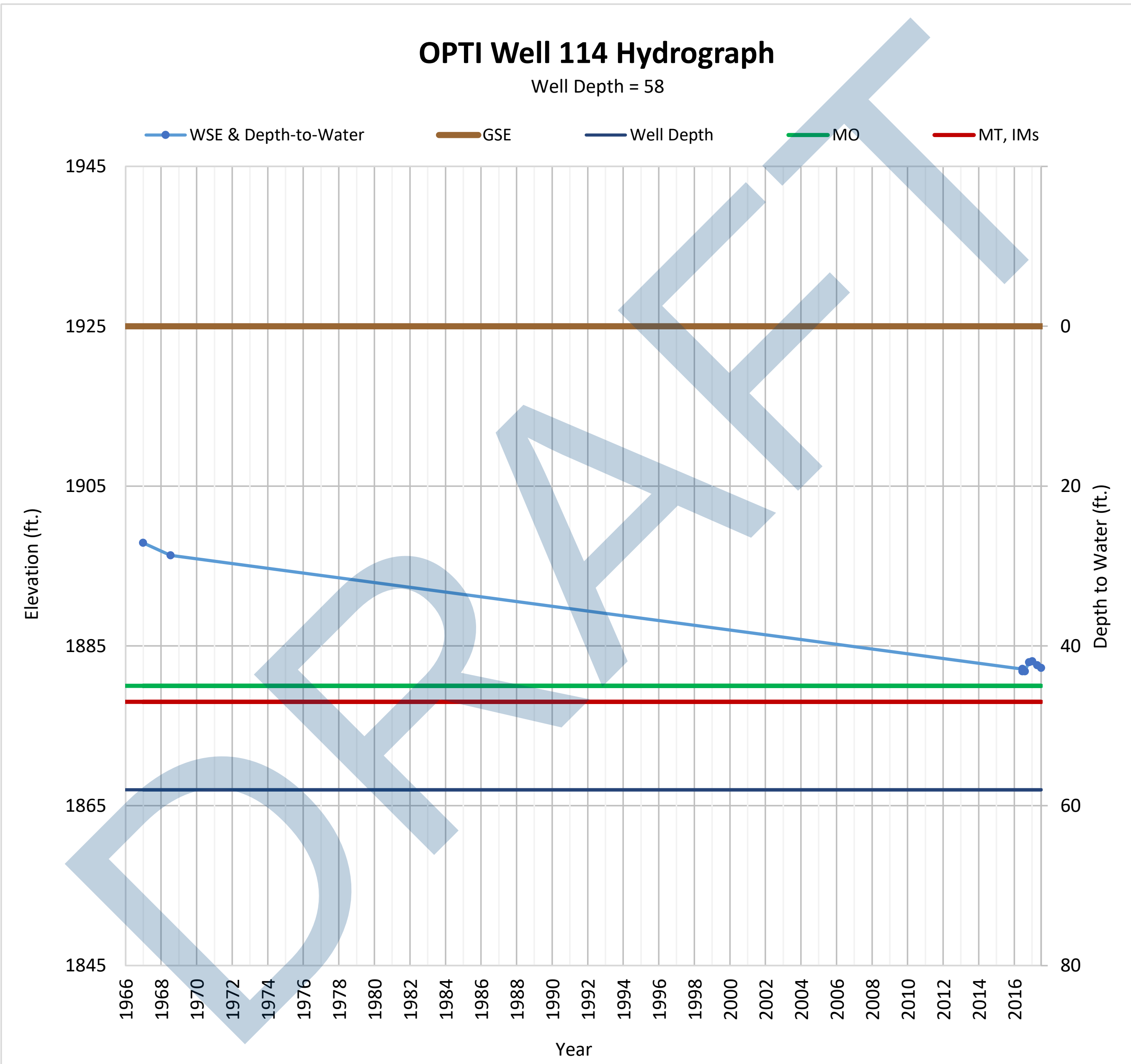

OPTI Well 114 Hydrograph
Well Depth = 58
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
1945
1925
1905
1885
1865
1845
0
20
40
60
80
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Year
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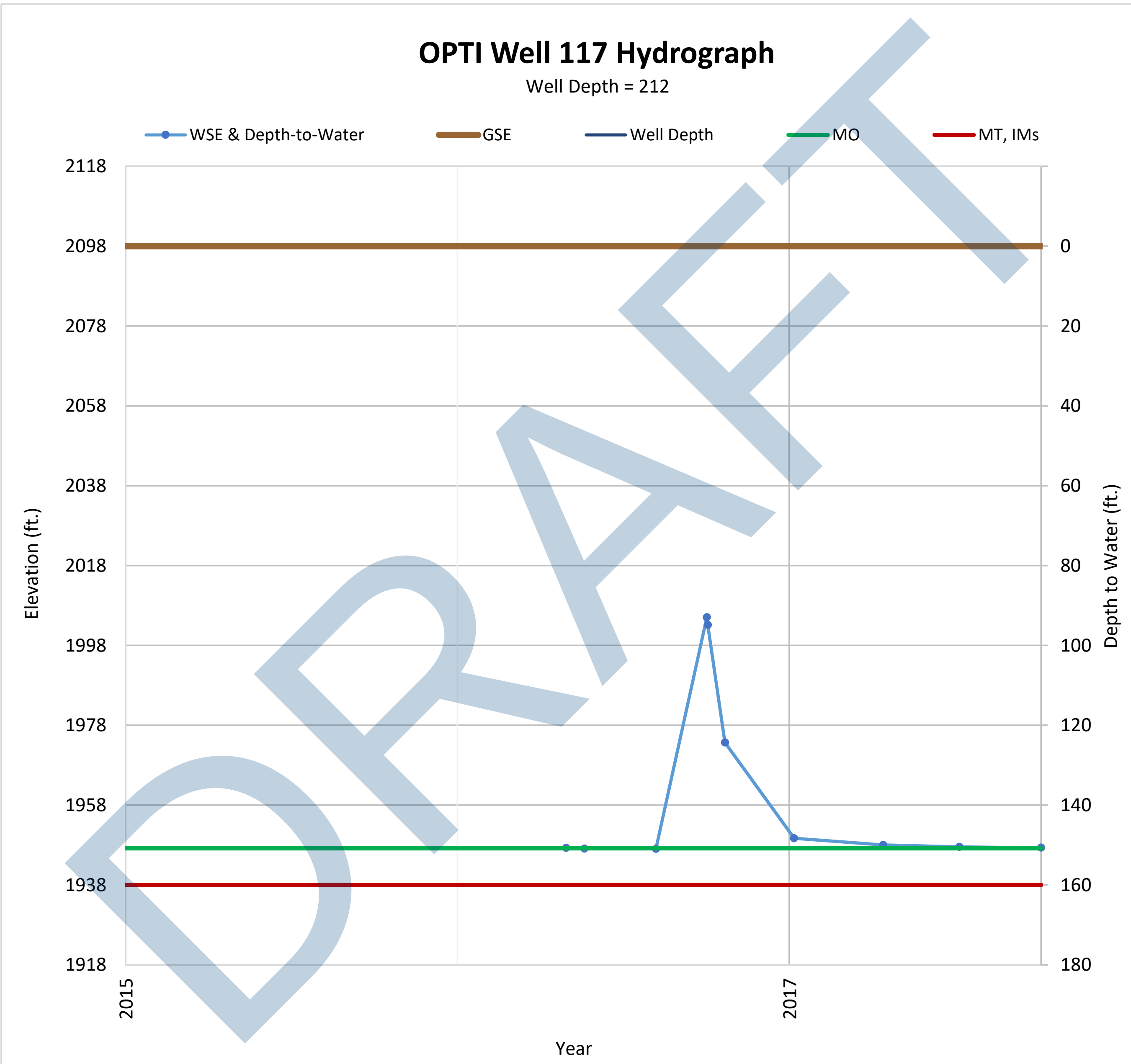
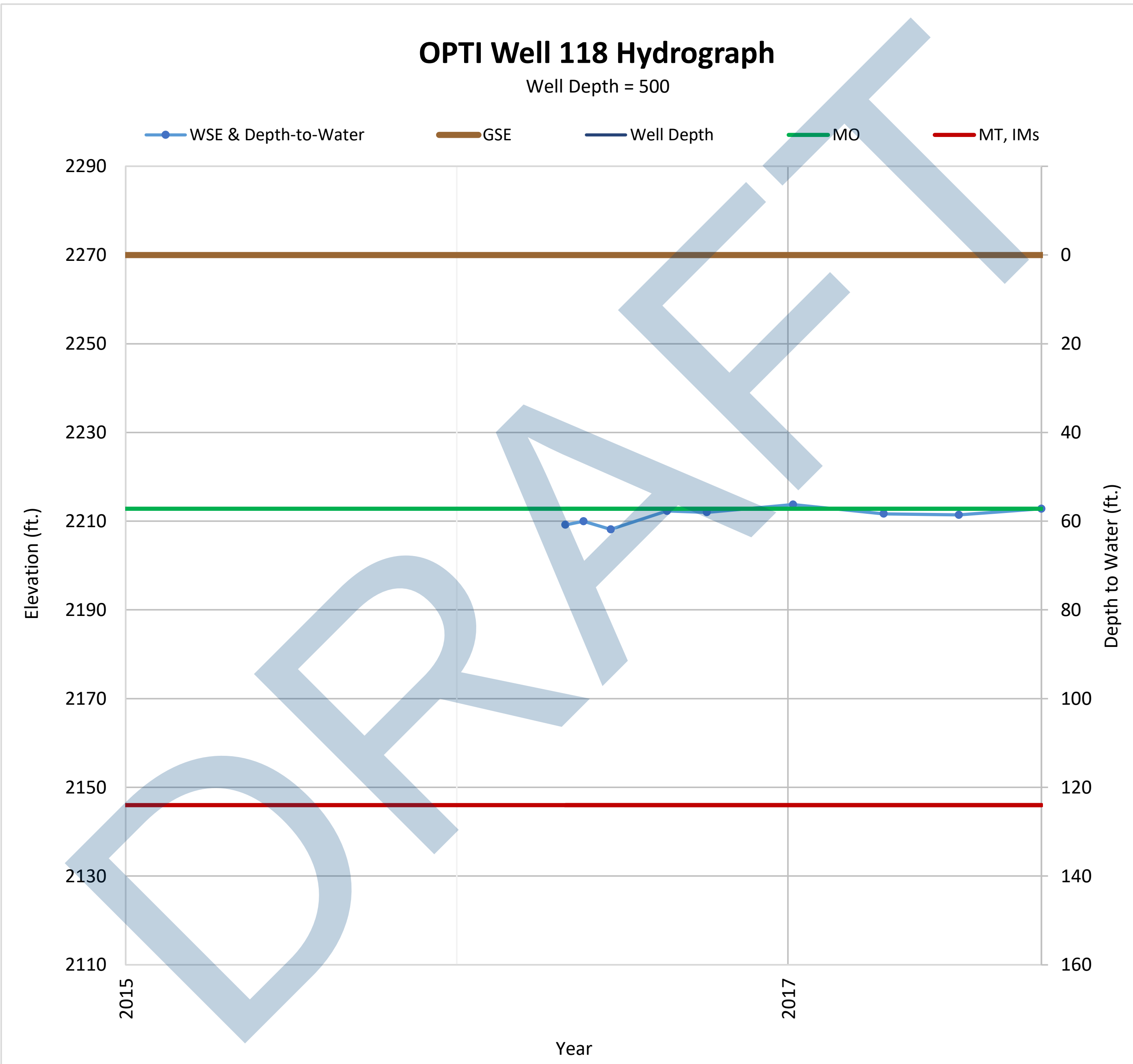
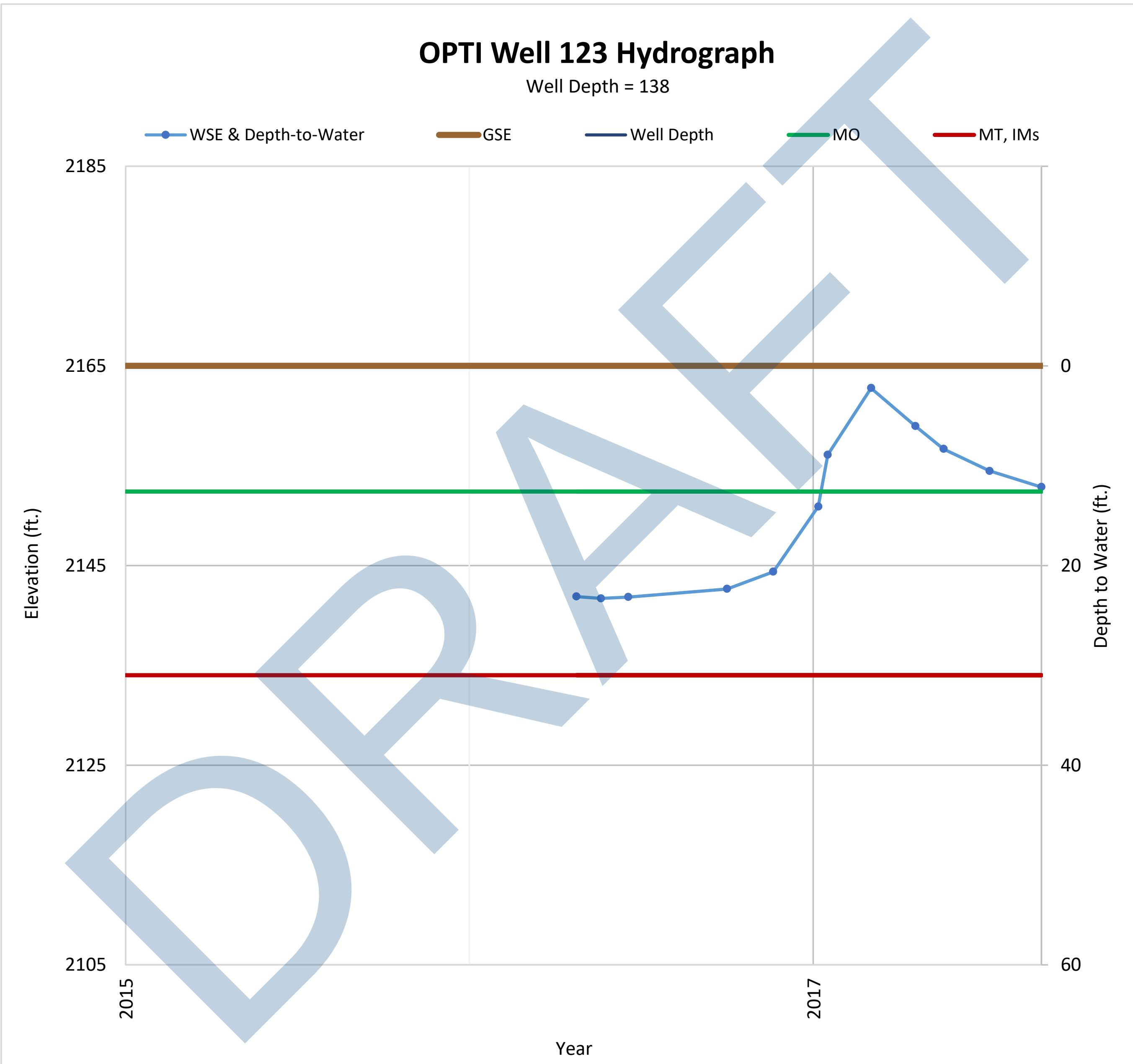
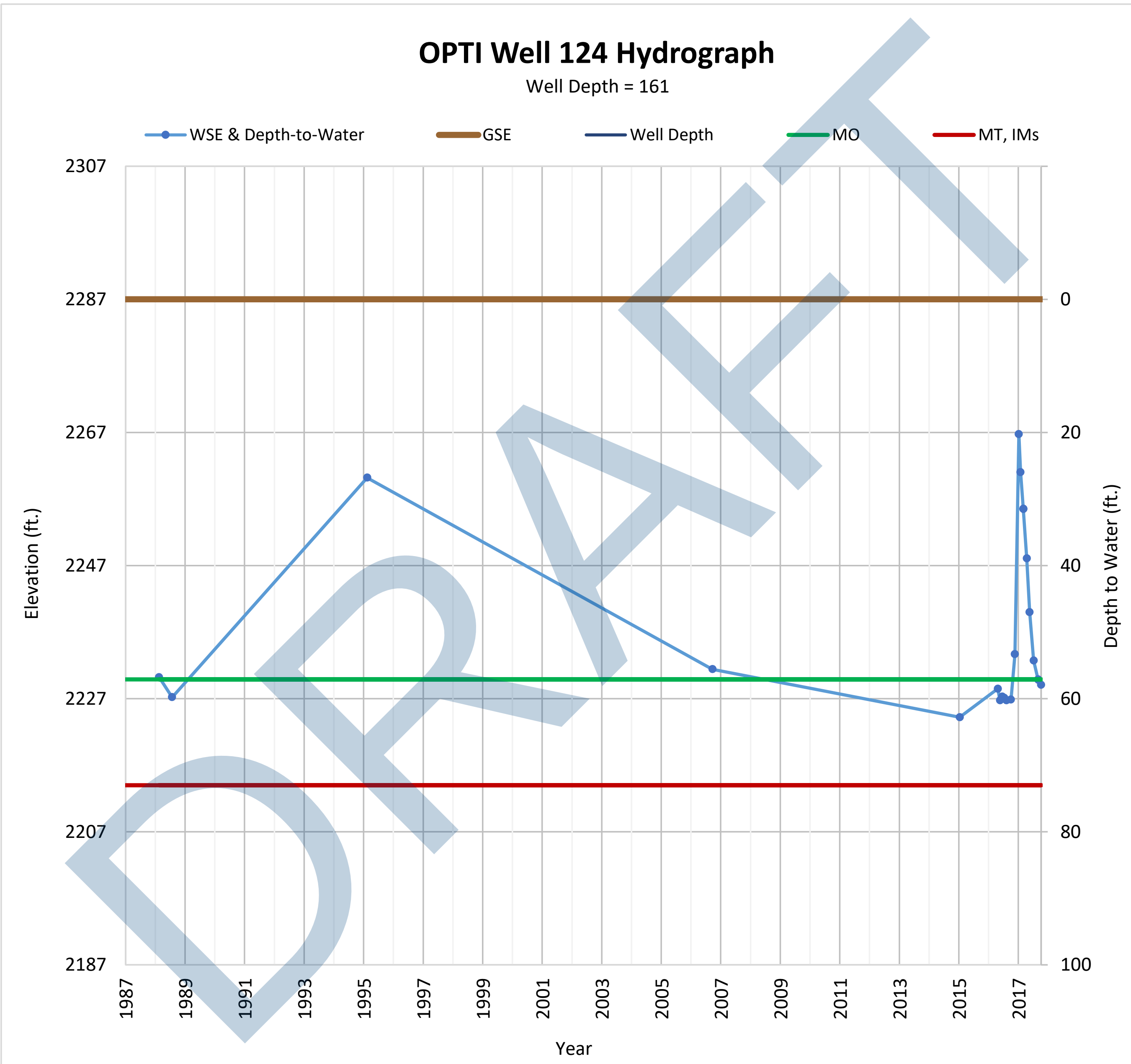
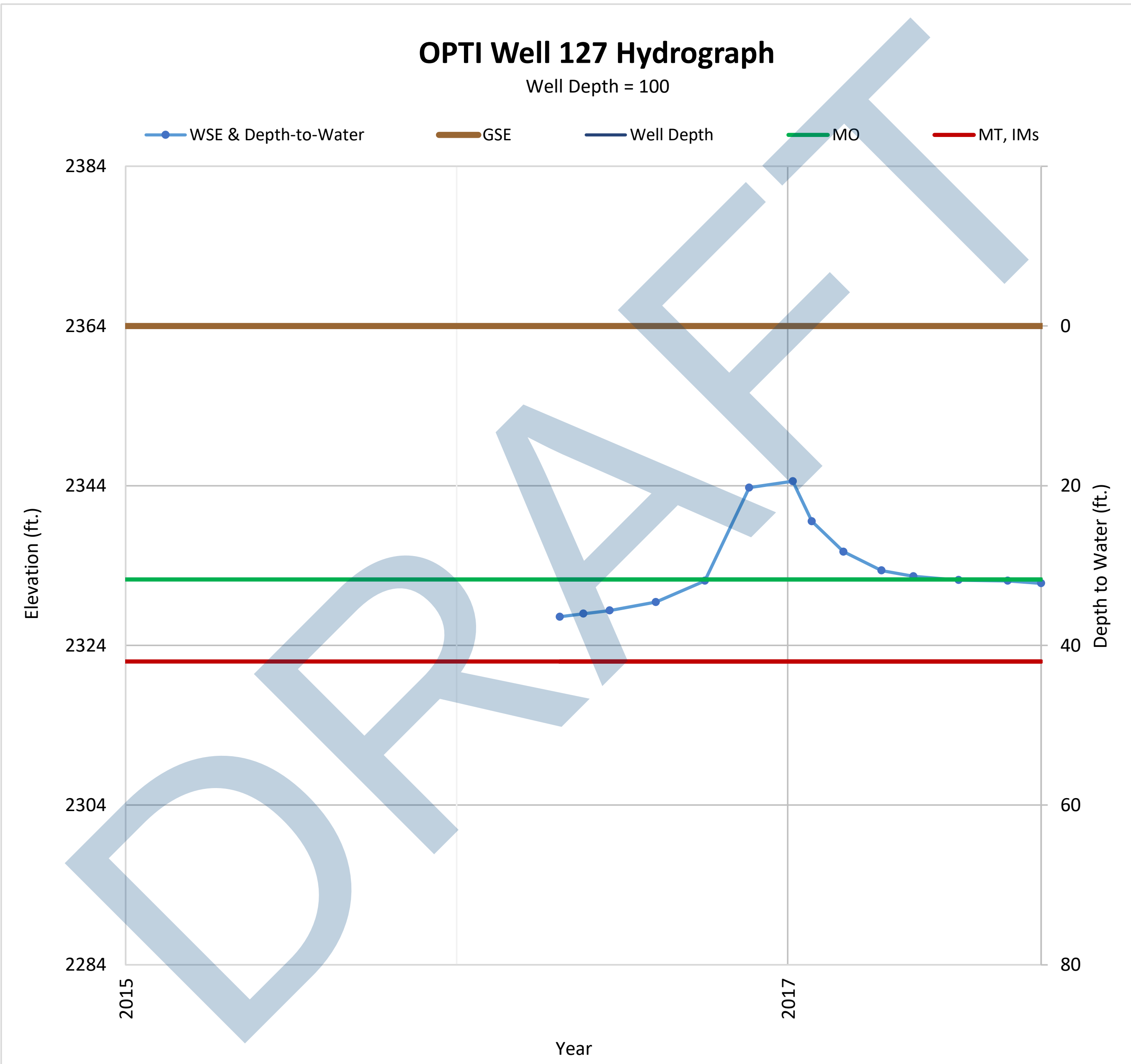

OPTI Well 117 Hydrograph
Well Depth = 212
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2118
2098
2078
2058
2038
2018
1998
1978
1958
1938
1918
Elevation (ft.)
0
20
40
60
80
100
120
140
160
180
Depth to Water (ft.)
2015
2017
Year
DRAFT

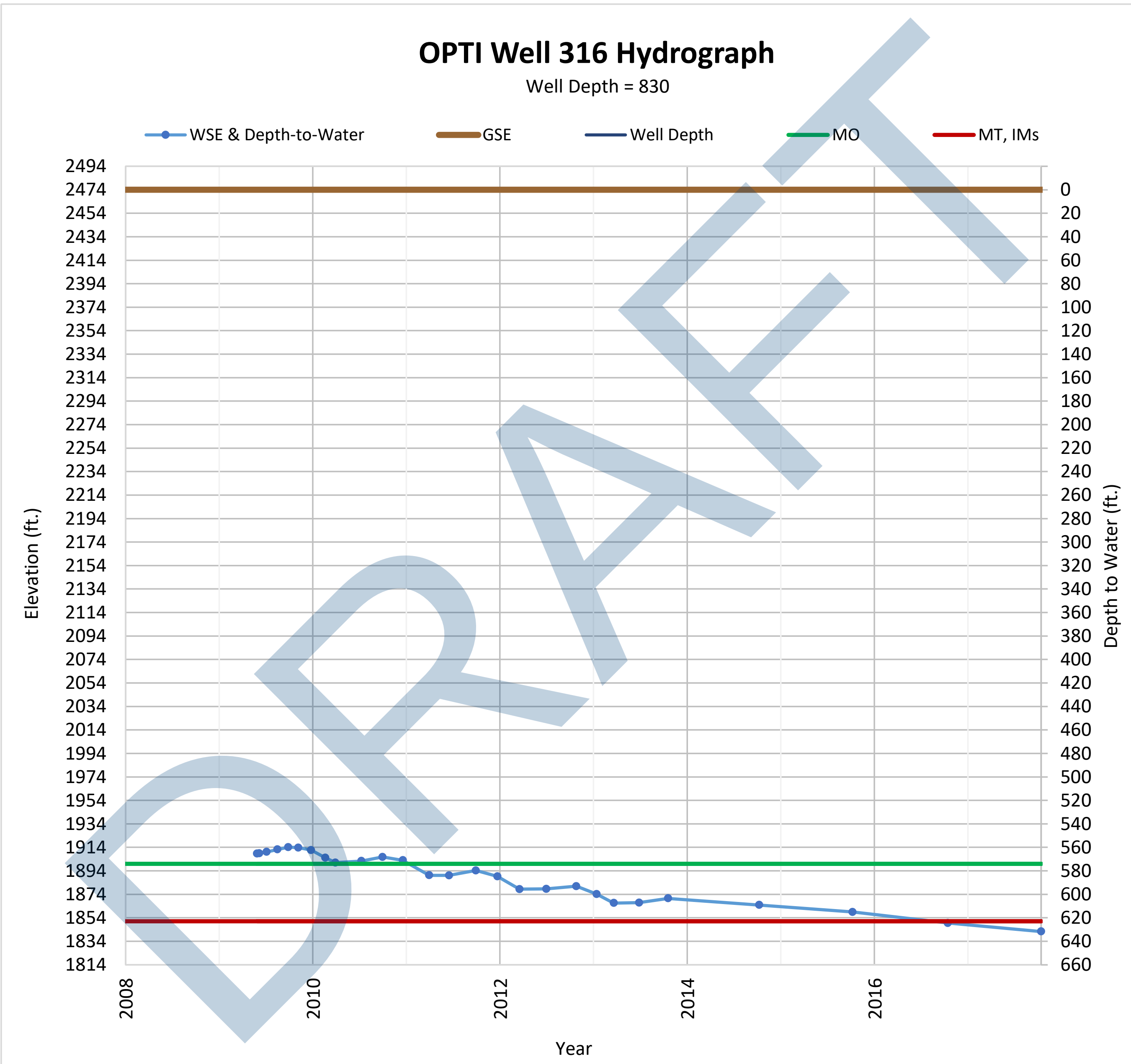

OPTI Well 118 Hydrograph
Well Depth = 500
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2290
2270
2250
2230
2210
2190
2170
2150
2130
2110
Elevation (ft.)
0
20
40
60
80
100
120
140
160
Depth to Water (ft.)
2015
2017
Year


OPTI Well 123 Hydrograph
Well Depth = 138
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2185
2165
2145
2125
2105
0
20
40
60
Elevation (ft.)
Depth to Water (ft.)
2015
2017
Year
DRAFT

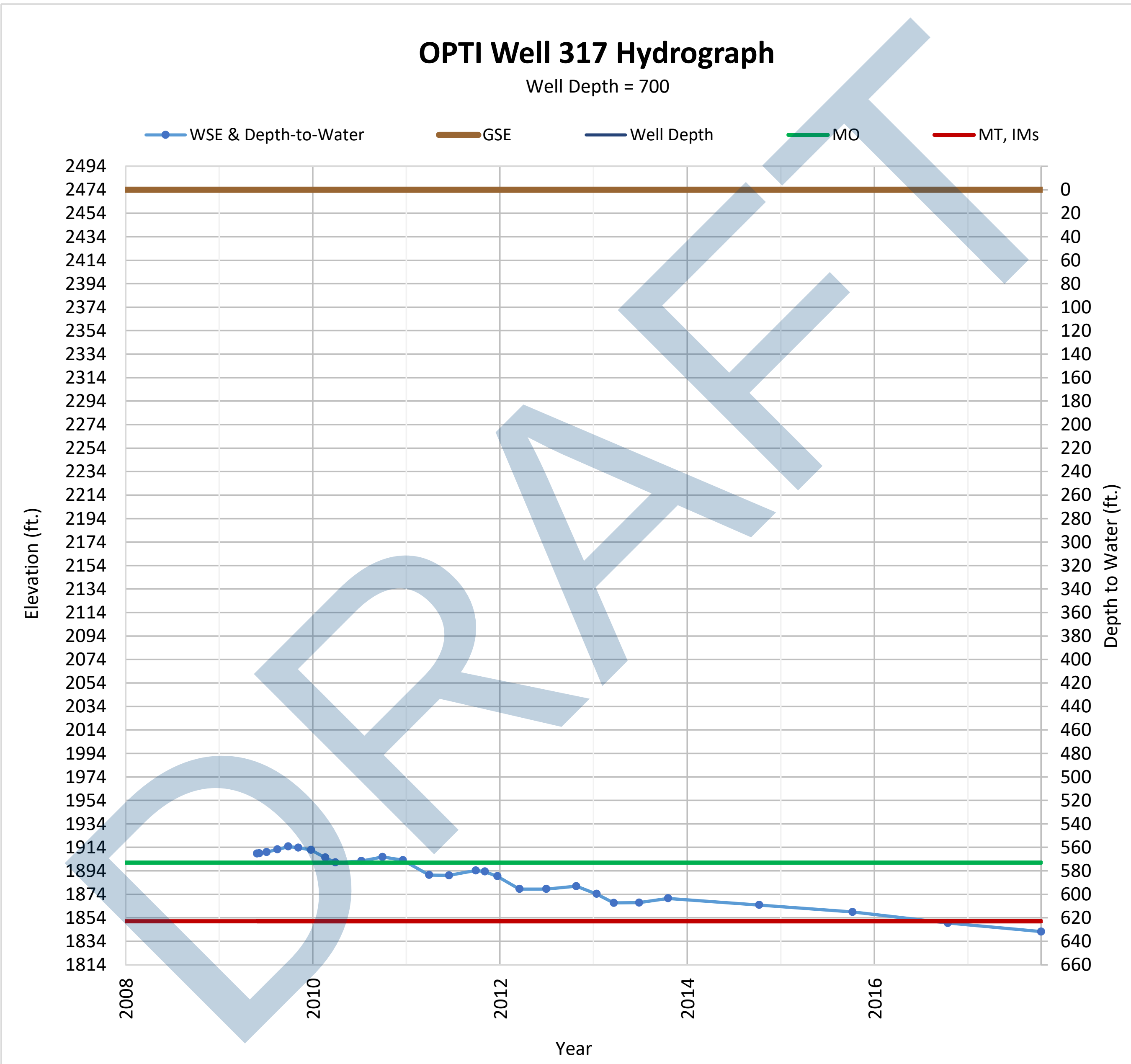


OPTI Well 124 Hydrograph
Well Depth = 161
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2307
2287
2267
2247
2227
2207
2187
0
20
40
60
80
100
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017

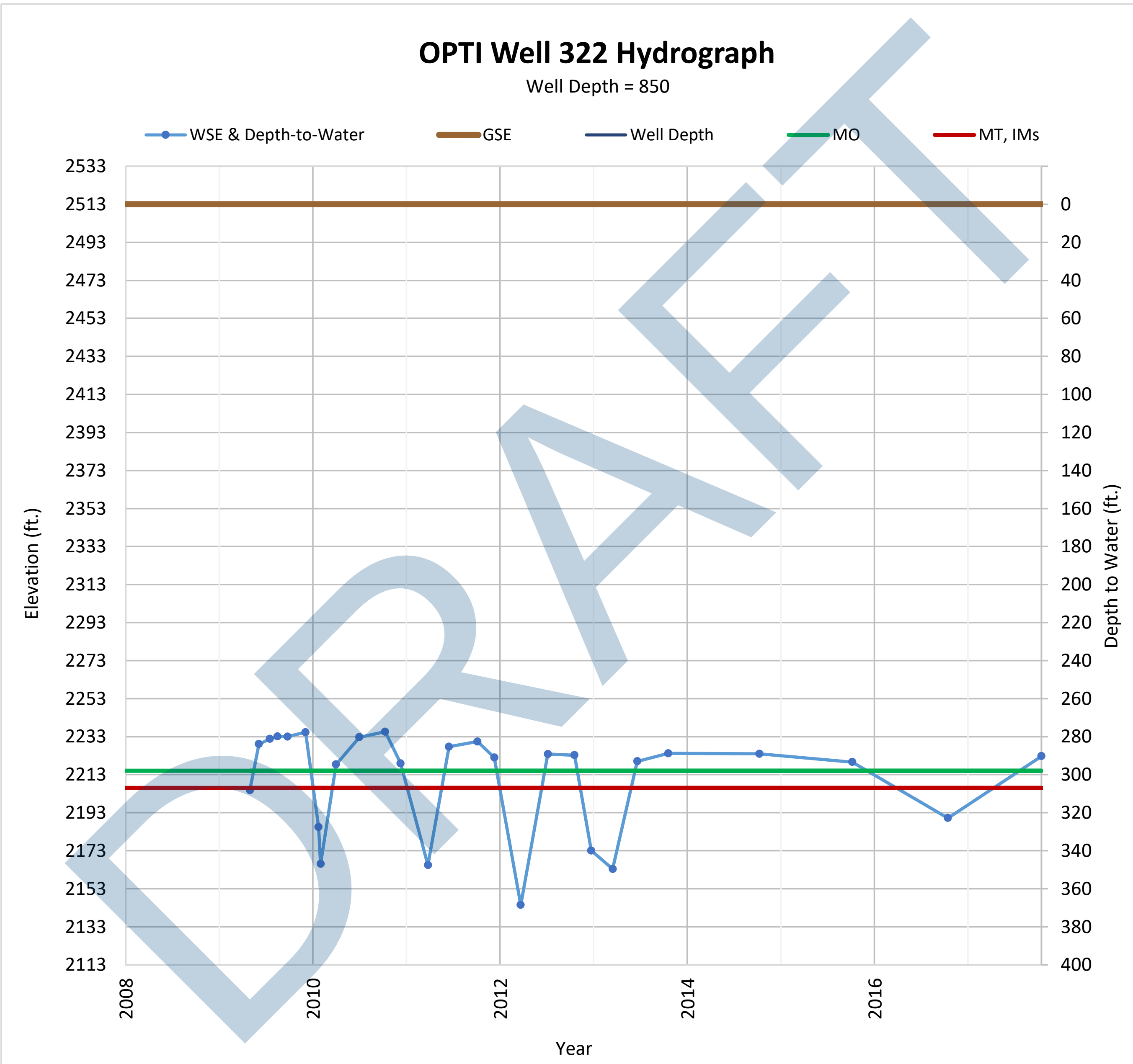

OPTI Well 127 Hydrograph
Well Depth = 100
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2384
2364
2344
2324
2304
2284
0
20
40
60
80
Elevation (ft.)
Depth to Water (ft.)
2015
2017
Year
DRAFT



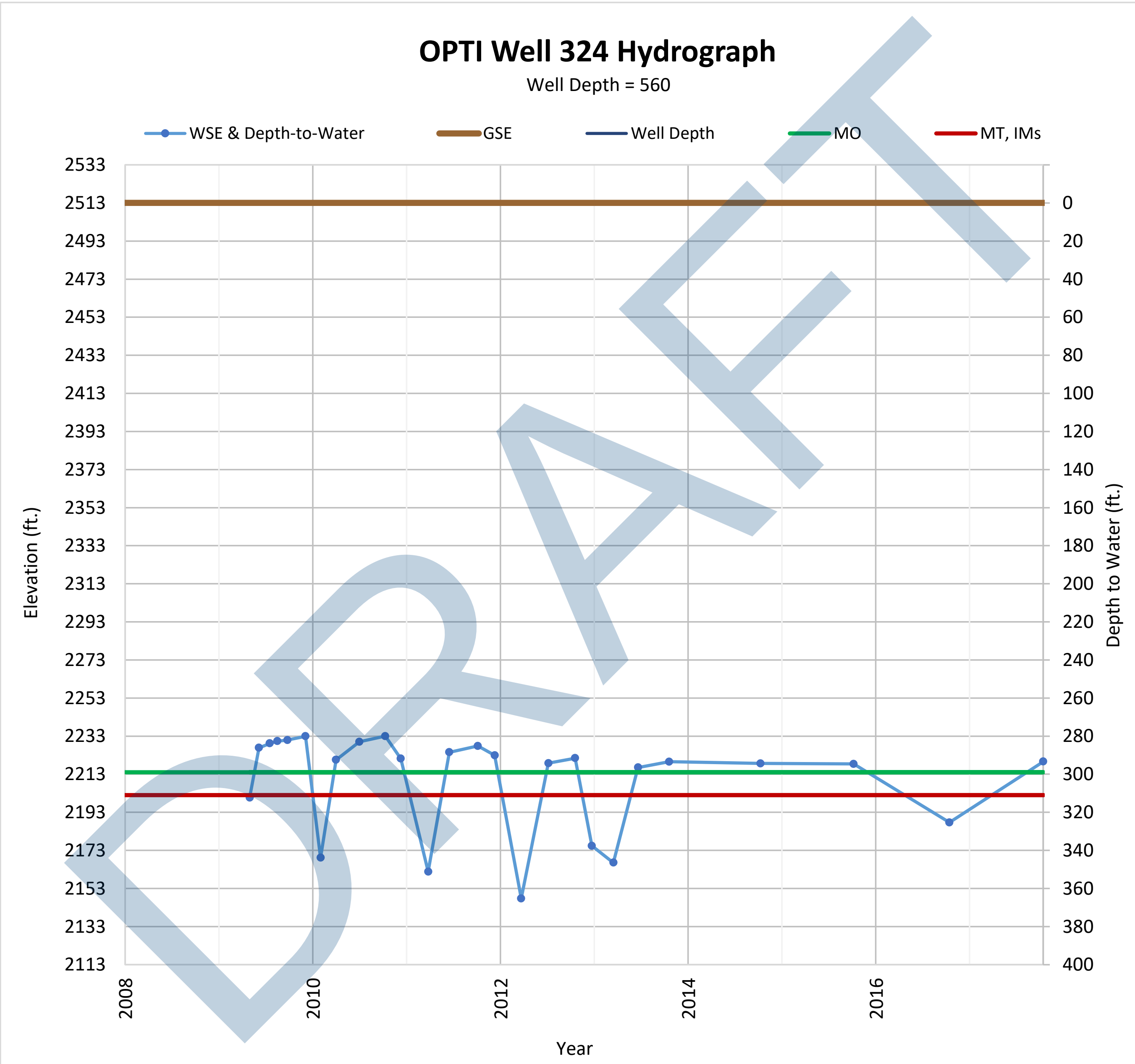
OPTI Well 316 Hydrograph
Well Depth = 830
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
2494
2474
2454
2434
2414
2394
2374
2354
2334
2314
2294
2274
2254
2234
2214
2194
2174
2154
2134
2114
2094
2074
2054
2034
2014
1994
1974
1954
1934
1914
1894
1874
1854
1834
1814
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
660
2008
2010
2012
2014
2016
Year
DRAFT



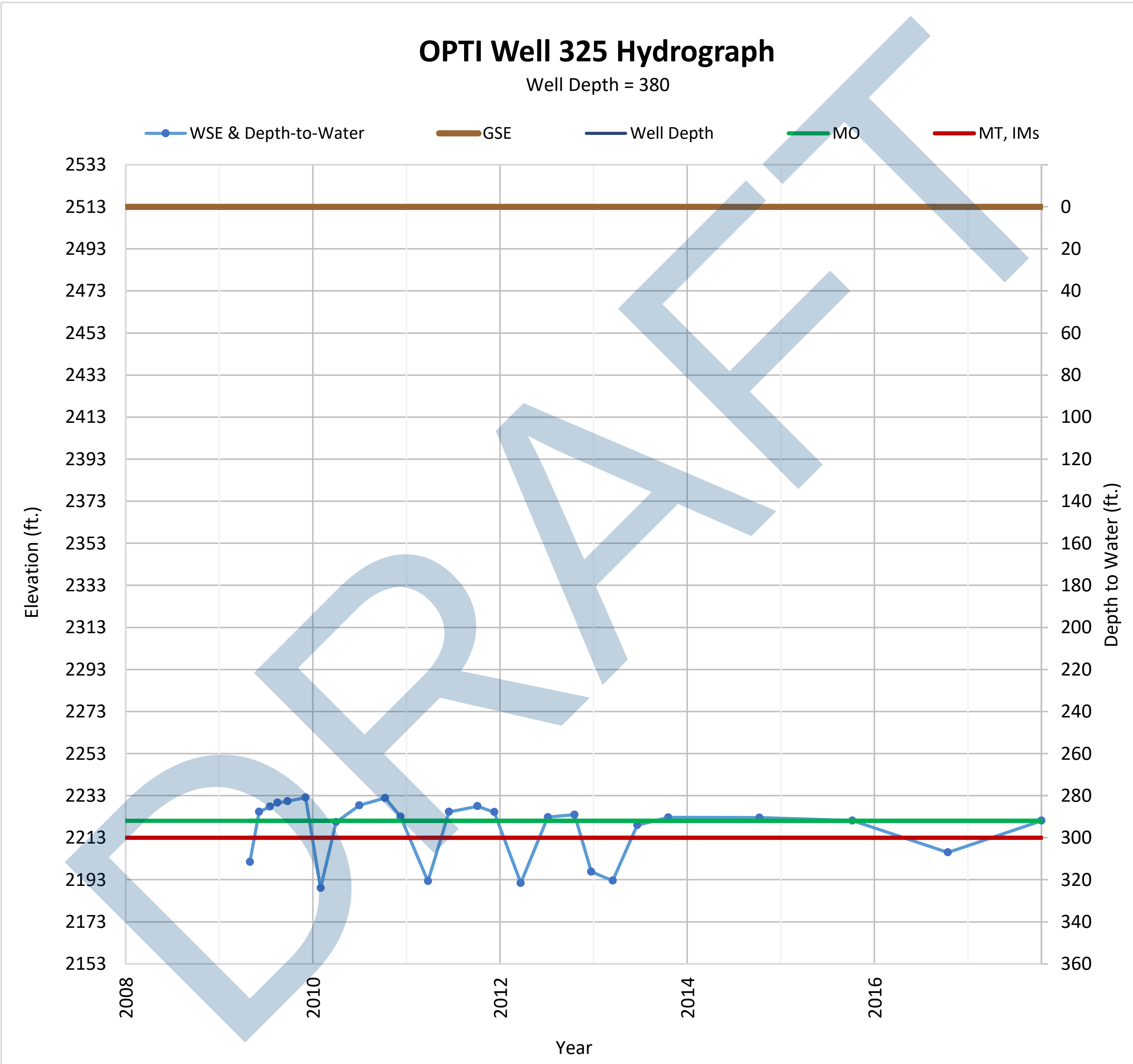
OPTI Well 317 Hydrograph
Well Depth = 700
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2008
2010
2012
2014
2016
DRAFT



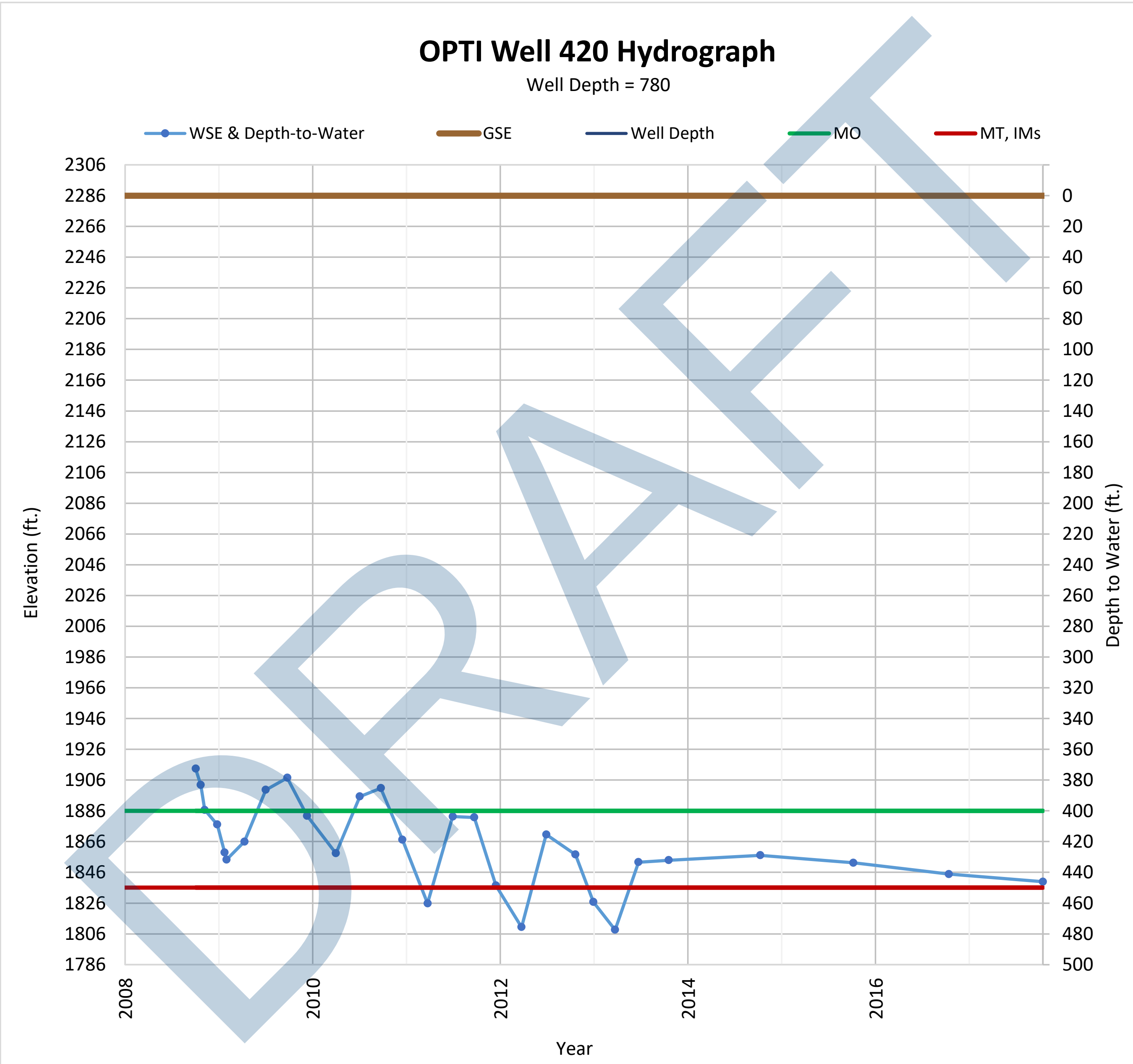
OPTI Well 322 Hydrograph
Well Depth = 850
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
2533
2513
2493
2473
2453
2433
2413
2393
2373
2353
2333
2313
2293
2273
2253
2233
2213
2193
2173
2153
2133
2113
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
2008
2010
2012
2014
2016
Year
DRAFT



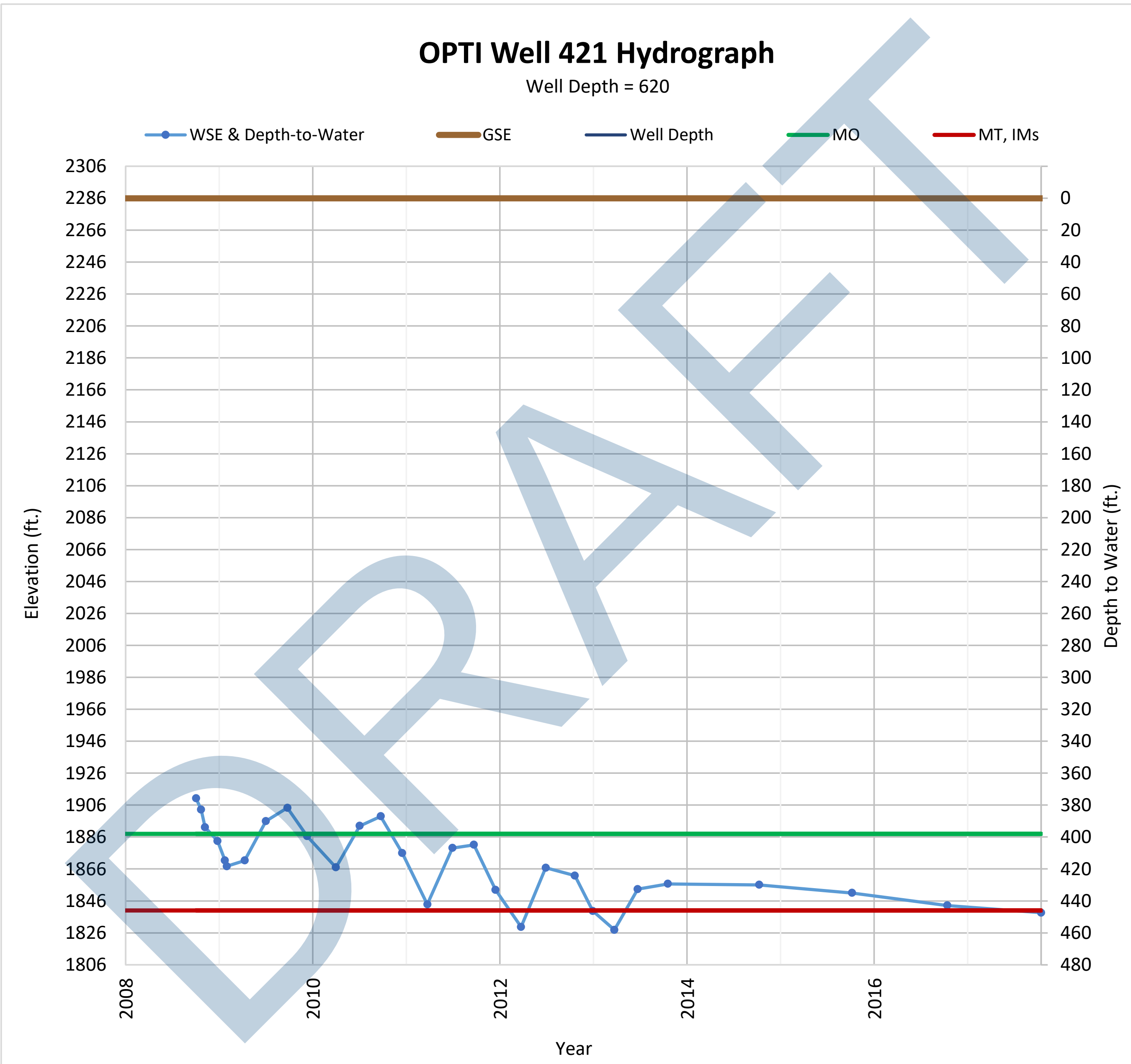
OPTI Well 324 Hydrograph
Well Depth = 560
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2533
2513
2493
2473
2453
2433
2413
2393
2373
2353
2333
2313
2293
2273
2253
2233
2213
2193
2173
2153
2133
2113
Elevation (ft.)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Depth to Water (ft.)
2008
2010
2012
2014
2016
Year
DRAFT

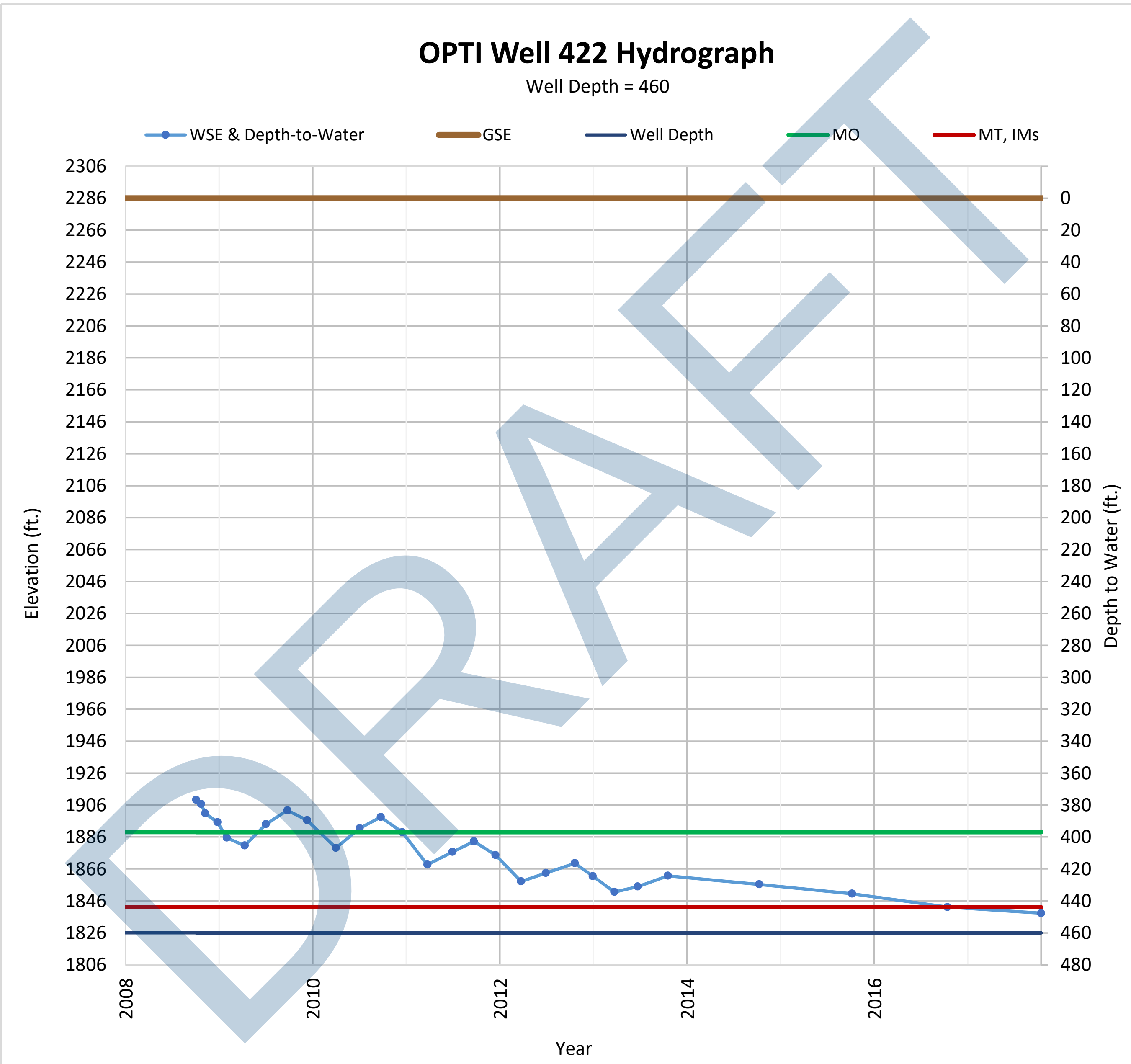


OPTI Well 325 Hydrograph
Well Depth = 380
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2533
2513
2493
2473
2453
2433
2413
2393
2373
2353
2333
2313
2293
2273
2253
2233
2213
2193
2173
2153
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
2008
2010
2012
2014
2016



OPTI Well 420 Hydrograph
Well Depth = 780
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2306
2286
2266
2246
2226
2206
2186
2166
2146
2126
2106
2086
2066
2046
2026
2006
1986
1966
1946
1926
1906
1886
1866
1846
1826
1806
1786
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
2008
2010
2012
2014
2016
DRAFT


OPTI Well 421 Hydrograph
Well Depth = 620
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2306
2286
2266
2246
2226
2206
2186
2166
2146
2126
2106
2086
2066
2046
2026
2006
1986
1966
1946
1926
1906
1886
1866
1846
1826
1806
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
2008
2010
2012
2014
2016
DRAFT



OPTI Well 422 Hydrograph
Well Depth = 460
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2008
2010
2012
2014
2016
2306
2286
2266
2246
2226
2206
2186
2166
2146
2126
2106
2086
2066
2046
2026
2006
1986
1966
1946
1926
1906
1886
1866
1846
1826
1806
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
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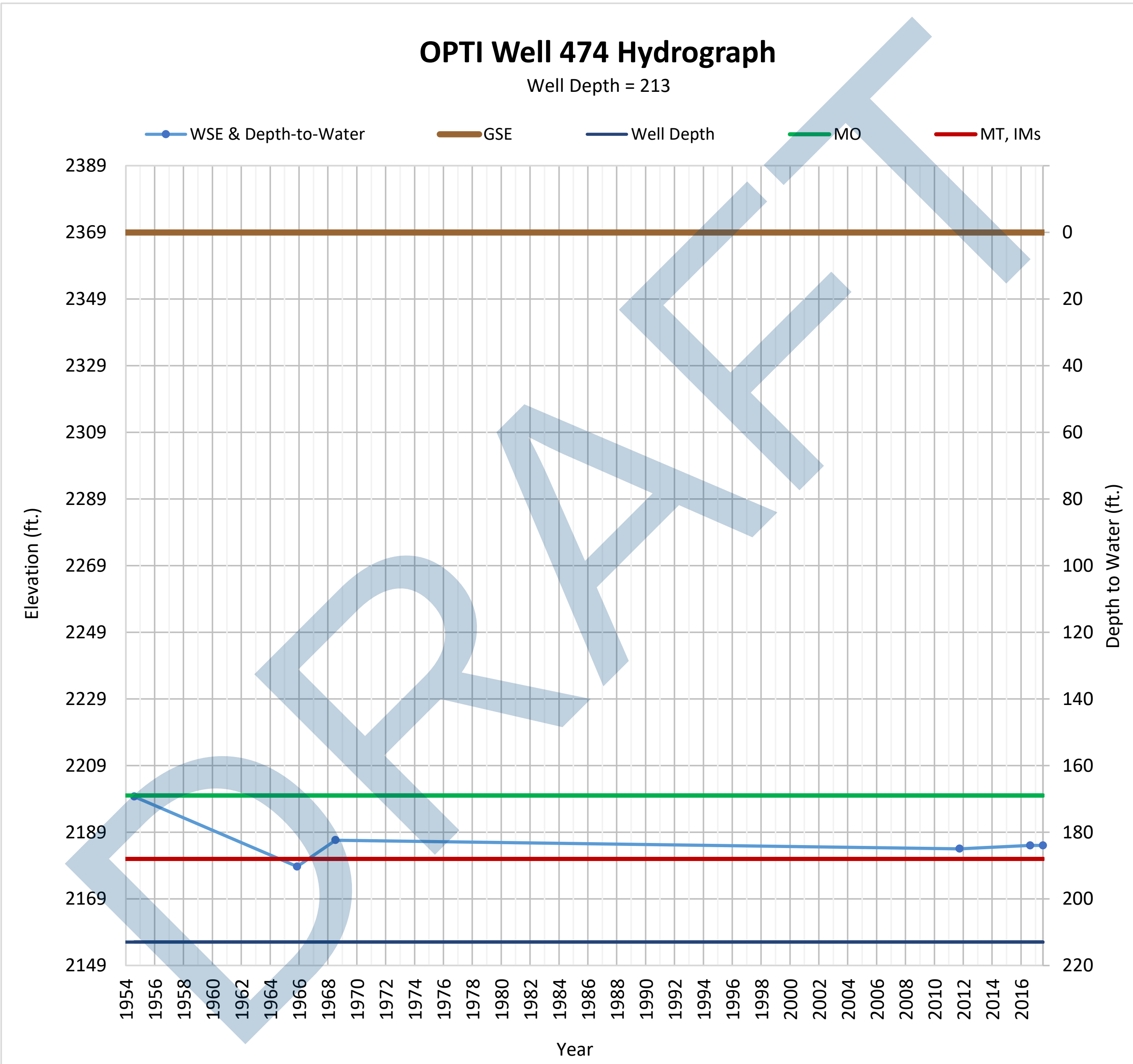
OPTI Well 474 Hydrograph
Well Depth = 213
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT
2389
2369
2349
2329
2309
2289
2269
2249
2229
2209
2189
2169
2149
0
20
40
60
80
100
120
140
160
180
200
220
1954
1956
1958
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
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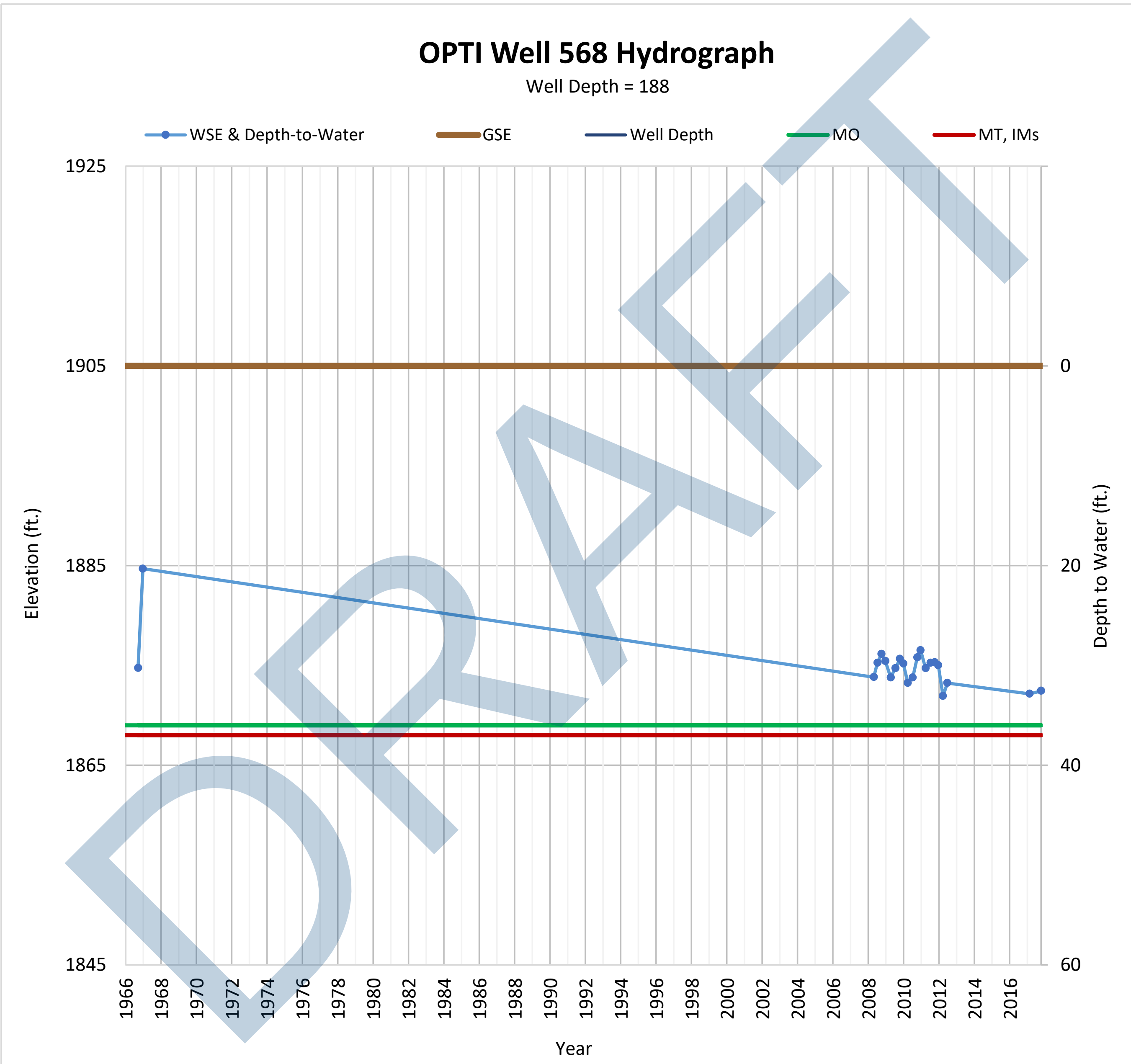
2002
2004
2006
2008
2010
2012
2014
2016



OPTI Well 568 Hydrograph
Well Depth = 188
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1925
1905
1885
1865
1845
0
20
40
60
Elevation (ft.)
Depth to Water (ft.)
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Year
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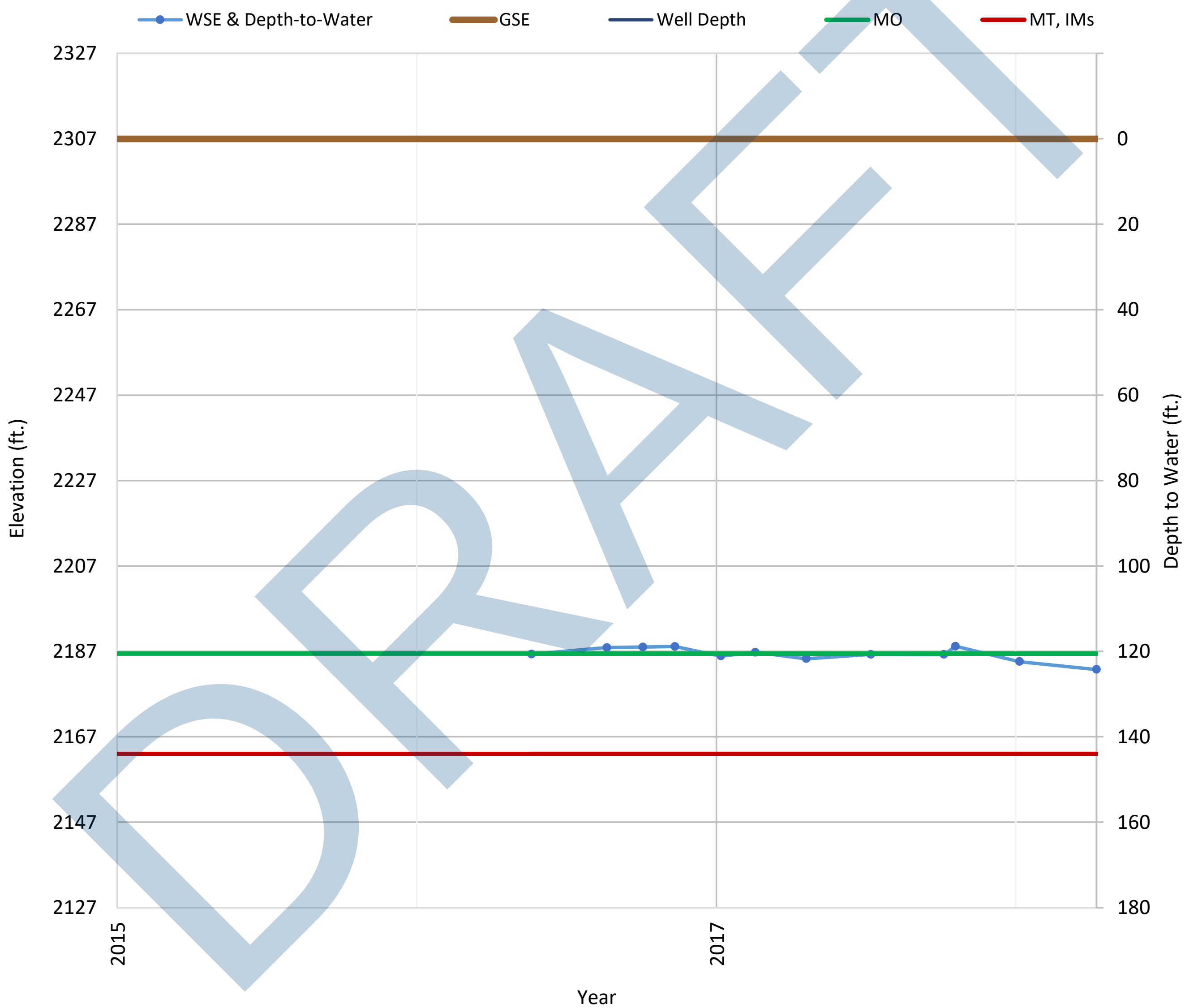
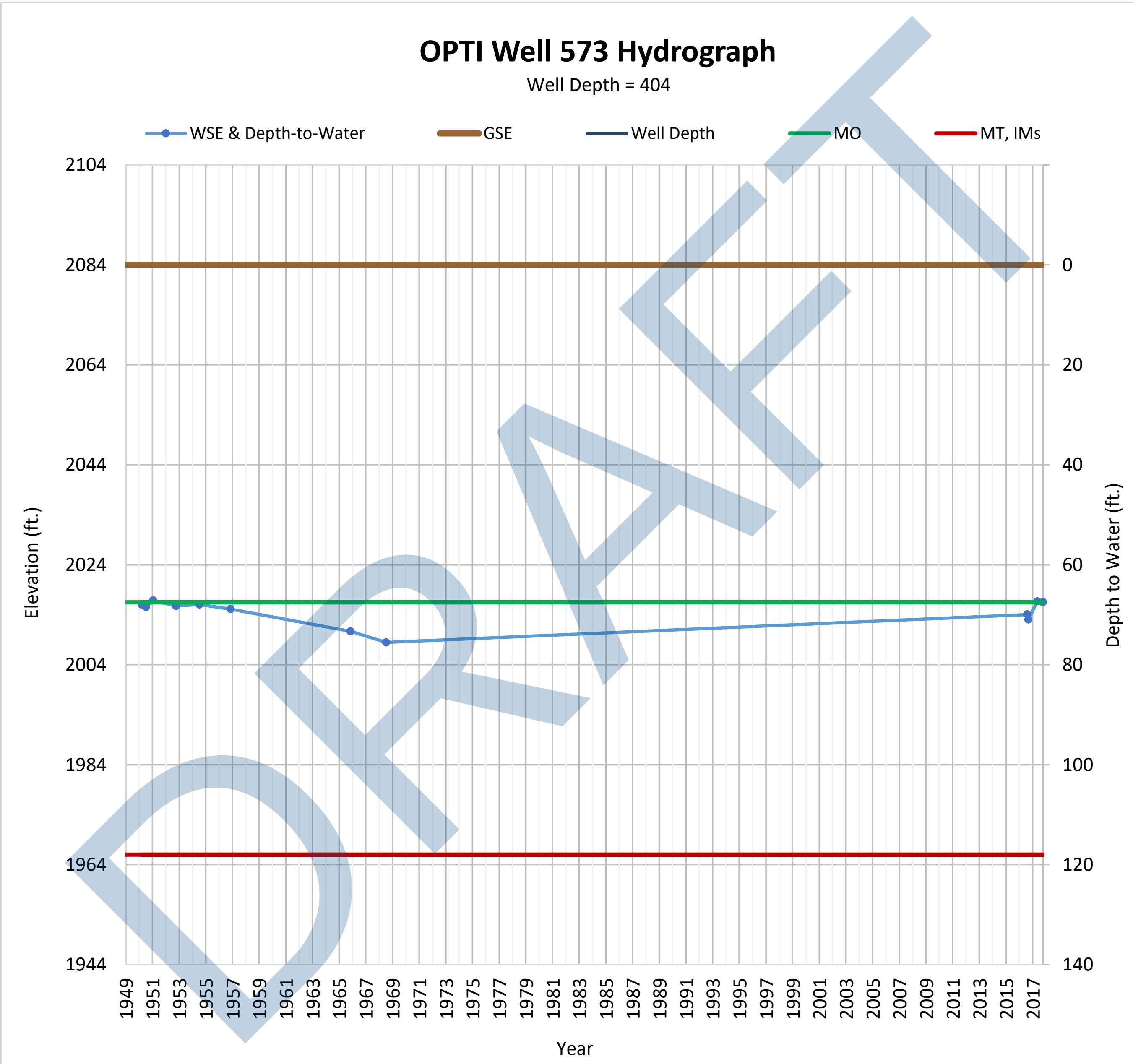
OPTI Well 571 Hydrograph

Well Depth = 280





OPTI Well 573 Hydrograph
Well Depth = 404
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
2104
2084
2064
2044
2024
2004
1984
1964
1944
Elevation (ft.)
0
20
40
60
80
100
120
140
Depth to Water (ft.)
1949
1951
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
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2009
2011
2013
2015
2017
Year
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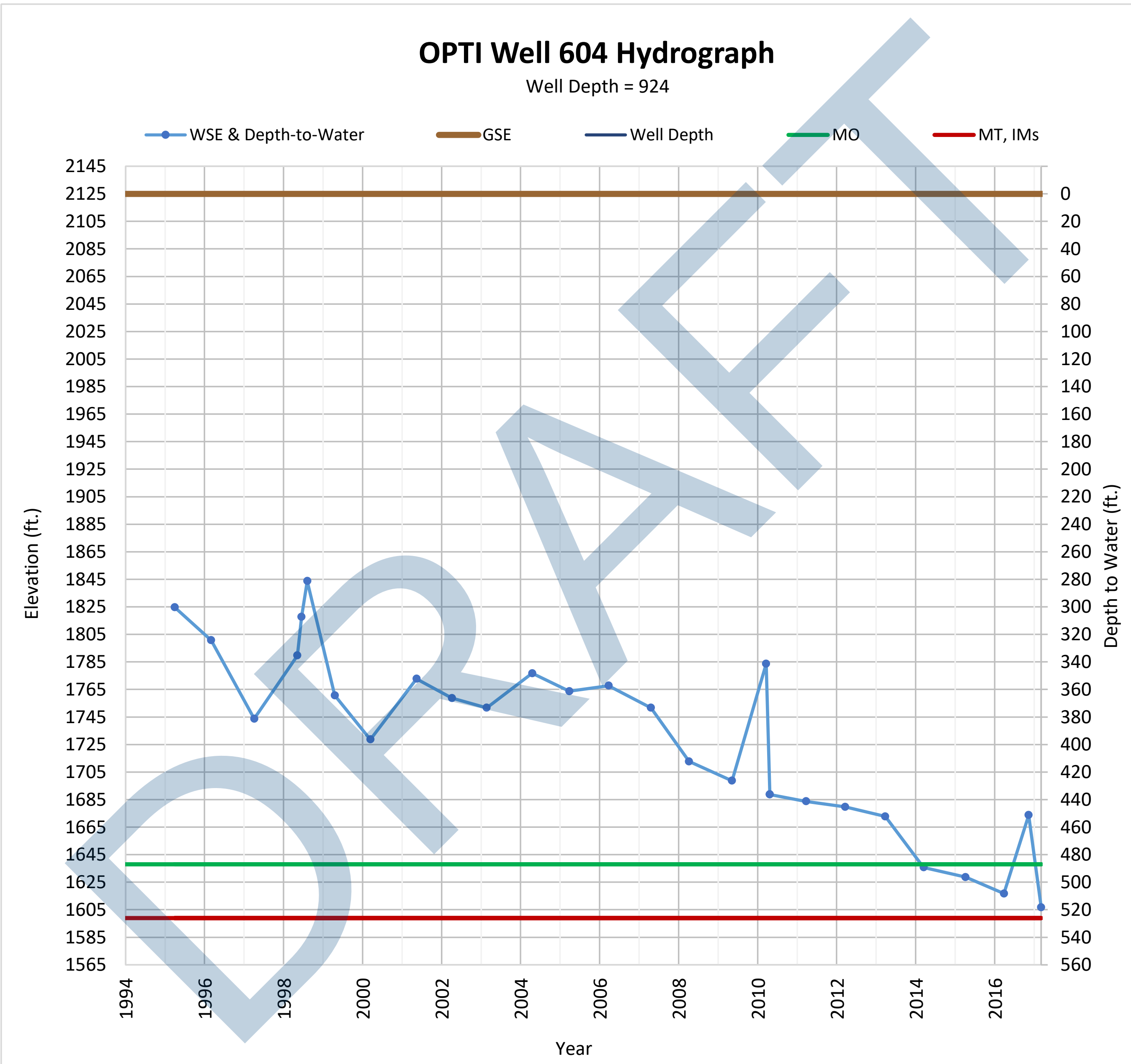

OPTI Well 604 Hydrograph
Well Depth = 924
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2145
2125
2105
2085
2065
2045
2025
2005
1985
1965
1945
1925
1905
1885
1865
1845
1825
1805
1785
1765
1745
1725
1705
1685
1665
1645
1625
1605
1585
1565
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
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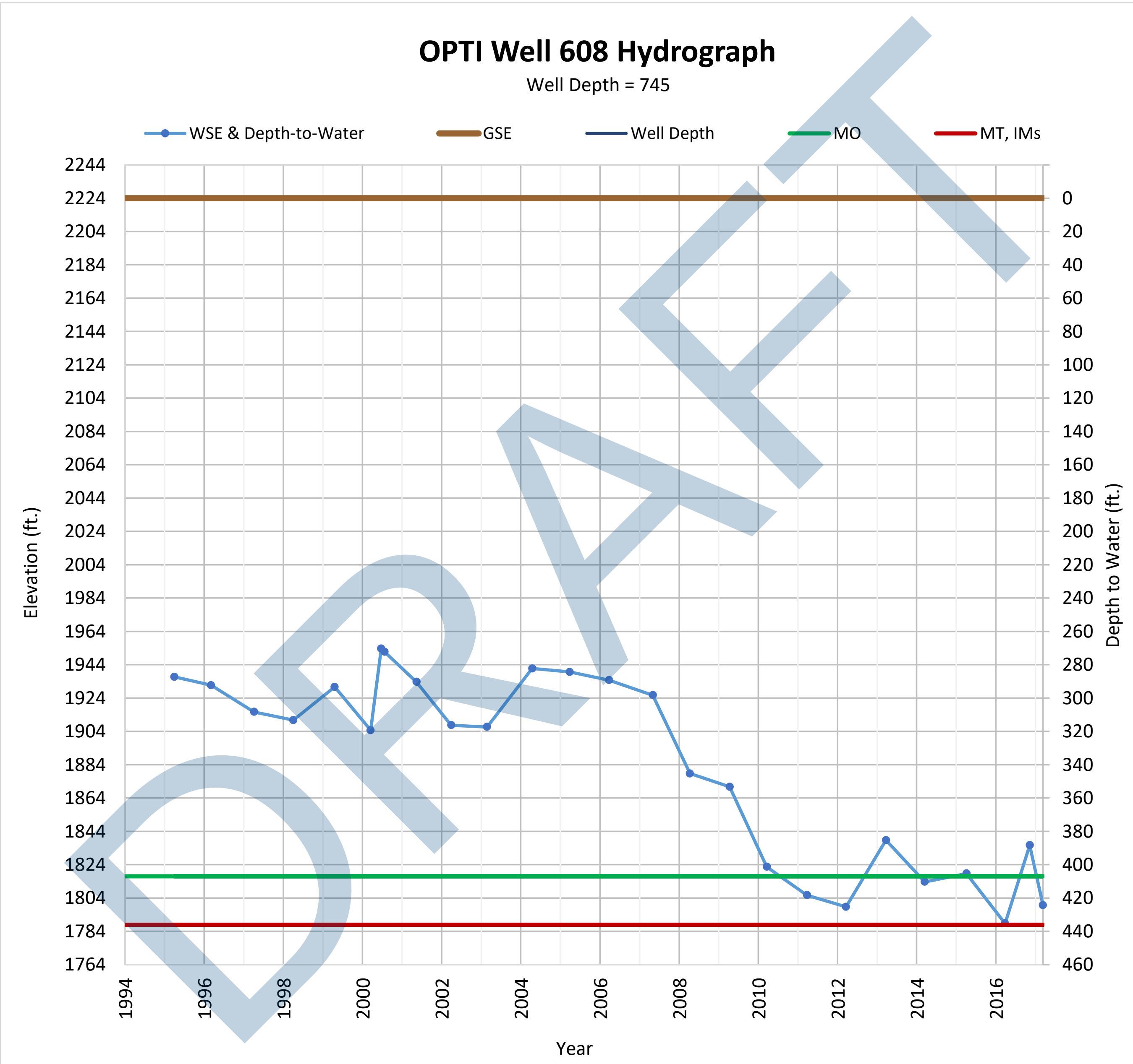
OPTI Well 608 Hydrograph
Well Depth = 745
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2244
2224
2204
2184
2164
2144
2124
2104
2084
2064
2044
2024
2004
1984
1964
1944
1924
1904
1884
1864
1844
1824
1804
1784
1764
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
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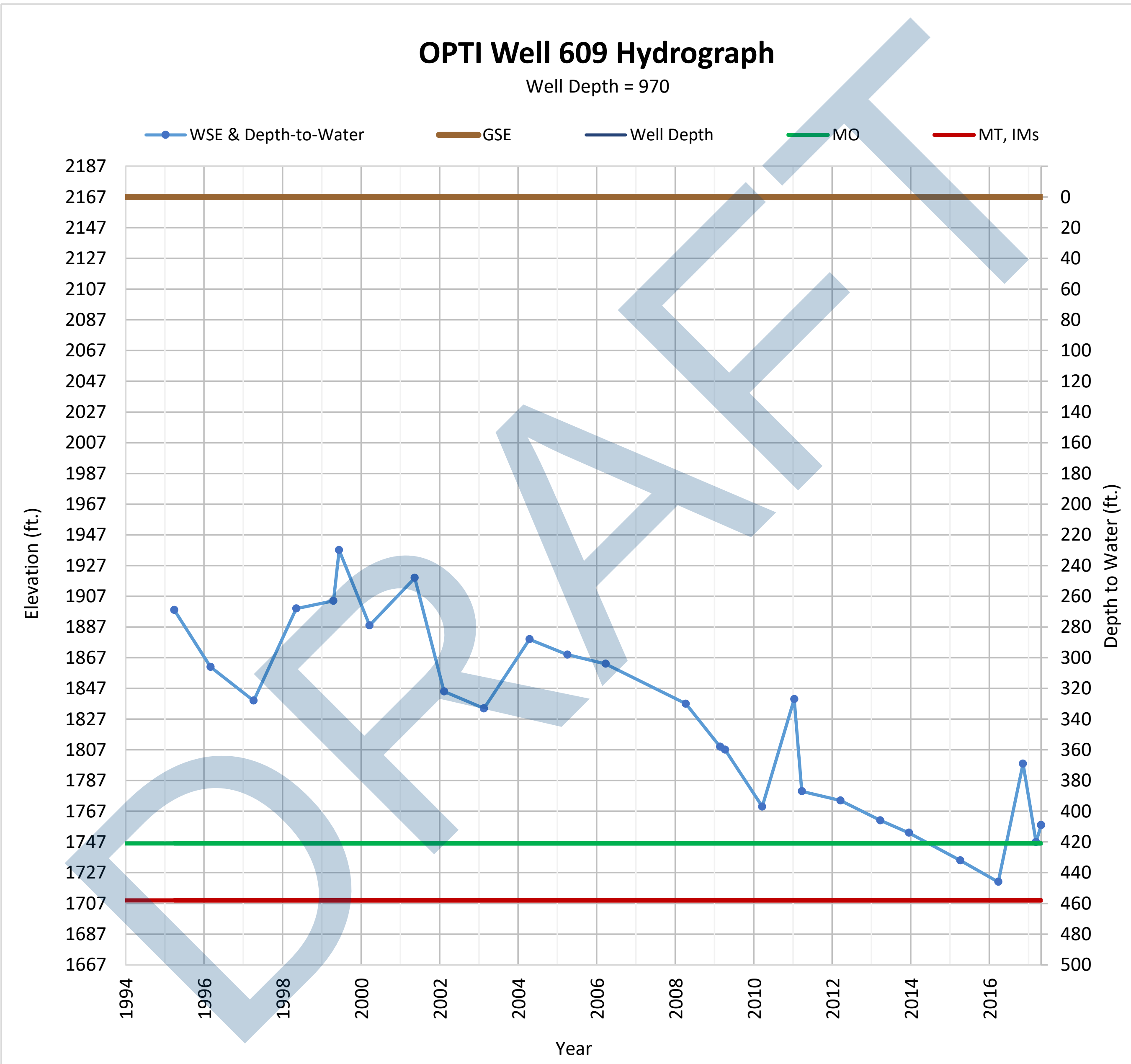

OPTI Well 609 Hydrograph
Well Depth = 970
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2187
2167
2147
2127
2107
2087
2067
2047
2027
2007
1987
1967
1947
1927
1907
1887
1867
1847
1827
1807
1787
1767
1747
1727
1707
1687
1667
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
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500
1994
1996
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2004
2006
2008
2010
2012
2014
2016
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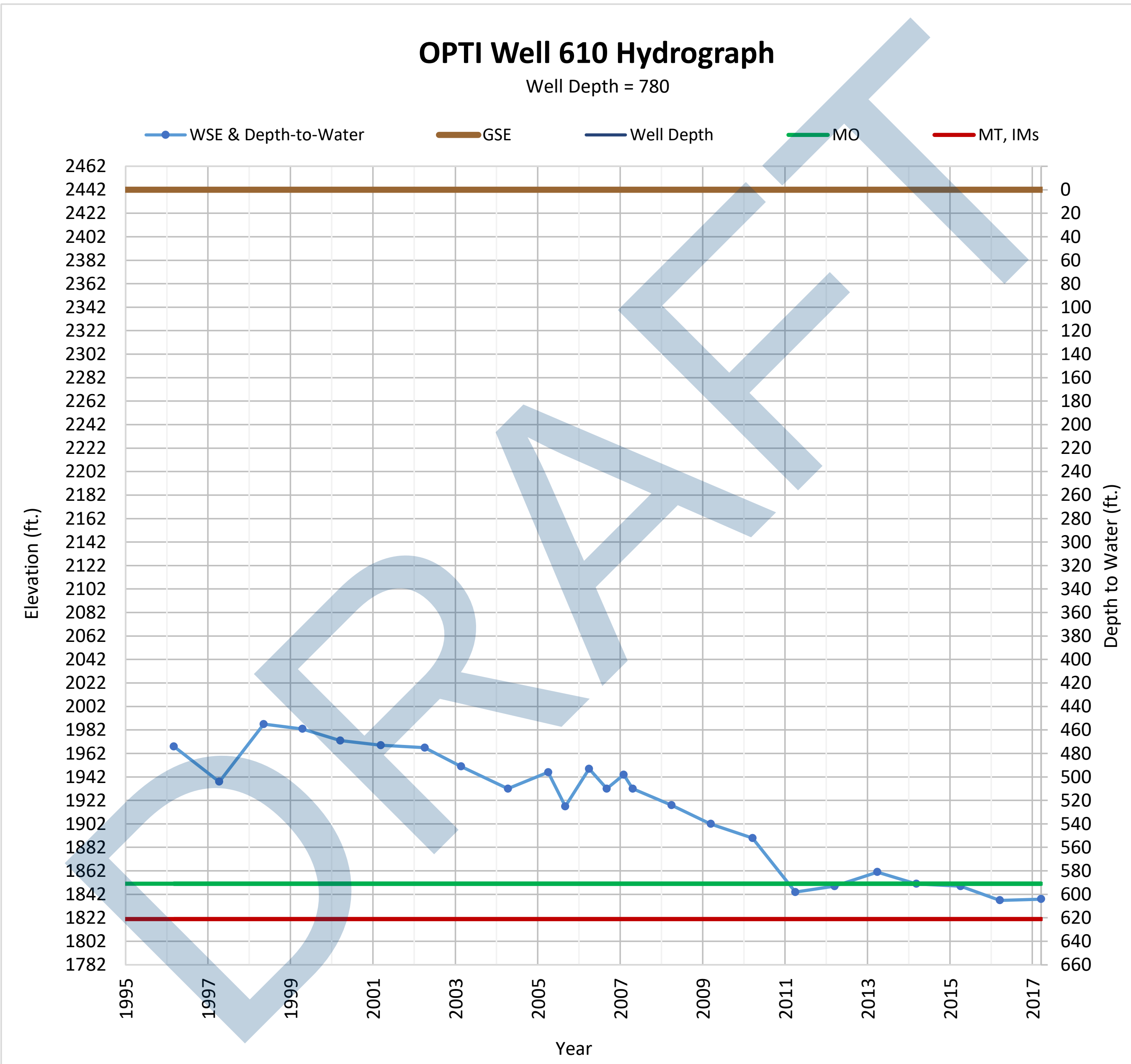
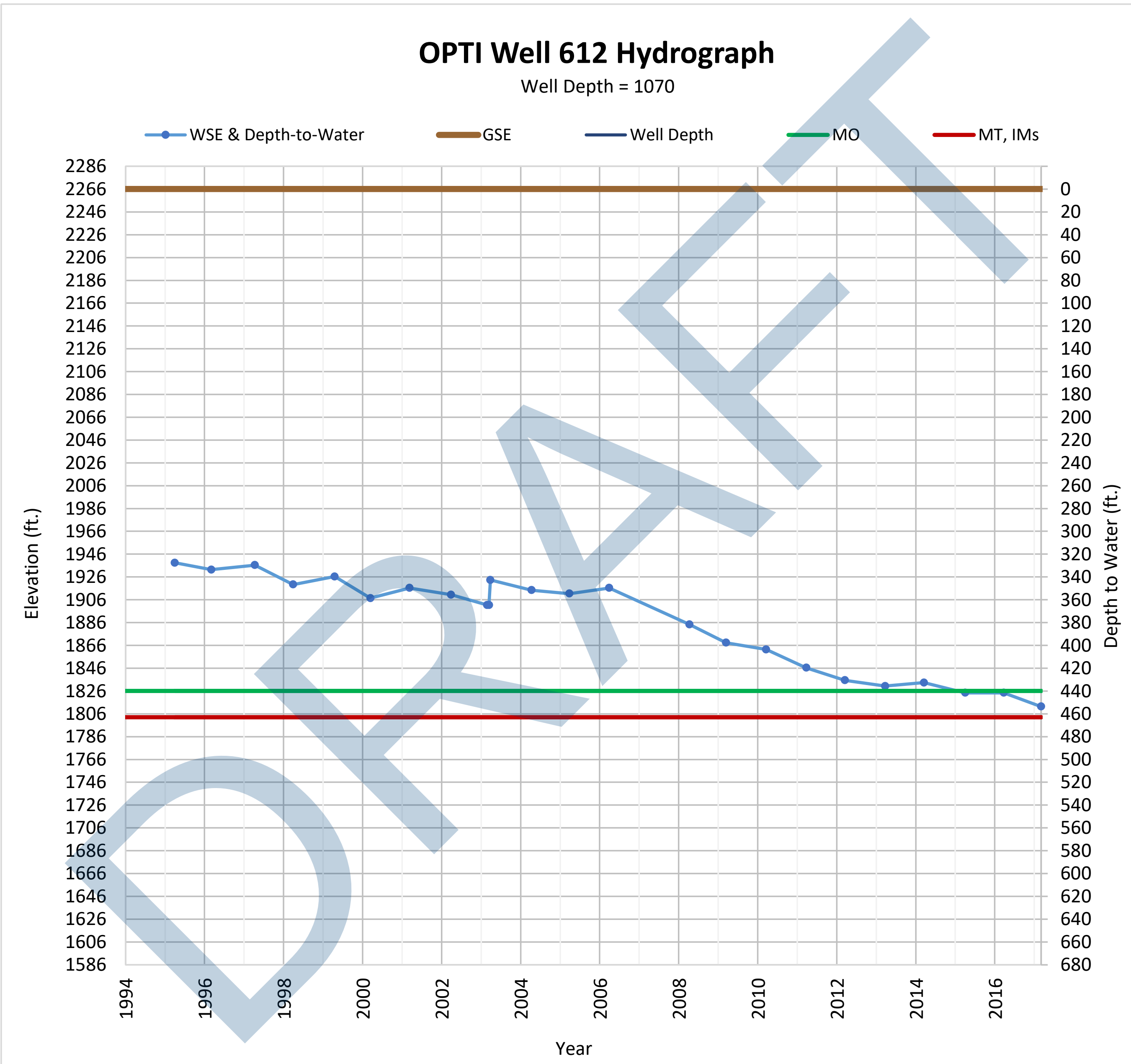
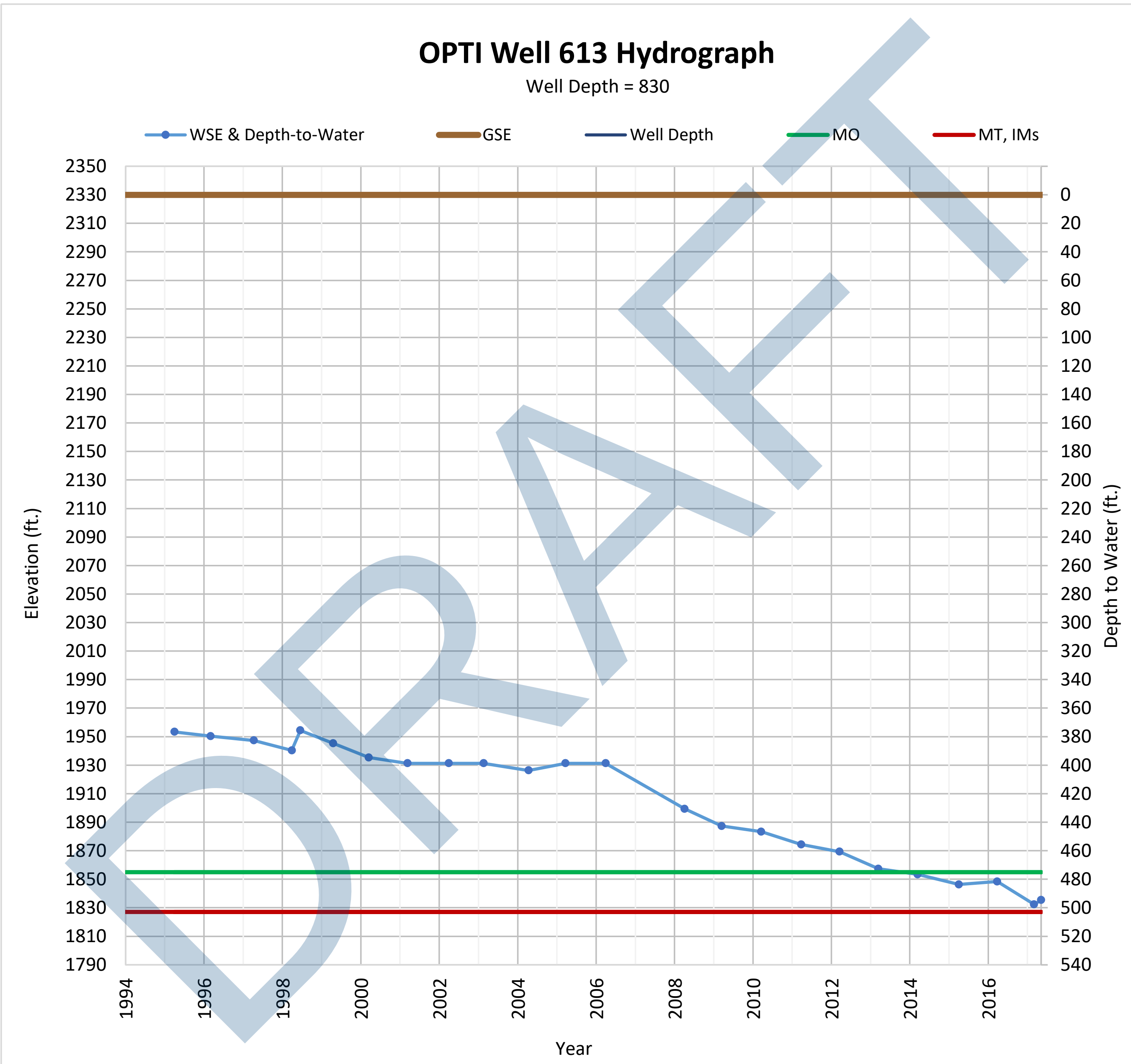
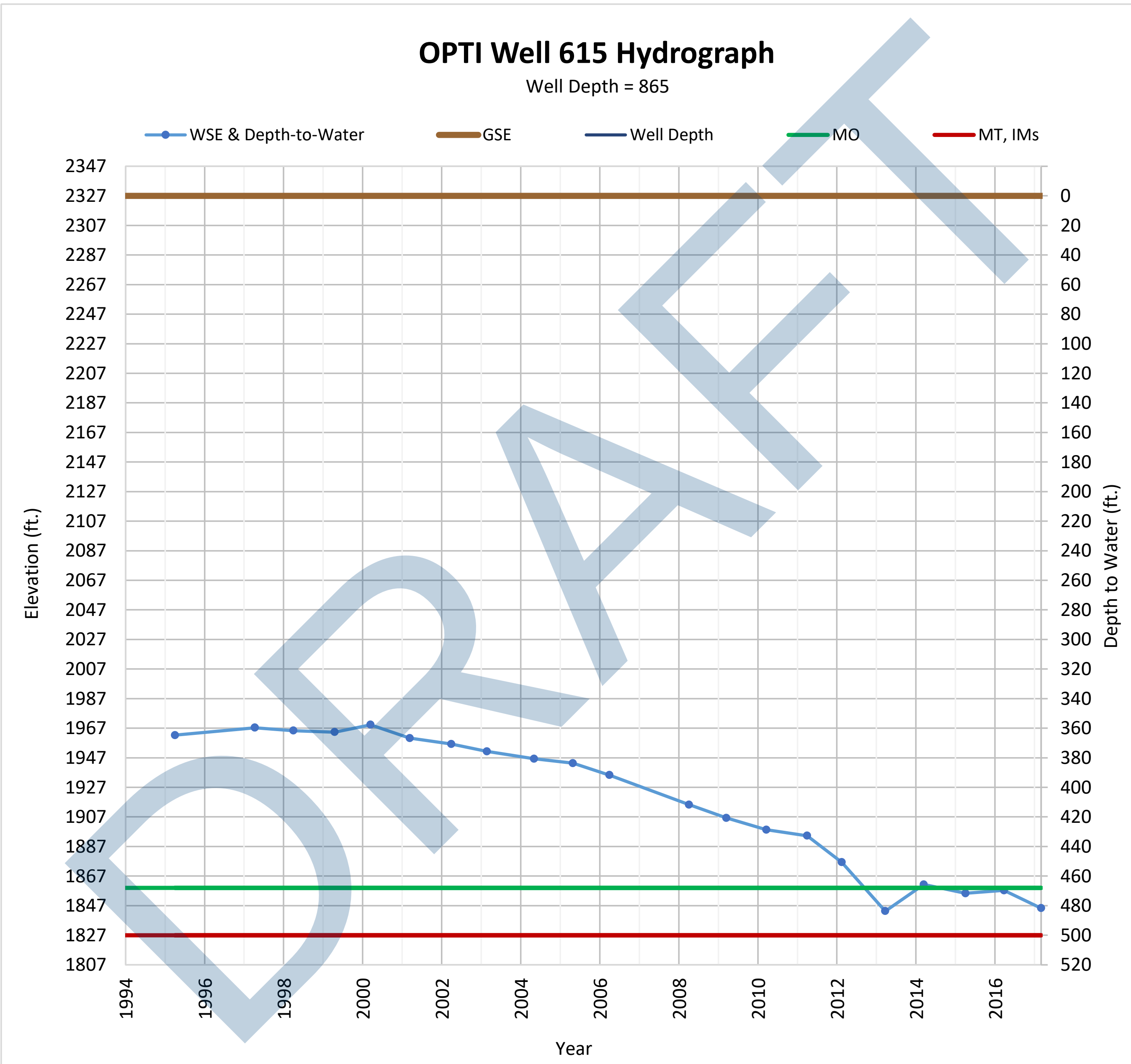


OPTI Well 610 Hydrograph
Well Depth = 780
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2462
2442
2422
2402
2382
2362
2342
2322
2302
2282
2262
2242
2222
2202
2182
2162
2142
2122
2102
2082
2062
2042
2022
2002
1982
1962
1942
1922
1902
1882
1862
1842
1822
1802
1782
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
660
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
DRAFT

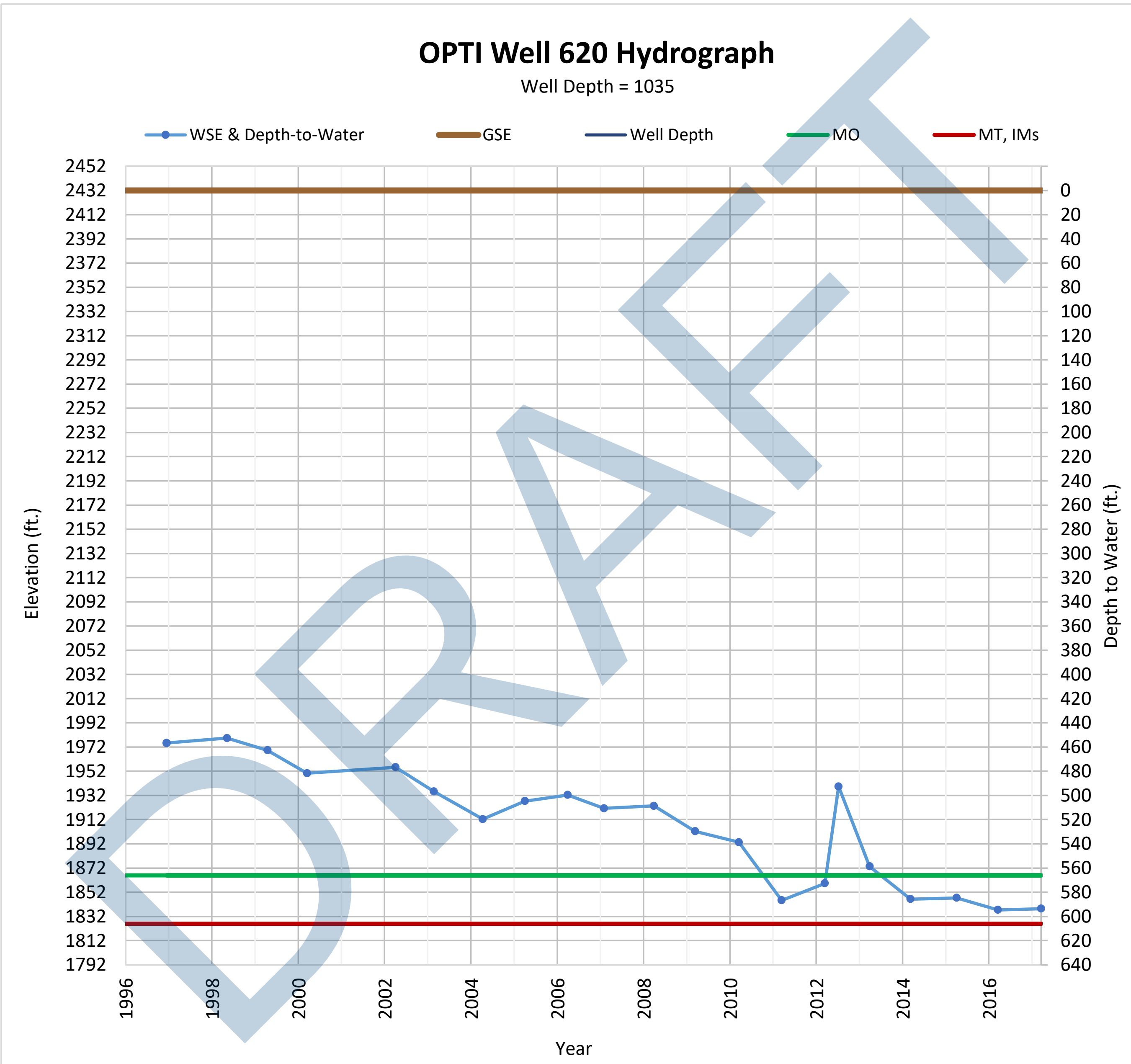


OPTI Well 612 Hydrograph
Well Depth = 1070
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT

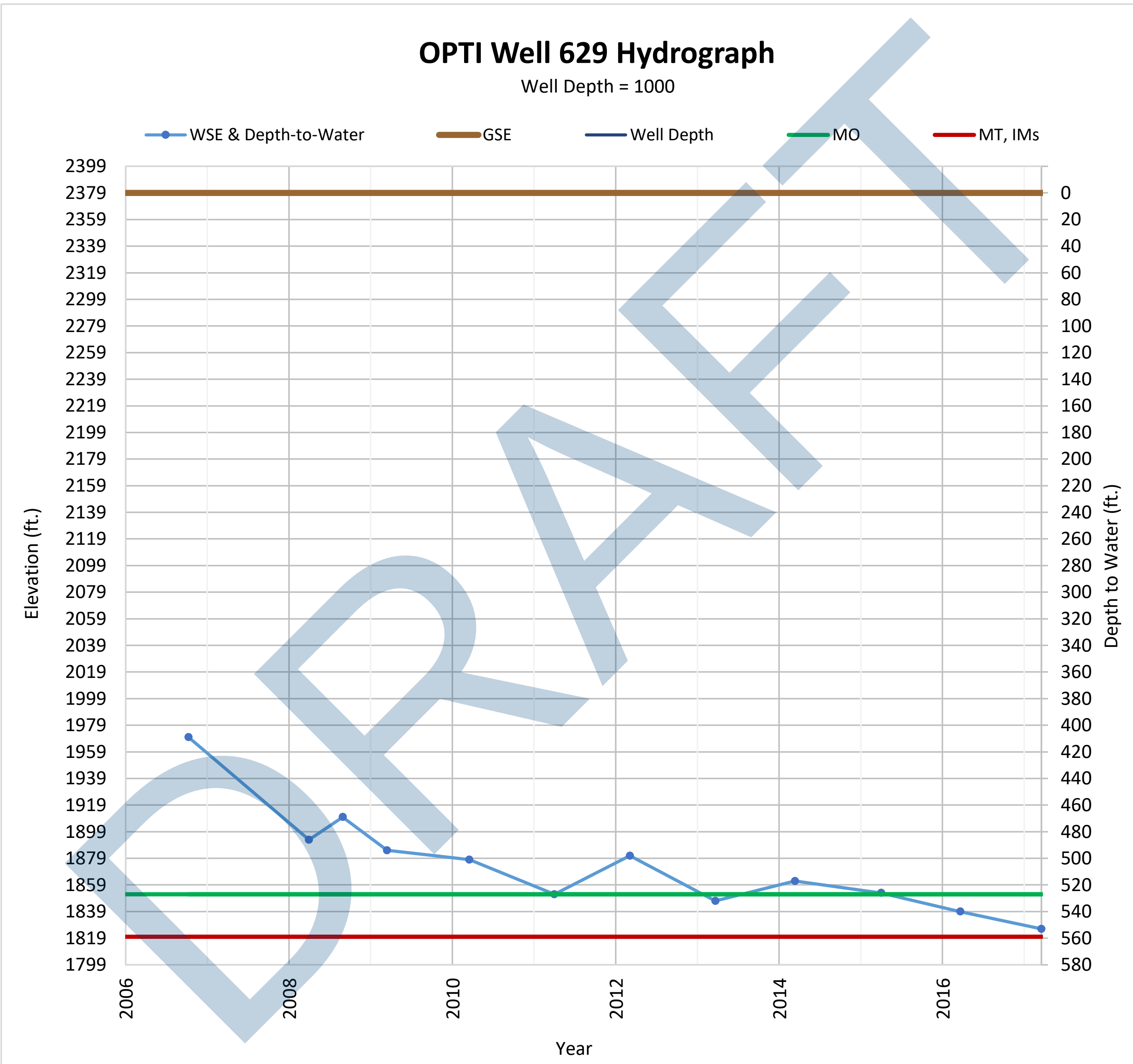

OPTI Well 613 Hydrograph
Well Depth = 830
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT



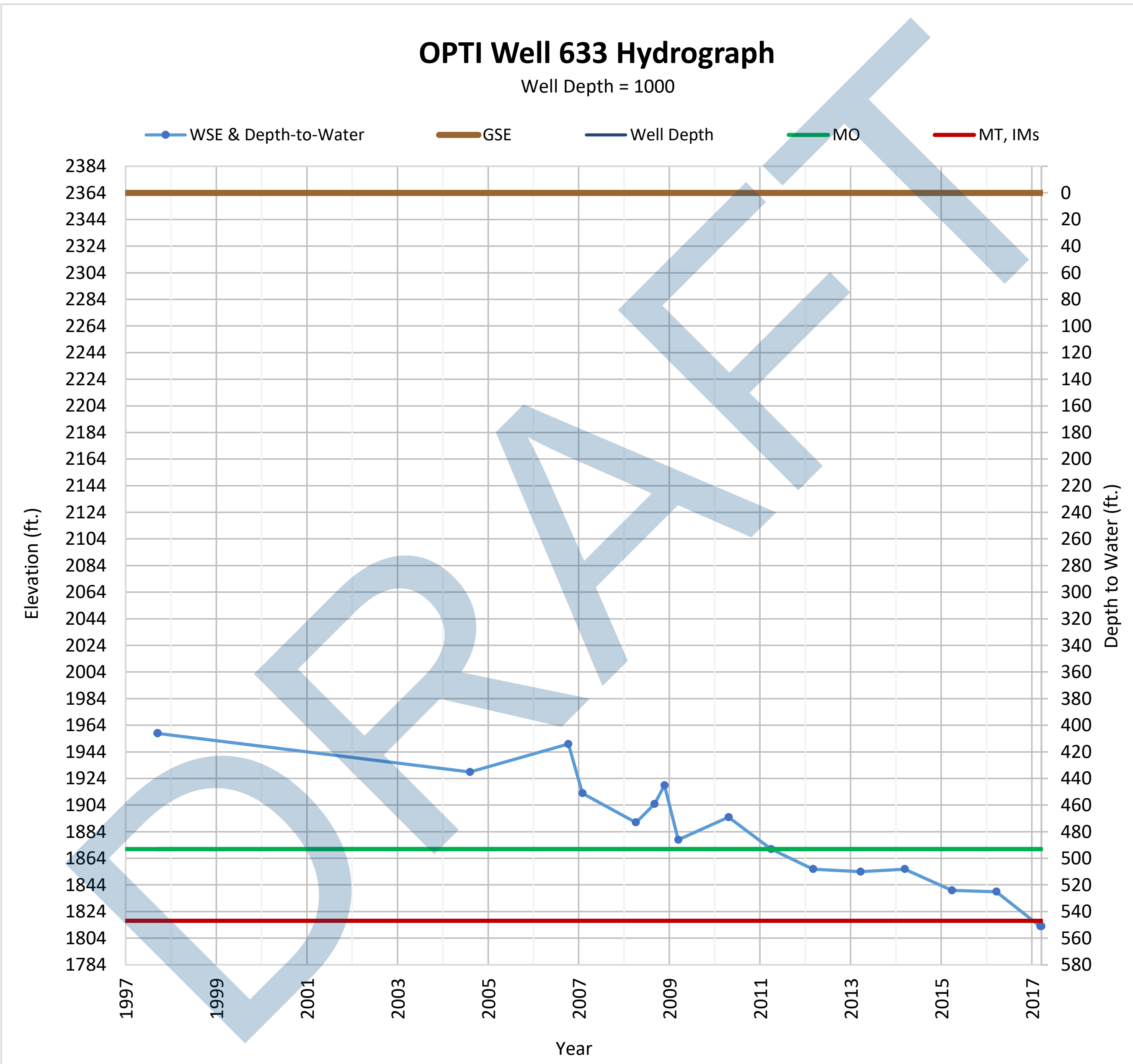
OPTI Well 615 Hydrograph
Well Depth = 865
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT



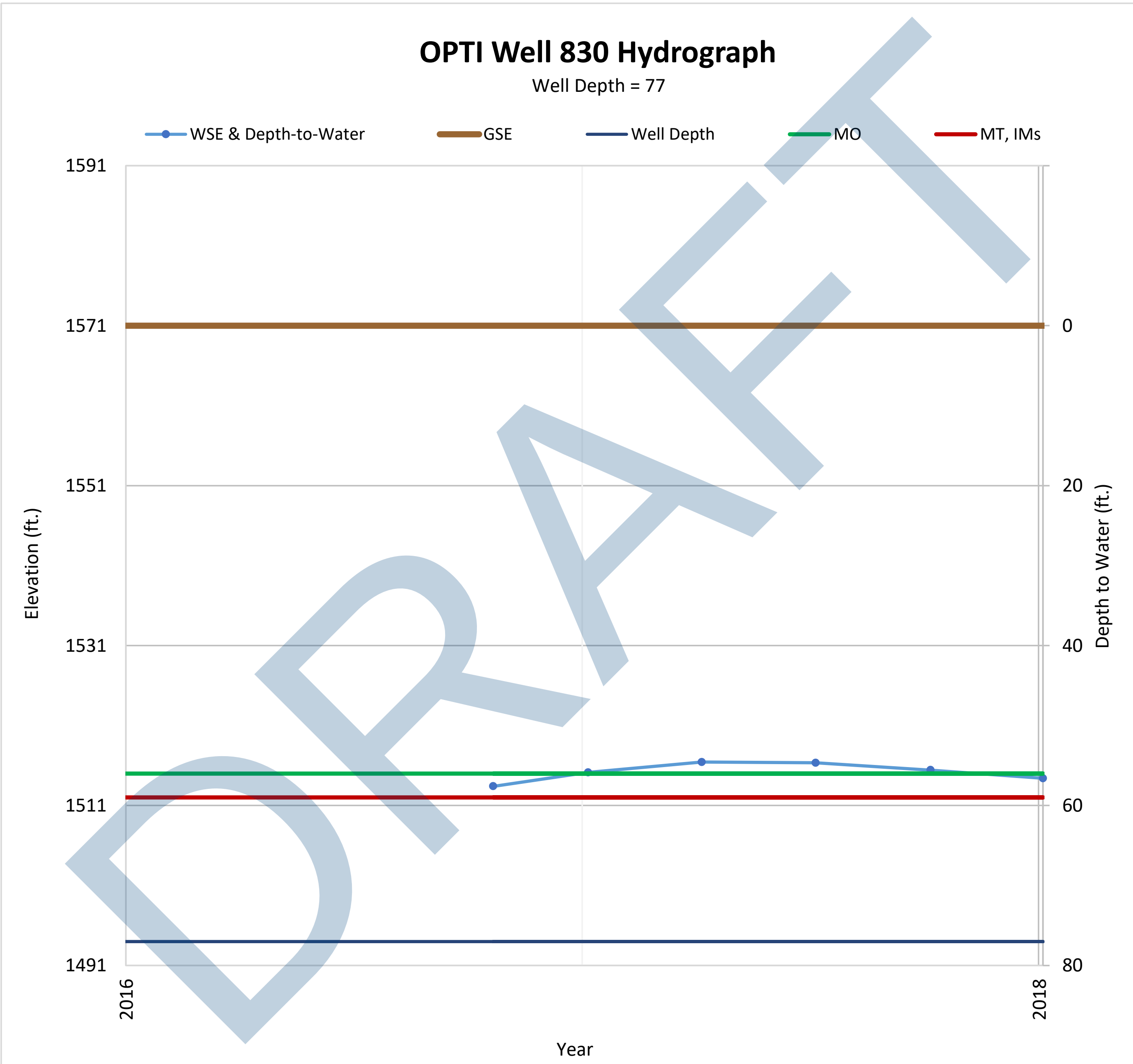
OPTI Well 620 Hydrograph
Well Depth = 1035
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2452
2432
2412
2392
2372
2352
2332
2312
2292
2272
2252
2232
2212
2192
2172
2152
2132
2112
2092
2072
2052
2032
2012
1992
1972
1952
1932
1912
1892
1872
1852
1832
1812
1792
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
DRAFT

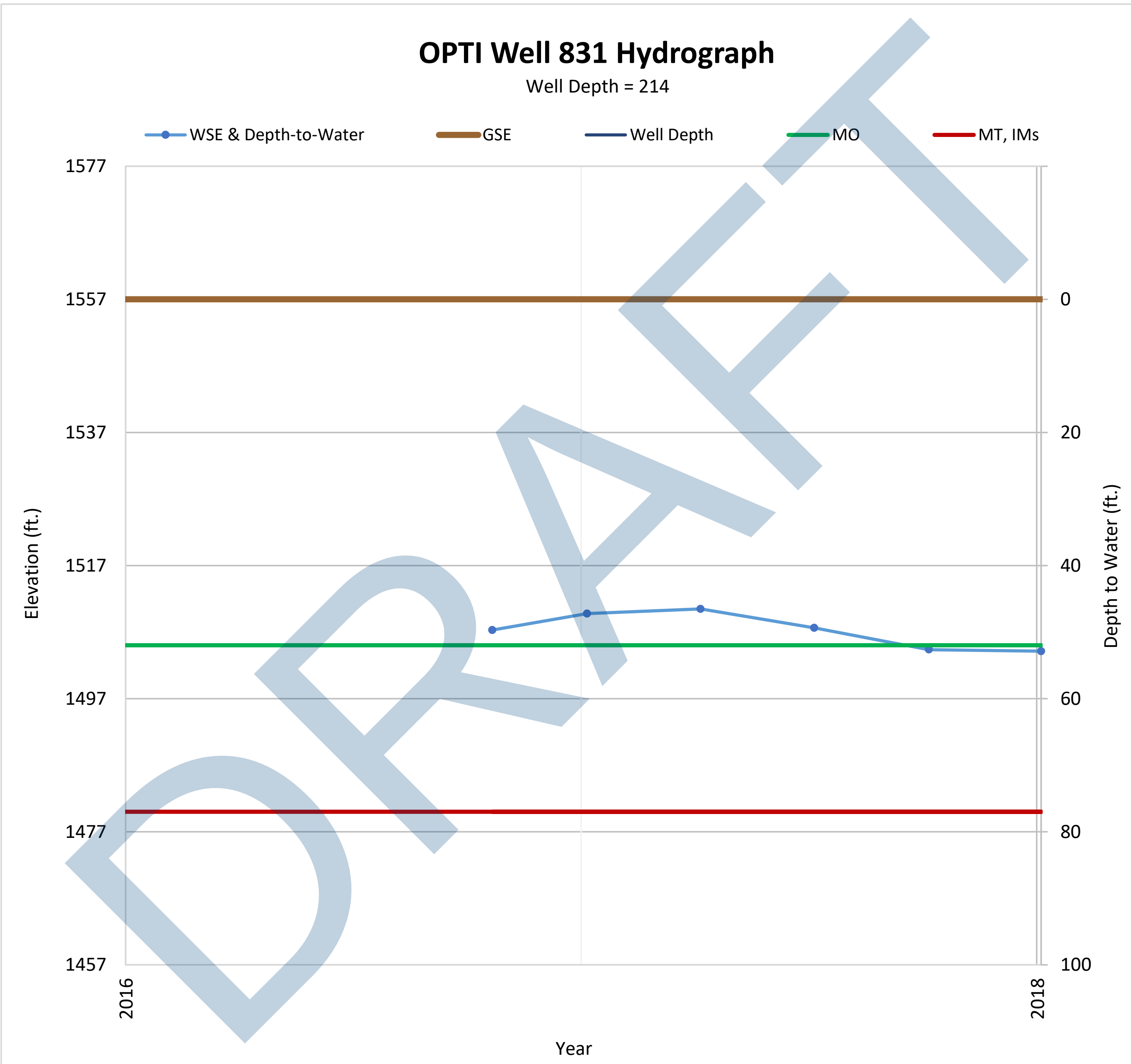


OPTI Well 629 Hydrograph
Well Depth = 1000
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
2006
2008
2010
2012
2014
2016
DRAFT

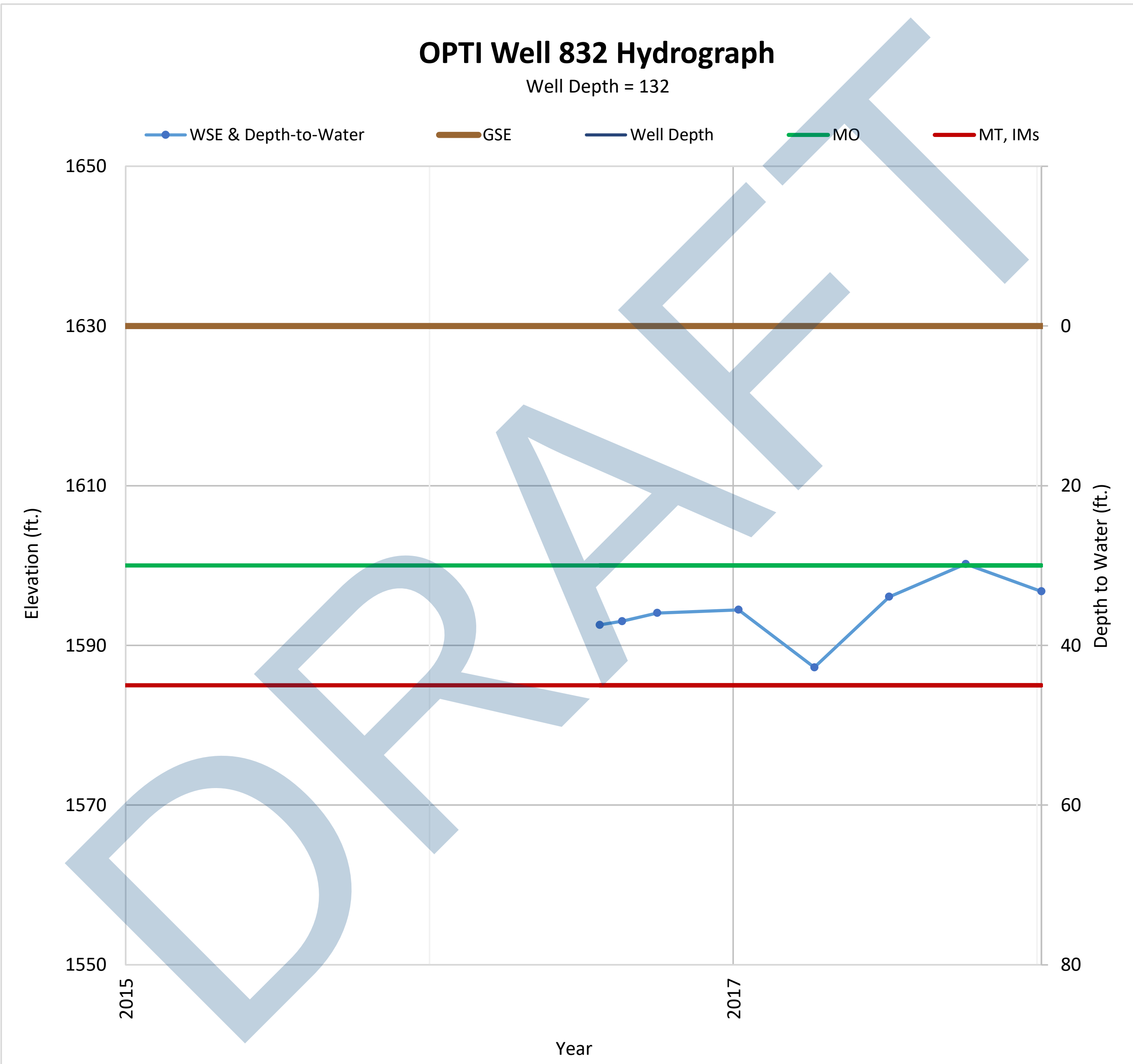


OPTI Well 633 Hydrograph
Well Depth = 1000
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
Year
DRAFT

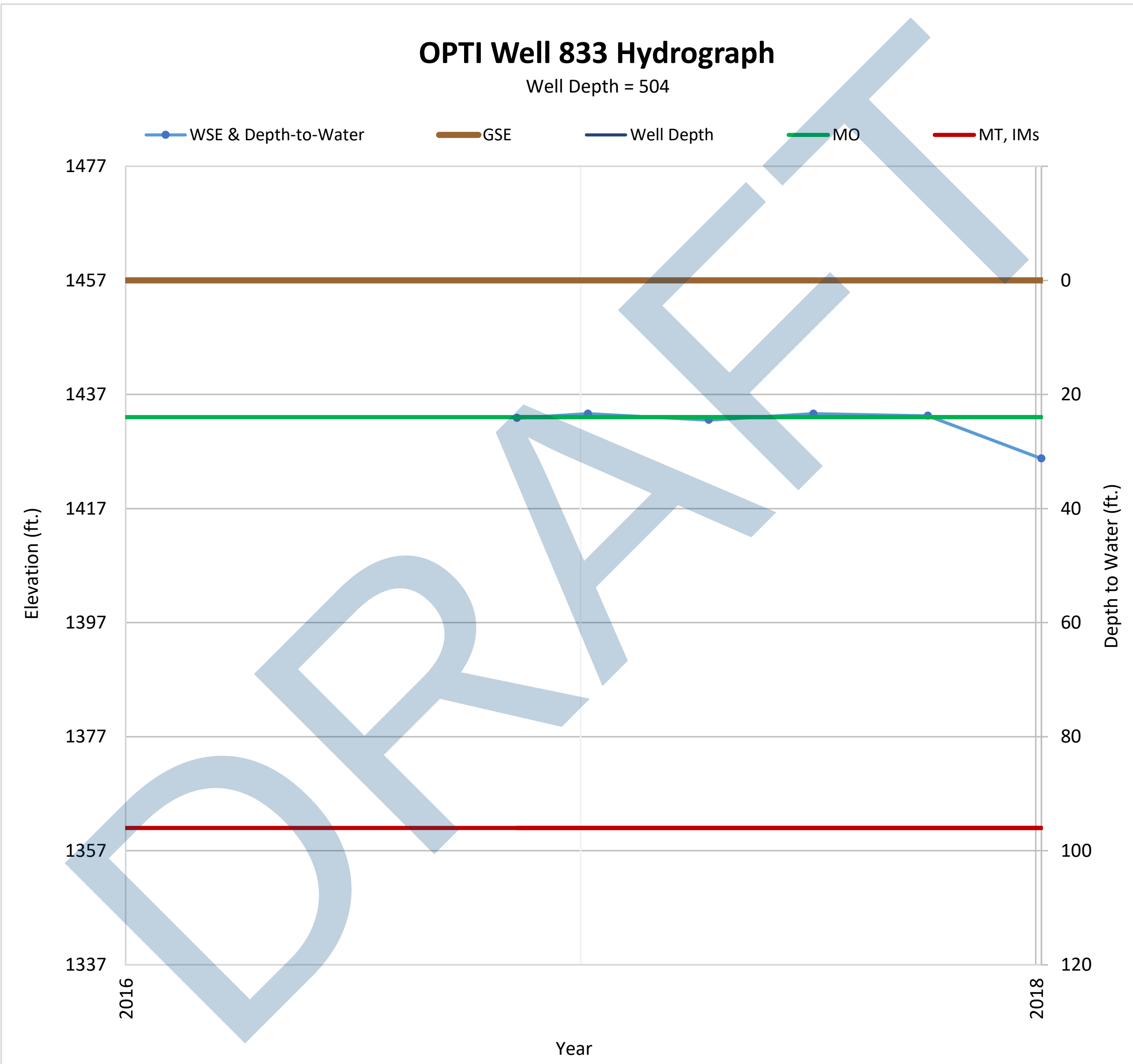

OPTI Well 830 Hydrograph
Well Depth = 77
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1591
1571
1551
1531
1511
1491
Elevation (ft.)
0
20
40
60
80
Depth to Water (ft.)
2016
2018
Year
DRAFT

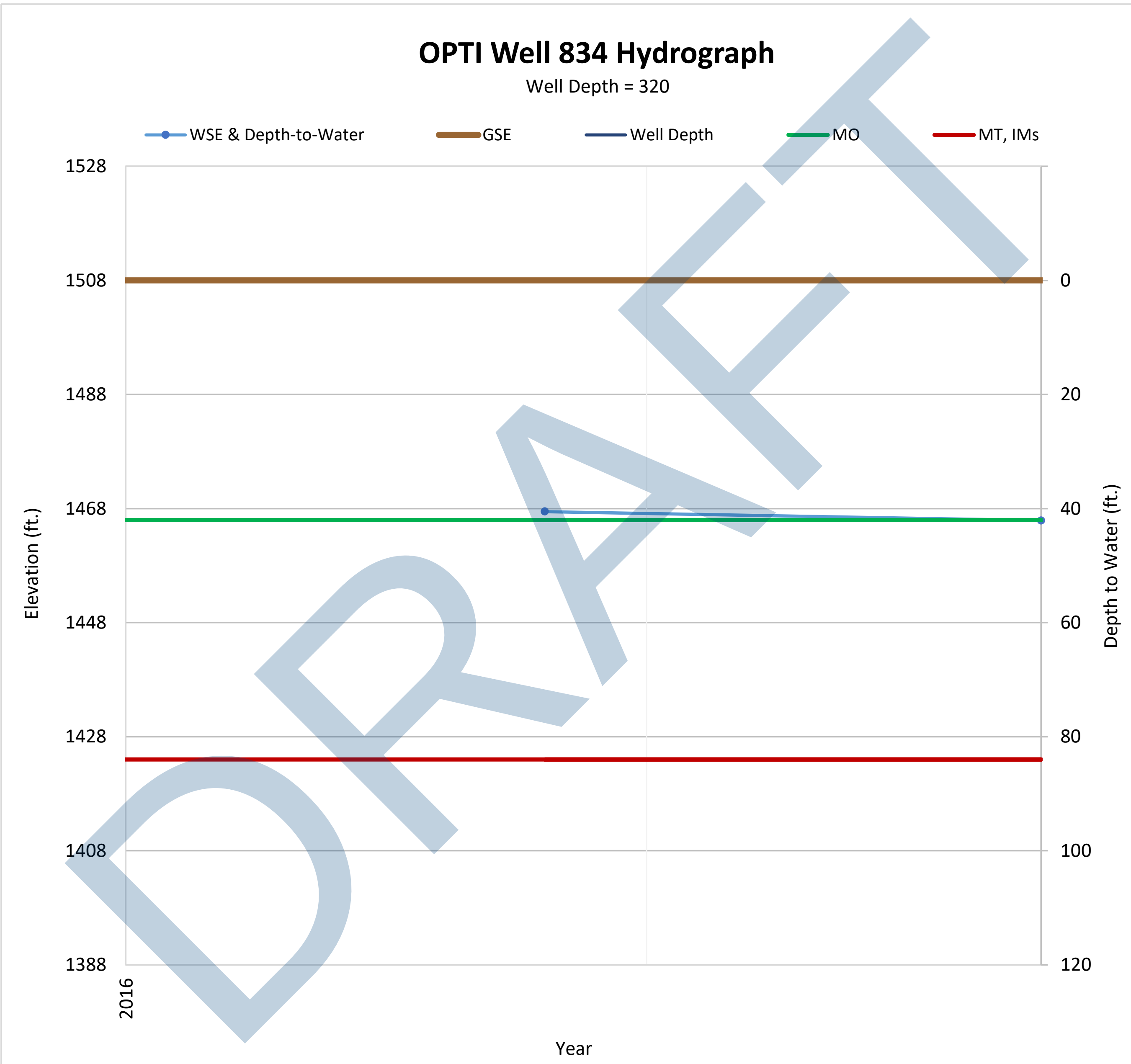


OPTI Well 831 Hydrograph
Well Depth = 214
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1577
1557
1537
1517
1497
1477
1457
Elevation (ft.)
0
20
40
60
80
100
Depth to Water (ft.)
2016
2018
Year
DRAFT

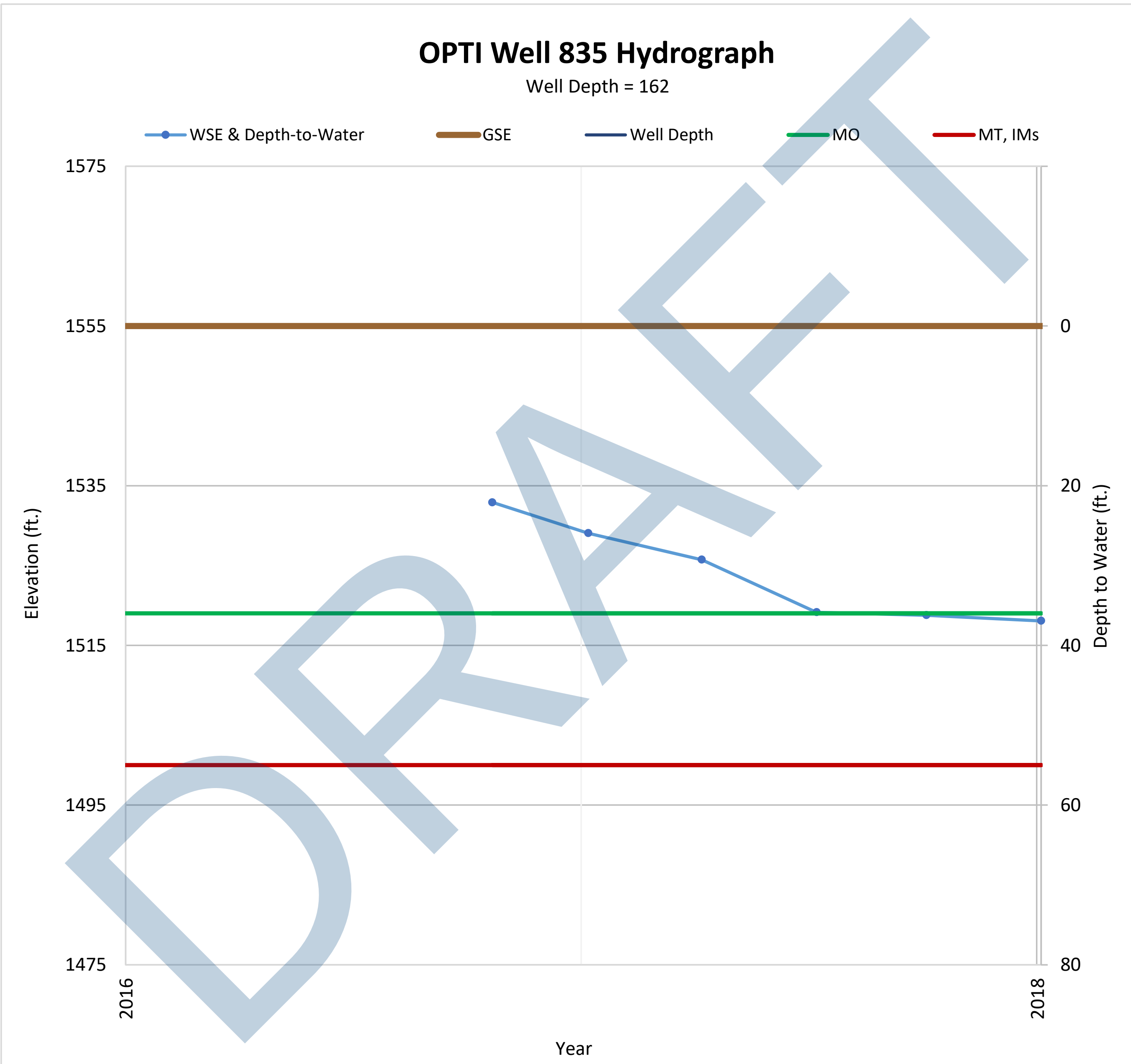


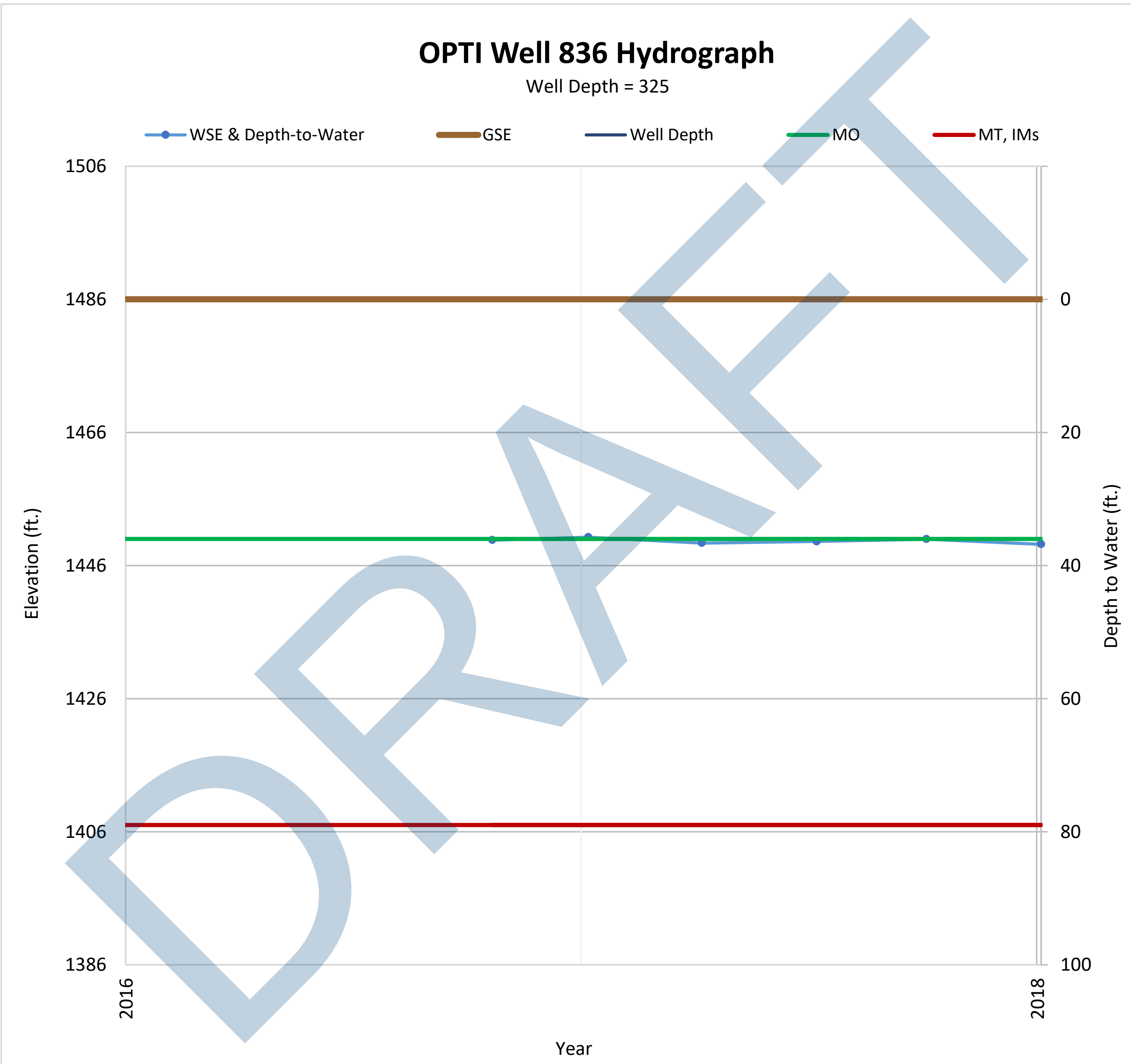
OPTI Well 832 Hydrograph
Well Depth = 132
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1650
1630
1610
1590
1570
1550
Elevation (ft.)
0
20
40
60
80
Depth to Water (ft.)
2015
2017
Year
DRAFT


OPTI Well 833 Hydrograph
Well Depth = 504
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1477
1457
1437
1417
1397
1377
1357
1337
Elevation (ft.)
0
20
40
60
80
100
120
Depth to Water (ft.)
2016
2018
Year
DRAFT

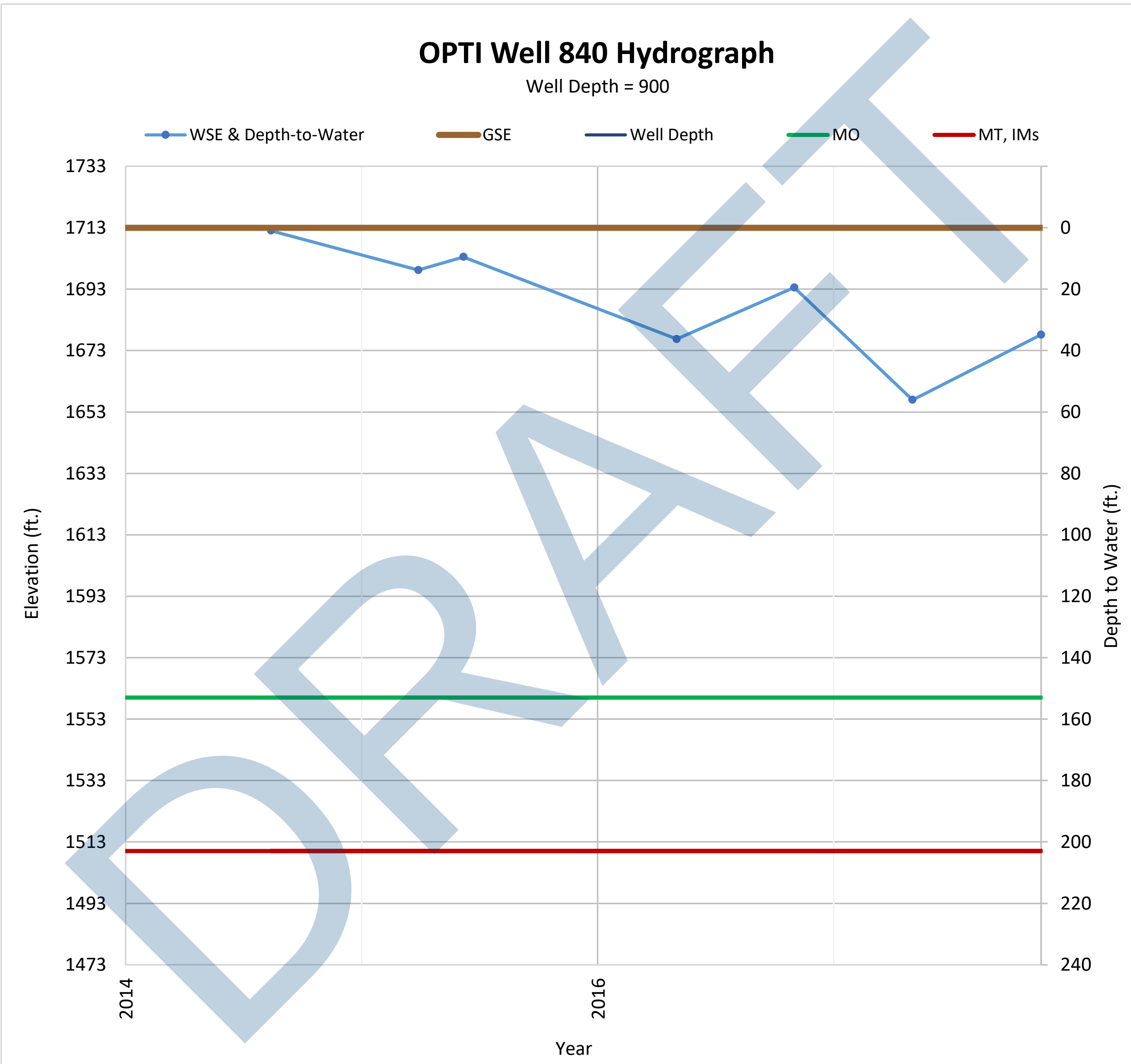


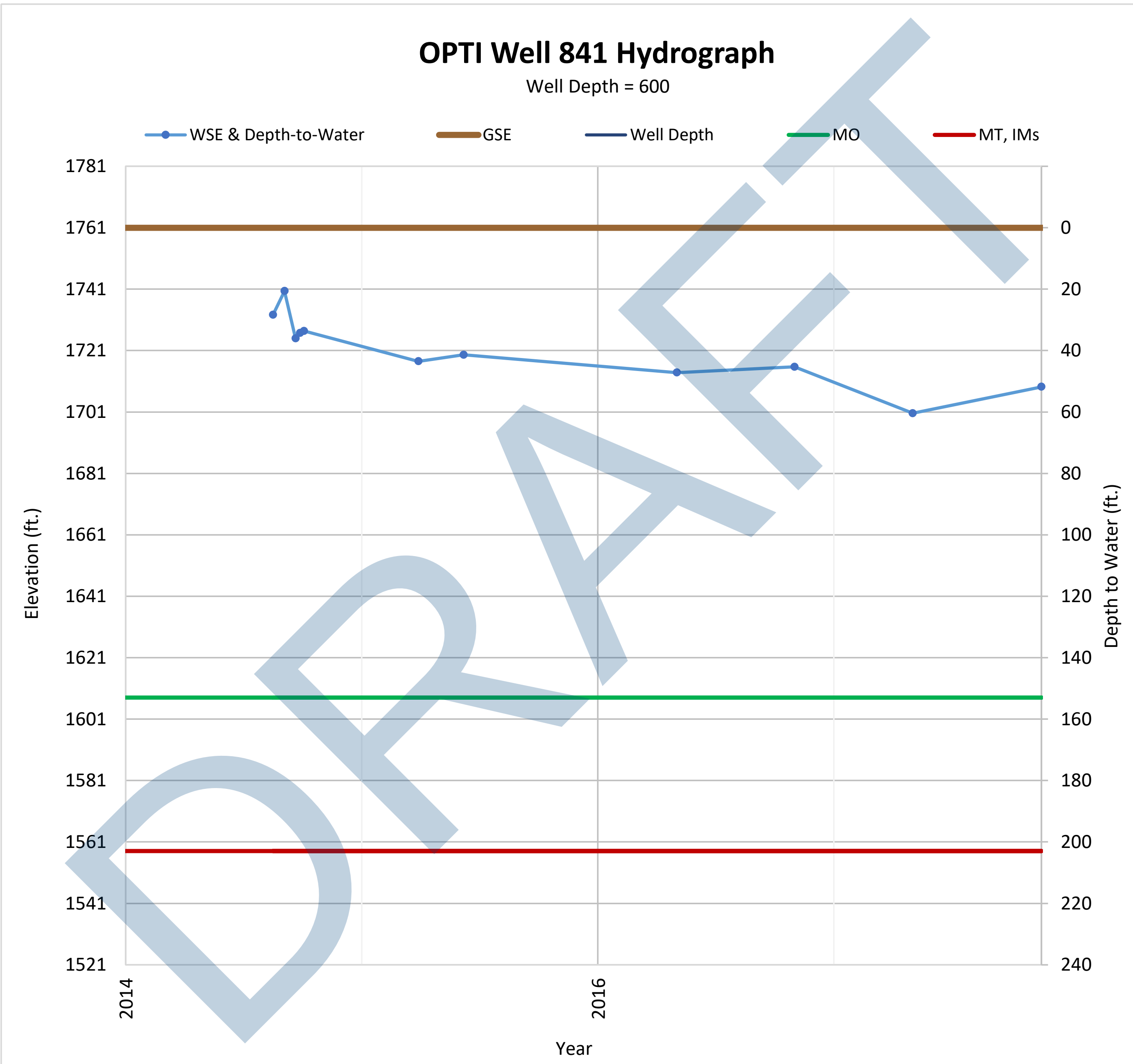
OPTI Well 834 Hydrograph
Well Depth = 320
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1528
1508
1488
1468
1448
1428
1408
1388
Elevation (ft.)
0
20
40
60
80
100
120
Depth to Water (ft.)
2016
Year
DRAFT


OPTI Well 835 Hydrograph
Well Depth = 162
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1575
1555
1535
1515
1495
1475
Elevation (ft.)
0
20
40
60
80
Depth to Water (ft.)
2016
2018
Year
DRAFT

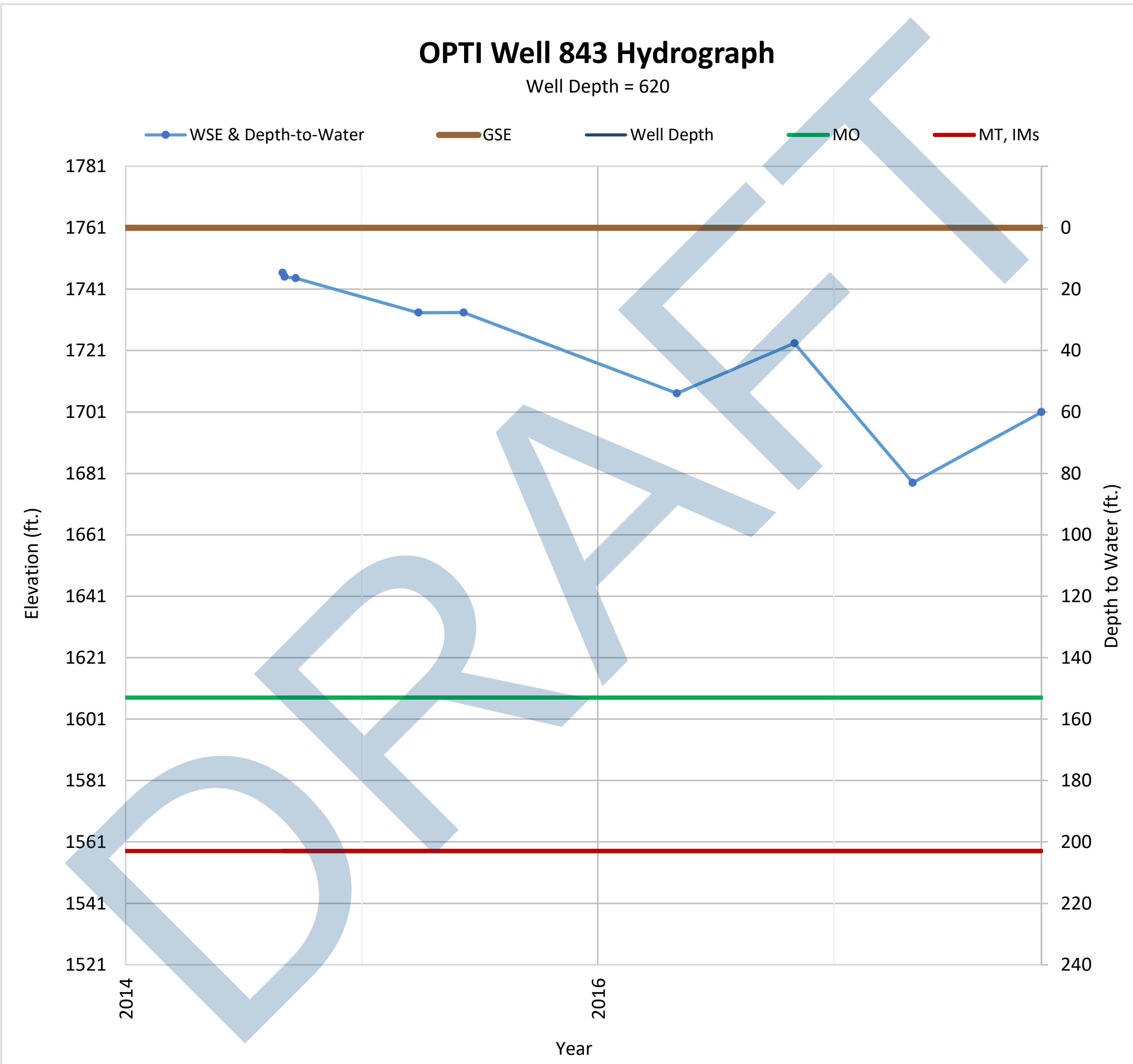


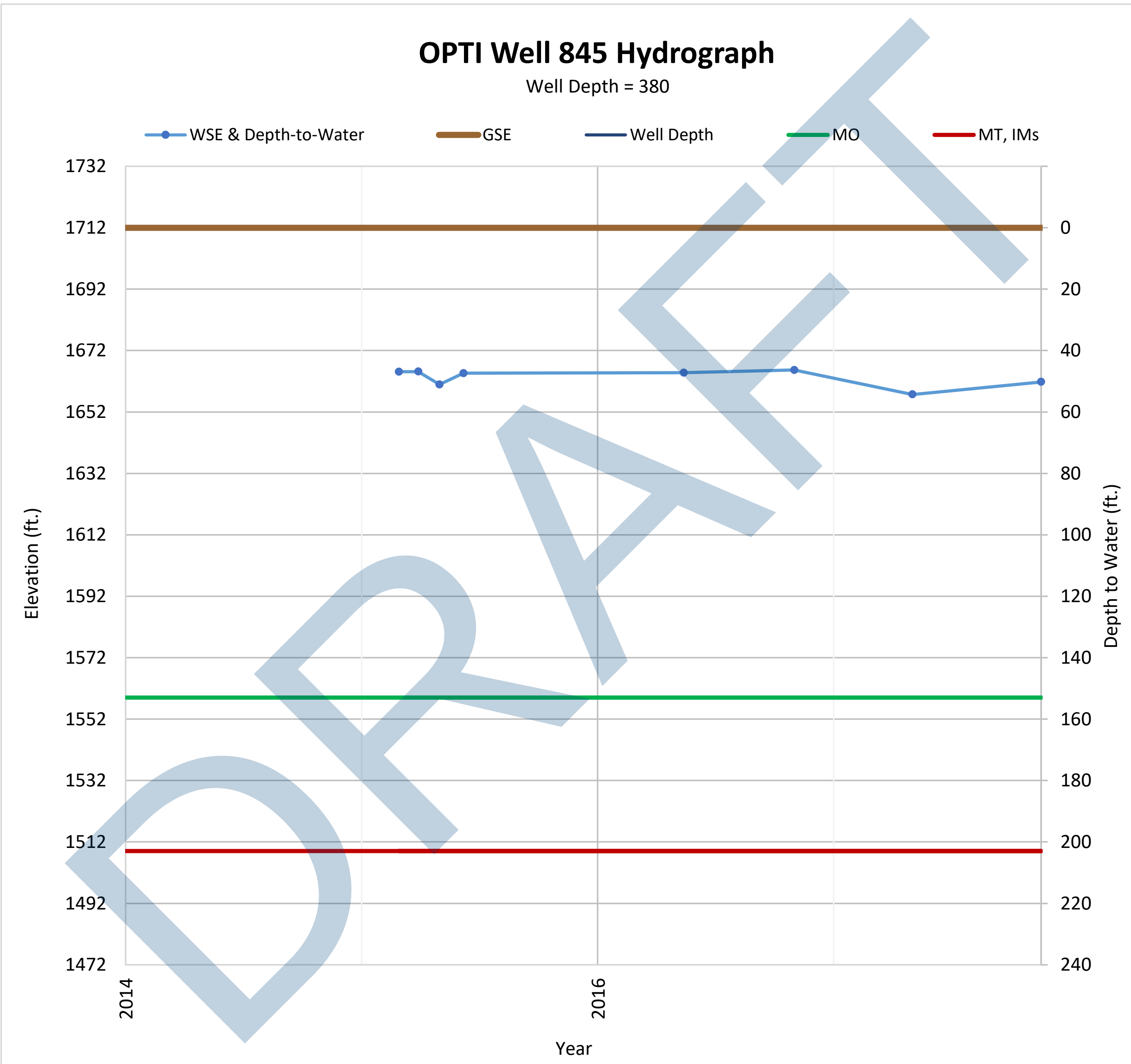
OPTI Well 836 Hydrograph
Well Depth = 325
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1506
1486
1466
1446
1426
1406
1386
Elevation (ft.)
0
20
40
60
80
100
Depth to Water (ft.)
2016
2018
Year
DRAFT


OPTI Well 840 Hydrograph
Well Depth = 900
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
1733
1713
1693
1673
1653
1633
1613
1593
1573
1553
1533
1513
1493
1473
Depth to Water (ft.)
0
20
40
60
80
100
120
140
160
180
200
220
240
2014
2016
Year
DRAFT

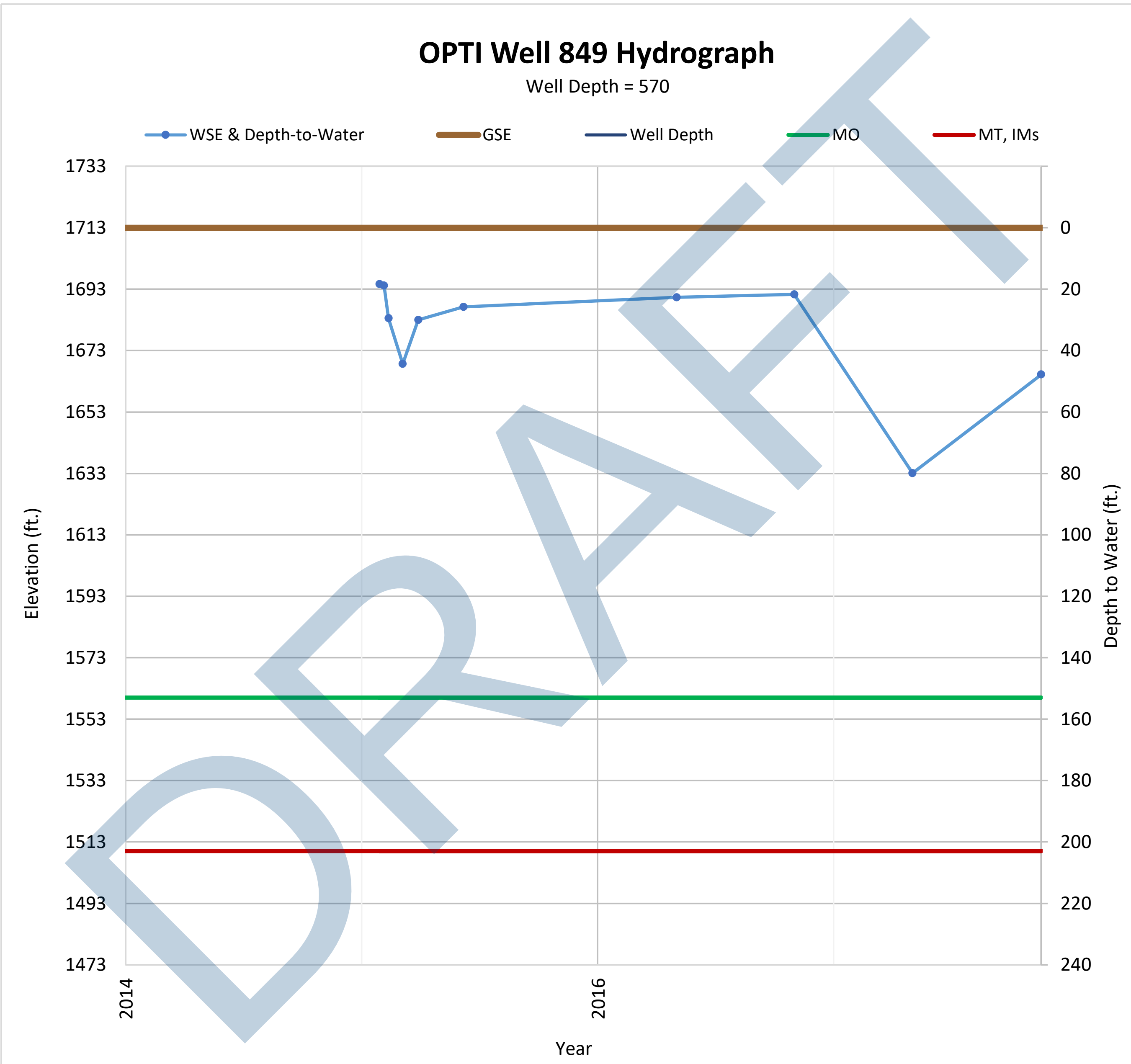


OPTI Well 841 Hydrograph
Well Depth = 600
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1781
1761
1741
1721
1701
1681
1661
1641
1621
1601
1581
1561
1541
1521
0
20
40
60
80
100
120
140
160
180
200
220
240
Elevation (ft.)
Depth to Water (ft.)
2014
2016
Year
DRAFT


OPTI Well 843 Hydrograph
Well Depth = 620
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
1781
1761
1741
1721
1701
1681
1661
1641
1621
1601
1581
1561
1541
1521
0
20
40
60
80
100
120
140
160
180
200
220
240
Elevation (ft.)
Depth to Water (ft.)
2014
2016
Year
DRAFT



OPTI Well 845 Hydrograph
Well Depth = 380
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
Depth to Water (ft.)
1732
1712
1692
1672
1652
1632
1612
1592
1572
1552
1532
1512
1492
1472
0
20
40
60
80
100
120
140
160
180
200
220
240
2014
2016
Year
DRAFT


OPTI Well 849 Hydrograph
Well Depth = 570
WSE & Depth-to-Water
GSE
Well Depth
MO
MT, IMs
Elevation (ft.)
1733
1713
1693
1673
1653
1633
1613
1593
1573
1553
1533
1513
1493
1473
Depth to Water (ft.)
0
20
40
60
80
100
120
140
160
180
200
220
240
2014
2016
Year
DRAFT