Union County Hydrogeology Project

Annual Progress Report

2018-2019

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Introduction

This report is Zeigler Geologic Consulting, LLC's (ZGC) annual progress report for the Union County Hydrogeology Project, sponsored by the Northeastern Soil and Water Conservation District. During the 2018-2019 fiscal year, ZGC measured static water level in 79 wells in January and February.

Static Water Level Measurements

Beginning in 2007, depth to water has been measured in approximately fifty wells spread across the county in the winter to track water levels during minimum use. Several wells have been removed due to infrastructure-related issues or wells going dry. In addition, several wells have been added to the monitoring network beginning in 2013. A 300 ft steel tape is used for most of the wells and a 500 ft steel tape for wells deeper than 300 ft. For open casing wells, we use a well level sounder (maximum length of 300 ft). The measuring point, or height of the entrance to the well above land surface, is subtracted from the total depth measurement such that the final static water level for all wells is calculated relative to the land surface. Measurements are repeated until two values that are within 0.01 ft of one another are obtained.

Of the wells that have been tracked since the beginning of the project and including wells added in the last three years, 19 show an overall increase in water level and 44 show a decline (numbers do not include wells dropped from the study). Individual hydrographs for each well still being monitored are found in Appendix I. Water level trends were determined using only the January measurements in order to avoid potential issues with measurements on wells that had perhaps not fully recovered after having pumps turned off. Geographically, wells that show a decline are located primarily around the Sedan and Seneca Valley areas, with a smaller area of decline east of Gladstone (Figure 1, Appendix I, II). It is important to note that since the beginning of the project, the rates of decline in wells in the Sedan area has decreased from three to five feet per year in 2011 to less than a foot per year starting in 2016.

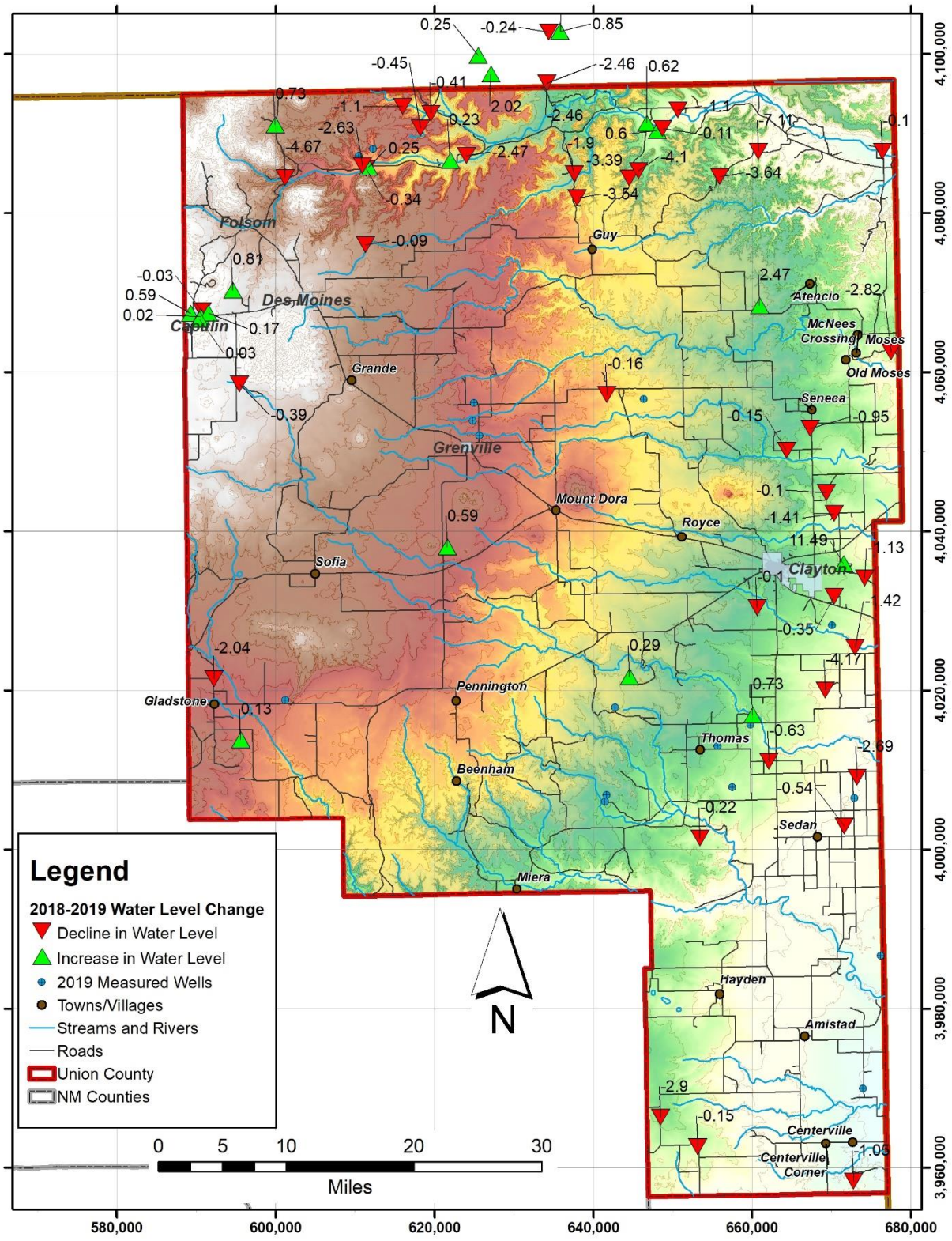

Figure 1. Groundwater change map for January 2018 compared to January 2019 static water level measurements.

Geologic Mapping

We are continuing to revise geologic maps of the 1:50,000 quadrangles that encompass the Dry Cimarron valley as well as central Union County (previously published as Baldwin and Muehlberger, 1959). Maps that have had in-field revisions completed are currently being digitized. Geologic mapping of the eastern Dry Cimarron is ongoing. Further revisions will be presented in subsequent reports. In general, the geology of Union County is fairly complicated (Figure 2). The deepest rock unit used for groundwater resources, the Triassic Dockum Group, is broadly folded, created variable thickness of the overlying Jurassic Exeter Sandstone. Where the Exeter Sandstone is thick, it can be a relatively reliable aquifer. Overlying the Exeter Sandstone, the Morrison Formation is a mixture of mudstone, coarse-grained sandstone and conglomerate, and limestone. Dominated by mudstone, groundwater resources are primarily confined to channel-shaped bodies of sandstone and conglomerate and/or beds of limestone. The Cretaceous Glencairn Formation and Dakota Group fills in on an eroded landscape on the top of the Morrison Formation, resulting in the Morrison Formation being at unexpectedly shallow depths in the subsurface. Incised into these older rock units are the paleovalley-fill sediments of the Ogallala Formation, which is primarily preserved in the eastern third of the county.

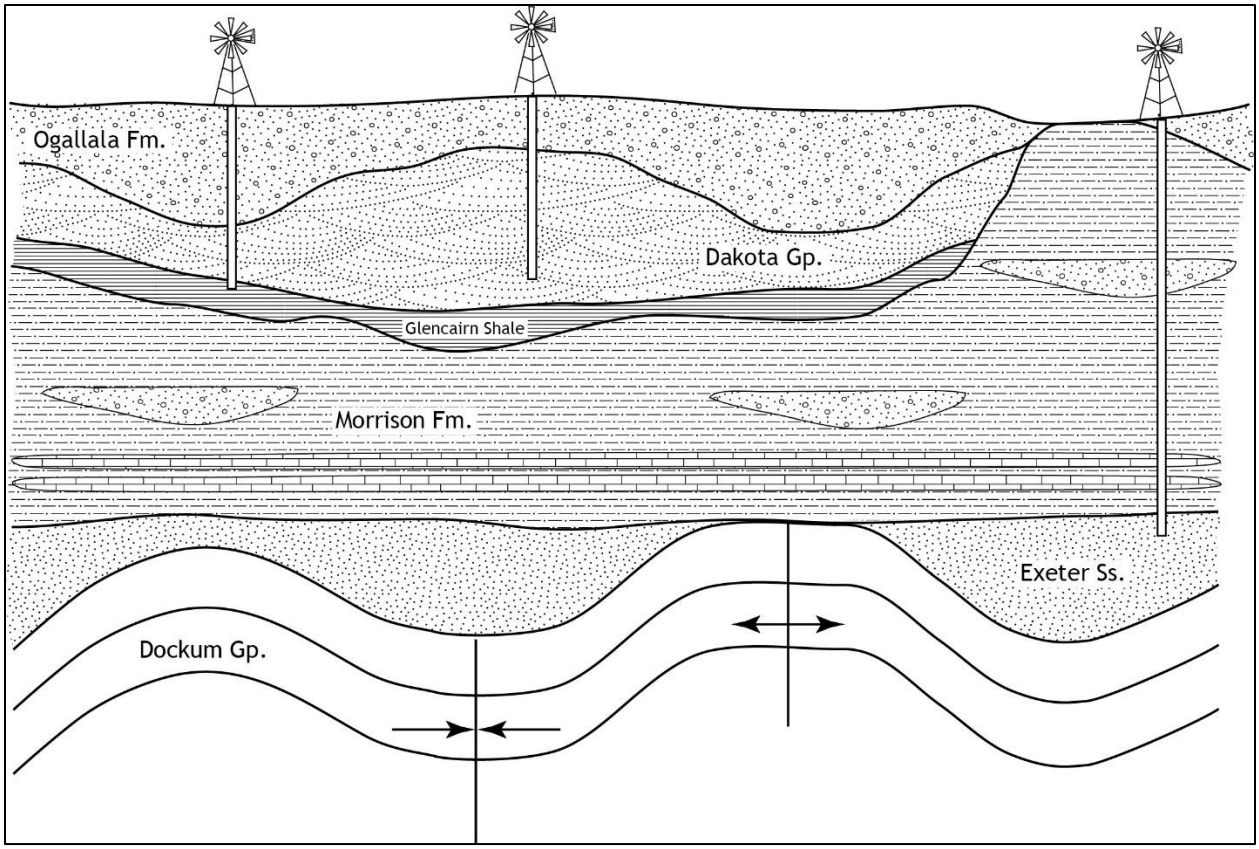

Figure 2. Schematic subsurface geology of Union County.

Hydrogeology of Union County

Five primary hydrostratigraphic units have been identified (from oldest rock unit to youngest): Dockum+alluvium, Morrison, Dakota, Ogallala, and basalt and we identify each of these by a combination of the yield rate and the chemical characteristics (Figure 3). Because most wells in the county are perforated along their entire cased lengths, wells are frequently drawing from more than one of these hydrostratigraphic units simultaneously. In some cases, more than one rock unit may be hydrologically connected to an underlying or overlying rock unit causing groundwater sources from more than one unit to be mixed. For example, the Ogallala Formation strata rests directly on underlying sandstone of the Dakota Group in the eastern half of the county, resulting in a combined hydrostratigraphic unit.

The Dockum Group, the "redbeds" of driller lingo, coupled with overlying alluvium, serve as a source of groundwater primarily in the northern portion of Union County, along the Dry Cimarron and its tributary canyons, as well as in localized areas in the southwestern corner of the county. The Exeter Sandstone can be a potential source of groundwater throughout the county, but little is known about this unit other than where well drilling efforts have penetrated it. It is not generally considered a target for drilling due to the variability both in thickness and in depth to the unit.

Significant heterogeneity within the Morrison Formation has resulted in many a dry hole and this rock unit is not generally considered to be a reliable source of groundwater. Reasonable resources occur where multiple beds of limestone are present and/or relatively wide and thick channel sandstone beds can create small-scale groundwater resources. Wells drawing water from the Morrison Formation occur in a northwest-southeast trending zone along Tramperos Creek, as well as occurring as individual wells scattered across the county that intersect the Morrison Formation where it occurs as paleoridgelines below the surface.

The Dakota Group is probably the most used source of groundwater in the area. The Ogallala Formation (frequently in association with the Dakota Group) is the primary source of groundwater for areas of center pivot irrigation with significant thicknesses of Ogallala strata occurring in two discrete paleovalleys – one northeast of Clayton near the village of Seneca and one to the southeast around the village of Sedan – as well as a small isolated pocket of Ogallala just west of Gladstone in the west-central portion of the county. Quaternary basalt flows act as local aquifers and are highly fractured. Where basalt flows sit above Ogallala Formation deposits, or subcrop of the Dakota Group or Morrison Formation, they are generally hydrologically connected. Basalt flows sitting on shale-dominated units such as the Graneros Shale are a strong control on the presence of the few springs in the county, which primarily occur around the Folsom area. Primary aquitards include the Dockum Group, where it is more mudstone dominated, the Bell Ranch and Morrison Formations where the Morrison is mudstone dominated, the Glencairn Formation and the Graneros Shale.

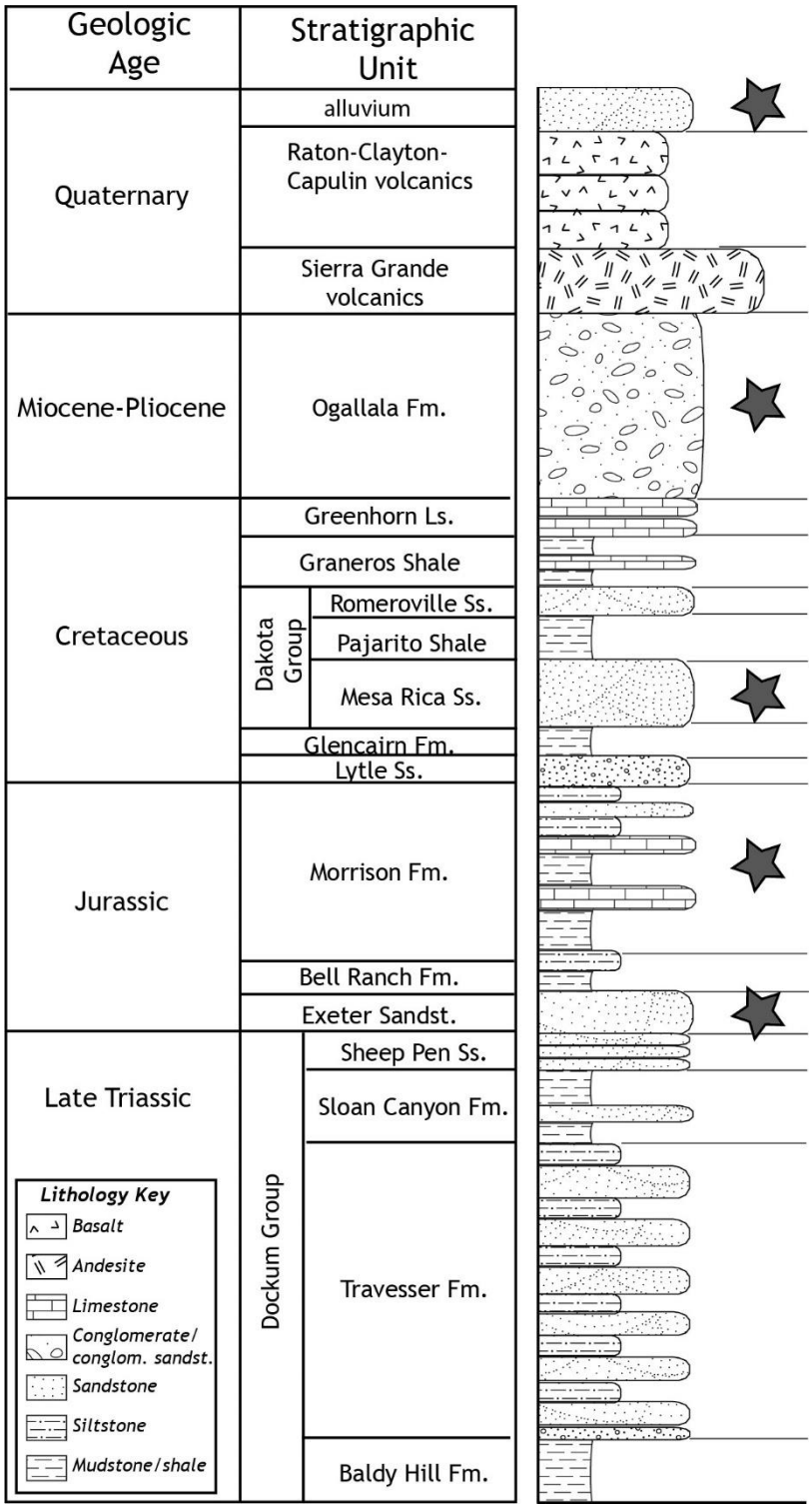

Figure 3. Schematic stratigraphy of Union County. Stars indicated primary groundwater-bearing rock units.

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Appendix I: Static Water Level Measurements

Individual well static water level measurements, corrected to land surface. *indicates measurement that may not be correct. Nm = not measured.

LOCAL ID & ELEVATION	DATE	DEPTH TO WATER
18N36E35.111	2/18/08	270.6
4465'	1/30/09	273.3
Centerville	1/5/10	270.8
	1/1/11	275.99
	1/3/12	273.95
	1/6/13	269.2
	1/3/14	259.2
	1/8/15	260.15
	1/15/16	nm
	1/30/17	274.11
	2/14/18	274.36
	1/7/19	275.41
18N34E15.422	2/18/08	114
4764'	1/30/09	106.3
Ione South	1/6/10	105.2
	1/7/11	105.25
	1/3/12	106.38
	1/6/13	105.3
	1/3/14	105.3
	1/8/15	105.4
	1/25/16	105.52
	1/30/17	105.52
	2/14/18	105.48
	1/7/19	105.63
19N34E32.133	2/18/08	157.7
4883'	1/30/09	151.2
Ione North	1/1/10	151.8
	1/1/11	149.14
	1/3/12	150.54
	1/6/13	148.5

	1/3/14	148.6
	1/8/15	148.7
	1/25/16	149.32
	1/30/17	148.98
	2/14/18	149.7
	1/7/19	152.6
19N36E23.244	2/6/08	154.9
4360'	1/30/09	155.2
Romero	1/1/10	153.13
*data recorder	1/1/11	153.43
	1/3/12	154.8
	1/6/13	153.8
	1/3/14	153.8
	1/31/15	153.1
	1/25/16	154.5
	1/31/17	154.75
	2/14/18	155.66
	1/7/19	155.52
21N36E35.122	2/24/09	147.42
4450'	1/12/10	159.84
Speer Rd	1/14/11	153.89
	1/7/12	160.34
	1/6/13	158.8
	1/4/14	161.6
	1/4/15	163.5
	2/12/16	165.95
	1/31/17	167.77
	2/1/18	nm
22N34E10.444	2/26/08	115.8
4765'	2/16/09	117.96
Betty's homestead	1/11/10	115.5
	1/11/11	120.3
	1/3/12	120.7
	1/6/13	119.2
	1/5/14	118.7
	1/8/15	117.9
	2/12/16	117.2
	2/1/17	122.28

	2/16/18	121.08
	1/8/19	121.3
22N36E10.411	2/19/08	308.2
4558'	2/9/09	310.51
Cowen South	1/13/10	311.35
	1/13/11	314.23
	1/2/12	316.08
	1/6/13	317
	1/4/14	317.7
	1/3/15	315.35
	1/25/16	318.22
	1/19/17	319.46
	1/10/18	319.99
	2/20/19	320.53
23N36E35.111	2/19/08	301.8
4611'	2/9/09	315.44
Cowen Middle	1/11/10	316.1
	1/12/11	318.1
	1/2/12	323.42
	1/6/13	318.2
	1/4/14	322.5
	1/11/15	323.7
	1/25/16	320.91
	1/19/17	319.77
	1/10/18	nm
	2/20/19	324.73
23N33E28.432	2/26/08	71.8
5020'	2/16/09	71.84
Clapham	1/12/10	72.77
*data recorder	1/15/11	72.63
	1/3/12	73.2
	1/6/13	72.91
	1/5/14	73
	1/8/15	72.9
	2/16/16	72.82
	2/1/17	73.7
	8/6/18	73.59
	1/8/19	73.58

23N36E23.341	2/19/08	206.9
4761'	2/9/09	210.56
Cowen North	1/15/10	212.52
	1/20/11	211.4
	1/2/12	211.91
	1/6/13	215.74
	1/4/14	218.1
	1/3/15	220.46
	1/25/16	222.15
	1/19/17	223.6
	1/10/18	225.37
	2/20/19	228.06
23N35E15.211	2/26/08	286.3
4797'	2/24/09	281.13
Furlow East	1/25/10	283.29
	1/15/11	285.58
	1/3/12	288.47
	1/6/13	290.3
	1/4/14	292
	1/8/15	293.21
	2/9/16	294.2
	1/19/17	294.75
	1/10/18	296.30
	2/20/19	296.93
24N35E28.134	2/27/08	183.5
4643'	2/16/09	178.17
Thomas Hwy/Diller	1/15/10	168.25
	1/16/11	172.79
	1/3/12	154.19
	1/6/13	159.5
	1/5/14	153.4
	1/8/15	153.9
	2/9/16	154.86
	2/1/17	164.19
	1/10/18	156.2
	1/8/19	155.47
24N33E22.322	2/27/08	84.75

5410'	2/11/09	88.03
Ringbone Rd	1/15/10	89.25
	1/15/11	90.39
	1/4/12	91.33
	1/6/13	88.6
	1/7/14	89
	1/8/15	90.5
	2/9/16	90.12
	2/1/17	89.99
	2/1/18	nm
	1/15/19	89.76
24N29E17.414	2/28/08	68.3
5760'	2/4/09	68.28
Triple M	1/16/10	70.62
Springer Hwy	1/12/11	70.85
	1/4/12	71.16
	1/6/13	70.6
	1/7/14	69.7
	1/2/15	70.75
	2/9/16	70.68
	1/15/17	nm
	1/15/18	nm
	2/27/19	71.18
24N33E11.213	2/27/08	114.4
5675'	2/4/09	111.66
Jordan Rd	1/16/10	111.38
	1/15/11	111.88
	1/6/12	108.84
	1/6/13	111.4
	1/7/14	111.9
	1/2/15	113.1
	2/9/16	112.44
	2/1/17	113.85
	2/16/18	112.38
	2/20/19	112.09
24N36E17.244	2/16/08	114.41
4707'	1/17/09	115.22
Burrows Rd	1/15/10	118.25

	1/23/11	122.06
	1/6/12	122.15
	1/6/13	122.95
	1/5/14	128.35
	1/9/15	129.5
	1/26/16	130.7
	1/31/17	130.05
	1/9/18	132.8
	2/20/19	136.97
25N36E.35.311	3/5/08	138.9
4682'	2/13/09	140.01
Campsey Rd	1/14/10	144.04
	1/15/11	142.68
	1/6/12	144.21
	1/6/13	146.2
	1/5/14	147.8
	1/9/15	149.65
	1/26/16	150.01
	1/31/17	151.33
	1/3/18	153.01
	1/15/19	154.43
25N35E16.132	2/27/08	72.65
5045'	2/26/09	80.55
Gard	1/14/10	78.69
	1/12/11	79.84
	1/6/12	80.7
	1/6/13	79.55
	1/5/14	79.15
	1/11/15	79.18
	2/9/16	79.25
	1/31/17	79.31
	1/3/18	79.35
	1/15/19	79.45
25N36E09.411	2/27/08	255.8
4850'	2/11/09	252.86
Texline Hwy	1/14/10	247.5
Lone Tree	1/13/11	256.4
	1/6/12	252.05

	1/6/13	253.7
	1/8/14	250.7
	1/11/15	250.98
	1/26/16	251.37
	1/31/17	nm
	1/4/18	252.44
	2/20/19	252.79
25N36E.02.243	2/27/08	257.7
4810'	2/11/09	251.29
Rawhide South	1/15/10	249.58
	1/14/11	248.68
	1/6/12	246.31
	1/6/13	244.8
	1/8/14	245.6
	1/11/15	246.55
	1/26/16	246.96
	1/31/17	247.79
	1/9/18	248.22
	1/16/19	249.35
26N36E.27.343	2/27/08	177.9
4810'	2/11/09	178.51
Rawhide North	1/15/10	169.6
	1/13/11	174.17
	1/6/12	167.75
	1/6/13	173.2
	1/8/14	170.2
	1/11/15	171.1
	1/26/16	170.99
	1/31/17	170.86
	1/9/18	182.9
	1/16/19	171.41
26N31E.21.124	2/28/08	276.8
6010'	2/4/09	269.04
Grenville	1/21/10	273.45
	1/14/11	273.1
	1/4/12	274.8
	1/6/13	268.6
	1/7/14	268.8

	1/10/15	268.7
	1/28/16	268.81
	1/10/17	268.88
	2/16/18	269.4
	1/18/19	268.81
26N36E.09.212	2/2/08	224.8
4792'	2/11/09	235.9
Booster Station	1/12/10	231.76
	1/12/11	235.2
	1/6/12	240.16
	1/6/13	242.5
	1/8/14	241.2
	1/6/15	243.12
	1/26/16	233.71
	1/31/17	235.69
	1/9/18	234.5
	1/16/19	235.91
27N36E.33.133	2/28/08	191.1
4892'	2/11/09	189.68
Kenton Hwy	1/12/10	191.32
Feedlot	1/11/11	192.38
	1/6/12	191.5
	1/6/13	190.6
	1/8/14	190.9
	1/6/15	191.2
	1/26/16	191.19
	1/31/17	190.81
	1/9/18	190.79
	1/16/19	190.89
27N35E.13.111	2/2/08	103.6
4963'	2/28/09	121.66
Mock Rd	1/5/10	119.54
	1/14/11	94.8
	1/5/12	95.02
	1/6/13	86.9
	1/8/14	nm
	1/6/15	84.7
	1/26/16	86.91

	1/31/17	85.01
	1/9/18	84.91
	1/16/19	85.06
28N33E.22.133	2/10/08	133.8
5546'	1/21/09	127.3
Garcia Rd	1/6/10	120.22
	1/7/11	122.55
	1/4/12	122.83
	1/6/13	119.3
	1/9/14	118
	2/11/15	118.87
	1/27/16	122.7
	2/2/17	120.39
	1/9/18	120.81
	1/16/19	120.97
28N28E.10.222	2/28/08	108.1
6814'	1/31/09	107.85
Kennedy Rd	1/6/10	107.76
	1/20/11	106.87
	1/4/12	107.5
	1/6/13	106.3
	1/6/14	107.6
	1/10/15	107.2
	1/28/16	107.51
	1/10/17	107.16
	1/3/18	
Kennedy 2	1/28/16	65.63
	1/10/17	66.19
	1/3/18	66.08
	2/12/19	66.47
28N37E.05.233	2/2/08	137
4811'	1/30/09	135.16
Billy Mock	1/7/10	137.8
	1/8/11	138.1
	1/5/12	137.98
	1/6/13	135.9
	1/6/14	136.9

	1/6/15	138.9
	1/27/16	141.89
	2/2/17	143.57
	1/10/18	145.4
	2/22/19	148.22
29N35E.15.313	2/10/08	110.15
5180'	1/31/09	117.48
Atencio Rd	1/7/10	120.36
	1/8/11	110.36
	1/4/12	111.69
	1/6/13	110.3
	1/9/14	108.6
	2/11/15	113.67
	1/27/16	113.6
	2/2/17	115.17
	1/9/18	113.67
	2/22/19	111.2
29N28E.18.322	2/28/08	22.7
6890'	1/31/09	22.78
Capulin	1/9/10	22.92
	1/6/11	22.32
	1/4/12	23.28
	1/6/13	22.5
	1/6/14	22.7
	1/10/15	23.25
	1/28/16	22.89
	1/18/17	22.88
	1/8/18	22.72
	1/21/19	22.13
31N33E25.331	2/10/08	60.05
5372'	1/31/09	63.18
Bechtel	1/8/10	64.05
	1/9/11	64.18
	1/5/12	67.12
	1/6/13	70.5
	1/6/14	64.6
	1/5/15	56.01
	1/28/16	51.04

	2/2/17	55.12
	1/5/18	56.72
	1/30/19	60.11
31N33E.30.212	2/10/08	38.1
5120'	1/31/09	40.4
Hamilton Rd.	1/8/10	34.68
	1/8/11	35.36
	1/5/12	35.48
	1/6/13	35.3
	1/6/14	35
	1/5/15	35.8
	1/28/16	28.13
	1/18/17	29.7
	1/8/18	29.6
	1/30/19	31.5
31N37E.18.424	1/6/10	24.87
4356'	1/5/11	25.29
Wiggins Rd	1/5/12	25.7
	1/6/13	26.05
	1/6/14	25
	1/5/15	24.3
	1/28/16	24.54
	2/3/17	24.9
	1/5/18	24.27
	2/22/19	24.37
Bannon Oak Canyon	1/6/13	21.7
	1/6/14	24.8
	1/5/15	23.02
	1/28/16	18.27
	1/18/17	16.88
	1/8/18	15.57
	8/16/18	17.13
	1/21/19	20.24
Bannon Tollgate	1/6/13	73.67
	1/6/14	74
	1/5/15	73.34
	1/28/16	73.15

	1/18/17	73.01
	1/8/18	73.00
	1/21/19	72.27
Bennett #1	1/8/13	152.3
	1/9/14	152.4
	1/10/15	152.3
	2/10/16	152.46
	1/10/17	152.67
	2/16/18	153.09
	8/16/18	152.71
	12/21/18	152.28
Bennett #3	1/8/13	75.9
	1/9/14	75.7
	2/11/15	75.95
	2/10/16	75.83
	2/1/17	75.71
	2/16/18	76.08
	8/17/18	nm
	1/18/19	76.17
Harris West	1/8/14	104.4
	1/6/15	103.4
	2/16/16	103.96
	1/31/17	103.66
	1/9/18	103.59
	1/16/19	104.54
Walker Pasture	1/6/14	189.1
*data recorder	2/15/16	191.31
	2/1/17	192.07
	8/6/18	192.81
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Burchard #1	3/12/14	19.78
	6/23/14	20.2
	1/5/15	21.09
	2/10/16	19.65
	2/2/17	20.87
	1/8/18	18.9

	8/7/18	17.16
	1/17/19	18.67
Burchard #2	1/5/15	16.85
	2/10/16	16.08
	2/2/17	17.9
	1/5/18	16.65
	8/7/18	18.46
	1/17/19	19.12
Bennefield #3	6/27/14	20.05
	1/5/15	18.91
	2/11/16	16.3
	1/18/17	18.22
	1/8/18	16.93
	1/16/19	20.47
Poling DR	8/12/14	107.5
*data recorder	1/10/15	106.75
	2/16/16	105.21
	1/31/17	98.75
	8/6/18	95.79
	1/16/19	93.2
H. Brown #1	6/9/15	36.88
	2/10/16	32.11
	1/18/17	35.48
	1/4/18	36.18
	8/17/18	36.33
	1/17/19	36.59
H. Brown #2	6/9/15	32.74
	2/10/16	31.3
	1/18/17	31.07
	1/4/18	31.63
	8/17/18	32.44
	1/17/19	32.08
H. Brown #3	6/9/15	33.04
	2/10/16	36.69
	1/18/17	34.77

	1/4/18	34.1
	8/17/18	34.7
	1/17/19	35.2
Durrett #1	6/16/15	90.57
	2/11/16	83.99
	8/5/16	92.1
	2/2/17	91.65
	1/5/18	92.38
	8/7/18	93.59
	1/30/19	96.48
Durrett #2	6/16/15	41.39
	2/11/16	42.2
	8/5/16	41.88
	2/2/17	42.49
	1/5/18	40.02
	8/7/18	39.65
	1/30/19	39.4
Durrett #3	6/16/15	33.52
	2/11/16	31.46
	8/5/16	30.42
	2/2/17	31.01
	1/5/18	28.85
	8/7/18	28.26
	1/30/19	28.25
Durrett #4	6/16/15	28.49
	2/11/16	23.02
	8/5/16	24.89
	2/2/17	22.32
	1/5/18	20.79
	8/7/18	21.45
	1/30/19	20.9
Durrett #5	6/16/15	52.44
	2/11/16	47.86
	8/5/16	48.59
	2/2/17	54.07
	1/4/18	32.25

	8/7/18	36.28
	1/30/19	39.36
Durrett #6	6/16/15	50.01
	2/11/16	50.05
	8/5/16	51.55
	2/2/17	51.52
	1/4/18	47.00
	8/7/18	51.36
	1/30/19	50.64
Durrett #7	6/16/15	36.31
	2/11/16	33.89
	8/5/16	33.81
	2/2/17	33.27
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	8/7/18	33.24
	1/30/19	33.14
Mason	3/13/13	175.81
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Seaman	3/13/13	304.52
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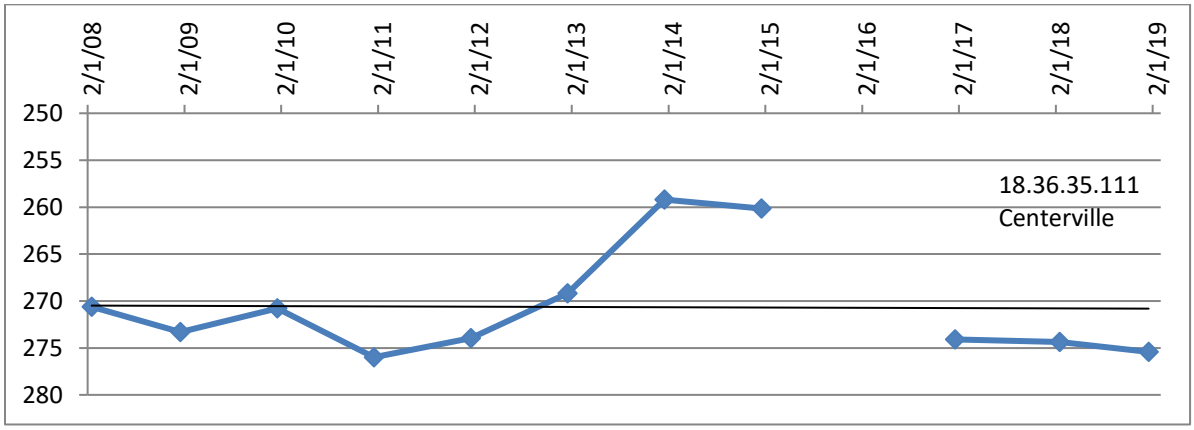
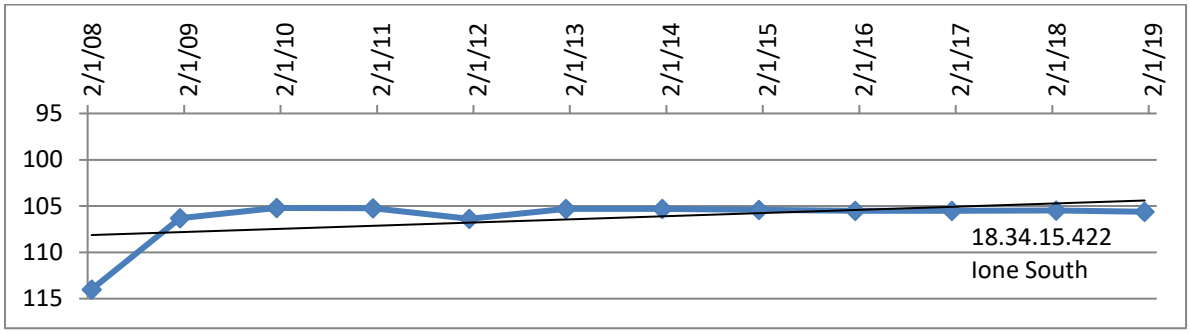
	8/6/18	308.11
	1/8/19	308.24
Cruz 1	1/27/17	73.34
	1/3/18	73.24
	2/12/19	73.27
Cruz 2	1/27/17	39.44
	1/3/18	39.41
	2/12/19	39.39

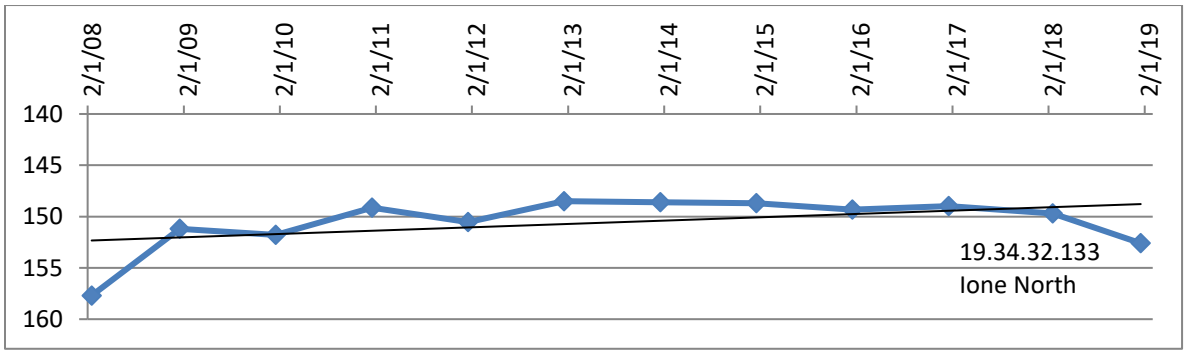
Cruz 3	1/27/17	100.61
	1/3/18	100.27
	2/12/19	100.1
Cruz 4	1/27/17	49.63
	1/3/18	49.58
	2/12/19	49.55
D. Brown 1	2/3/17	48.23
	1/4/18	42.12
	8/17/18	52.79
	1/30/19	42.46
D. Brown 2	2/3/17	46.32
	1/4/18	42.35
	8/17/18	49.14
	1/30/19	42.1
D. Brown 3	2/3/17	23.54
	1/4/18	21.85
	8/17/18	24.23
	1/30/19	24.48
D. Brown 4	8/17/18	72.84
	1/30/19	67.97
D. Brown 5	8/17/18	89.35
	1/30/19	86.9
Baker Ranch #1	2/15/18	47.91
	8/16/18	45.72
	1/17/19	45.89
Baker Ranch #2	2/15/18	37.2
	8/16/18	35.57
	1/17/19	36.95
Baker Ranch #3	6/17/15	21.82
	2/15/18	22.74

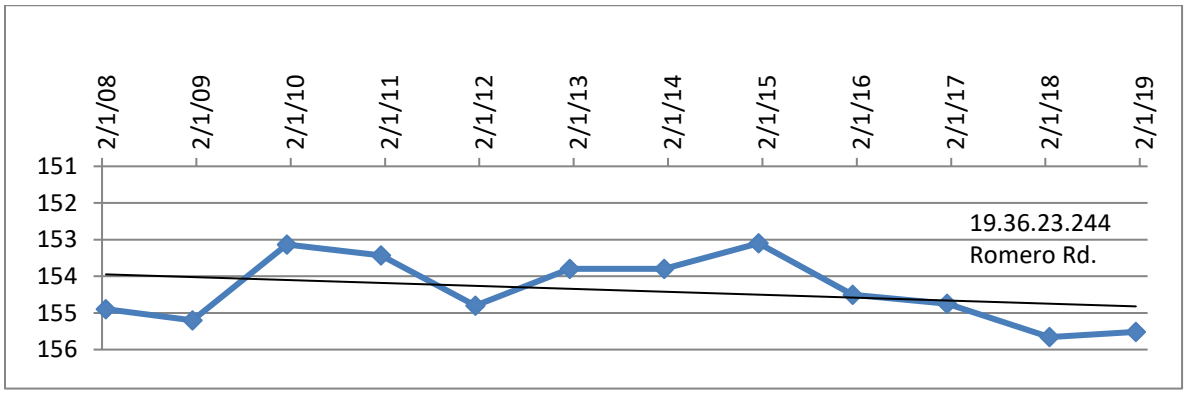
	8/16/18	24.87
	1/17/19	25.2
Baker Ranch #4	7/28/15	133.94
	2/15/18	133.9
	8/16/18	143.93
	1/17/19	134.14
Baker Ranch #5	7/28/15	188.53
	2/15/18	181.02
	8/16/18	180.43
	1/17/19	180.17
Baker Ranch #6	6/17/15	13.53
	8/16/18	14.85
	1/17/18	15.53
Floyd Grinde	1/31/18	81.4
	8/14/18	83.22
	2/27/19	83.44
Beard Gladstone	1/31/18	92.7
	8/14/18	97.14
	2/27/19	92.57

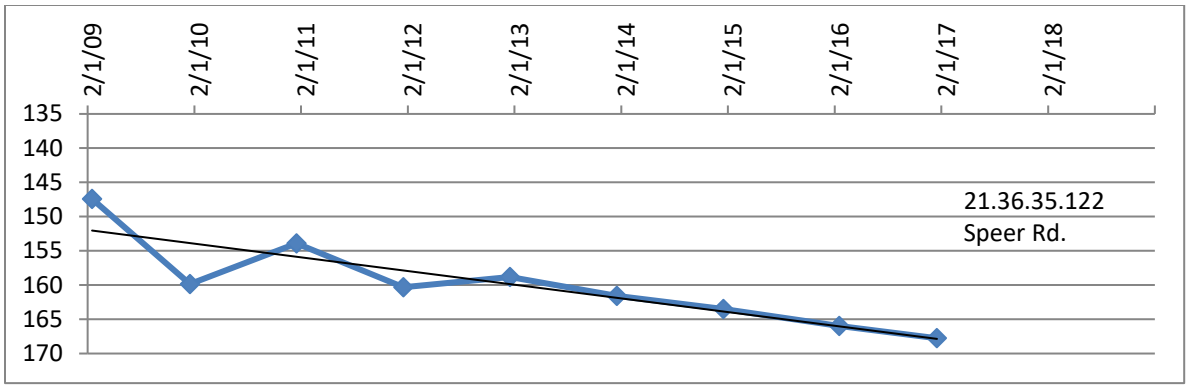
Appendix II: Well Hydrographs







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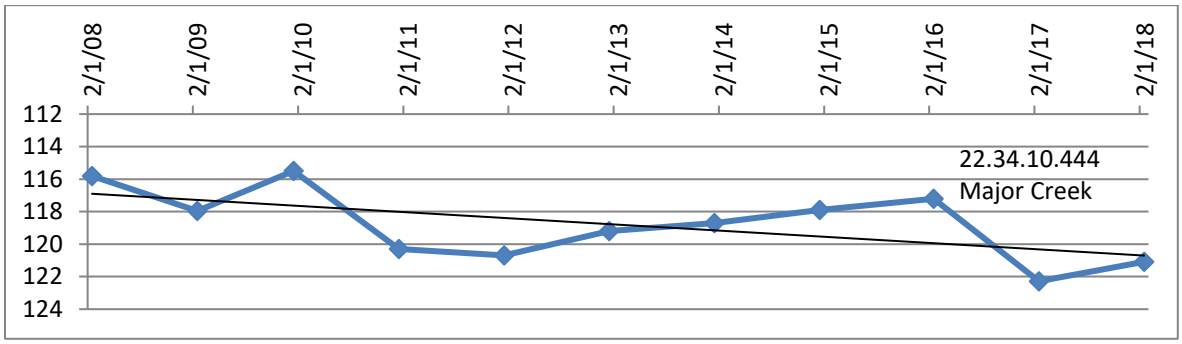
21.36.35.122
Speer Rd.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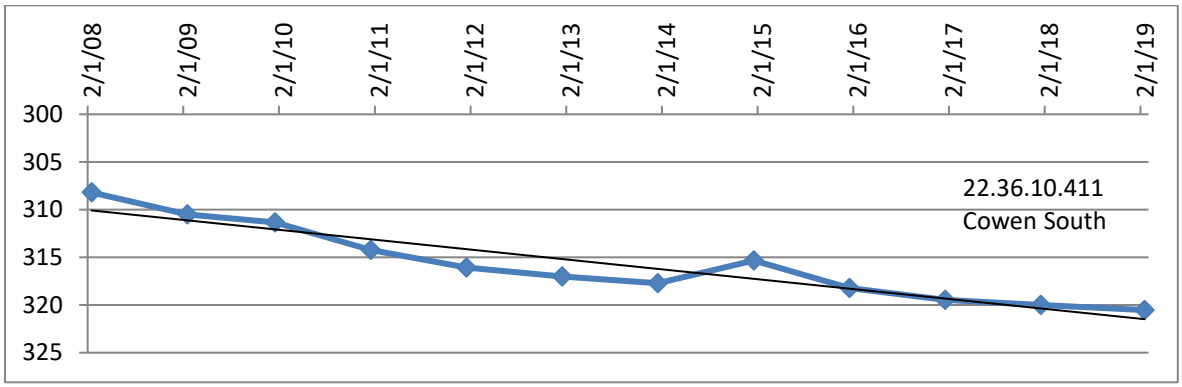
Major Creek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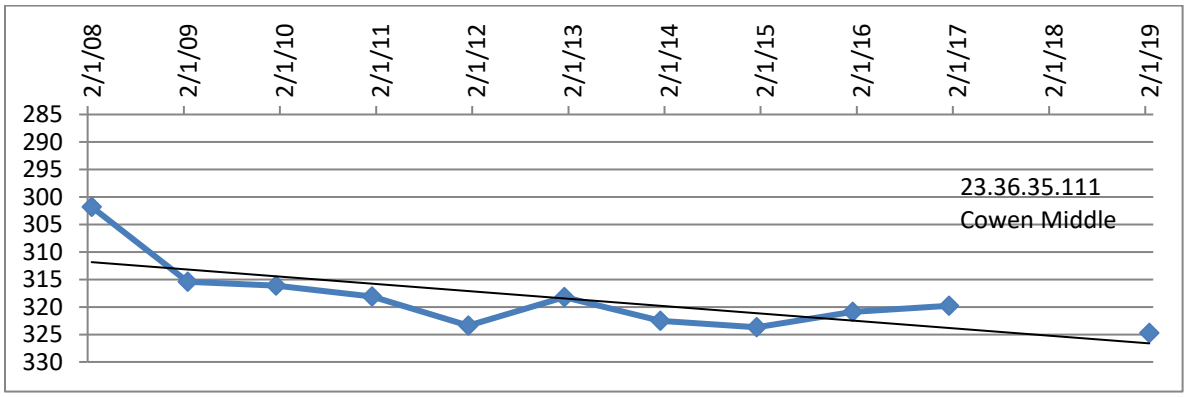
Cowen South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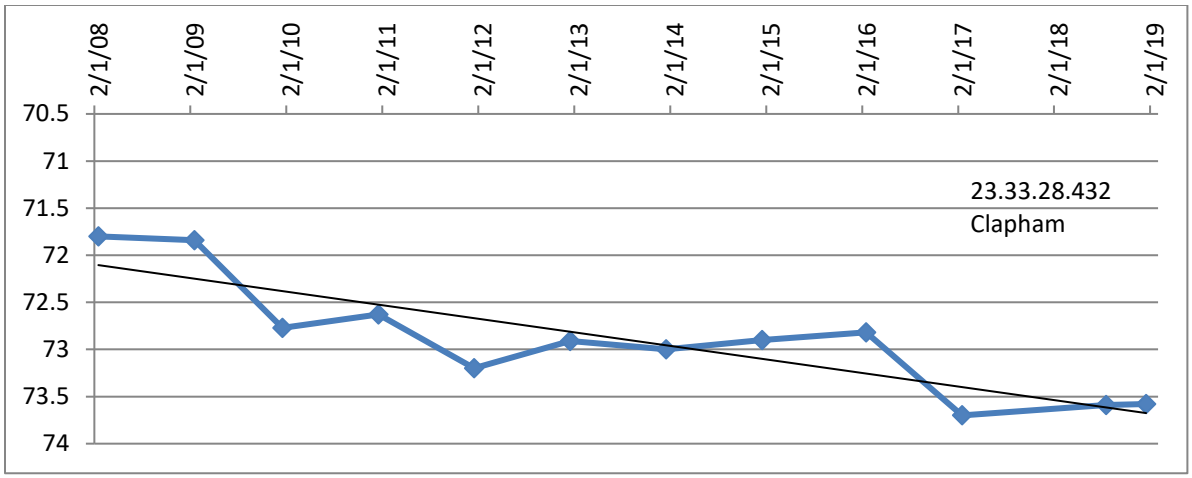
Cowen Middle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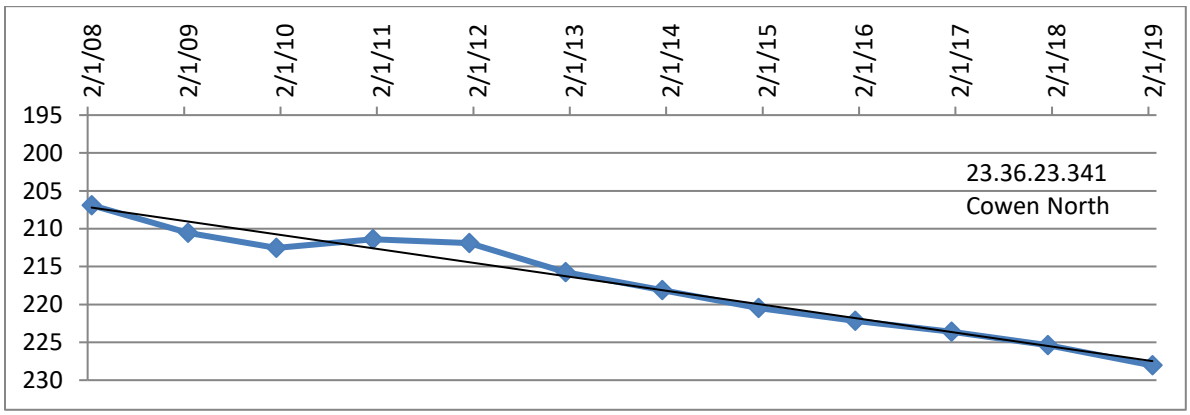
Clapham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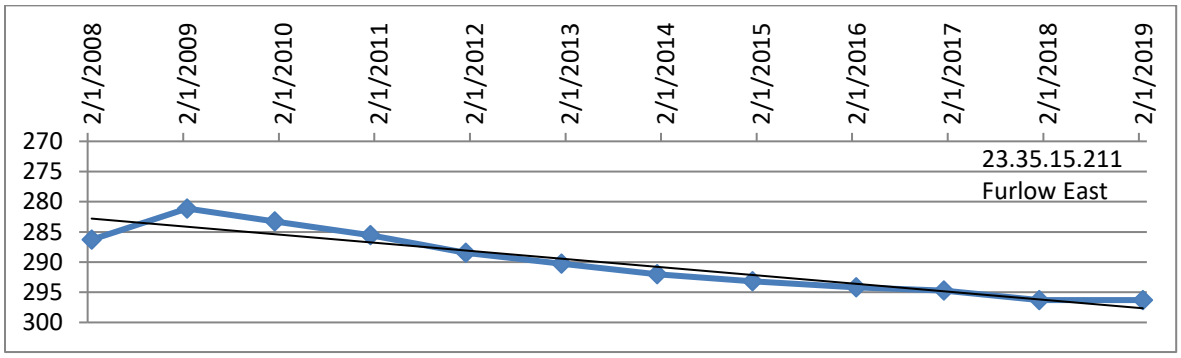
Cowen North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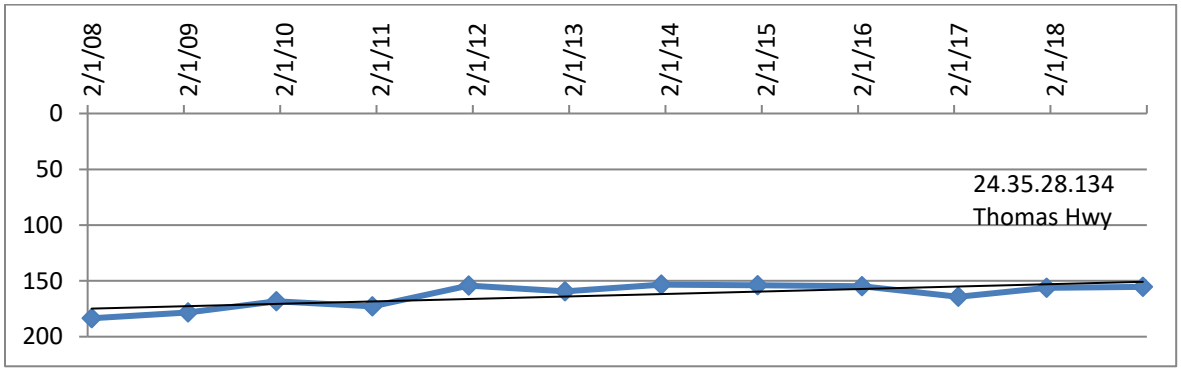
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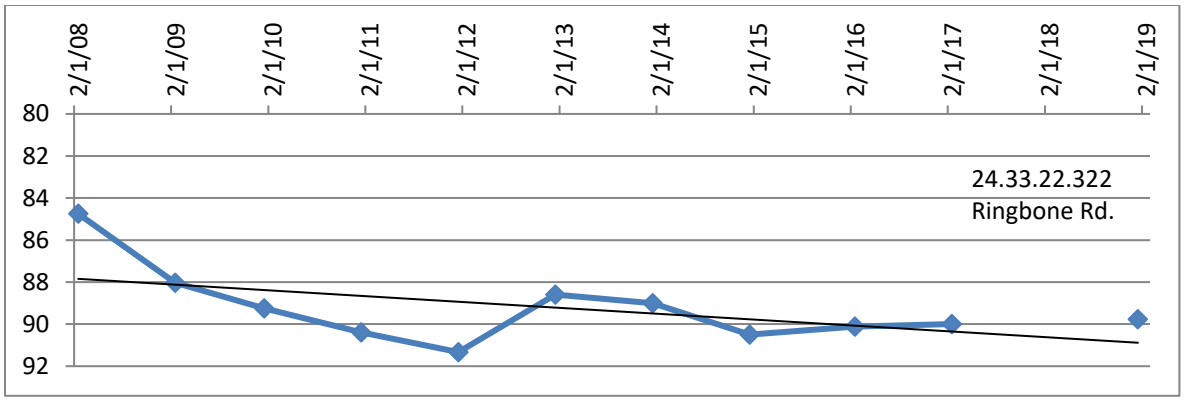
Thomas Hwy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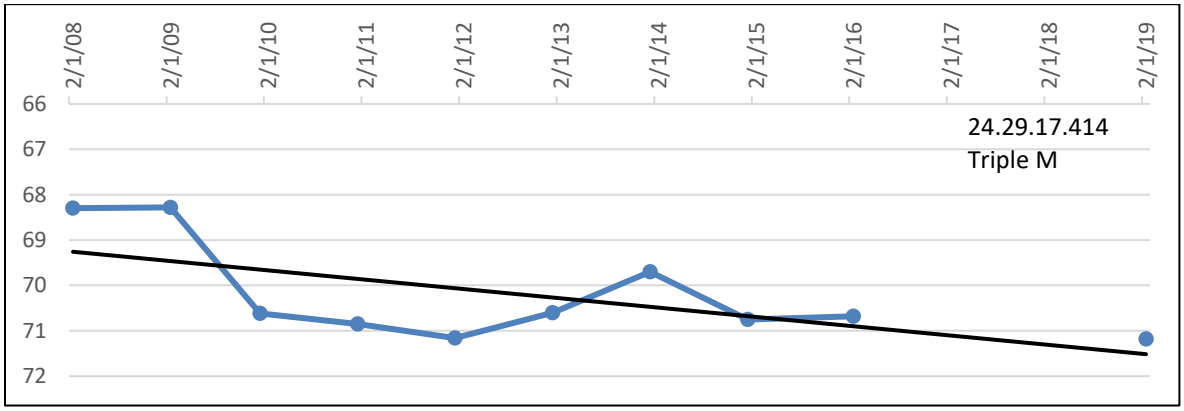
Ringbone Rd.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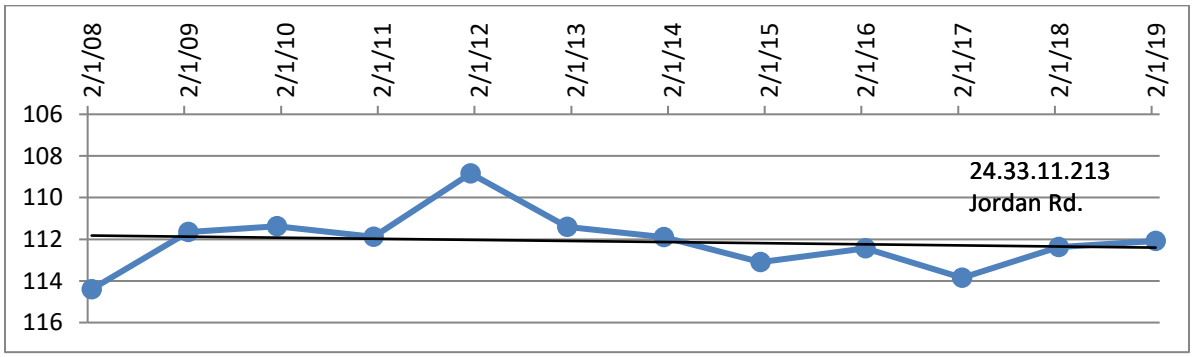
Triple M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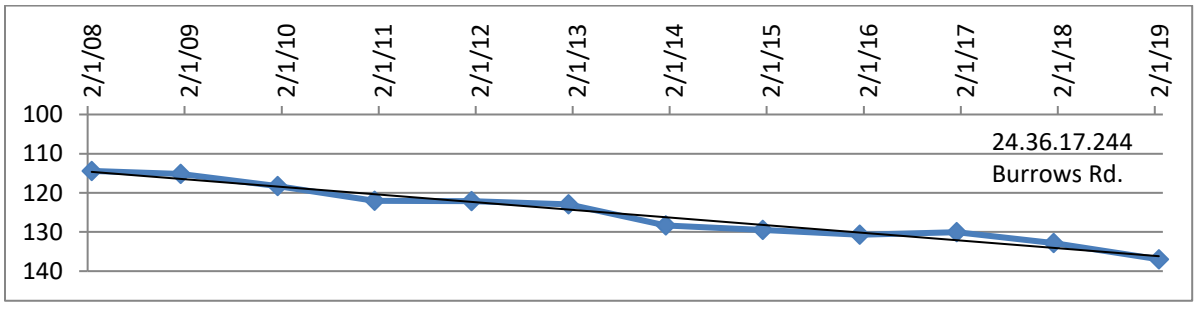
Jordan Rd.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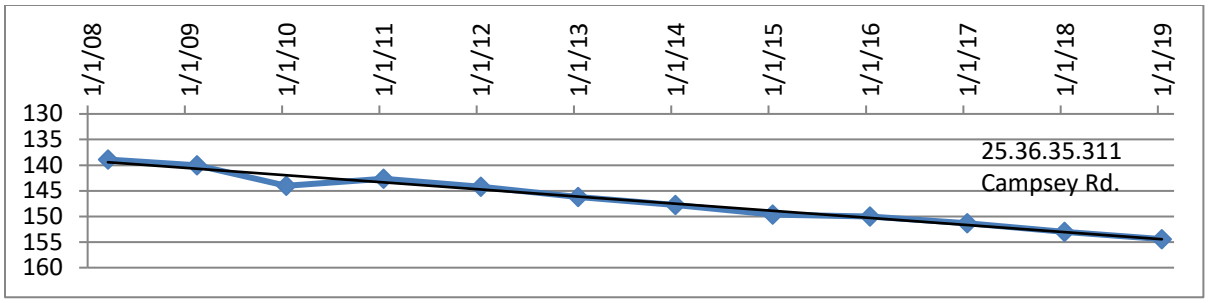
Burrows Rd.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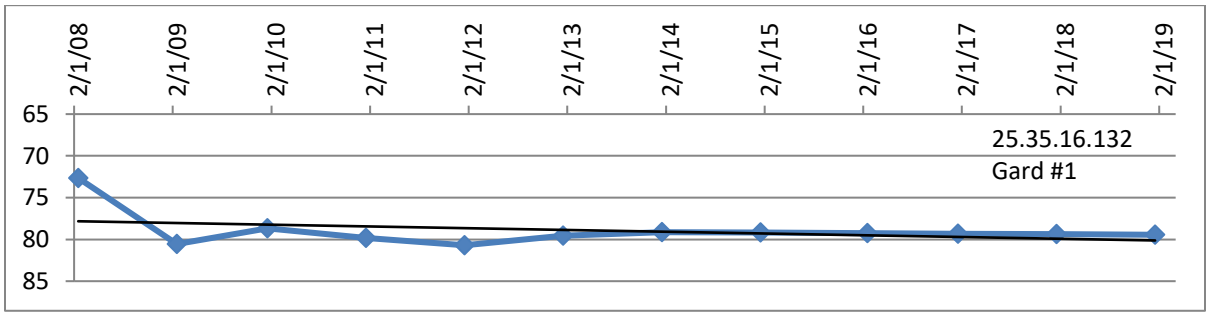
Campsey Rd.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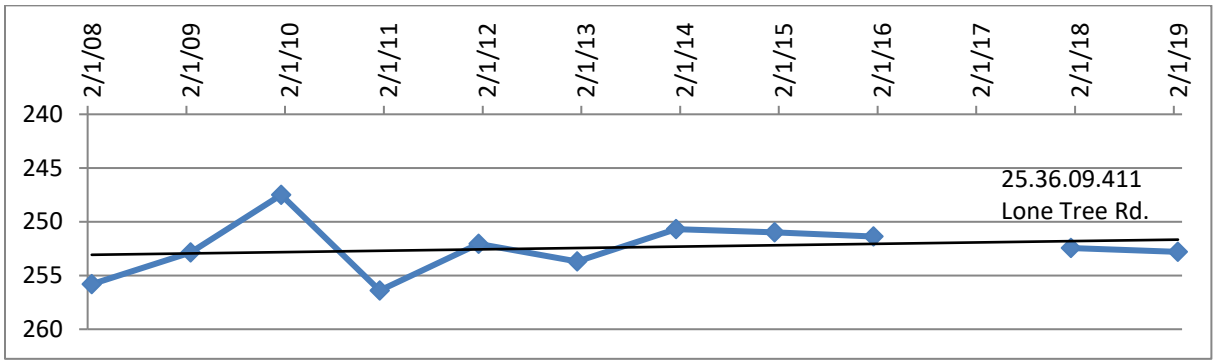
Gard #1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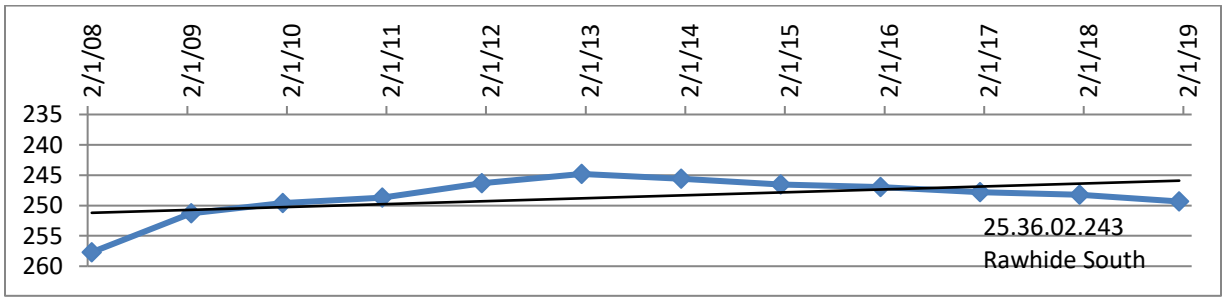
Lone Tree Rd.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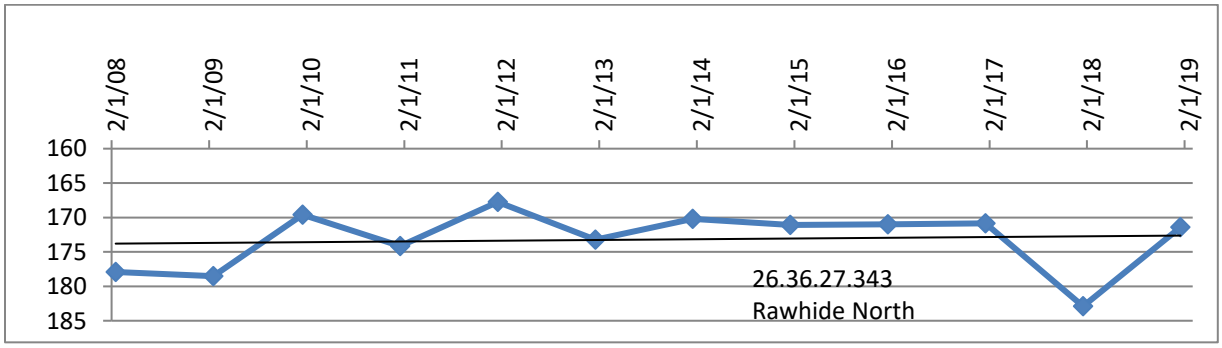
Rawhide South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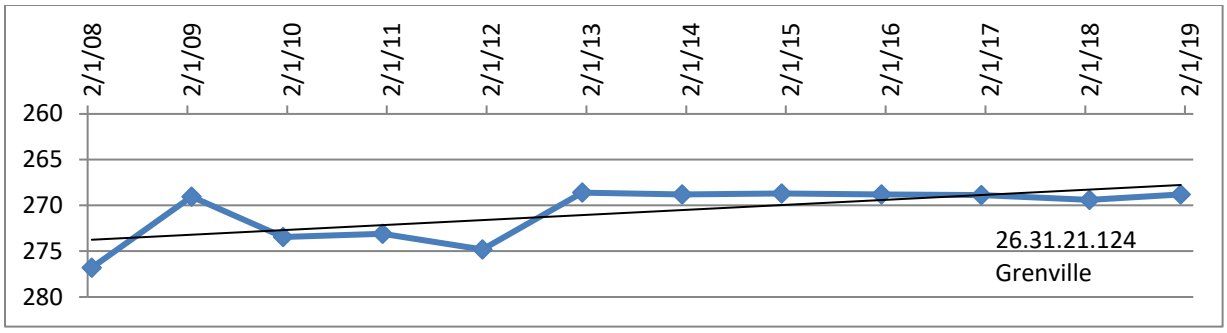
Rawhide North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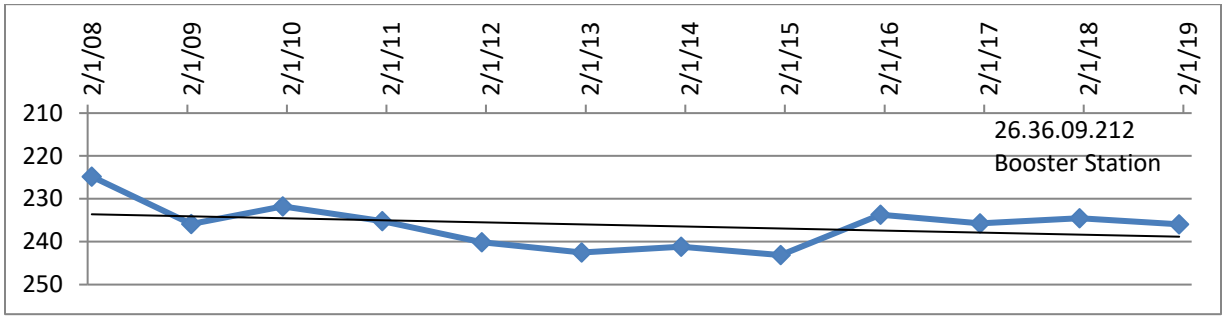
Grenville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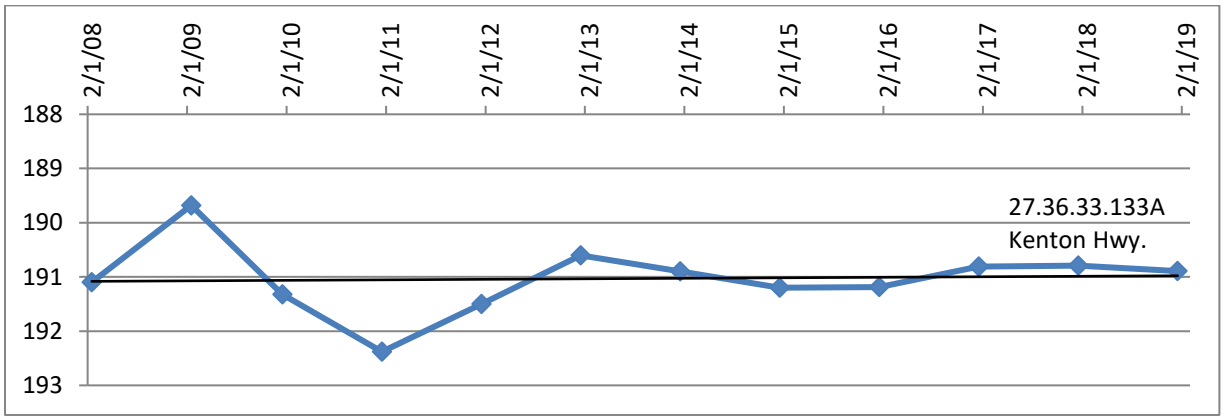
Booster Station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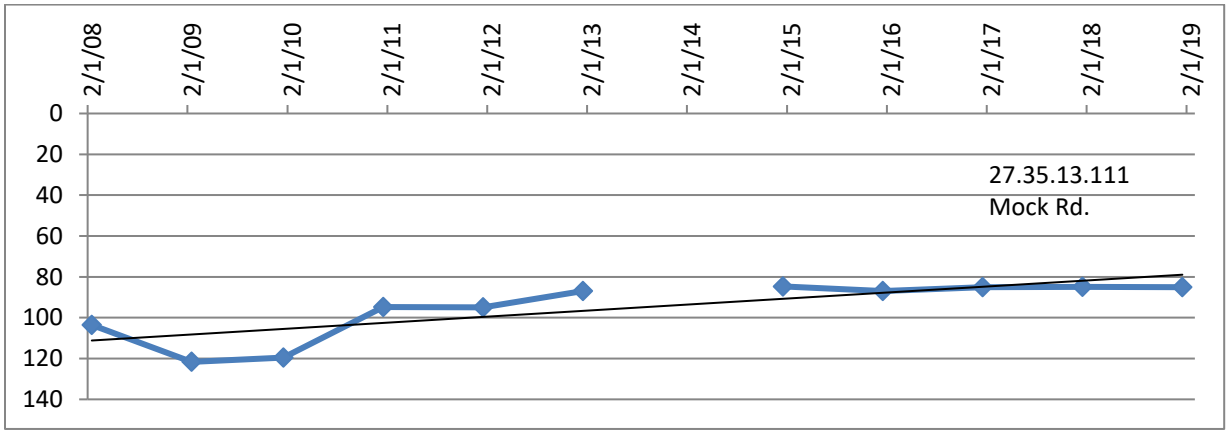
Kenton Hwy.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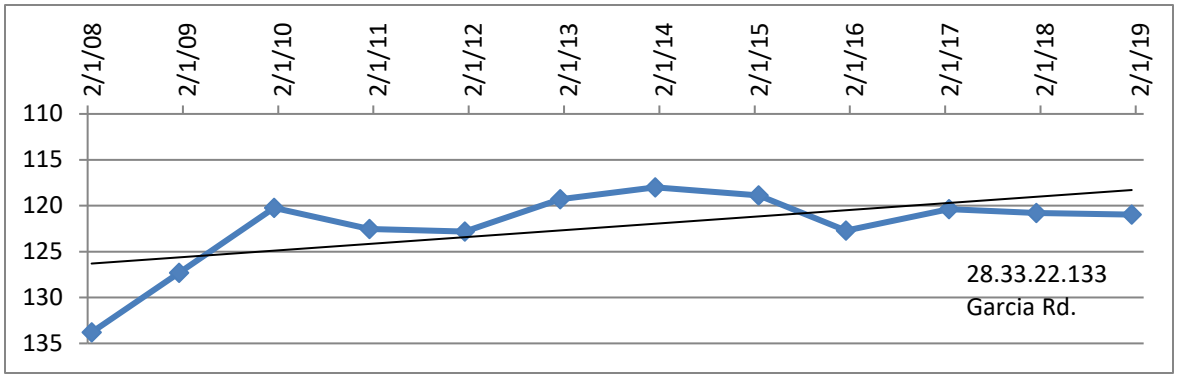
Mock Rd.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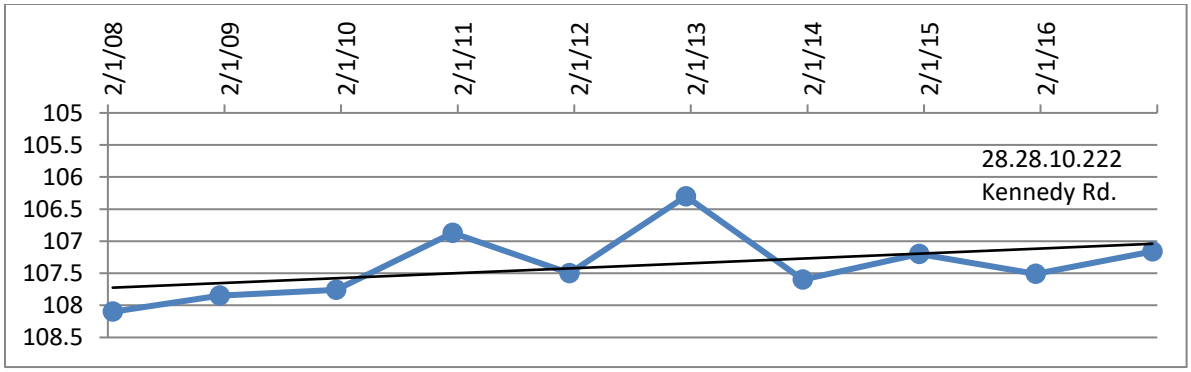
Garcia Rd.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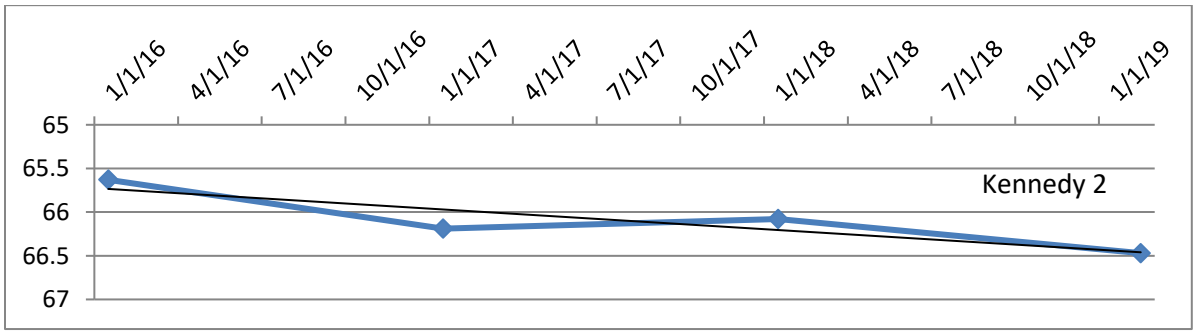
Kennedy Rd.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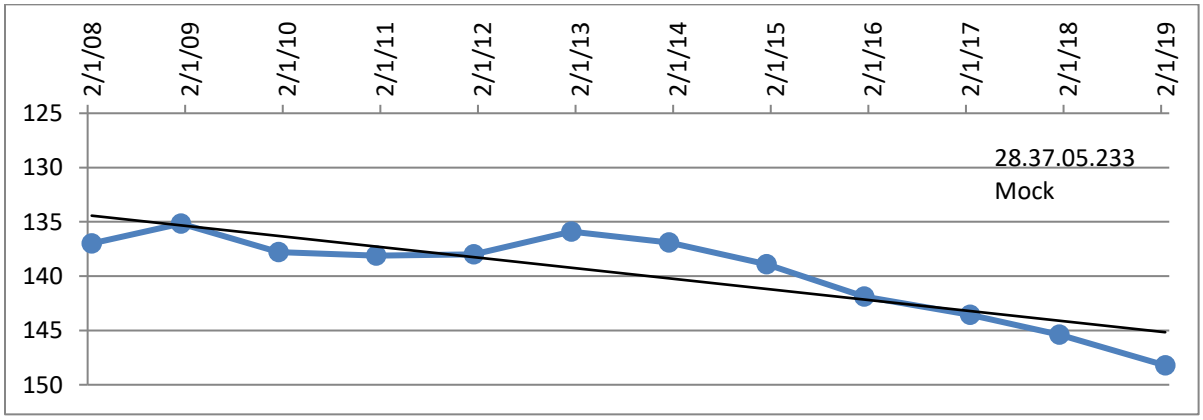
Kennedy 2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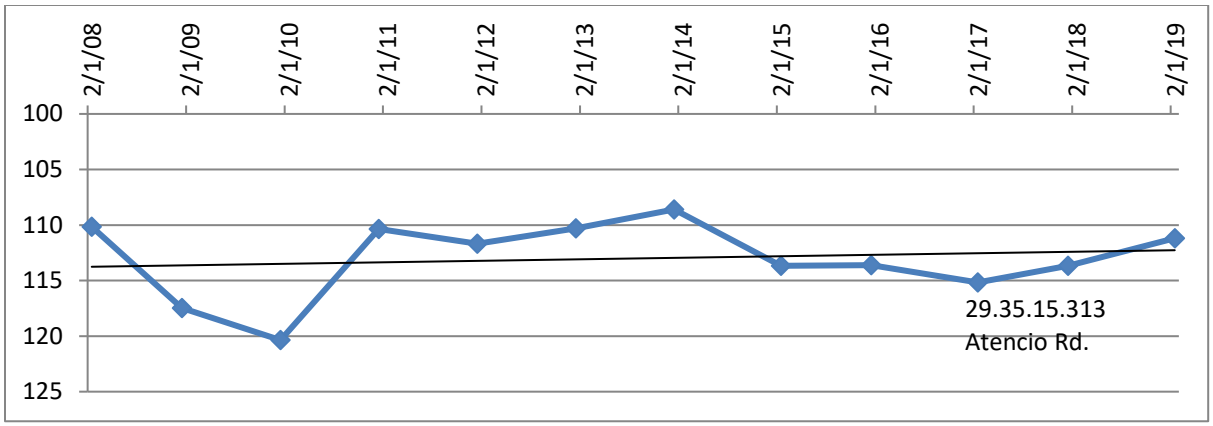
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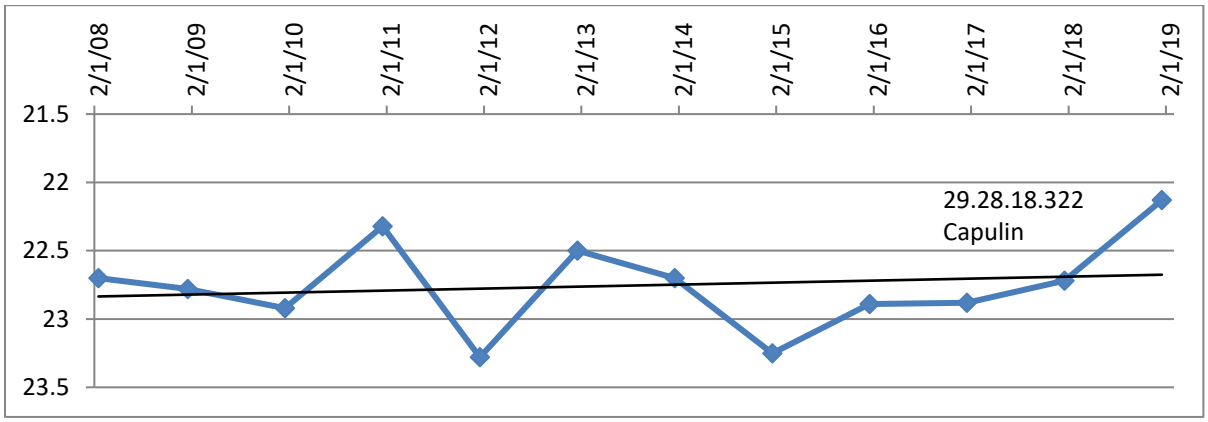
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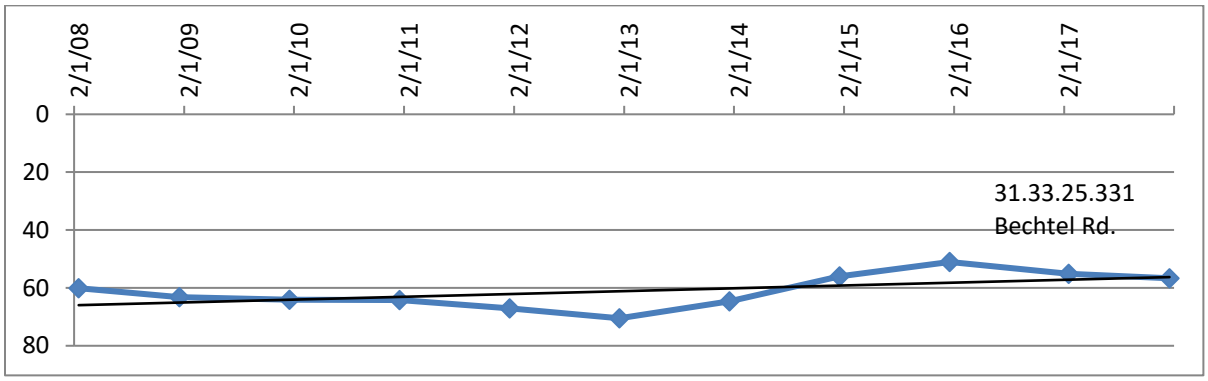
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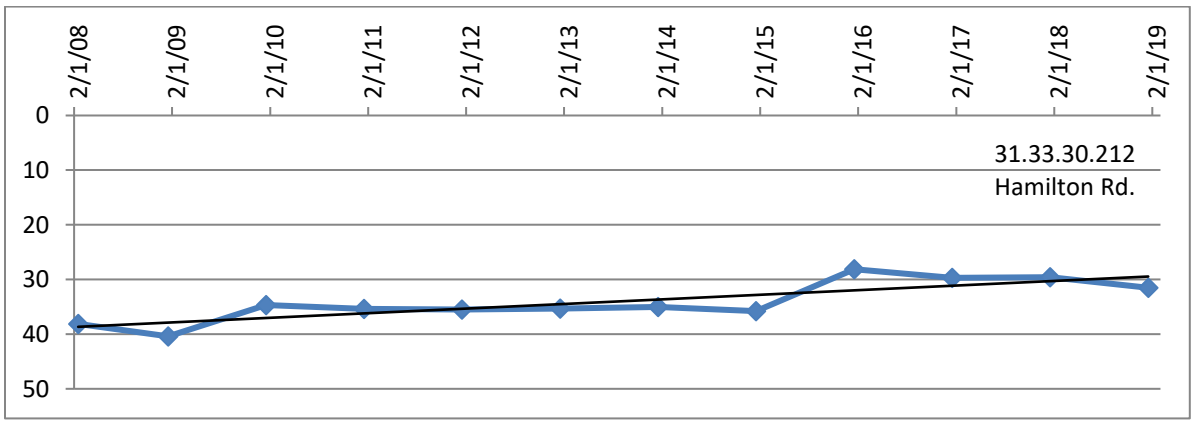
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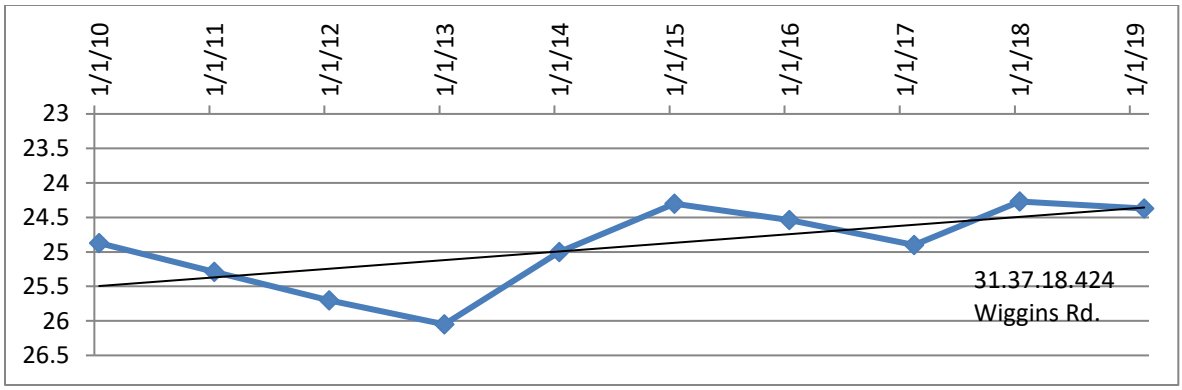
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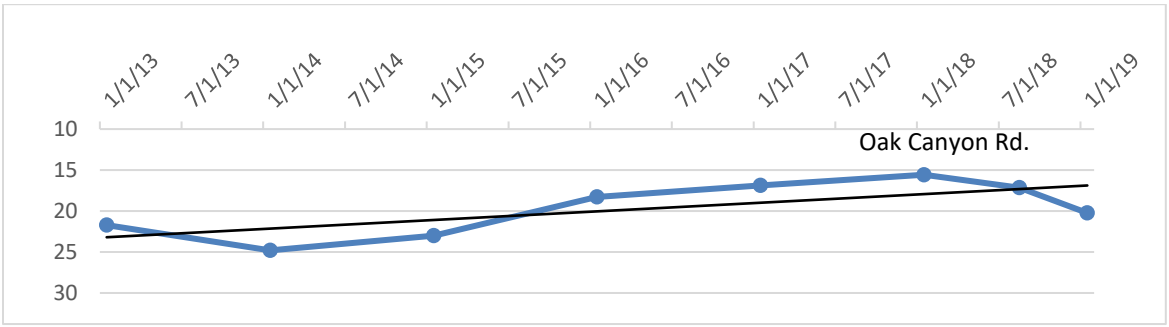
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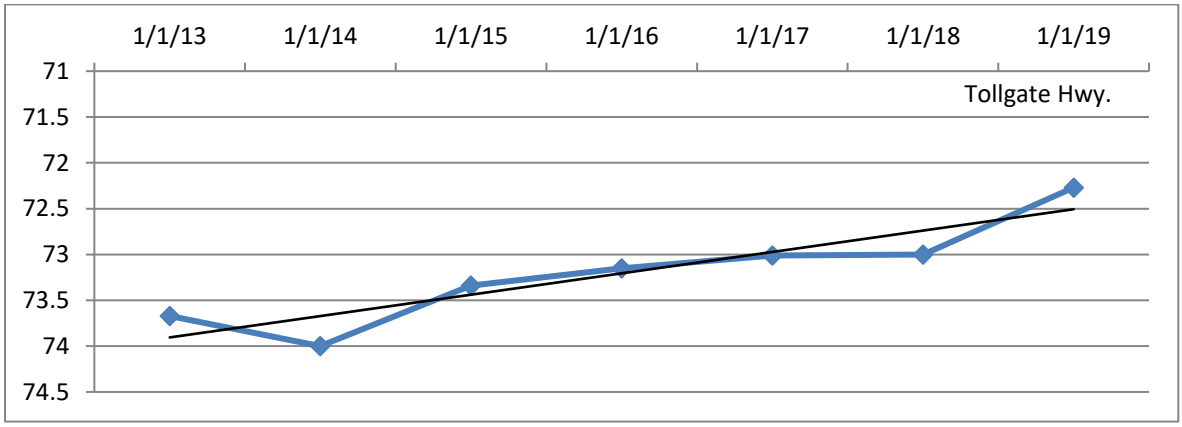
Oak Canyon Rd.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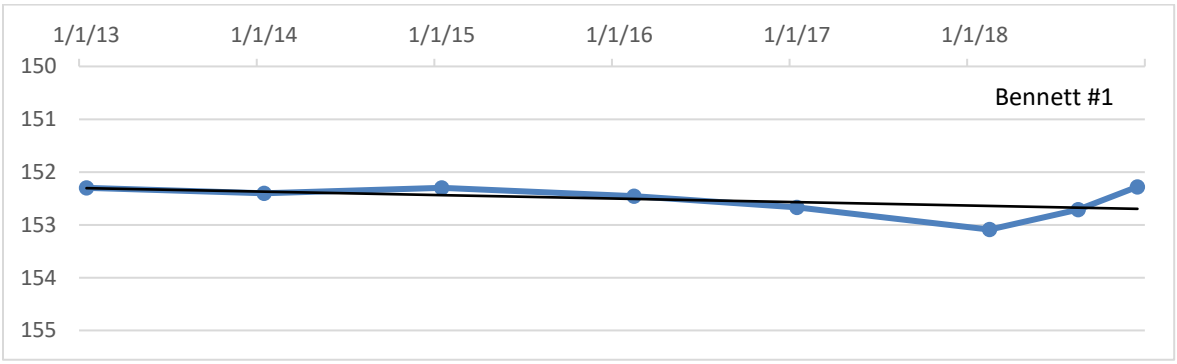
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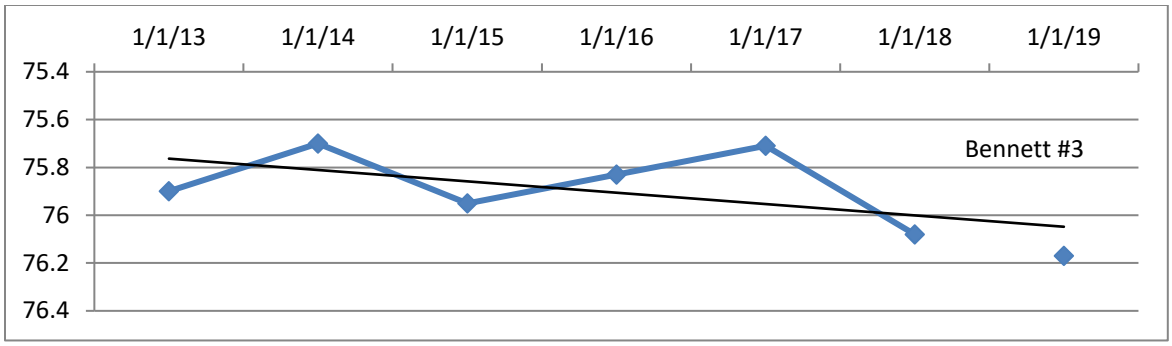
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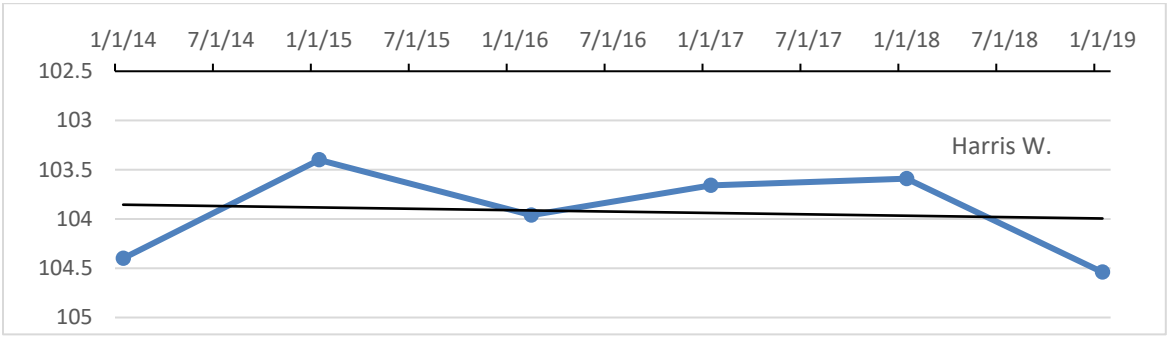
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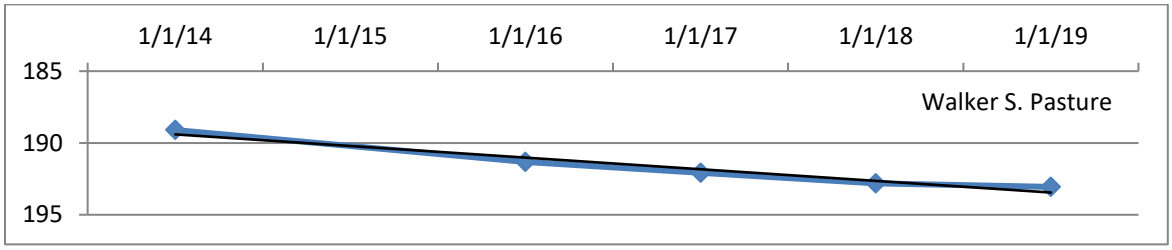
Harris W.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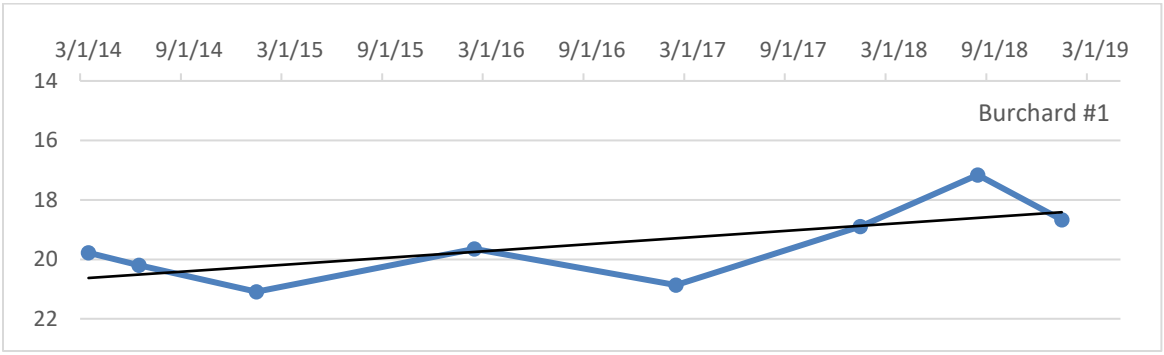
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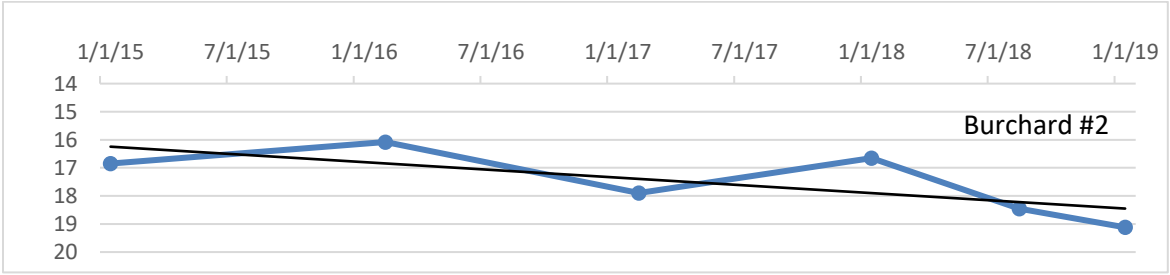
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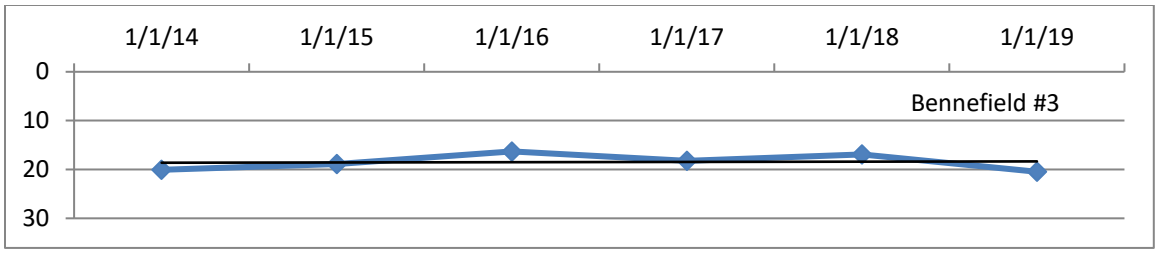
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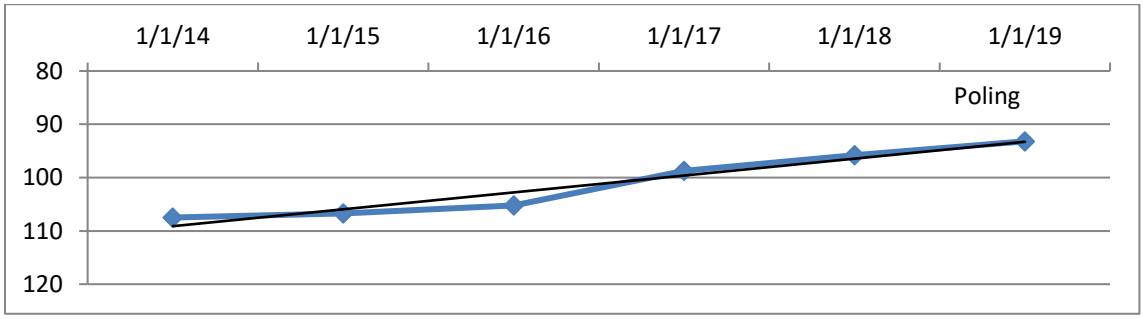
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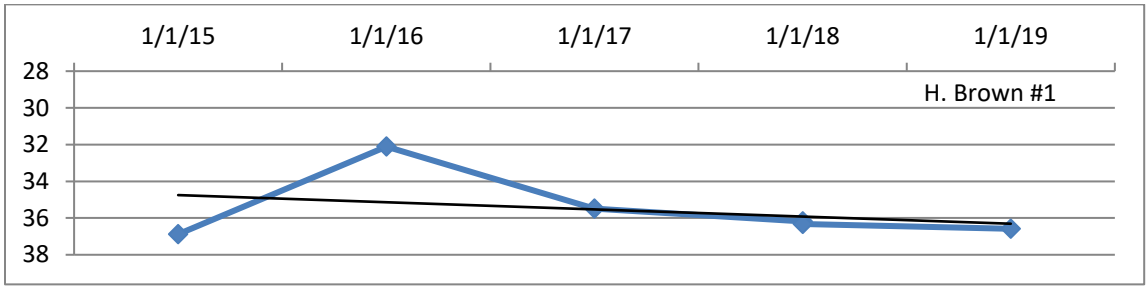
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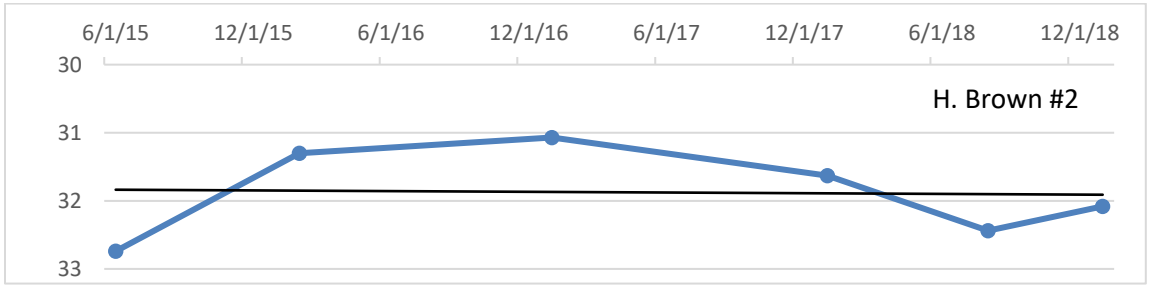
H. Brown #1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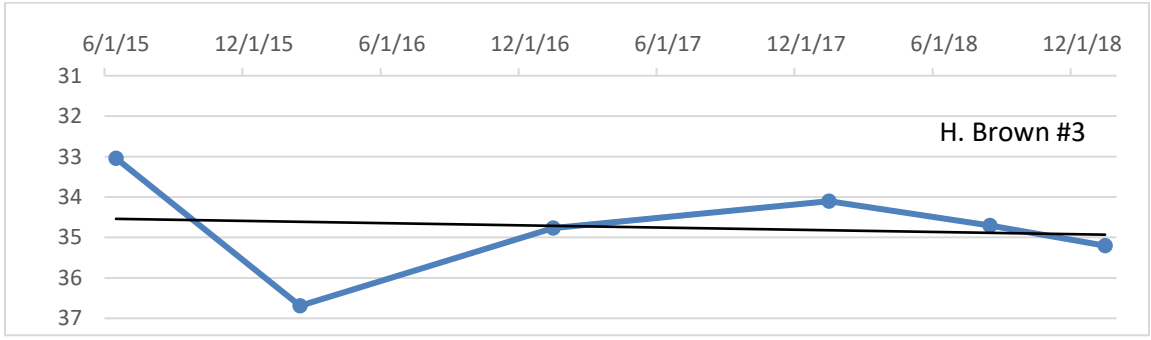
H. Brown #2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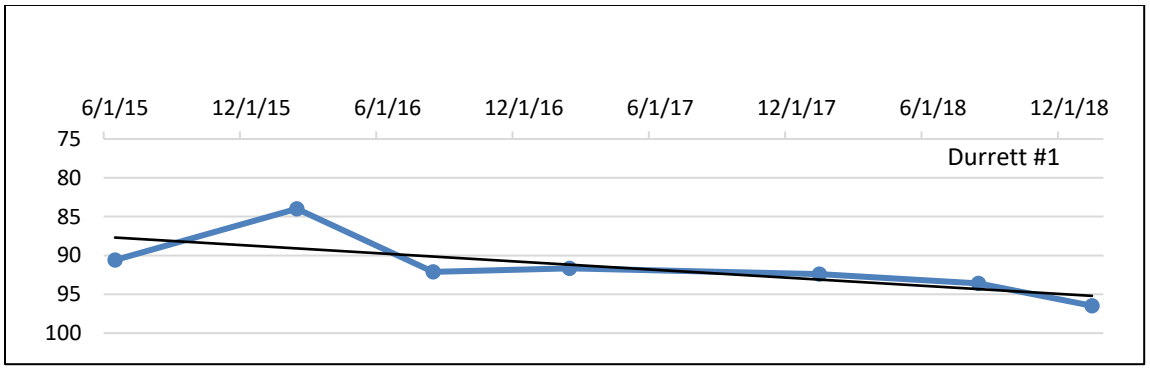
H. Brown #3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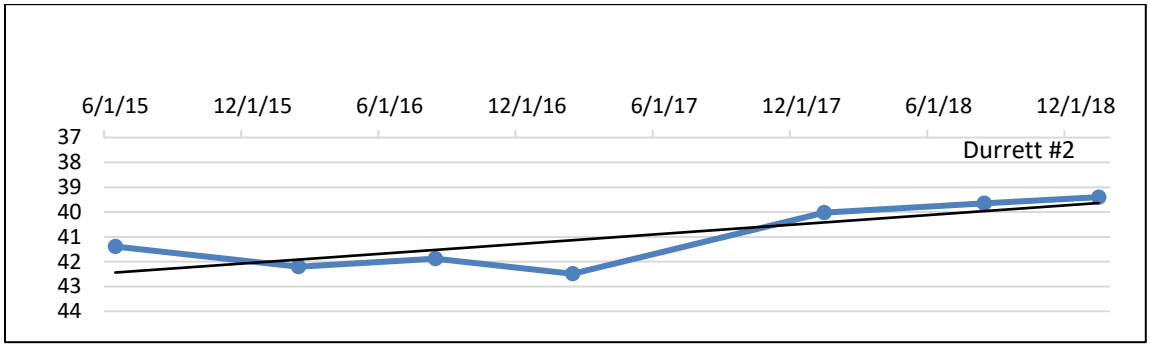
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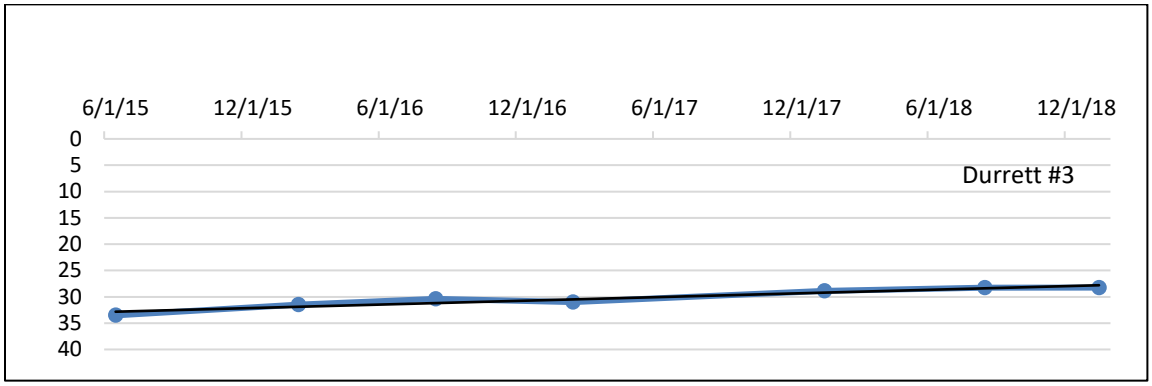
Durrett #2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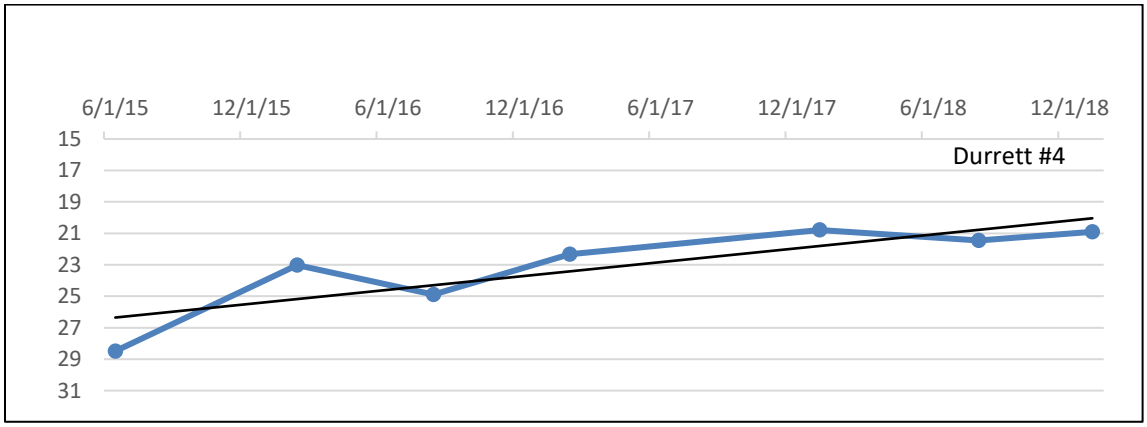
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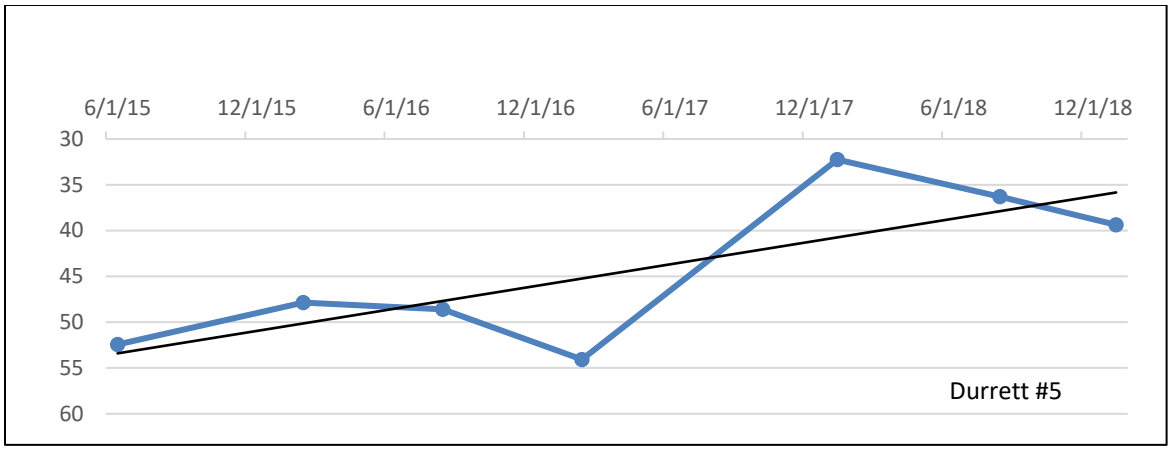
Durrett #4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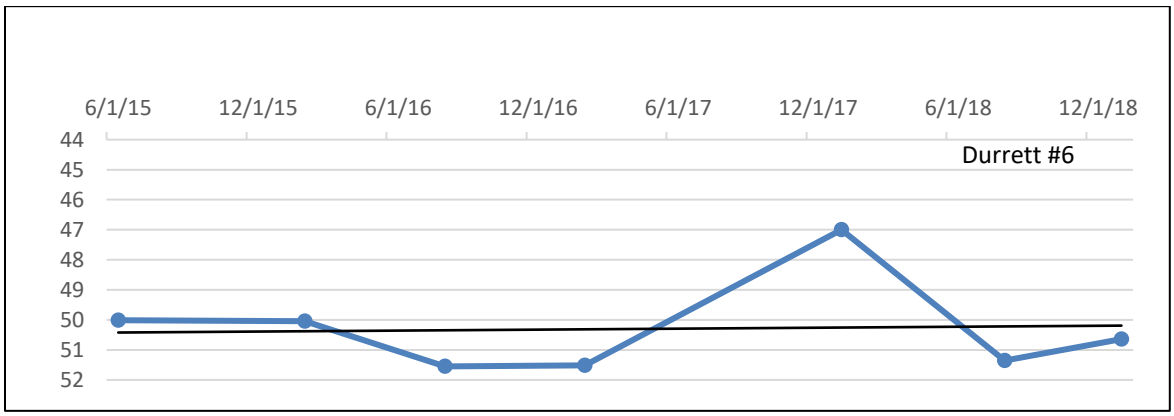
Durrett #5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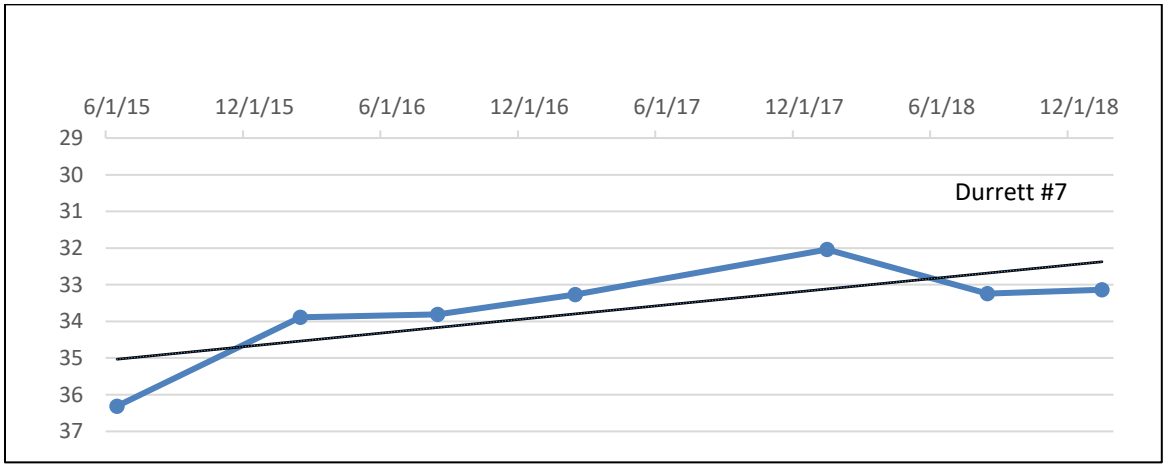
Durrett #6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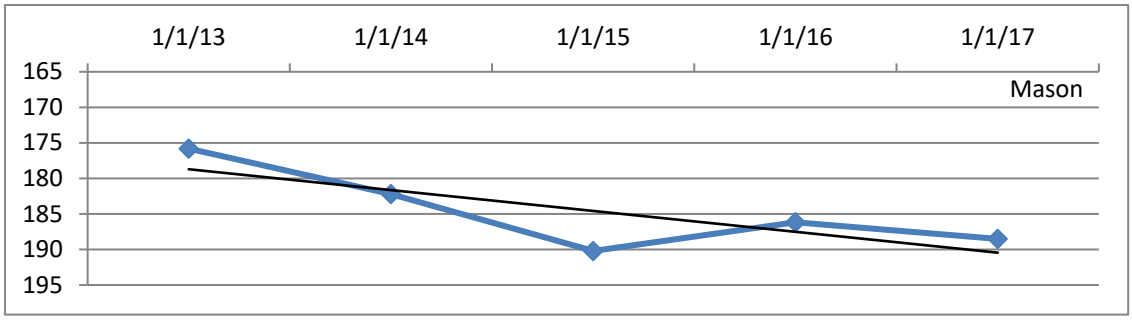
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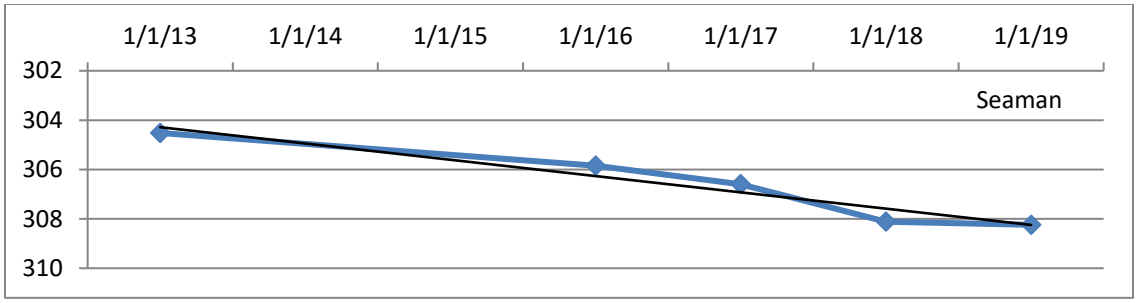
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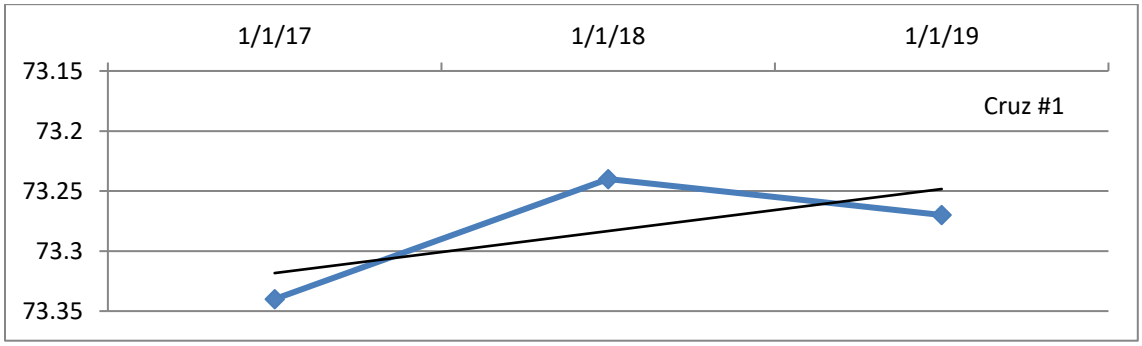
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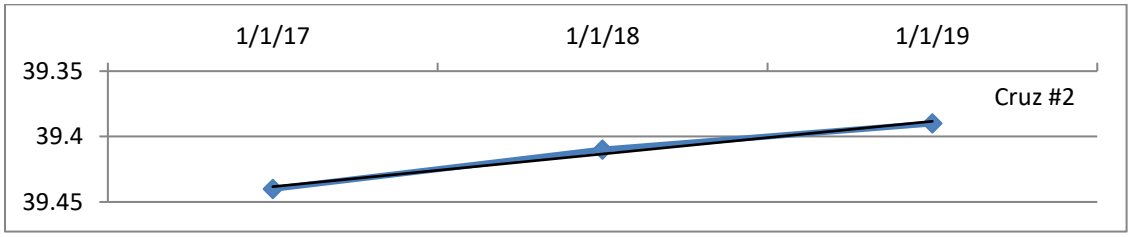
Cruz #1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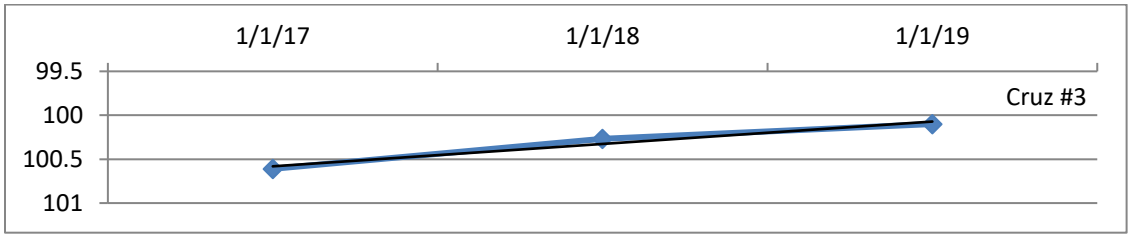
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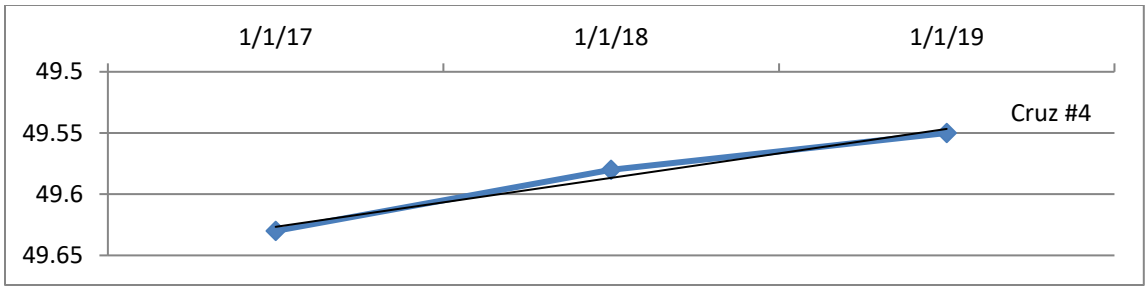
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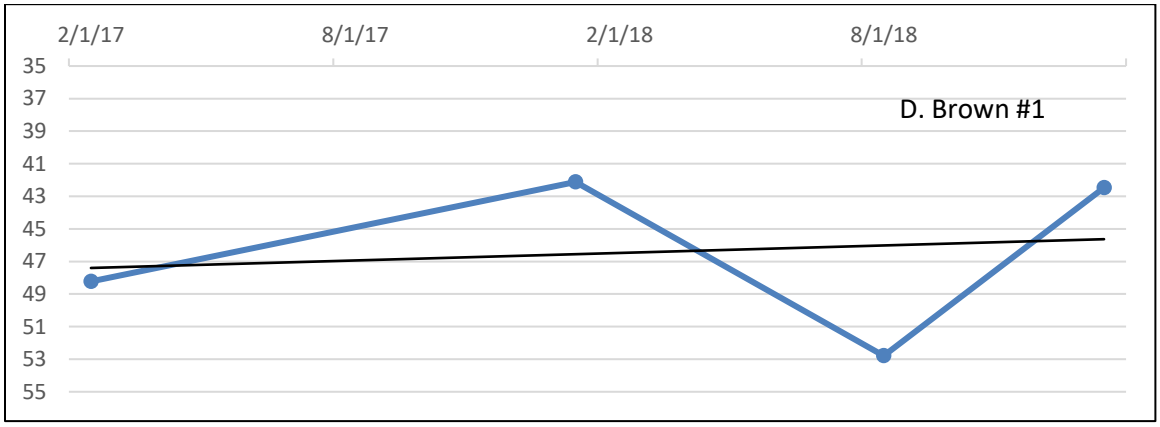
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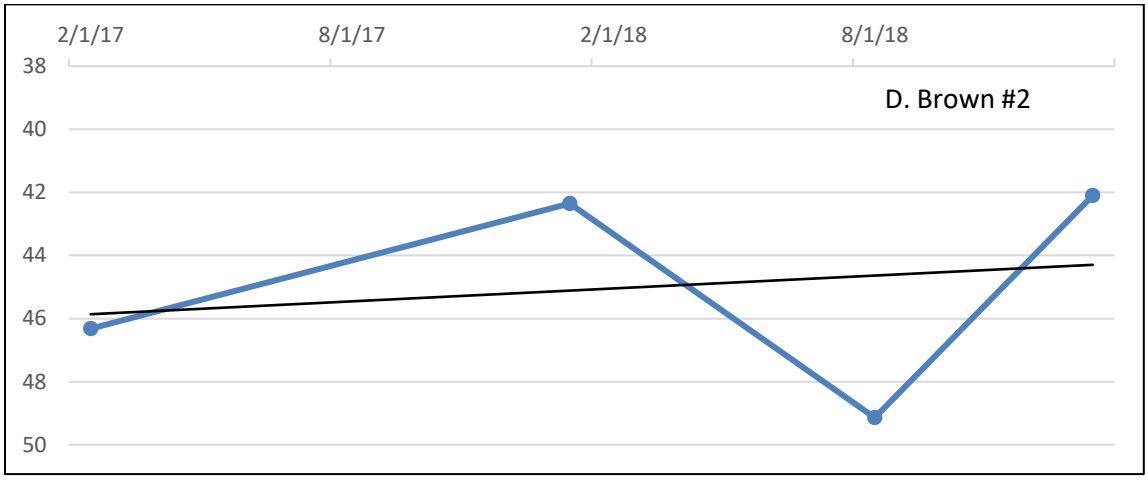
D. Brown #1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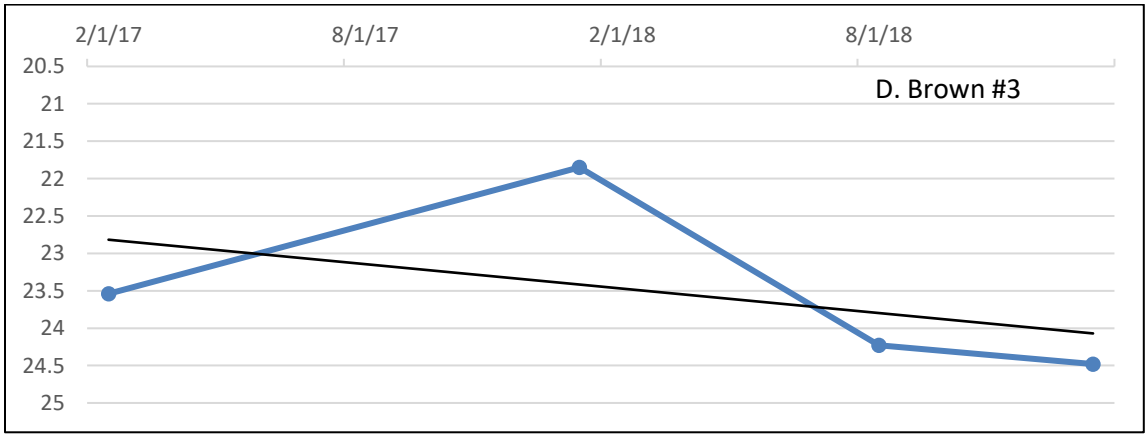
D. Brown #2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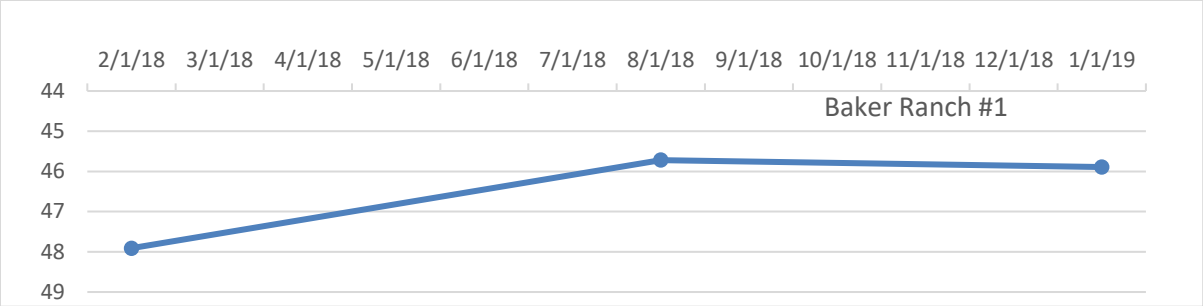
D. Brown #3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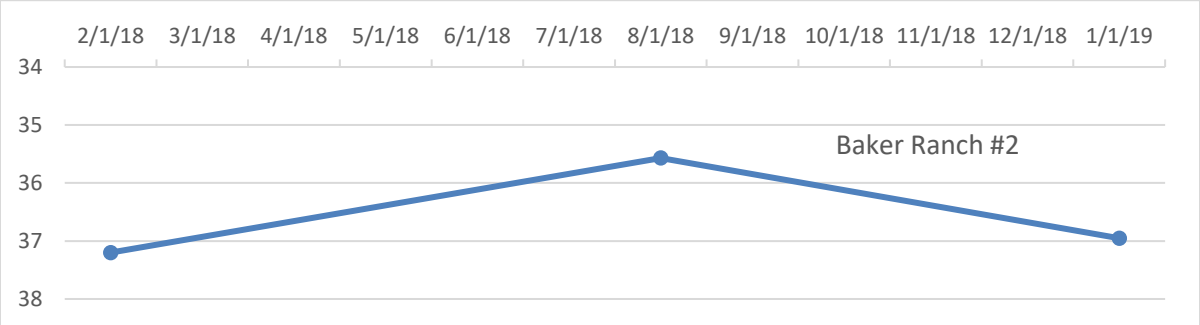
Baker Ranch #1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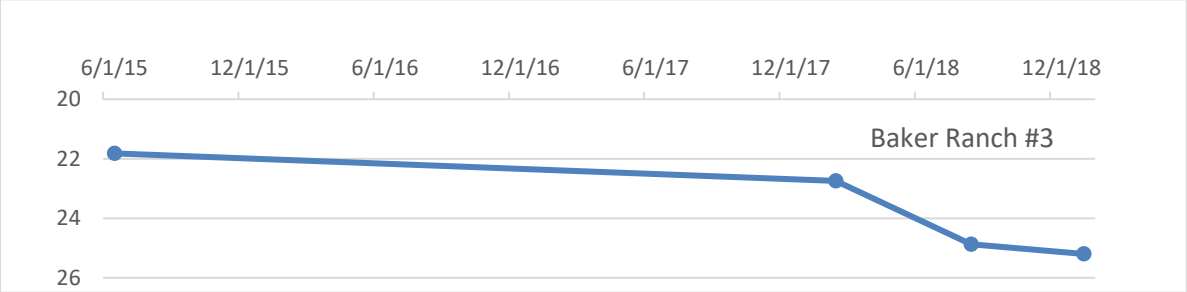
Baker Ranch #2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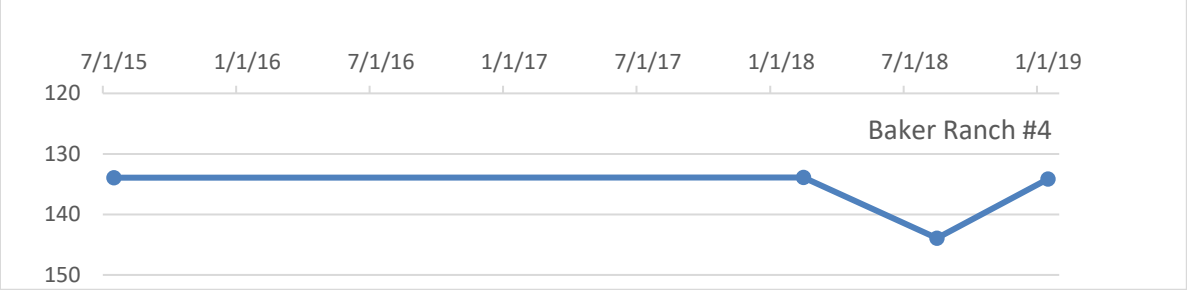
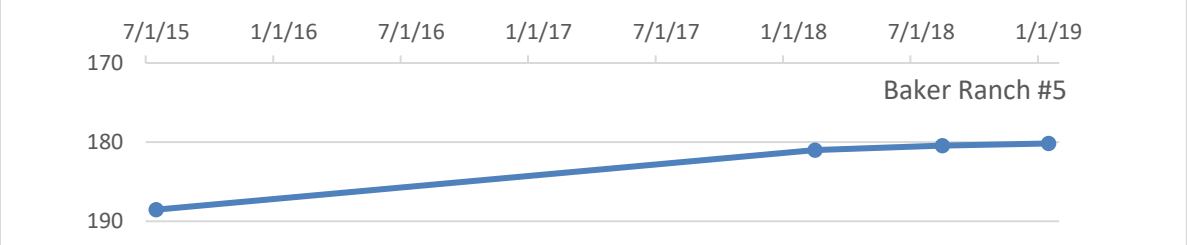
26
Baker Ranch #3


7/1/15
1/1/16
7/1/16
1/1/17
7/1/17
1/1/18
7/1/18
1/1/19
120
130
140
150
Baker Ranch #4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1/1/16
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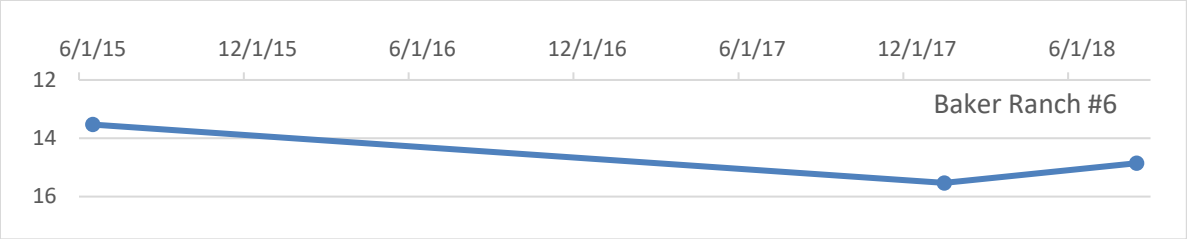
1/1/18
7/1/18
1/1/19
170
180
190
Baker Ranch #5


6/1/15
12/1/15
6/1/16
12/1/16
6/1/17
12/1/17
6/1/18
12
14
16
Baker Ranch #6