Cave Drip Monitoring

Fiscal Year 2021 Report



Prepared by 4CAVES Institute P.B.C.

For the City of Austin - Austin Water Utility - Wildland Conservation Division

4CAVES

INSTITUTE P.B.C.

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Cover Photo: Cave Specialist Justin Shaw performing a calibration on the Aquifer Room station in District Park Cave.

Introduction

This report is an update to the status of ongoing cave drip monitoring activities within caves associated with the Balconies Canyonlands Preserve (BCP). This report covers monitoring conducted during the City of Austin 2021 fiscal year, which ran from October 1, 2020 through September 30, 2021.

This monitoring and research were conducted for the City of Austin – Austin Water Utility – Wildlands Conservation Division in assistance of compliance with their federal permit commitments associated with the Balconies Canyonlands Conservation Plan (BCCP).

We conducted drip rate monitoring at 17 sites within 7 caves. Most drip rate measurements were automated, while others were conducted manually. Our efforts during FY 2021 produced 391,746 new drip rate measurements, bringing our full drip rate data set to a total of 1,864,512 drip rate measurements recorded since August of 2012.

Specifications used for conducting these hydrogeological studies are provided in Hauwert, N., and Cowan, B. 2013, Delineating Source Areas To Cave Drips And Cave Streams In Austin Texas, USA: 13th Sinkhole Conference, Carlsbad, NM. https://www.researchgate.net/publication/313013527_Delineating_Source_Areas_to_Cave_Drips_and_Cave_Streams_in_Austin_Texas_USA

FY2021 Drip Monitoring Overview

Cave	Site Name	Mean	Min	Max		Measurements
		Statistical Volumes in Milliliters per Minute				
District Park	Aquifer Room Drip	0.00	0.00	0.83		33,529
District Park	Aggie Level Drip	0.00	0.00	0.00		35,032
Flint Ridge	Balcony Room Drips	2.07	0.00	95.42		35,034
Flint Ridge	Balcony Joint	0.00	0.00	0.00		14,711
Flint Ridge	Fondue Drip	0.00	0.00	0.00		27,202
Flint Ridge	Cheese and Chocolate Drip	null	null	null		0
Flint Ridge	Fault Dome	10.15	6.95	13.89		31,145
Flint Ridge	Drip Pit	51.57	26.03	135.99		23,020
Tabor Crevice	Zeus' Finger	3.38	0.00	4.88		2,931
Tabor Crevice	Jupiter Drips	0.01	0.00	0.93		2,931
Tabor Crevice	Sparkles Infeeder	0.00	0.00	0.00		2,931
Dunvegan Dungeon	Dunvegan Drip	0.00	0.00	0.79		30,607
Dunvegan Dungeon	Drip Above Dunvegan Pool	1.64	0.00	443.05		56,951
Millipede	Bedding Plane Drips	0.93	0.00	2.44		35,032
Millipede Annex	Annex North Drip	0.03	0.00	0.79		29,121
Stovepipe	Stovepipe South Crawl	0.01	0.00	26.97		30,947
Whirlpool	Lost Legends	46.90	21.74	65.22		622
				FY 2021 total measurements		391,746

Complete Drip Monitoring Overview

Cave	Site Name	Mean	Min	Max		Measurements	First Measurment	Last Measurment
		Statistical Volumes in Milliliters per Minute						
District Park	Aquifer Room Drip	0.01	0.00	30.83		182,772	August 4, 2012	November 18, 2021
District Park	Aggie Level Drip	0.02	0.00	48.80		278,151	August 4, 2012	November 18, 2021
Flint Ridge	Balcony Room Drips	2.02	0.00	116.70		186,415	October 1, 2014	November 2, 2021
Flint Ridge	Balcony Joint	1.02	0.00	405.39		111,802	March 17, 2016	March 17, 2021
Flint Ridge	Fondue Drip	0.03	0.00	11.43		124,512	March 22, 2016	July 26, 2021
Flint Ridge	Cheese and Chocolate Drip	3.56	0.00	446.07		137,680	October 1, 2014	July 13, 2020
Flint Ridge	Fault Dome	22.29	6.25	65.53		167,787	November 6, 2014	November 2, 2021
Flint Ridge	Drip Pit	59.28	0.00	135.99		133,824	October 7, 2014	November 2, 2021
Tabor Crevice	Zeus' Finger	11.73	0.00	77.96		46,004	August 19, 2014	November 11, 2021
Tabor Crevice	Jupiter Drips	0.01	0.00	6.35		47,837	April 10, 2016	November 11, 2021
Tabor Crevice	Sparkles Infeeder	1.12	0.00	100.00		19,752	May 14, 2017	November 11, 2021
Dunvegan Dungeon	Dunvegan Drip	0.14	0.00	15.07		142,925	April 12, 2016	December 30, 2020
Dunvegan Dungeon	Drip Above Dunvegan Pool	1.52	0.00	789.60		123,502	May 14, 2017	November 11, 2021
Millipede	Bedding Plane Drips	0.92	0.00	2.44		69,568	December 5, 2019	November 29, 2021
Millipede Annex	North Drip	0.04	0.00	0.79		52,293	December 5, 2019	November 29, 2021
Stovepipe	Stovepipe South Crawl	0.01	0.00	26.97		36,685	November 12, 2020	November 29, 2021
Whirlpool	Lost Legends	46.90	21.74	65.22		622	June 2, 2021	June 9, 2021
Flint Ridge	Balcony Sparkle	6.52	3.76	12.36		2,350	March 17, 2016	April 15, 2016
Flint Ridge	The Alter	2.23	0.09	5.20		10	November 11, 2014	April 15, 2016
Flint Ridge	Mudmight	0.76	0.34	1.64		21	December 2, 2014	April 12, 2018
				Total measurements:		1,864,512		

Flint Ridge Cave

Flint Ridge Cave is one of the most significant caves of the 62 that were committed for protection under the Balconies Canyonlands Conservation Plan. Today the entrance of the cave serves as a significant recharge feature for the Barton Springs Segment of the Edwards Aquifer. In the spring of 1984 cavers from the Underground Texas Grotto dug into the cave through a dirt and rock plug in the corner of a sinkhole. Prior to this the sinkhole was plugged, likely in an effort to keep water at the surface for livestock. Observable speleogenic evidence within the cave indicates it had formed with an open entrance.

While the surface catchment can appear obvious, there is a cryptic subterranean network of passages which link numerous nearby karst features into the larger Flint Ridge Cave system. This is observable within Flint Ridge Cave as there are thousands of cave drips, each of which is feeding water through the vadose zone of the Edwards Aquifer.

Selected for ongoing study are 6 cave drip monitoring stations that are representative of the character of the cave drips throughout the cave. Some of these drip stations are individual speleothem formations, while others are groups of dripping formations captured on a tarp and funneled together.



Cave Specialist David Siddons in Flint Ridge Cave.

Flint Ridge Cave

Travis County Texas

Traverse Length 1,738 ft
Maximum Depth Below Datum 153 ft
Maximum Depth Below Surface 151 ft

Cartography by Justin Shaw
June 2018
Magnetic Declination at Publication +3.8°

DistoX2 Survey by

Justin Shaw
Mason Lewis
Kevin Walsh
Rich Zarria
Galen Falgout
Dylan Beeler
Amy Morton
Kraig Fenton
Devra Heyer
Ellie Watson
Peter "Dash" Gott
Mimi Alexander
Mary Hicks
Davey Siddons

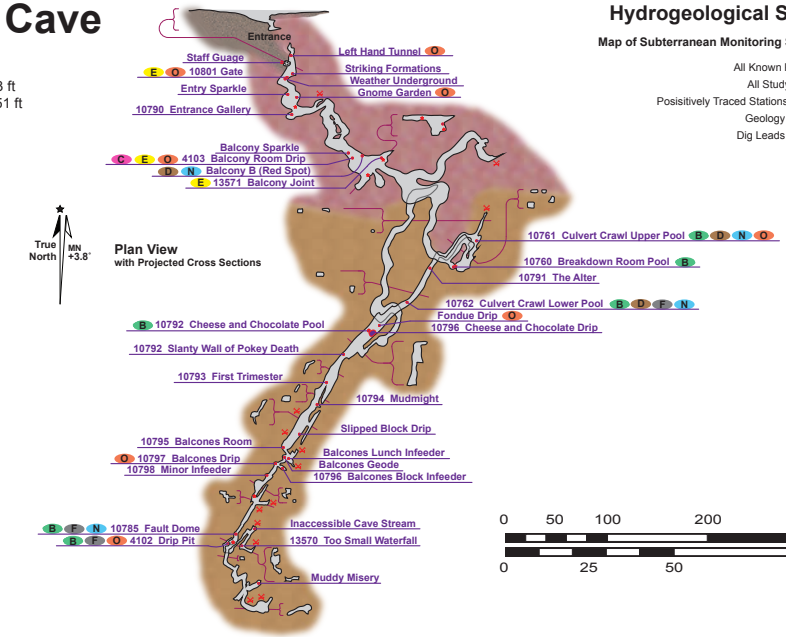
July 2017 through November 2017

Cave Radio Location Survey by

Keith Heuss
Nico Hauwert
Bill Russell
Julie Jenkins

April 2006

This map was drafted solely from the Distox2 data set.



Plan View
with Projected Cross Sections

Hydrogeological Study

Map of Subterranean Monitoring Stations

All Known Passages
All Study Stations
Positivitely Traced Stations Denoted
Geology Indicated
Dig Leads Identified

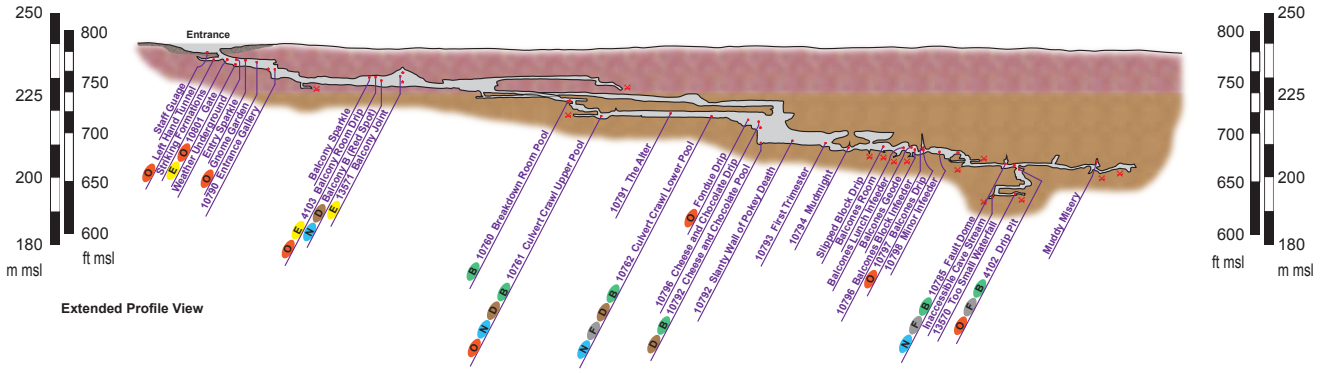
Positive Traces

- B TAB11 Funnel
- C Soil Pipe
- D F62a North Tributary Mudsink
- E MW
- F Honeycomb Drainage
- N Green Emerald Gate Sink
- O Agravita Cave

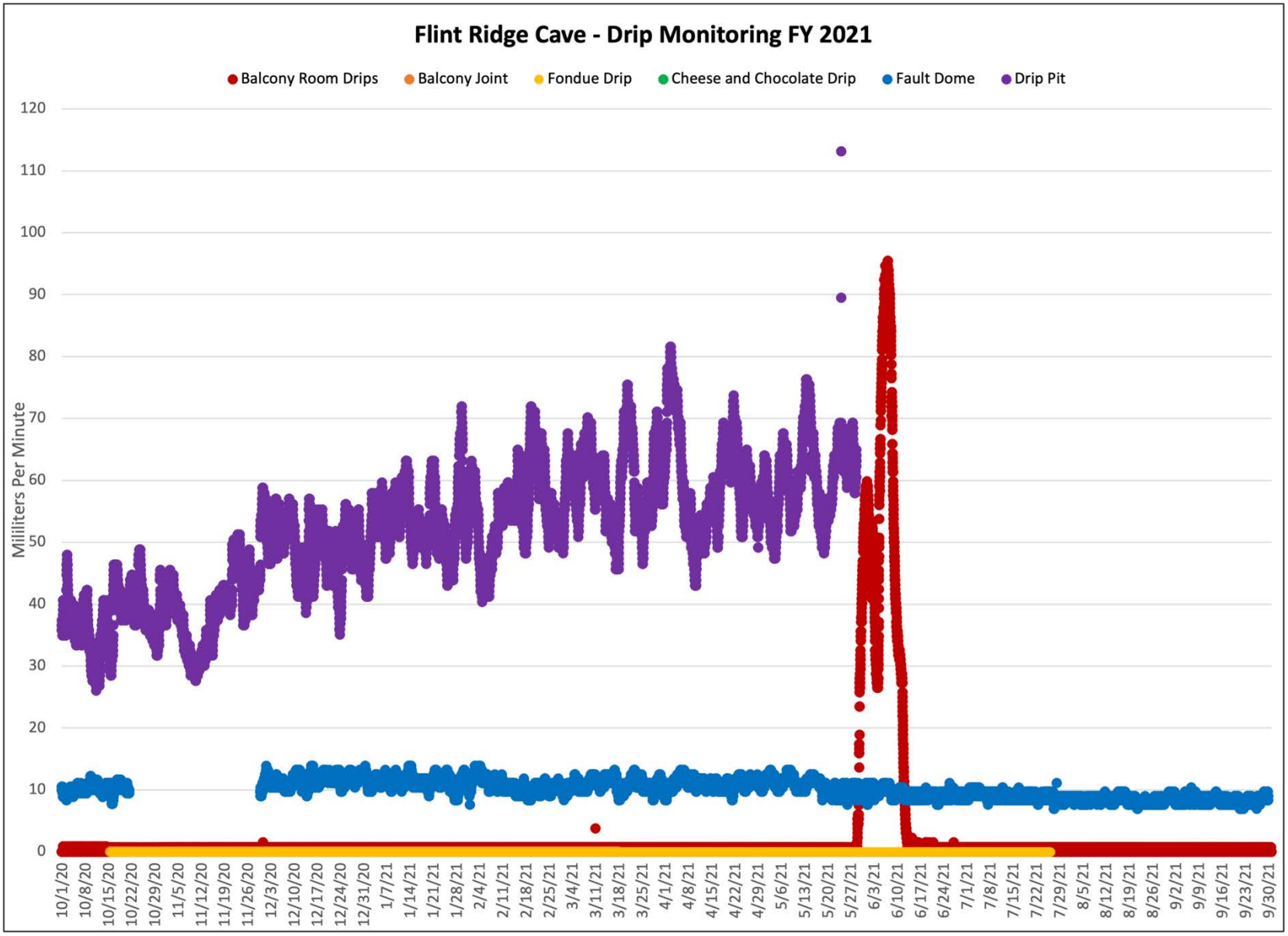
Key

- Monitoring Station
- B Tracer Hit
- Cave Radio Station
- Dig Lead
- Kirschberg Member of the Edwards Group
- Dolomitic Member of the Edwards Group
- Anthropogenic Fill

0 50 100 200 300 400 500 Feet
0 25 50 100 150 Meters



Extended Profile View


Flint Ridge Cave - Drip Monitoring FY 2021
Balcony Room Drips
Balcony Joint
Fondue Drip
Cheese and Chocolate Drip
Fault Dome
Drip Pit
Milliliters Per Minute
120
110
100
90
80
70
60
50
40
30
20
10
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
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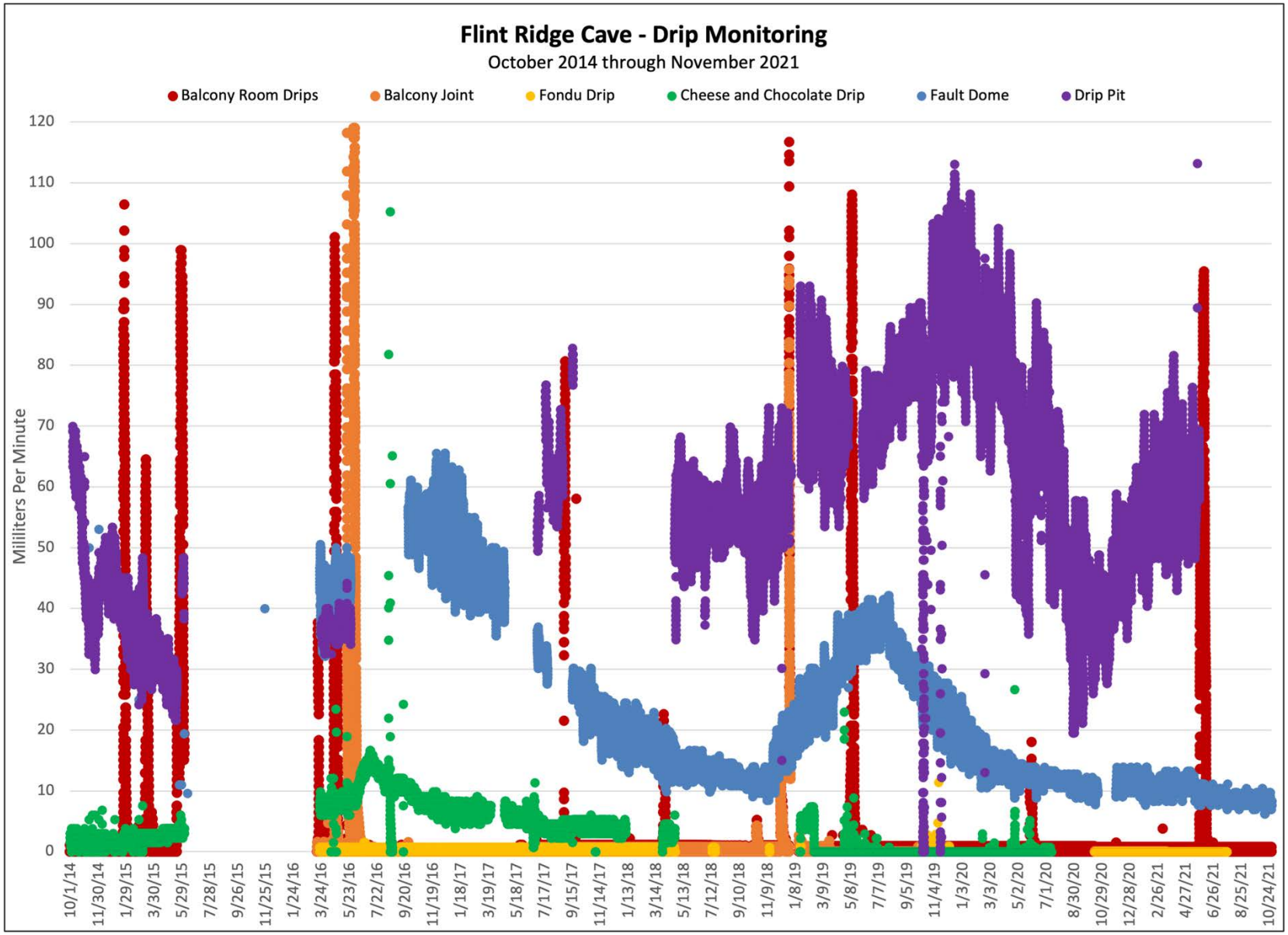
9/16/21
9/23/21
9/30/21


Flint Ridge Cave - Drip Monitoring
October 2014 through November 2021
Balcony Room Drips
Balcony Joint
Fondu Drip
Cheese and Chocolate Drip
Fault Dome
Drip Pit
Milliliters Per Minute
120
110
100
90
80
70
60
50
40
30
20
10
0
10/1/14
11/30/14
1/29/15
3/30/15
5/29/15
7/28/15
9/26/15
11/25/15
1/24/16
3/24/16
5/23/16
7/22/16
9/20/16
11/19/16
1/18/17
3/19/17
5/18/17
7/17/17
9/15/17
11/14/17
1/13/18
3/14/18
5/13/18
7/12/18
9/10/18
11/9/18
1/8/19
3/9/19
5/8/19
7/7/19
9/5/19
11/4/19
1/3/20
3/3/20
5/2/20
7/1/20
8/30/20
10/29/20
12/28/20
2/26/21
4/27/21
6/26/21
8/25/21
10/24/21

Balcony Room Drips

Discrete Cave Drip

This site is a group of stalactites located at an elevation of 755.8 ft msl and is within the Kirschberg Member of the Edwards Group. These formations only drip as a rapid response to rain events.

Statistical volumes below are in milliliters per minute.

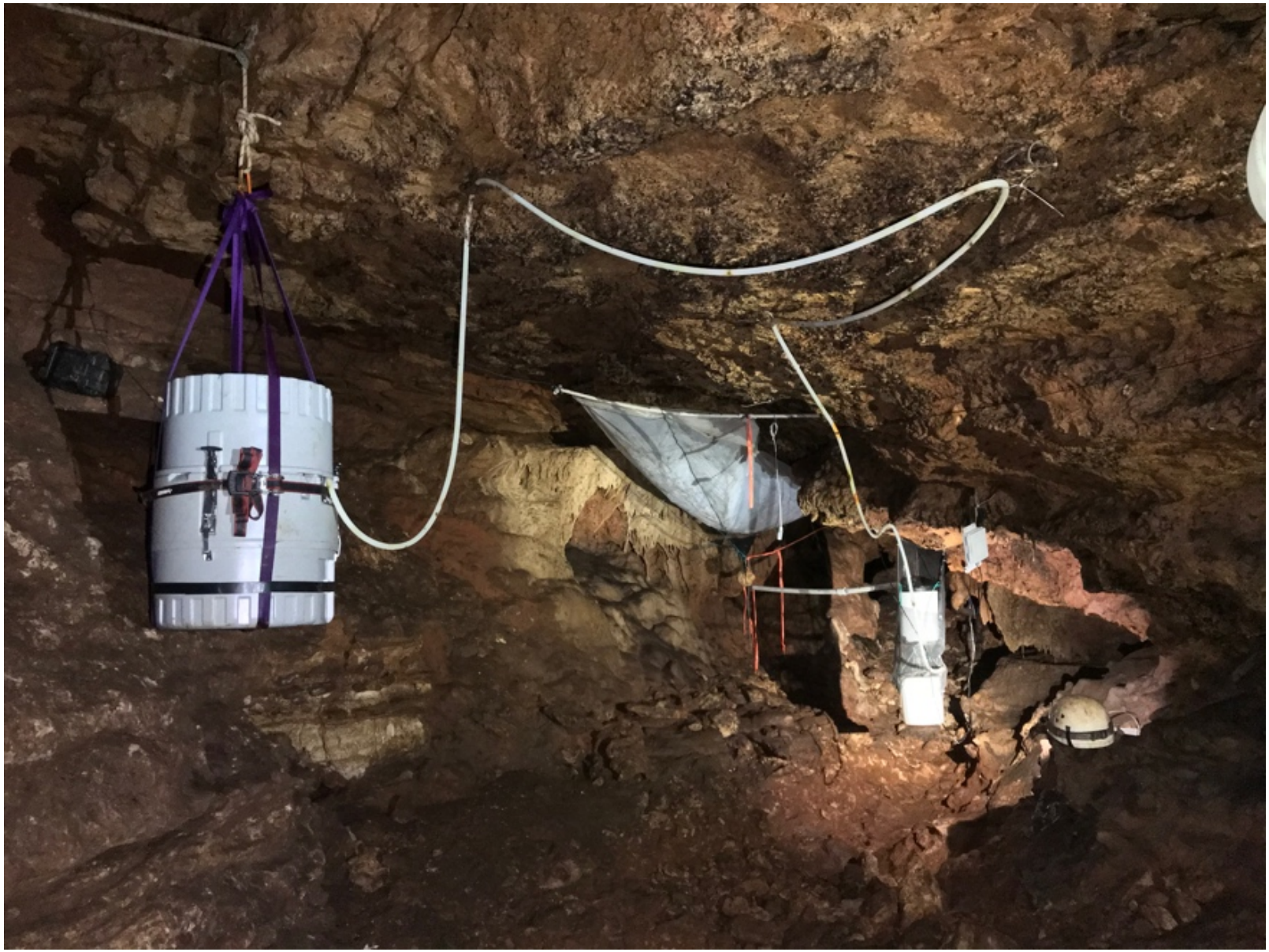
35,034 drip rate measurements during FY 2021.
Mean 2.07 – Minimum 0.00 – Maximum 95.42

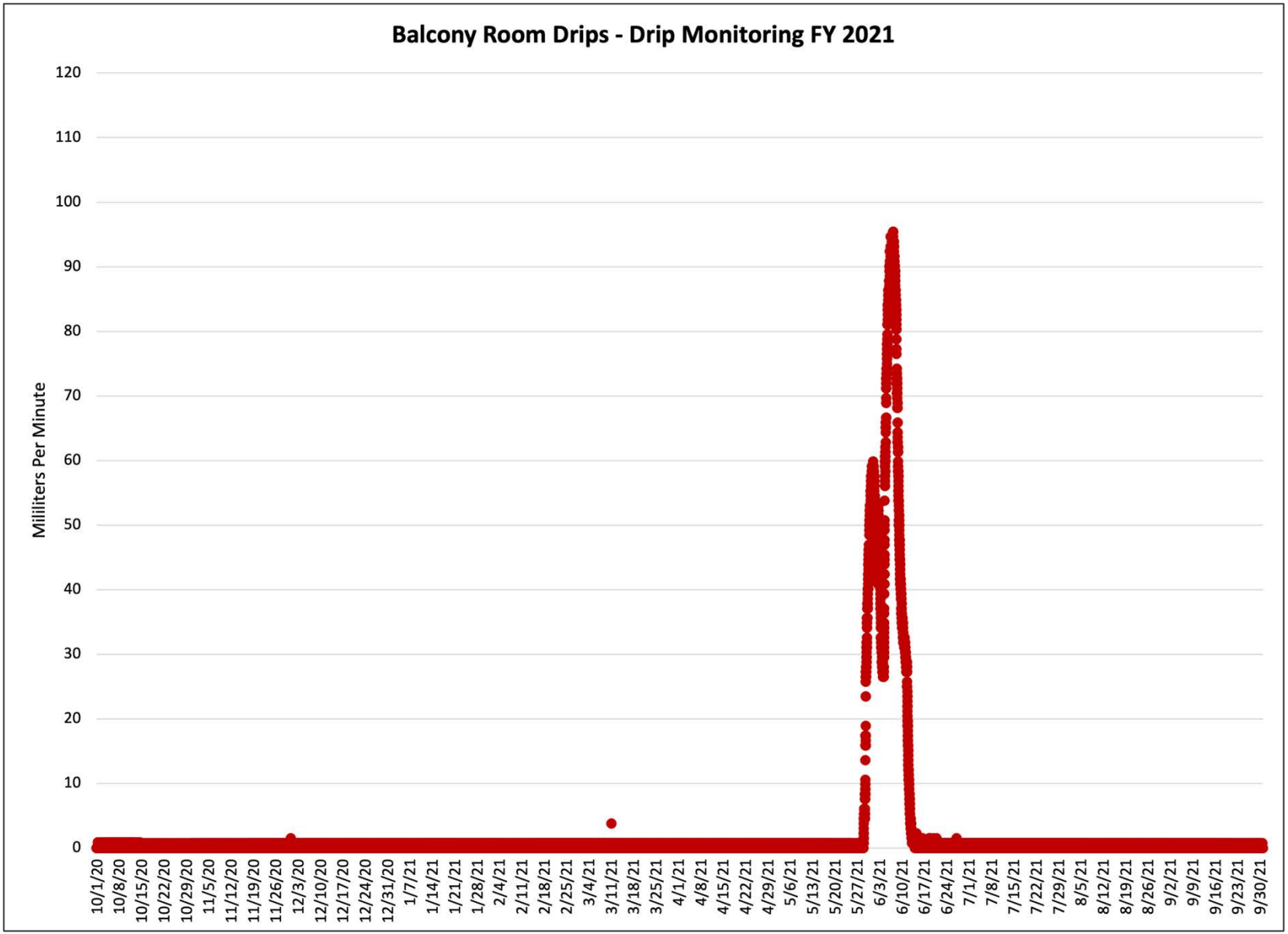
149,633 drip rate measurements since October 2014.
Mean 2.02 – Minimum 0.00 – Maximum 116.70

Deviation of 2021 drip rates from complete record:
Mean +0.05 – Minimum 0.00 – Maximum -21.28

Good data collected all year.

This station is currently deployed and operational. The current configuration consists of a plastic sheet tarp hung to collects the drips and funnel them through an isco 674 tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB. The RainWise tipper is suspended with a bucket hanging below it which collects just over 2 liters of water before pouring over. There is an isco 6712 Autosampler with a 23 ft suction line for drawing samples from the bucket. To keep it safer during recharge events the autosampler is suspended from the ceiling utilizing a pully system which allows it to be lowered for sample retrieval.




Balcony Room Drips - Drip Monitoring FY 2021
Milliliters Per Minute
120
110
100
90
80
70
60
50
40
30
20
10
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
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5/20/21
5/27/21
6/3/21
6/10/21
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6/24/21
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7/8/21
7/15/21
7/22/21
7/29/21
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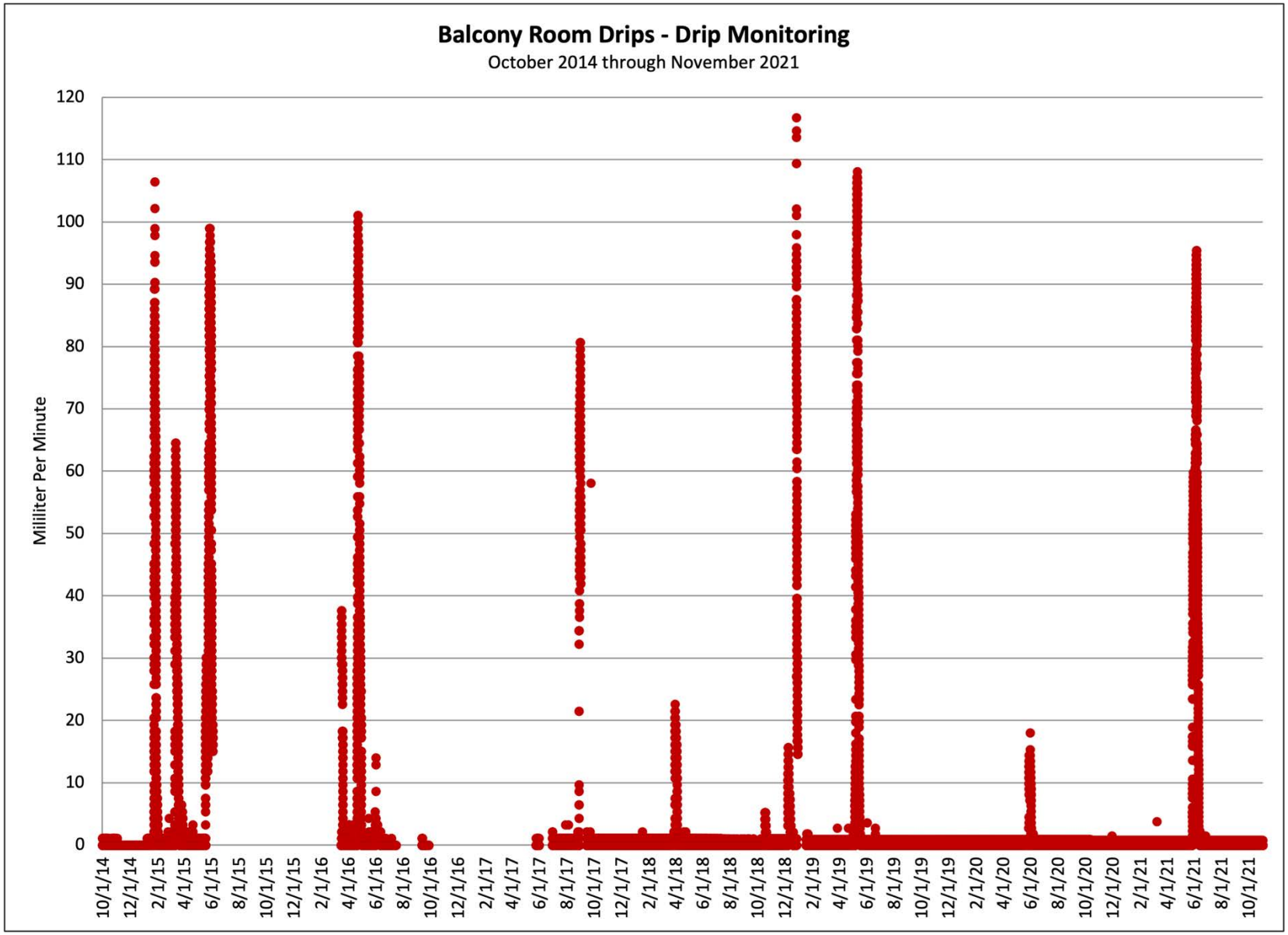
9/23/21
9/30/21


Balcony Room Drips - Drip Monitoring
October 2014 through November 2021
Milliliter Per Minute
120
110
100
90
80
70
60
50
40
30
20
10
0
10/1/14
12/1/14
2/1/15
4/1/15
6/1/15
8/1/15
10/1/15
12/1/15
2/1/16
4/1/16
6/1/16
8/1/16
10/1/16
12/1/16
2/1/17
4/1/17
6/1/17
8/1/17
10/1/17
12/1/17
2/1/18
4/1/18
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2/1/19
4/1/19
6/1/19
8/1/19
10/1/19
12/1/19
2/1/20
4/1/20
6/1/20
8/1/20
10/1/20
12/1/20
2/1/21
4/1/21
6/1/21
8/1/21
10/1/21

Balcony Joint

Infeeder

This site is an infeeder located at an elevation of 756.8 ft msl and is within the Kirschberg Member of the Edwards Group. This infeeder only flows or drips as a rapid response to rain events.

Statistical volumes below are in milliliters per minute.

14,711 drip rate measurements during FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.00

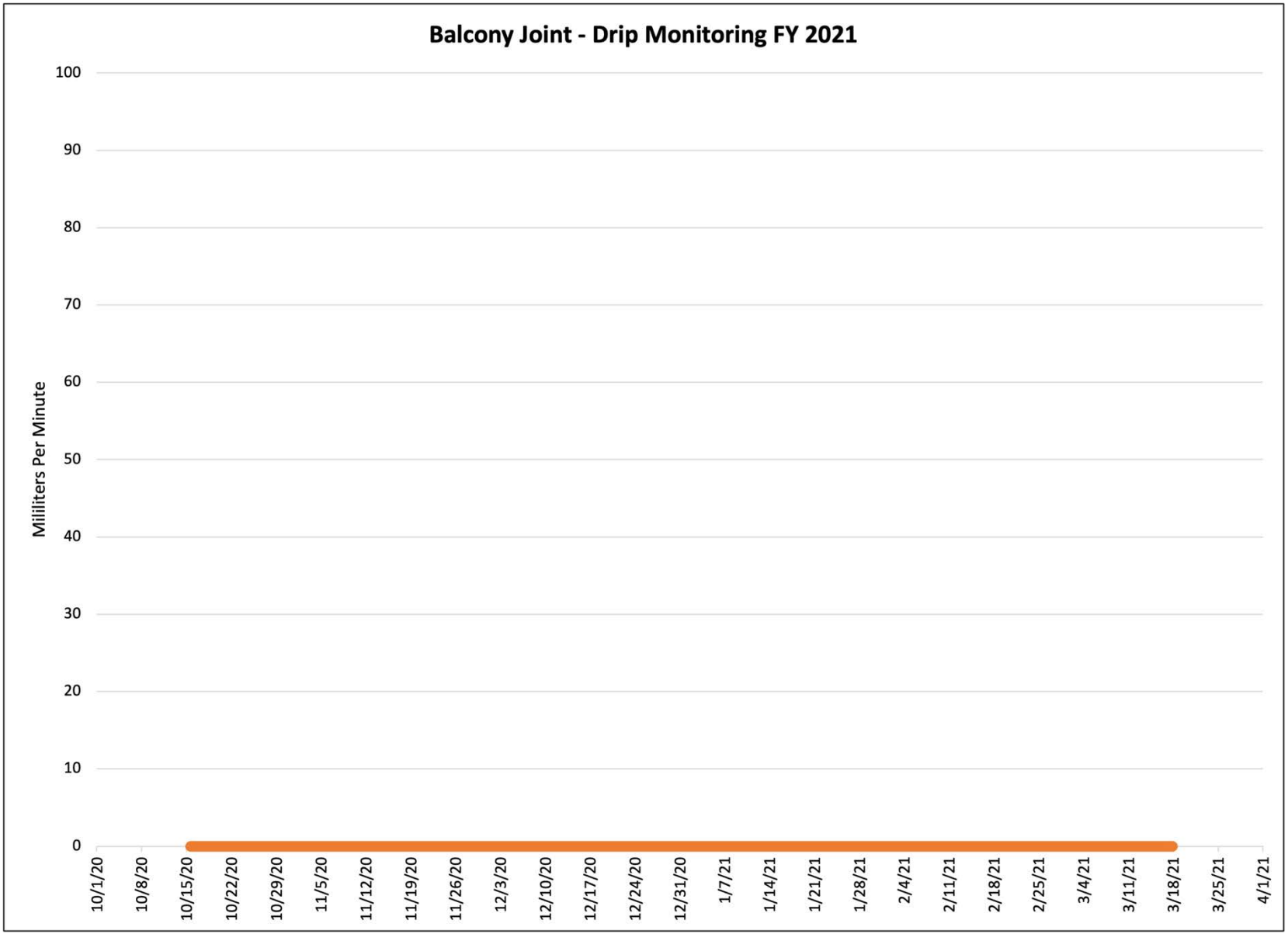
111,803 drip rate measurements since March 2016.
Mean 1.02 – Minimum – 0.00 – Maximum 405.39

Deviation of 2020 drip rates from complete record:
Mean -1.02 – Minimum 0.00 – Maximum -405.39

Good data collected October 15, 2020 through March 17, 2021. The gap in data beginning on March 17, 2021 was due to datalogger failure. The cause of the datalogger failure could not be determined.

The station is currently deployed and operational. The current configuration consists of a plastic sheet tarp hung to collects the flow and funnel it through a RainWise tipper connected to an Onset HOBO Pendant Event Data Logger UA-003-64




Balcony Joint - Drip Monitoring FY 2021
Milliliters Per Minute
100
90
80
70
60
50
40
30
20
10
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
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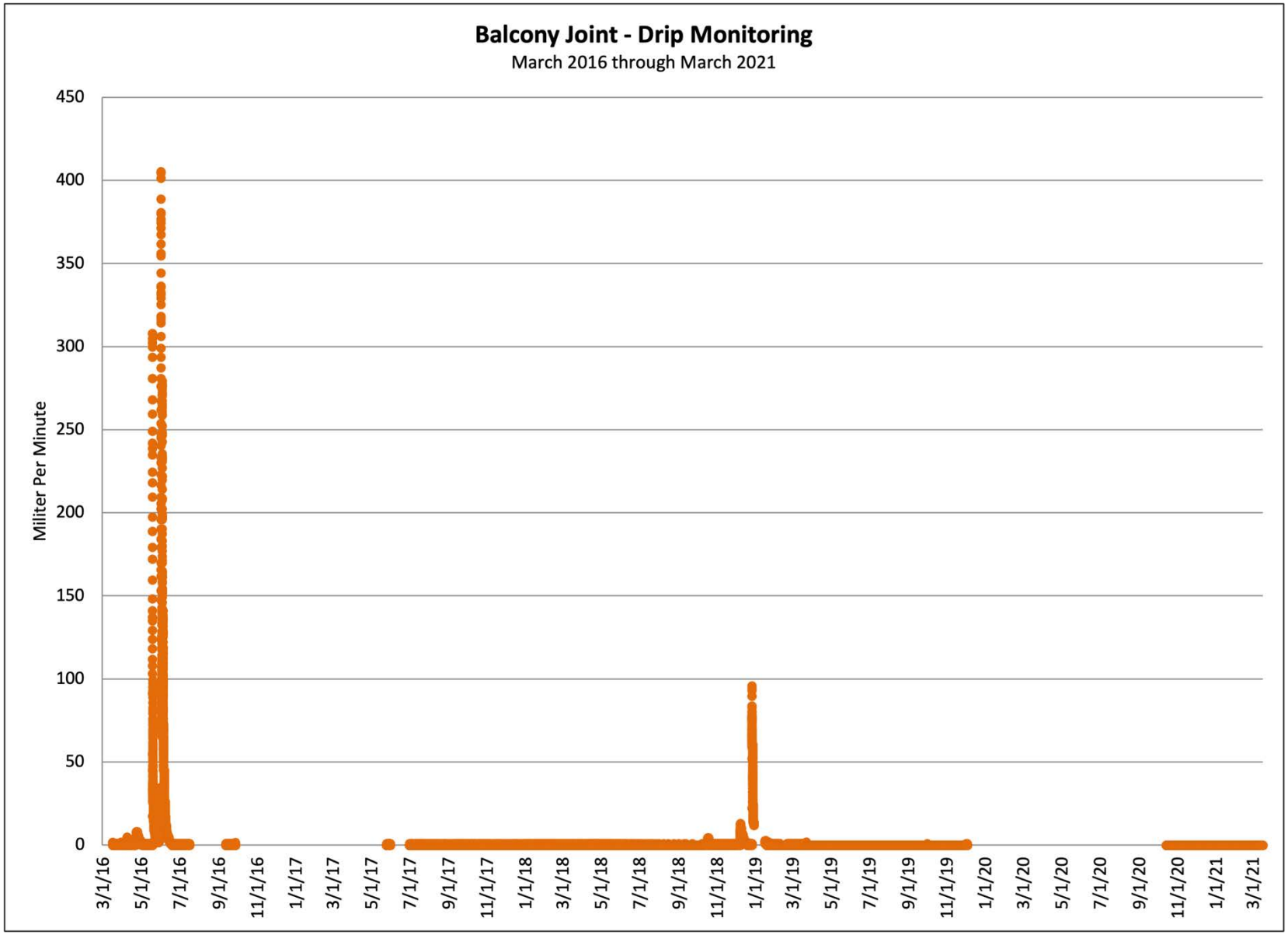
3/18/21
3/25/21
4/1/21


Balcony Joint - Drip Monitoring
March 2016 through March 2021
Militer Per Minute
450
400
350
300
250
200
150
100
50
0
3/1/16
5/1/16
7/1/16
9/1/16
11/1/16
1/1/17
3/1/17
5/1/17
7/1/17
9/1/17
11/1/17
1/1/18
3/1/18
5/1/18
7/1/18
9/1/18
11/1/18
1/1/19
3/1/19
5/1/19
7/1/19
9/1/19
11/1/19
1/1/20
3/1/20
5/1/20
7/1/20
9/1/20
11/1/20
1/1/21
3/1/21

Fondue Drip

Discrete Cave Drip

This site is a dripping formation area located at an elevation of 712.9 ft msl and is within the Dolomitic Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

27,202 drip rate measurements during FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.00

124,512 drip rate measurements since March 2016.
Mean 0.03 – Minimum – 0.00 – Maximum 11.43

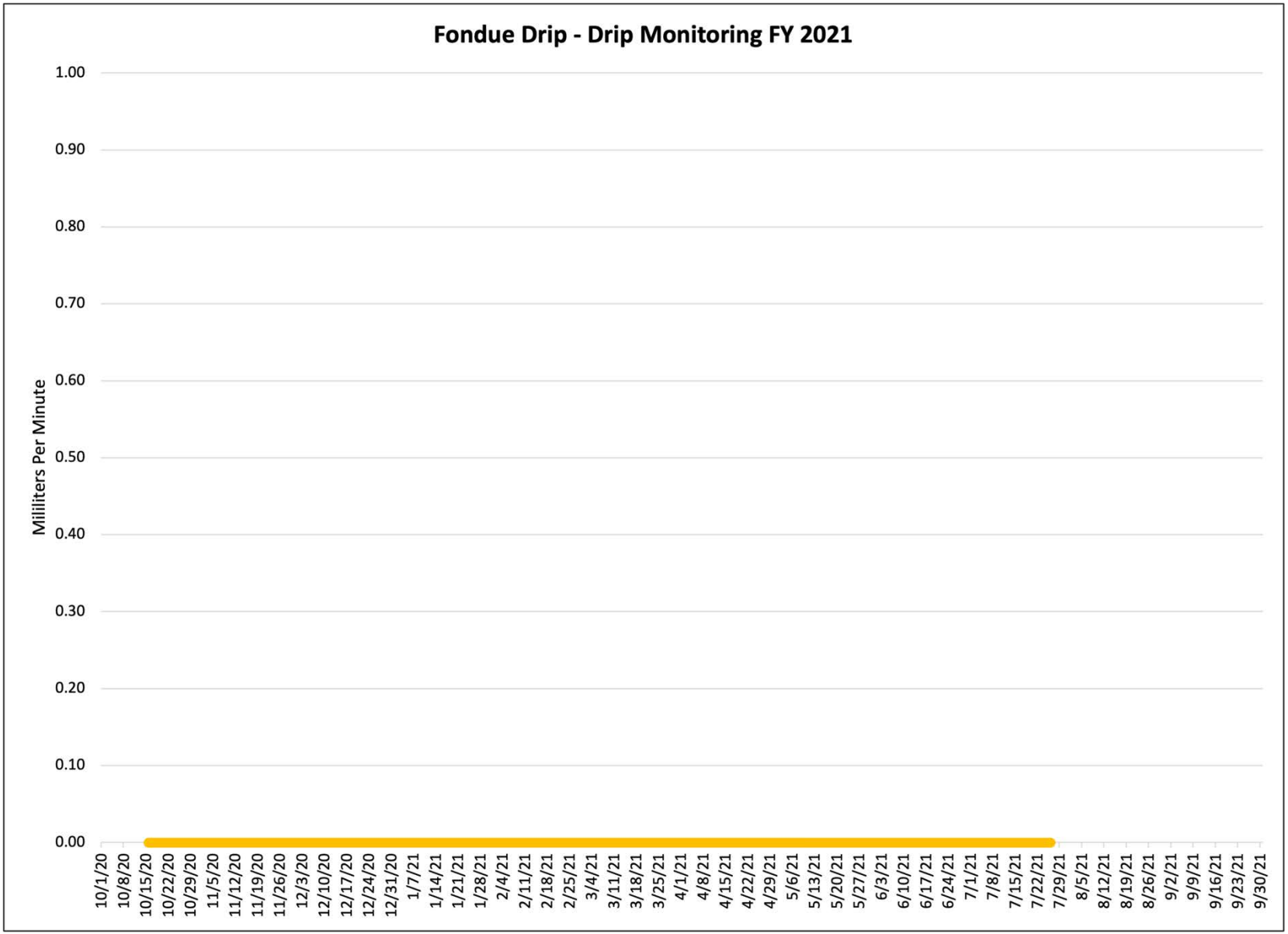
Deviation of 2020 drip rates from complete record:
Mean -0.03 – Minimum 0.00 – Maximum -11.43

Good data collected October 8, 2020 through July 26, 2021. The gap in data beginning on July 26, 2021 was due to data logger failure. The cause of the failure could not be determined.

The station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO Pendant Event Data Logger UA-003-64



Cave Specialist Dylan Beeler at Fondue Drip


Fondue Drip - Drip Monitoring FY 2021
Milliliters Per Minute
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
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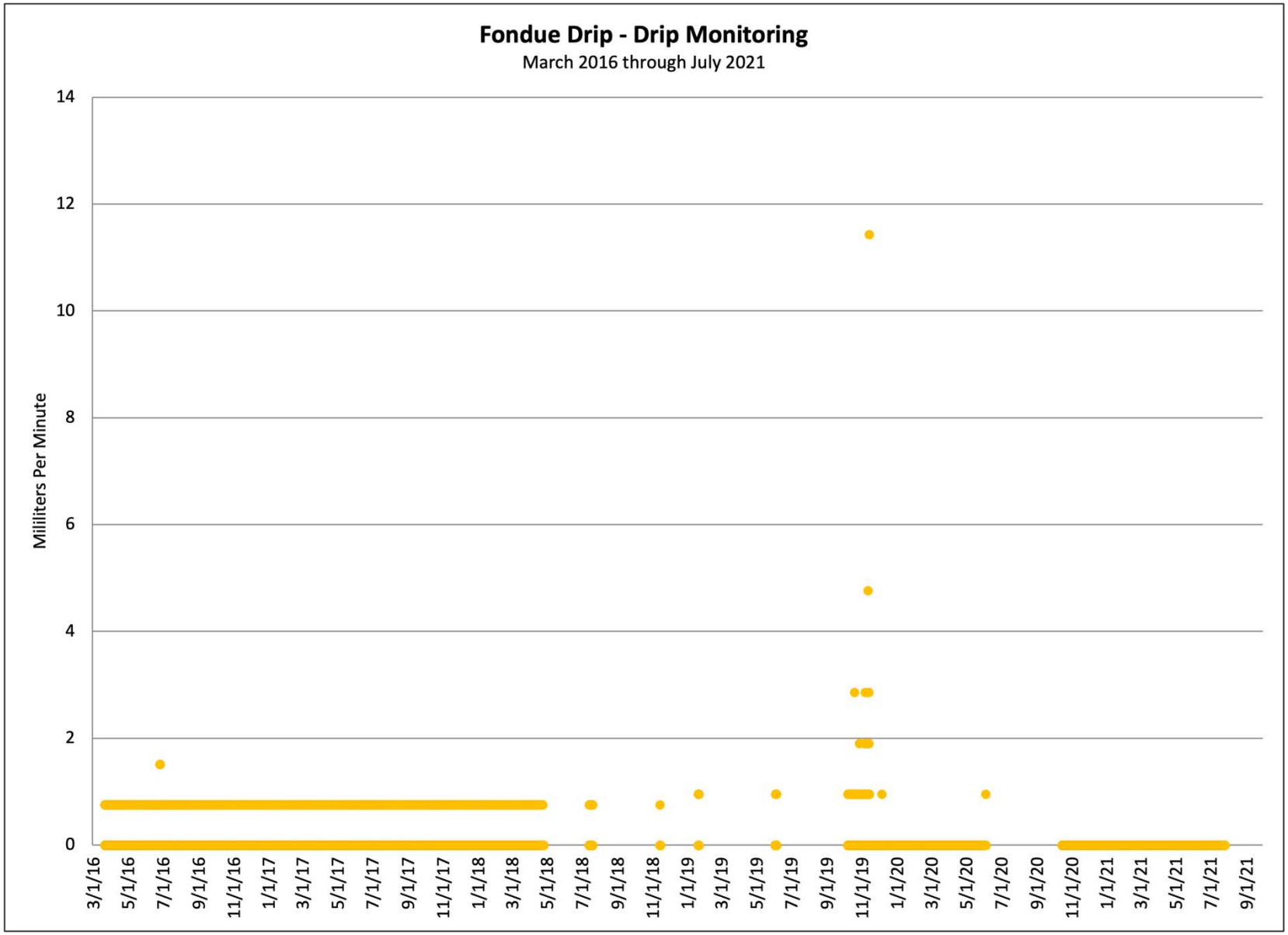
9/23/21
9/30/21


Fondue Drip - Drip Monitoring
March 2016 through July 2021
Milliliters Per Minute
14
12
10
8
6
4
2
0
3/1/16
5/1/16
7/1/16
9/1/16
11/1/16
1/1/17
3/1/17
5/1/17
7/1/17
9/1/17
11/1/17
1/1/18
3/1/18
5/1/18
7/1/18
9/1/18
11/1/18
1/1/19
3/1/19
5/1/19
7/1/19
9/1/19
11/1/19
1/1/20
3/1/20
5/1/20
7/1/20
9/1/20
11/1/20
1/1/21
3/1/21
5/1/21
7/1/21
9/1/21

Cheese and Chocolate Drip

Discrete Cave Drip

This site is a collection of drips located at an elevation of 712.9 ft msl and is within the Dolomitic Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

0 drip rate measurements during FY 2021.

137,680 drip rate measurements since October 2014.
Mean 3.56 – Minimum – 0.00 – Maximum 446.07

No data collected due to failure of the datalogger and tipper. The cause of the failures could not be determined.

The station is currently deployed and operational. The current configuration consists of a plastic sheet tarp hung to collects the drips and funnel them through a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB The RainWise tipper is suspended with a bucket hanging below it which collects just over 2 liters of water before pouring over.

At this same location there is also an isco 6712 Autosampler with a 71 ft suction line for drawing samples from Culvert Crawl Lower Pool. To keep it safer during recharge events the autosampler is suspended from the ceiling utilizing a pully system which allows it to be lowered for sample retrieval.

The peculiar positioning of equipment in this area is dictated by the locations of natural rock outcroppings appropriate and competent to support anchors sufficient to carry the loads; while also keeping all equipment clear of the primary flow paths inundated during recharge events.

On October 15, 2020 the webbing hanging the autosampler was found to be cut, with the autosampler hanging precariously from it's horizontal stabilization supports. By counting the stitches from the knot to the cut and comparing with high resolution photographs it was determined that the webbing cut was in a place where the webbing was free hanging and not rubbing against rock. It is worth noting that this setup survived intact throughout all previous massive flood events.





Photo on the left shows the cut webbing as it was found. Photo on the right shows the autosampler hanging precariously and oriented horizontally.



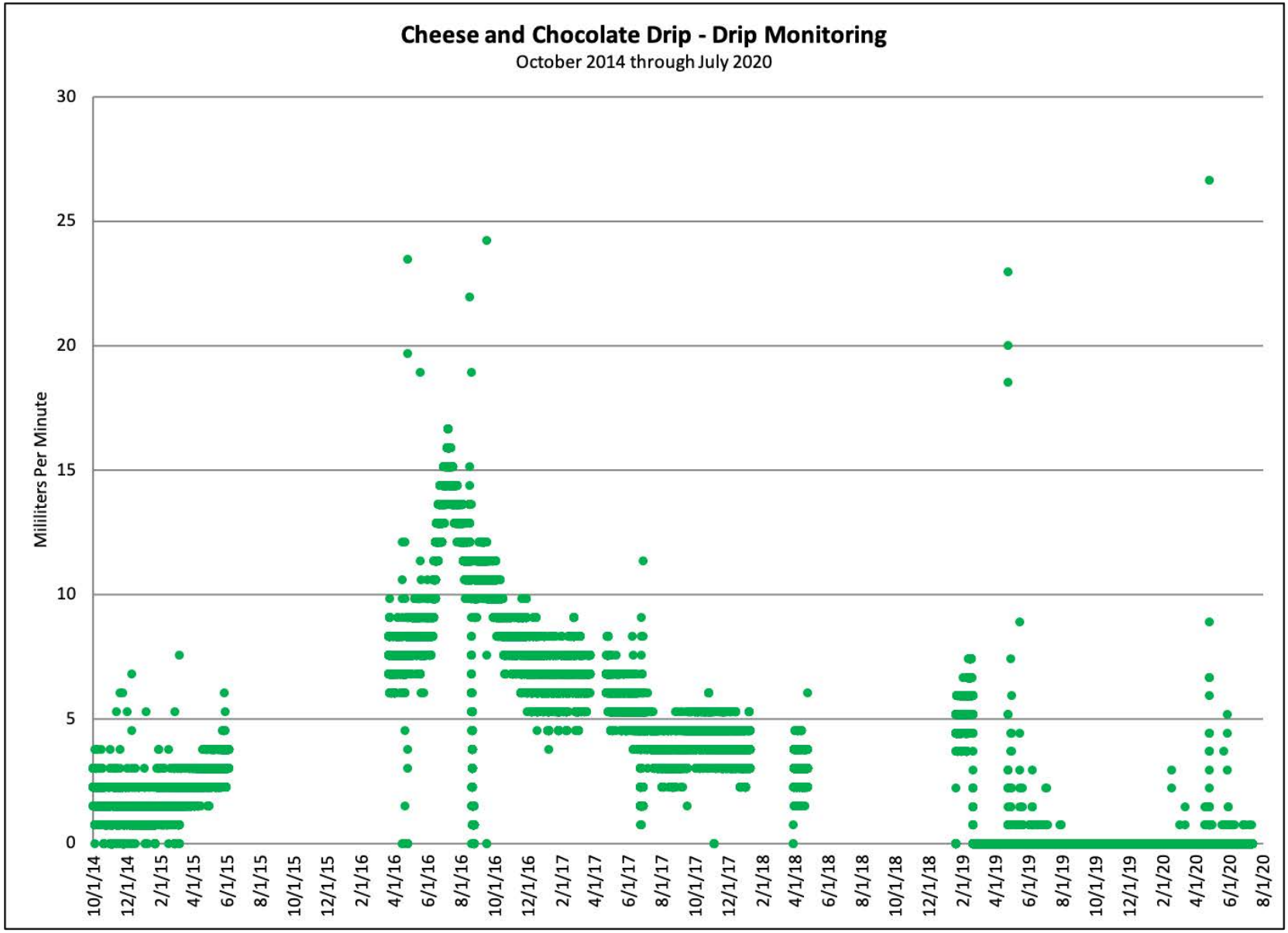


Photo on the Left was taken on October 8, 2020. Photo on the right shows how the equipment was found on October 15, 2020.



Cheese and Chocolate as is should appear.

In this picture is the Cheese and Chocolate Drip, Fondue Drip, and the autosampler for Culvert Crawl Lower Pool.


Cheese and Chocolate Drip - Drip Monitoring
October 2014 through July 2020
Milliliters Per Minute
30
25
20
15
10
5
0
10/1/14
12/1/14
2/1/15
4/1/15
6/1/15
8/1/15
10/1/15
12/1/15
2/1/16
4/1/16
6/1/16
8/1/16
10/1/16
12/1/16
2/1/17
4/1/17
6/1/17
8/1/17
10/1/17
12/1/17
2/1/18
4/1/18
6/1/18
8/1/18
10/1/18
12/1/18
2/1/19
4/1/19
6/1/19
8/1/19
10/1/19
12/1/19
2/1/20
4/1/20
6/1/20
8/1/20

Fault Dome
Discrete Cave Drip

This site is a discrete cave drip located at an elevation of 669.1 ft msl and is within fault breccia of the primary fault the cave is formed along.

Statistical volumes below are in milliliters per minute.

31,145 drip rate measurements during FY 2021.
Mean 10.15 – Minimum 6.95 – Maximum 13.89

167,787 drip rate measurements since November 2014.
Mean 25.29 – Minimum – 6.25 – Maximum 65.53

Deviation of 2020 drip rates from complete record:
Mean -15.14 – Minimum 0.70 – Maximum -51.64

Good data collected October 1, 2020 through October 21, 2020, and November 29, 2020 through November 20, 2020, and December 1, 2020 through September 29, 2021.

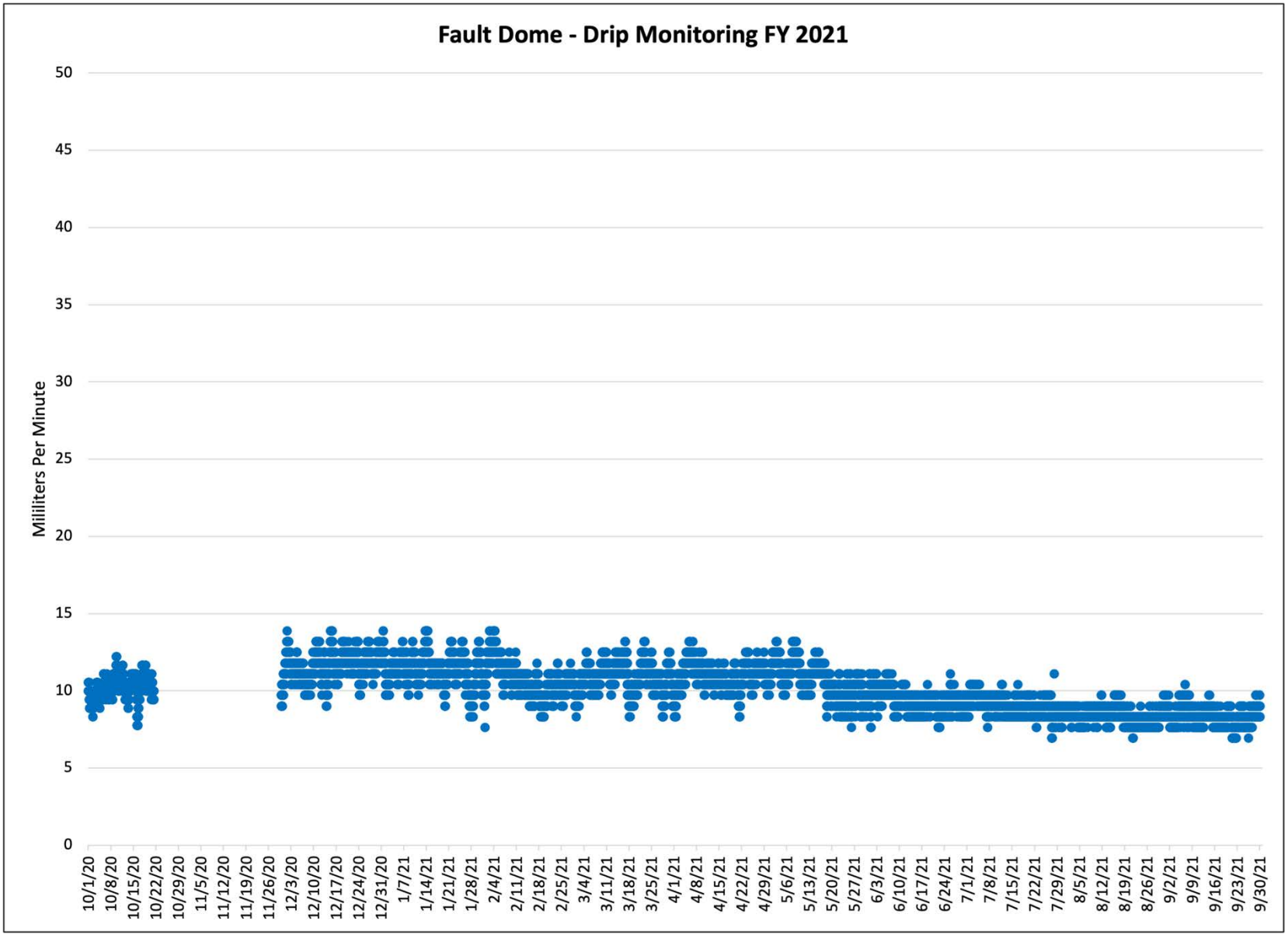
The gap in data from October 21, 2020 through November 29, 2020 was due to the station experiencing an unplanned physical rearrangement of its components. On November 21, 2020 the station was discovered in disarray with the tipper gauge pulled away from the wall towards the entrance. A large nylon cable tie (ziptie) rated with a tensile of 778_{N} / 175_{LBF} was broken, and 14 gauge wire with a 100_{LBS} safe working load rating was mangled. This disarray appeared markedly different from when the station has previously experienced an unplanned rearrangement of its components due to an overwhelming flood pulse and the station is pushed into the wall and in the direction away from the direction of the entrance. The gap in data from November 20, 2020 through December 1, 2020 was due to datalogger failure. The cause of the failure could not be determined.

The station is currently deployed and operational. The current configuration funnels a two foot diameter area of drips through an Onset RG3 tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB



Fault Dome station in disarray as discovered on November 29, 2020




Fault Dome - Drip Monitoring FY 2021
Milliliters Per Minute
50
45
40
35
30
25
20
15
10
5
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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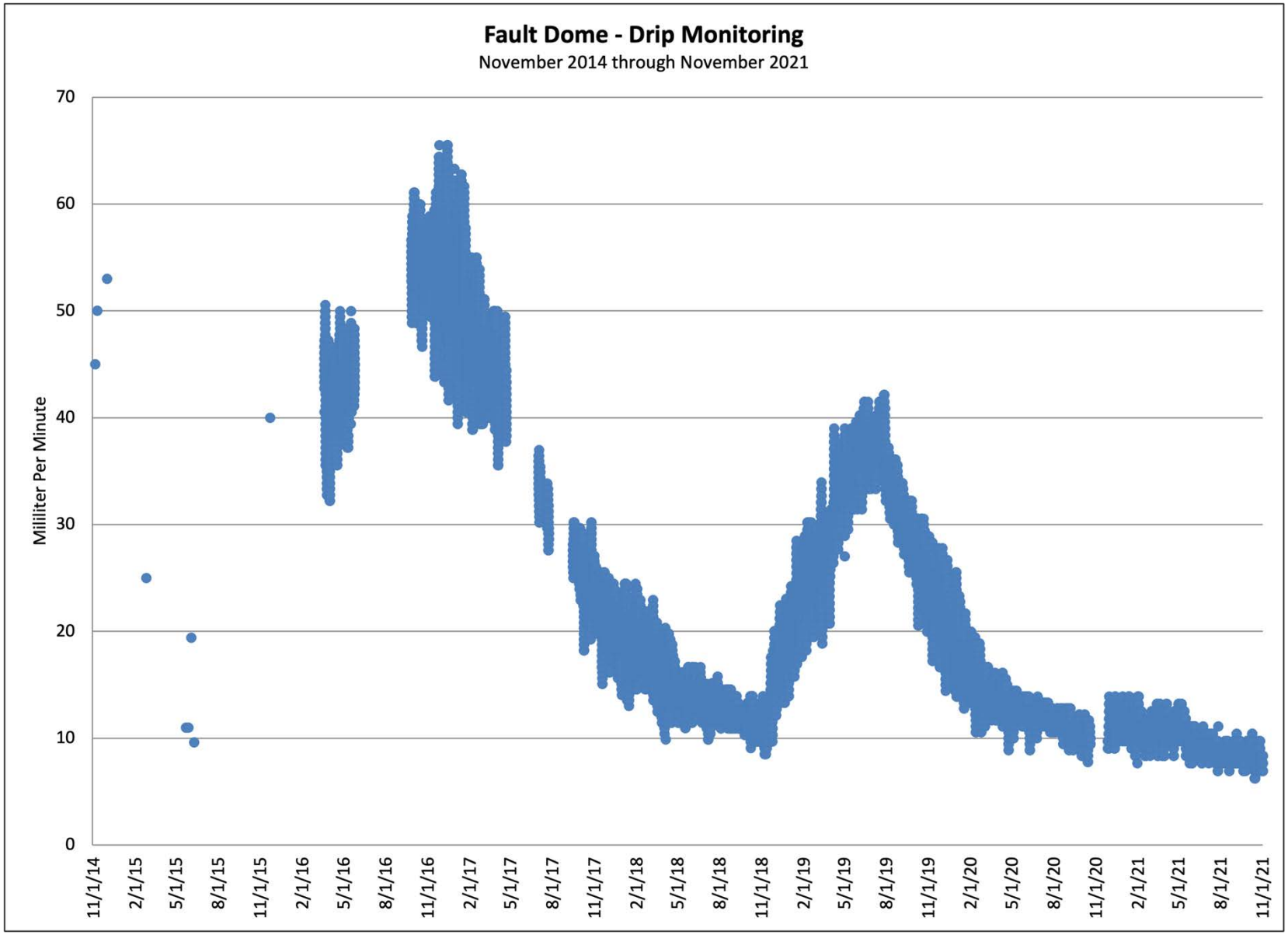
9/9/21
9/16/21
9/23/21
9/30/21


Fault Dome - Drip Monitoring
November 2014 through November 2021
Milliliter Per Minute
70
60
50
40
30
20
10
0
11/1/14
2/1/15
5/1/15
8/1/15
11/1/15
2/1/16
5/1/16
8/1/16
11/1/16
2/1/17
5/1/17
8/1/17
11/1/17
2/1/18
5/1/18
8/1/18
11/1/18
2/1/19
5/1/19
8/1/19
11/1/19
2/1/20
5/1/20
8/1/20
11/1/20
2/1/21
5/1/21
8/1/21
11/1/21

Drip Pit

Discrete Cave Drip

This site is the most active single dripping speleothem in the cave. It is a prominent stalactite, the tip of which is at an elevation of 663.6 ft msl. This is within the Dolomitic Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

23,020 drip rate measurements during FY 2021.
Mean 51.57 – Minimum 26.03 – Maximum 135.99

133,824 drip rate measurements since October 2014.
Mean 59.28 – Minimum – 0.00 – Maximum 135.99

Deviation of 2020 drip rates from complete record:
Mean -7.71 – Minimum +26.03 – Maximum 0.00

Good data collected from October 1, 2020 through May 28, 2021. Data gap beginning on May 28, 2021 due to tipper gauge failure from corrosion on the circuit board.

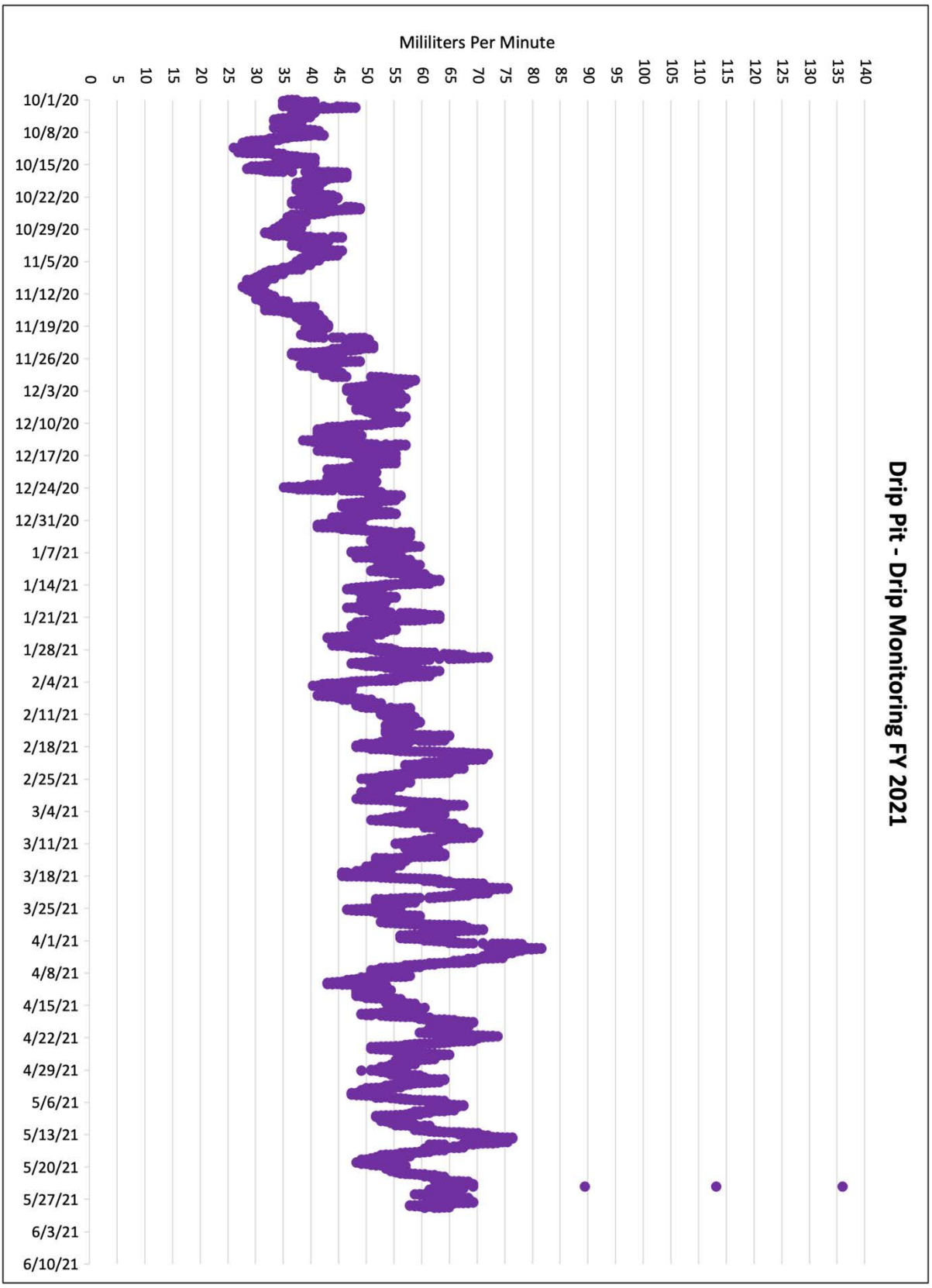
This station is currently deployed and operational. Current configuration funnels the water from the single stalactite through a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB. The RainWise tipper is suspended from the ceiling, with a bucket hanging below it which collects just over 2 liters of water before pouring over. There is an isco 6712 Autosampler with a 5 ft suction line for drawing samples from the bucket. To keep it safer during recharge events the autosampler is suspended from the ceiling utilizing a pully system which allows it to be lowered for sample retrieval.

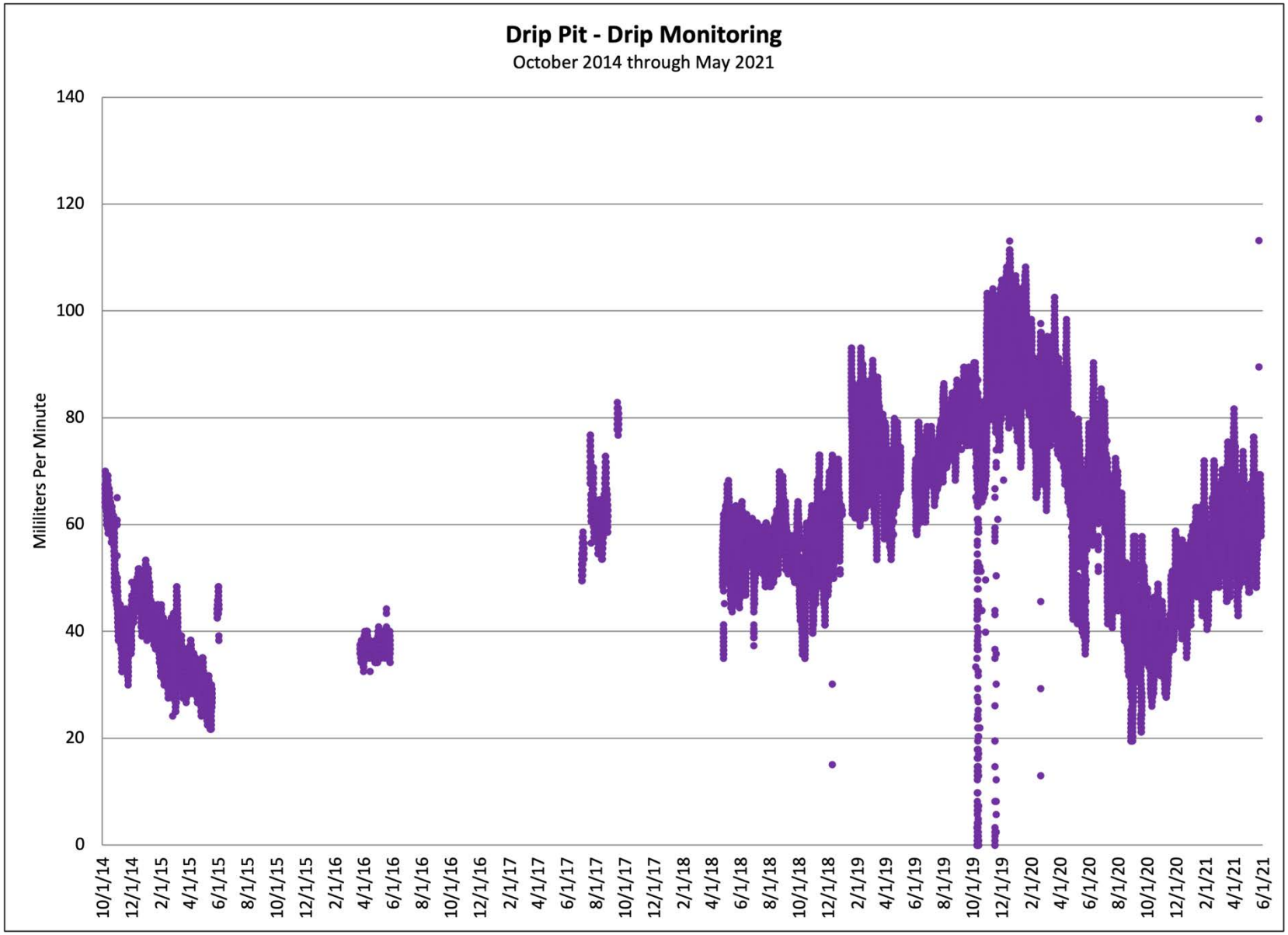




The Drip Pit Stalactite drips into a funnel, as shown in the picture on the left. As seen on the right, this funnel flows into a tipper that is suspended from the ceiling with a bucket hanging below it which collects just over 2 liters of water before pouring out/over through the hole seen in the picture. There is also an autosampler suspended from the ceiling, with a suction line for drawing samples from the bucket.




Drip Pit - Drip Monitoring FY 2021
Milliliters Per Minute
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21


Drip Pit - Drip Monitoring
October 2014 through May 2021
Milliliters Per Minute
140
120
100
80
60
40
20
0
10/1/14
12/1/14
2/1/15
4/1/15
6/1/15
8/1/15
10/1/15
12/1/15
2/1/16
4/1/16
6/1/16
8/1/16
10/1/16
12/1/16
2/1/17
4/1/17
6/1/17
8/1/17
10/1/17
12/1/17
2/1/18
4/1/18
6/1/18
8/1/18
10/1/18
12/1/18
2/1/19
4/1/19
6/1/19
8/1/19
10/1/19
12/1/19
2/1/20
4/1/20
6/1/20
8/1/20
10/1/20
12/1/20
2/1/21
4/1/21
6/1/21

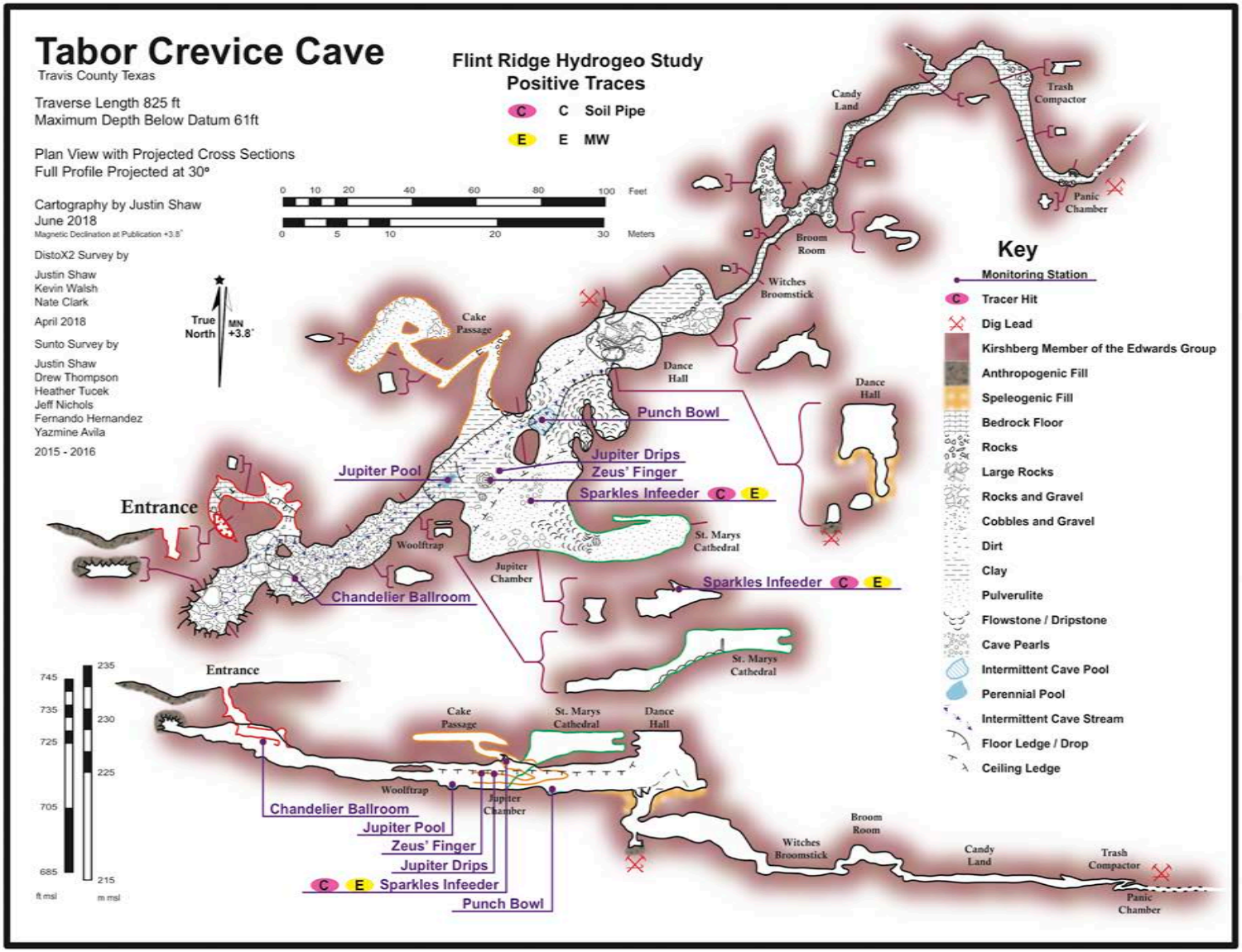
Tabor Crevice Cave

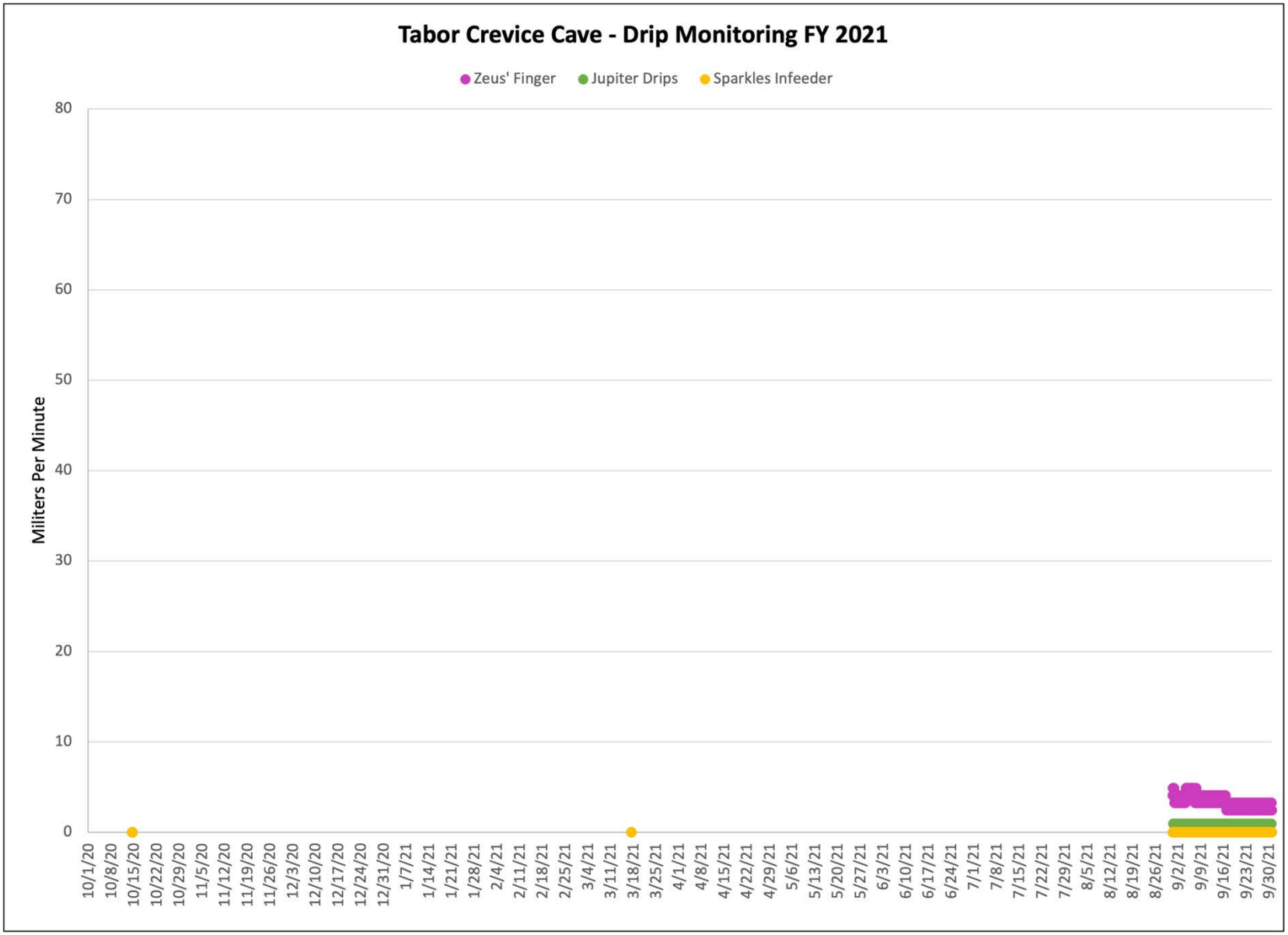
Tabor Crevice Cave is located on a remote part of the Tabor Water Quality Management Area. The cave was dug into by members of the City of Austin Cave Team during July of 2014.

Hydrogeologically it is part of the Flint Ridge System. Though a human sized connection has yet to be made, tracer studies have revealed interconnected flow paths within the vadose zone.



Cave Specialist Ethan Perrine in the Dance Hall in Tabor Crevice Cave.


Tabor Crevice Cave
Travis County Texas
Traverse Length 825 ft
Maximum Depth Below Datum 61ft
Plan View with Projected Cross Sections
Full Profile Projected at 30°
Cartography by Justin Shaw
June 2018
Magnetic Declination at Publication +3.8°
DistoX2 Survey by
Justin Shaw
Kevin Walsh
Nate Clark
April 2018
Sunto Survey by
Justin Shaw
Drew Thompson
Heather Tucek
Jeff Nichols
Fernando Hernandez
Yazmine Avila
2015 - 2016
Flint Ridge Hydrogeo Study
Positive Traces
C C Soil Pipe
E E MW
0 10 20 40 60 80 100 Feet
0 5 10 20 30 Meters
True North MN +3.8°
Entrance
Cake Passage
Dance Hall
Punch Bowl
Jupiter Drips
Zeus' Finger
Jupiter Pool
Sparkles Infeeder C E
Woolftrap
Jupiter Chamber
St. Marys Cathedral
Chandelier Ballroom
Candy Land
Trash Compactor
Panic Chamber
Broom Room
Witches Broomstick
Key
Monitoring Station
Tracer Hit
Dig Lead
Kirshberg Member of the Edwards Group
Anthropogenic Fill
Speleogenic Fill
Bedrock Floor
Rocks
Large Rocks
Rocks and Gravel
Cobbles and Gravel
Dirt
Clay
Pulverulite
Flowstone / Dripstone
Cave Pearls
Intermittent Cave Pool
Perennial Pool
Intermittent Cave Stream
Floor Ledge / Drop
Ceiling Ledge
745
735
725
705
685
ft msl
235
230
225
215
m msl


Tabor Crevice Cave - Drip Monitoring FY 2021
Zeus' Finger
Jupiter Drips
Sparkles Infeeder
Militers Per Minute
80
70
60
50
40
30
20
10
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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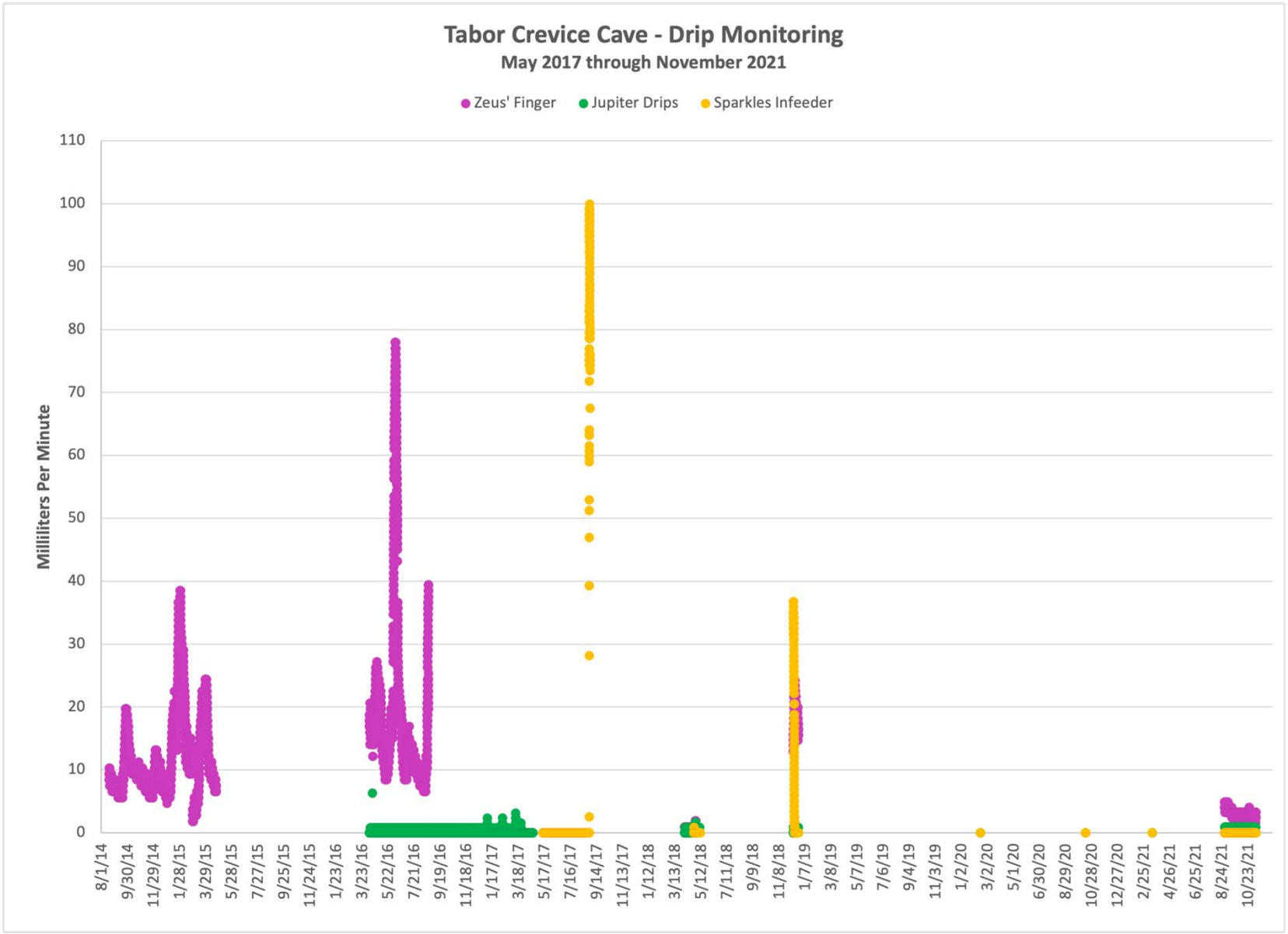
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21


Tabor Crevice Cave - Drip Monitoring
May 2017 through November 2021
Zeus' Finger
Jupiter Drips
Sparkles Infeeder
Milliliters Per Minute
110
100
90
80
70
60
50
40
30
20
10
0
8/1/14
9/30/14
11/29/14
1/28/15
3/29/15
5/28/15
7/27/15
9/25/15
11/24/15
1/23/16
3/23/16
5/22/16
7/21/16
9/19/16
11/18/16
1/17/17
3/18/17
5/17/17
7/16/17
9/14/17
11/13/17
1/12/18
3/13/18
5/12/18
7/11/18
9/9/18
11/8/18
1/7/19
3/8/19
5/7/19
7/6/19
9/4/19
11/3/19
1/2/20
3/2/20
5/1/20
6/30/20
8/29/20
10/28/20
12/27/20
2/25/21
4/26/21
6/25/21
8/24/21
10/23/21

Zeus' Finger

Discrete Cave Drip

This site has historically been the most active drip inside Tabor Crevice Cave, with a mean flow rate of 13.30 milliliters per minute. It is a stalactite located within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

2,931 drip rate measurements during FY 2021.
Mean 3.38 – Minimum 0.00 – Maximum 4.88

46,004 drip rate measurements since August 2014.
Mean 11.73 – Minimum – 0.00 – Maximum 77.96

Deviation of 2020 drip rates from complete record:
Mean -8.35 – Minimum 0.00 – Maximum -73.08

Drip rate manually recorded on October 14, 2020 and March 17, 2021. Good data recorded August 31, 2021 through November 30, 2021.

Datalogger failures were due to undetermined causes. All stations in Tabor Crevice Cave are connected to the same datalogger. Datalogger was replaced on October 14, 2020 and August 31, 2021.

To facilitate FY 2021 monitoring the cave was accessed four times and during the first two trips Zeus' Finger was observed dry, which is anomalous. While this stations complete drip monitoring record (46,004 drip rate measurements since August 2015) shows some 15-minute intervals of zero tips during April of 2018, the drip was never dry and as such the zero records can result in a deceptive interpretation and calculated statistical mean of 0.00 milliliters per minute. If during the period of lowest flow the drip rate is calculated hourly you get a true minimum flow rate of 0.23 milliliters per minute.

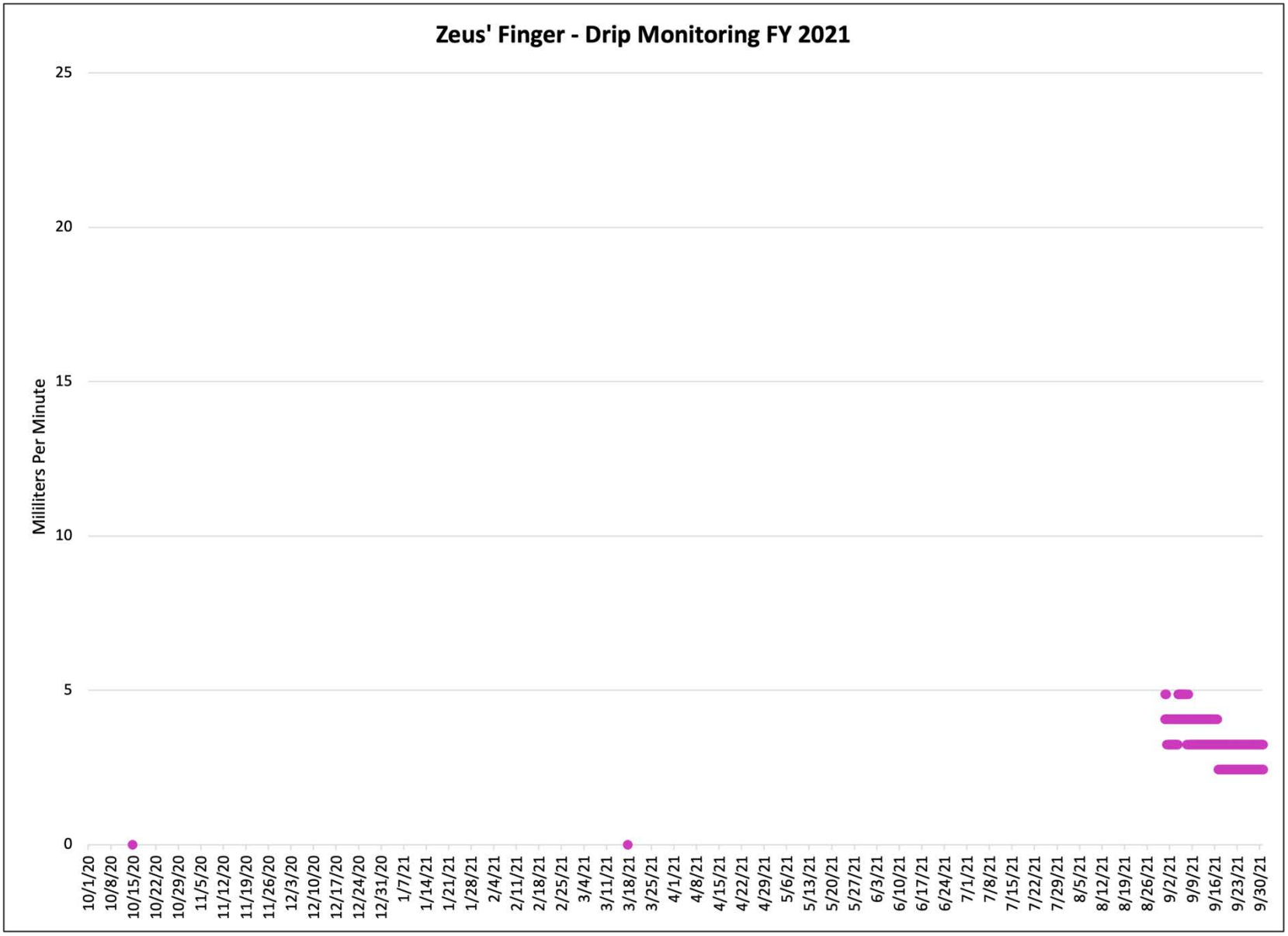
Station is currently deployed and operational. The current configuration is a Rain Wise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB



Current setup of Zeus' Finger monitoring station. The large rocks are necessary to keep playful racoons from destroying the equipment.



A rapid succession of cave drips, flowing at a rate of 17.9 milliliters per minute, strike dripstone formations after issuing from Zeus' Finger in this photo from May 30, 2015.


Zeus' Finger - Drip Monitoring FY 2021
Milliliters Per Minute
25
20
15
10
5
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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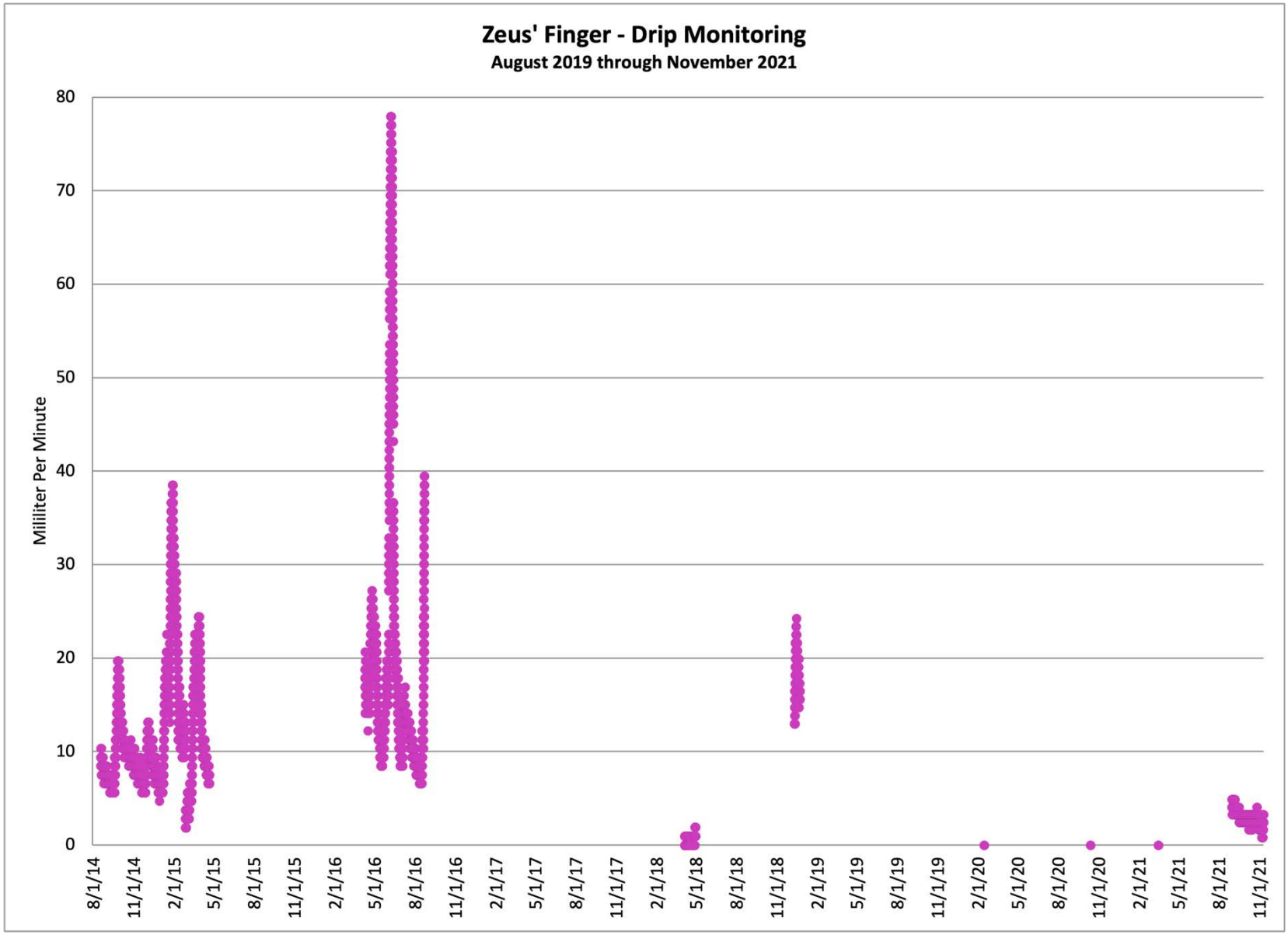
9/16/21
9/23/21
9/30/21


Zeus' Finger - Drip Monitoring
August 2019 through November 2021
Milliliter Per Minute
80
70
60
50
40
30
20
10
0
8/1/14
11/1/14
2/1/15
5/1/15
8/1/15
11/1/15
2/1/16
5/1/16
8/1/16
11/1/16
2/1/17
5/1/17
8/1/17
11/1/17
2/1/18
5/1/18
8/1/18
11/1/18
2/1/19
5/1/19
8/1/19
11/1/19
2/1/20
5/1/20
8/1/20
11/1/20
2/1/21
5/1/21
8/1/21
11/1/21

Jupiter Drips

Discrete Cave Drip

This site is a collection of drips from tubular stalactites located within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

2.931 drip rate measurements during FY 2021.
Mean 0.01 – Minimum 0.00 – Maximum 0.93

47,837 drip rate measurements since April 2016.
Mean 0.01 – Minimum – 0.00 – Maximum 6.35

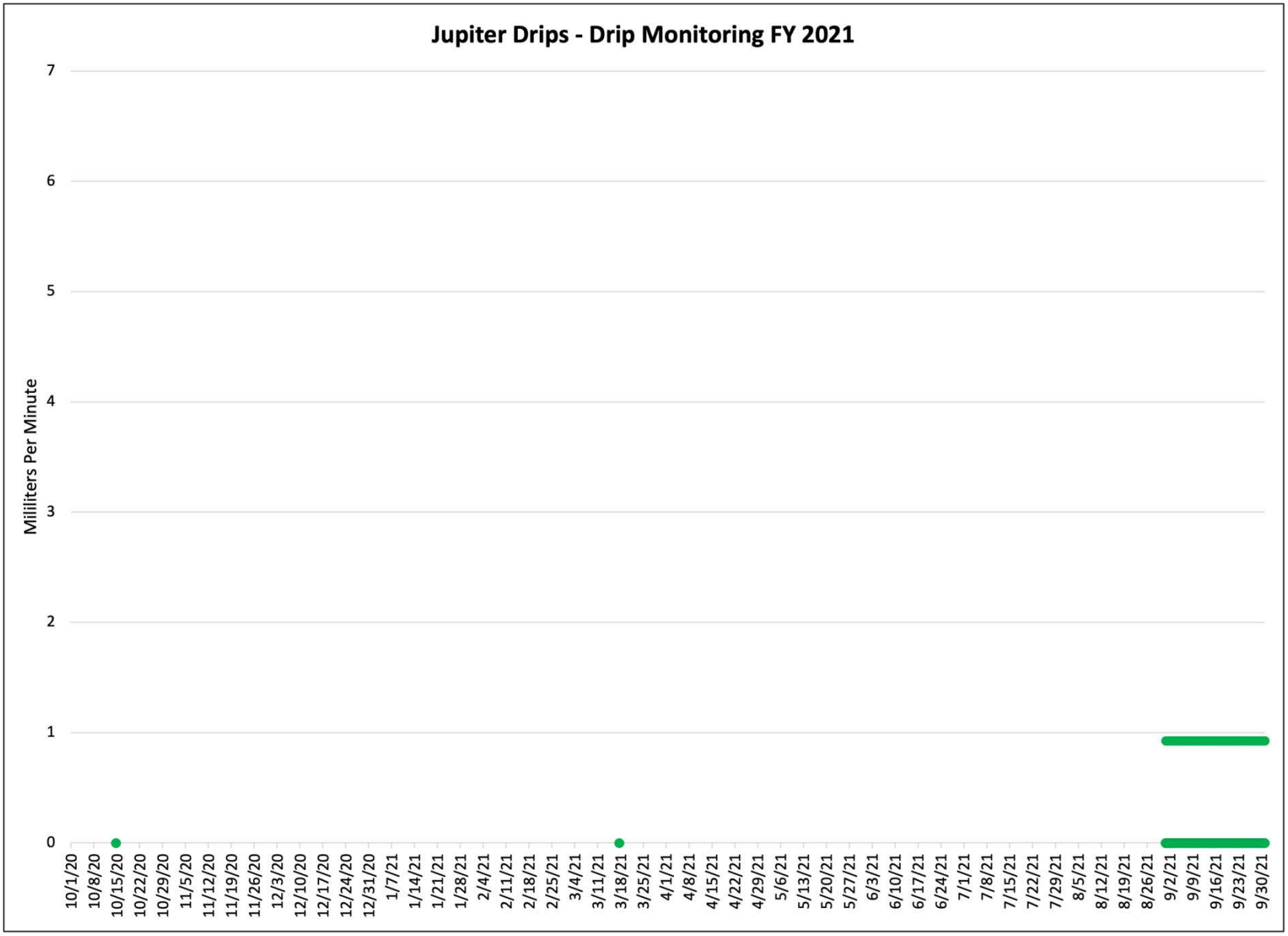
Deviation of 2020 drip rates from complete record:
Mean 0.00 – Minimum 0.00 – Maximum -5.42

Drip rate manually recorded on October 14, 2020 and March 17, 2021. Good data recorded August 31, 2021 through November 30, 2021.

Datalogger failures were due to undetermined causes. All stations in Tabor Crevice Cave are connected to the same datalogger. Datalogger was replaced on October 14, 2020 and August 31, 2021.

Station is currently deployed and operational. The current configuration consists of a small plastic sheet tarp funneling multiple drips through a Rain Wise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB




Jupiter Drips - Drip Monitoring FY 2021
Milliliters Per Minute
7
6
5
4
3
2
1
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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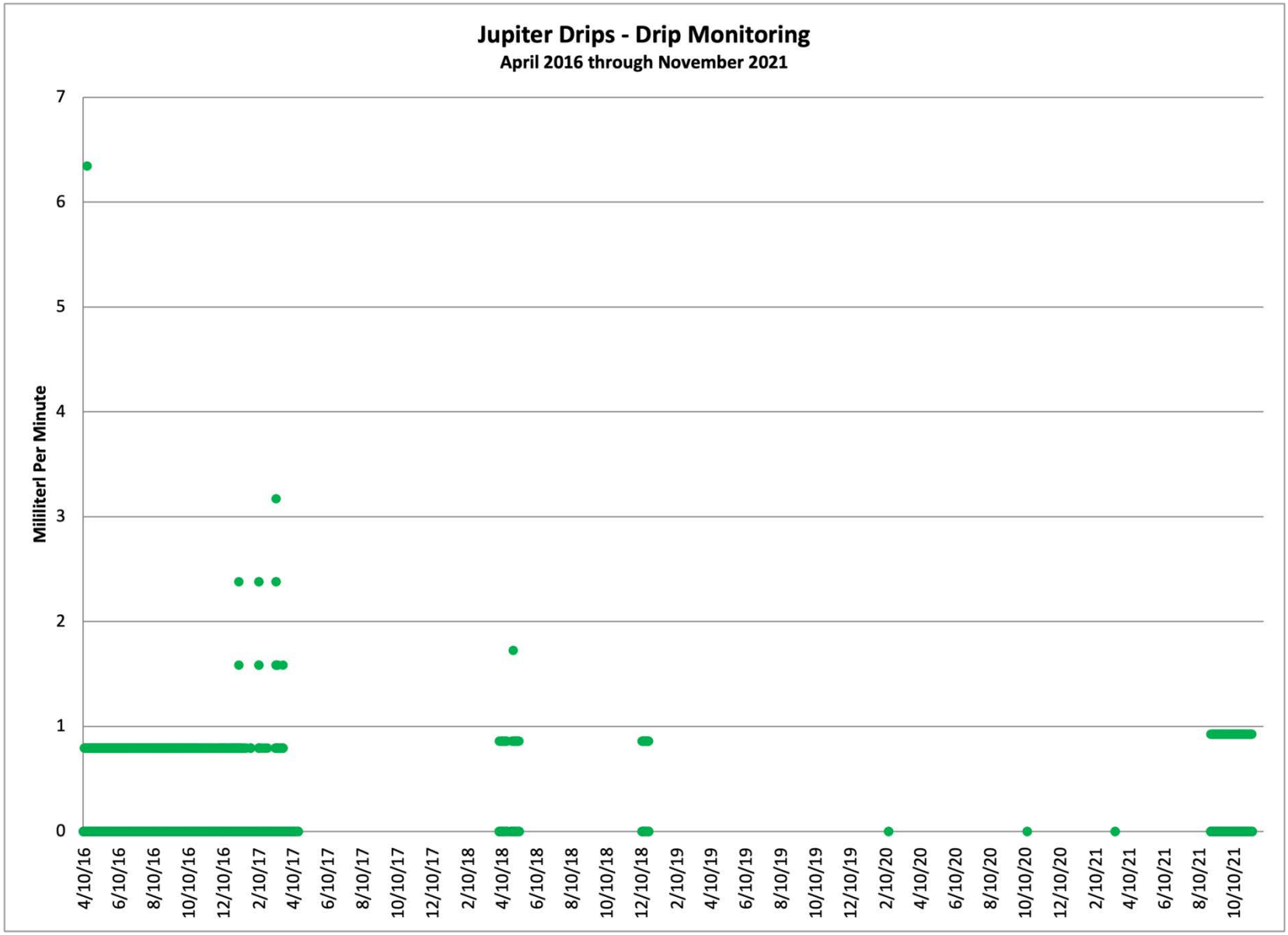
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21


Jupiter Drips - Drip Monitoring
April 2016 through November 2021
Milliliterl Per Minute
7
6
5
4
3
2
1
0
4/10/16
6/10/16
8/10/16
10/10/16
12/10/16
2/10/17
4/10/17
6/10/17
8/10/17
10/10/17
12/10/17
2/10/18
4/10/18
6/10/18
8/10/18
10/10/18
12/10/18
2/10/19
4/10/19
6/10/19
8/10/19
10/10/19
12/10/19
2/10/20
4/10/20
6/10/20
8/10/20
10/10/20
12/10/20
2/10/21
4/10/21
6/10/21
8/10/21
10/10/21

Sparkles Infeeder

Infeeder

This site is an infeeder and is within the Kirschberg Member of the Edwards Group. The site is decorated with brilliant white sparkling stalactites and below it is an area of microtravertine dams and the only known occurrence of cave pearls in Travis Co. This is a normally dry formation area and only flows for a short time after rain events.

Statistical volumes below are in milliliters per minute.

2,931 drip rate measurements during FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.00

39,924 drip rate measurements since May 2017.
Mean 1.12 – Minimum – 0.00 – Maximum 100.00

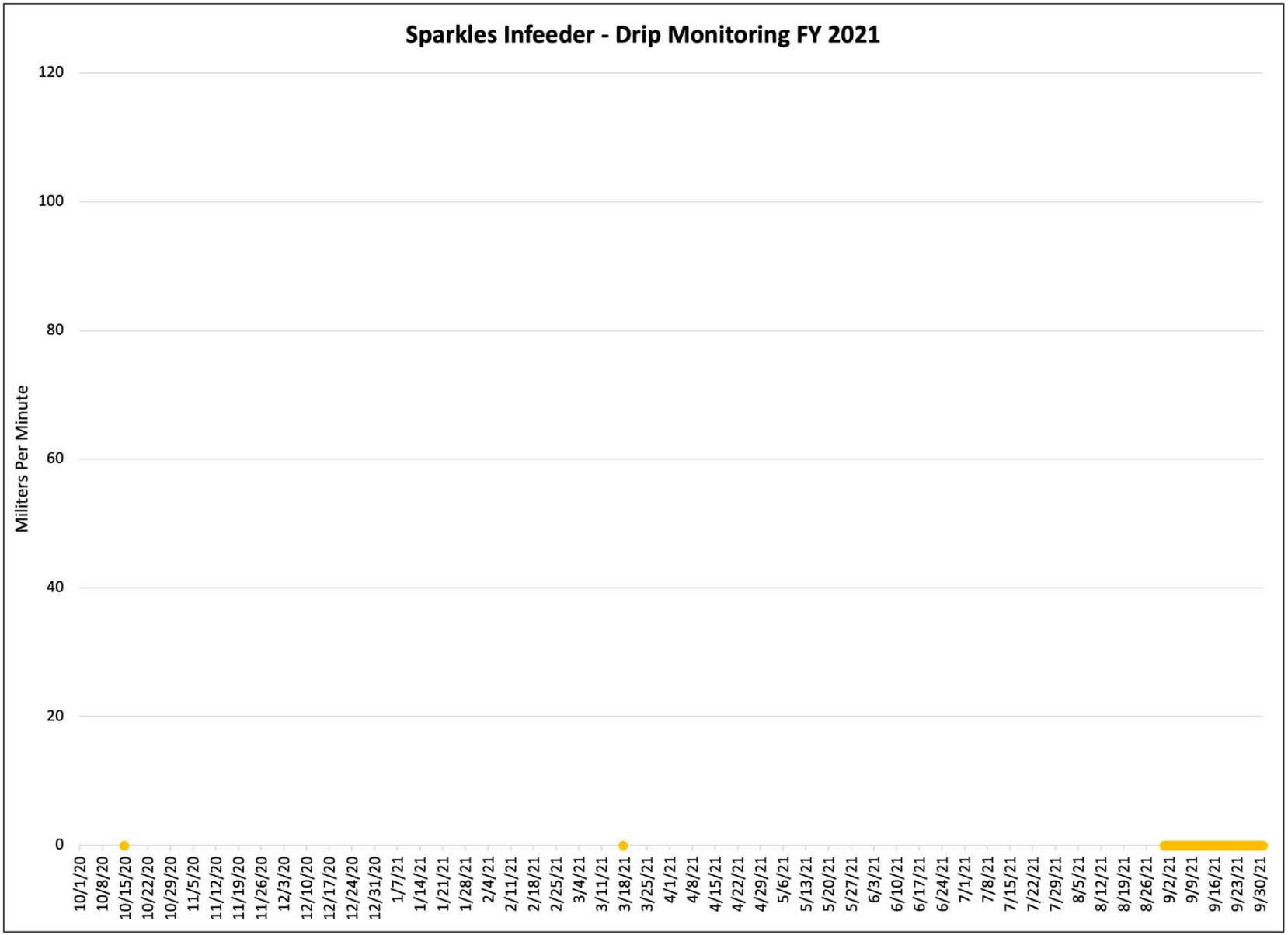
Deviation of 2020 drip rates from complete record:
Mean -1.12 – Minimum 0.00 – Maximum -100.00

Drip rate manually recorded on October 14, 2020 and March 17, 2021. Good data recorded August 31, 2021 through November 30, 2021.

Datalogger failures were due to undetermined causes. All stations in Tabor Crevice Cave are connected to the same datalogger. Datalogger was replaced on October 14, 2020 and August 31, 2021.

Station is currently deployed and operational. The current configuration is a Rain Wise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB




Sparkles Infeeder - Drip Monitoring FY 2021
Militers Per Minute
120
100
80
60
40
20
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
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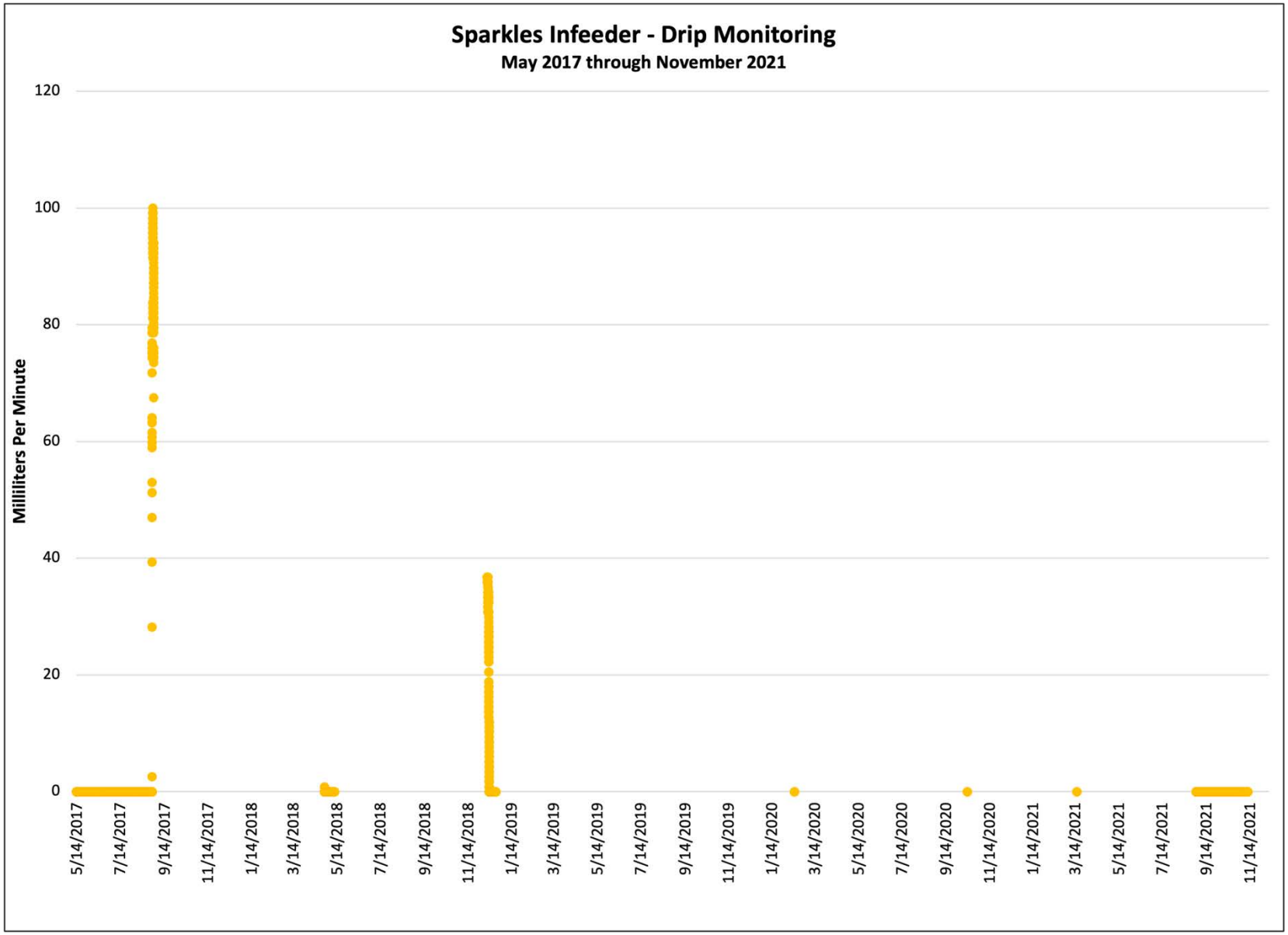
9/16/21
9/23/21
9/30/21


Sparkles Infeeder - Drip Monitoring
May 2017 through November 2021
Milliliters Per Minute
120
100
80
60
40
20
0
5/14/2017
7/14/2017
9/14/2017
11/14/2017
1/14/2018
3/14/2018
5/14/2018
7/14/2018
9/14/2018
11/14/2018
1/14/2019
3/14/2019
5/14/2019
7/14/2019
9/14/2019
11/14/2019
1/14/2020
3/14/2020
5/14/2020
7/14/2020
9/14/2020
11/14/2020
1/14/2021
3/14/2021
5/14/2021
7/14/2021
9/14/2021
11/14/2021

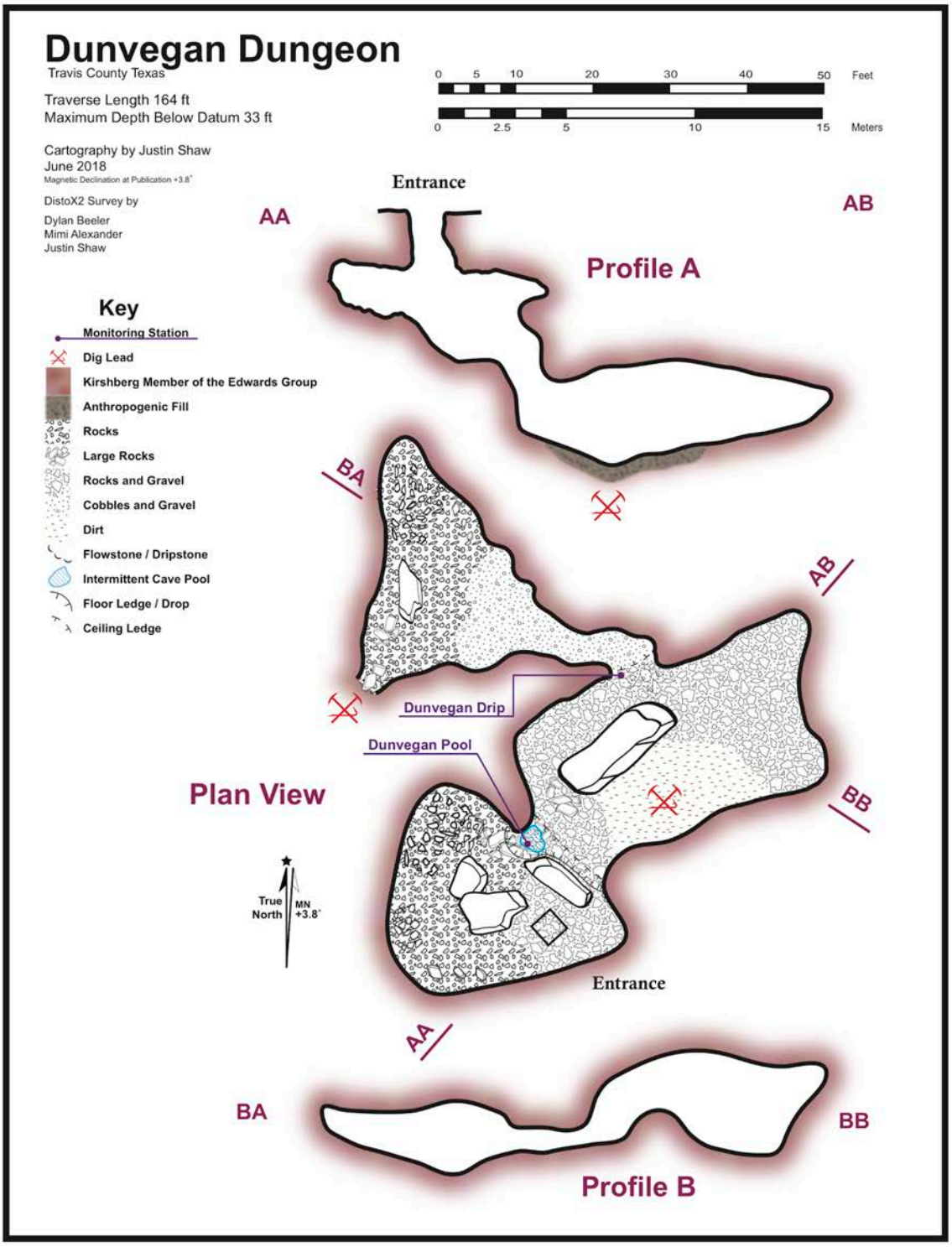
Dunvegan Dungeon Cave

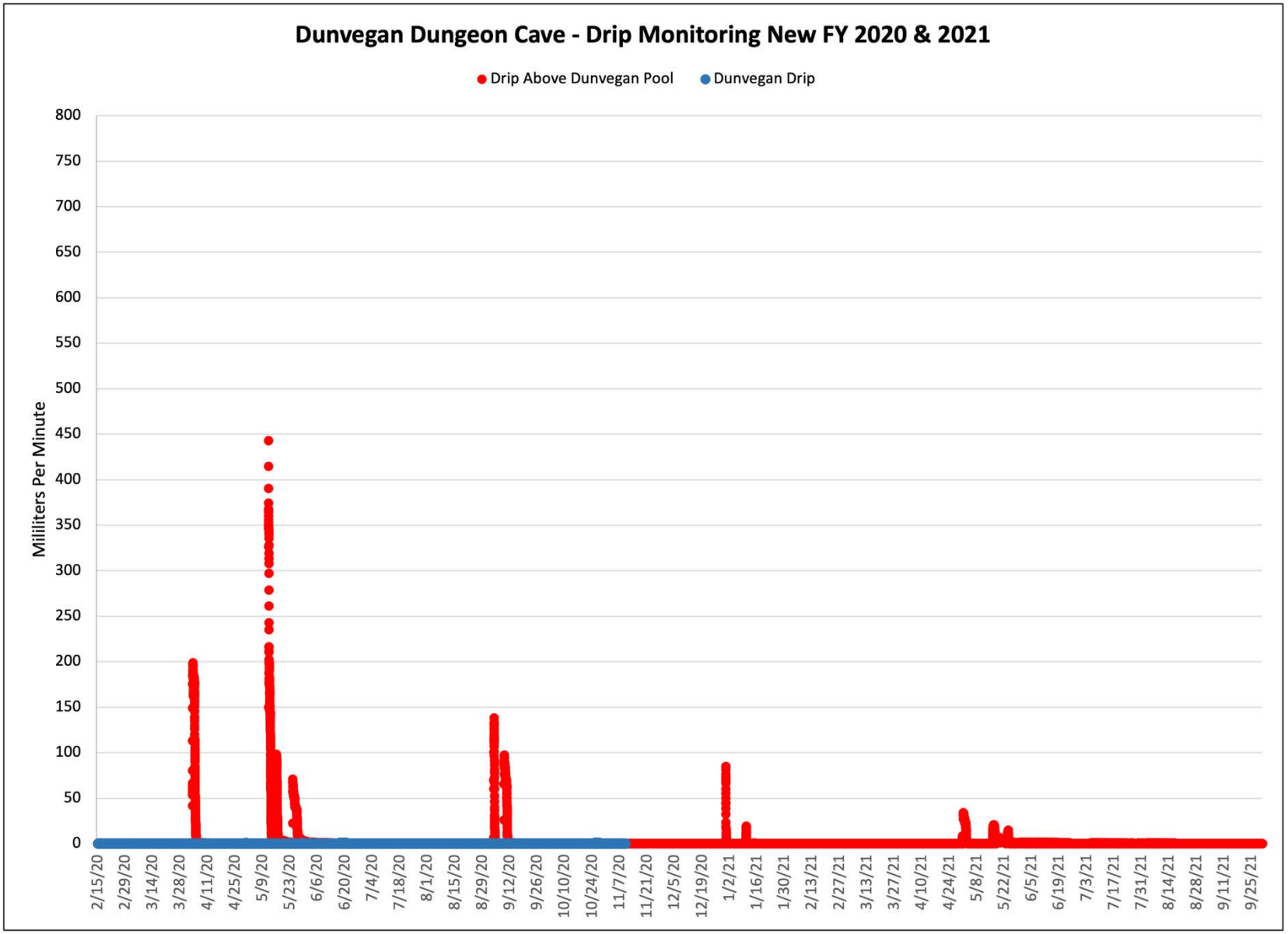
Dunvegan Dungeon Cave is located on the Tabor Water Quality Management Area. The cave was first located by neighbor Craig Turner and dug into by members of the Underground Texas Grotto during the fall of 1995.

As discussed in *Cave Drip Monitoring FY 2020 Report*, this cave serves as a wildlife nexus, with one of its users being bobcat. Due to a bobcat encounter in the cave last year, we were unable to retrieve most of the data for FY 2020. This year we were able to access the cave without a bobcat encounter, and so now present the missing FY 2020 data here (beginning February 15, 2020) combined with the FY 2021 data.



Cave Specialist Justin Shaw conducting calibration of Drip Above Dunvegan Pool.


Dunvegan Dungeon
Travis County Texas
Traverse Length 164 ft
Maximum Depth Below Datum 33 ft
Cartography by Justin Shaw
June 2018
Magnetic Declination at Publication +3.8°
DistoX2 Survey by
Dylan Beeler
Mimi Alexander
Justin Shaw
0 5 10 20 30 40 50 Feet
0 2.5 5 10 15 Meters
Key
Monitoring Station
Dig Lead
Kirshberg Member of the Edwards Group
Anthropogenic Fill
Rocks
Large Rocks
Rocks and Gravel
Cobbles and Gravel
Dirt
Flowstone / Dripstone
Intermittent Cave Pool
Floor Ledge / Drop
Ceiling Ledge
Entrance
AA
AB
Profile A
BA
AB
Dunvegan Drip
Dunvegan Pool
Plan View
BB
True North
MN +3.8°
Entrance
AA
BA
BB
Profile B


Dunvegan Dungeon Cave - Drip Monitoring New FY 2020 & 2021
Drip Above Dunvegan Pool
Dunvegan Drip
Milliliters Per Minute
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
2/15/20
2/29/20
3/14/20
3/28/20
4/11/20
4/25/20
5/9/20
5/23/20
6/6/20
6/20/20
7/4/20
7/18/20
8/1/20
8/15/20
8/29/20
9/12/20
9/26/20
10/10/20
10/24/20
11/7/20
11/21/20
12/5/20
12/19/20
1/2/21
1/16/21
1/30/21
2/13/21
2/27/21
3/13/21
3/27/21
4/10/21
4/24/21
5/8/21
5/22/21
6/5/21
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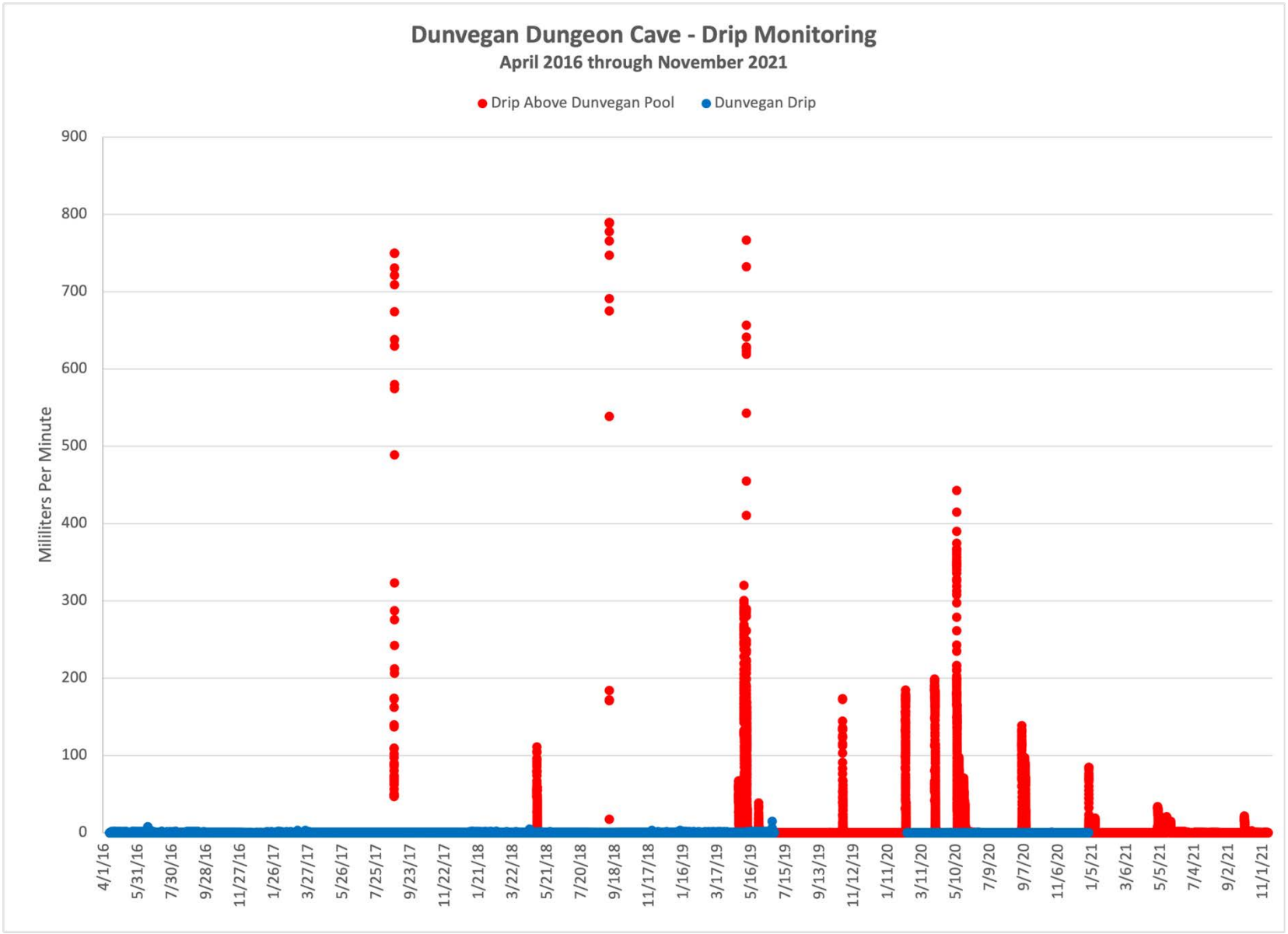
7/31/21
8/14/21
8/28/21
9/11/21
9/25/21


Dunvegan Dungeon Cave - Drip Monitoring
April 2016 through November 2021
Drip Above Dunvegan Pool
Dunvegan Drip
Milliliters Per Minute
900
800
700
600
500
400
300
200
100
0
4/1/16
5/31/16
7/30/16
9/28/16
11/27/16
1/26/17
3/27/17
5/26/17
7/25/17
9/23/17
11/22/17
1/21/18
3/22/18
5/21/18
7/20/18
9/18/18
11/17/18
1/16/19
3/17/19
5/16/19
7/15/19
9/13/19
11/12/19
1/11/20
3/11/20
5/10/20
7/9/20
9/7/20
11/6/20
1/5/21
3/6/21
5/5/21
7/4/21
9/2/21
11/1/21

Drip Above Dunvegan Pool

Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg Member of the Edwards Group. This site holds the record for highest recorded flowrate of any monitored station, at 789.60 milliliters per minute recorded in September of 2018.

Statistical volumes below are in milliliters per minute.

56,951 drip rate measurements beginning February 15, 2020 through FY 2021.
Mean 1.64 – Minimum 0.00 – Maximum 443.05

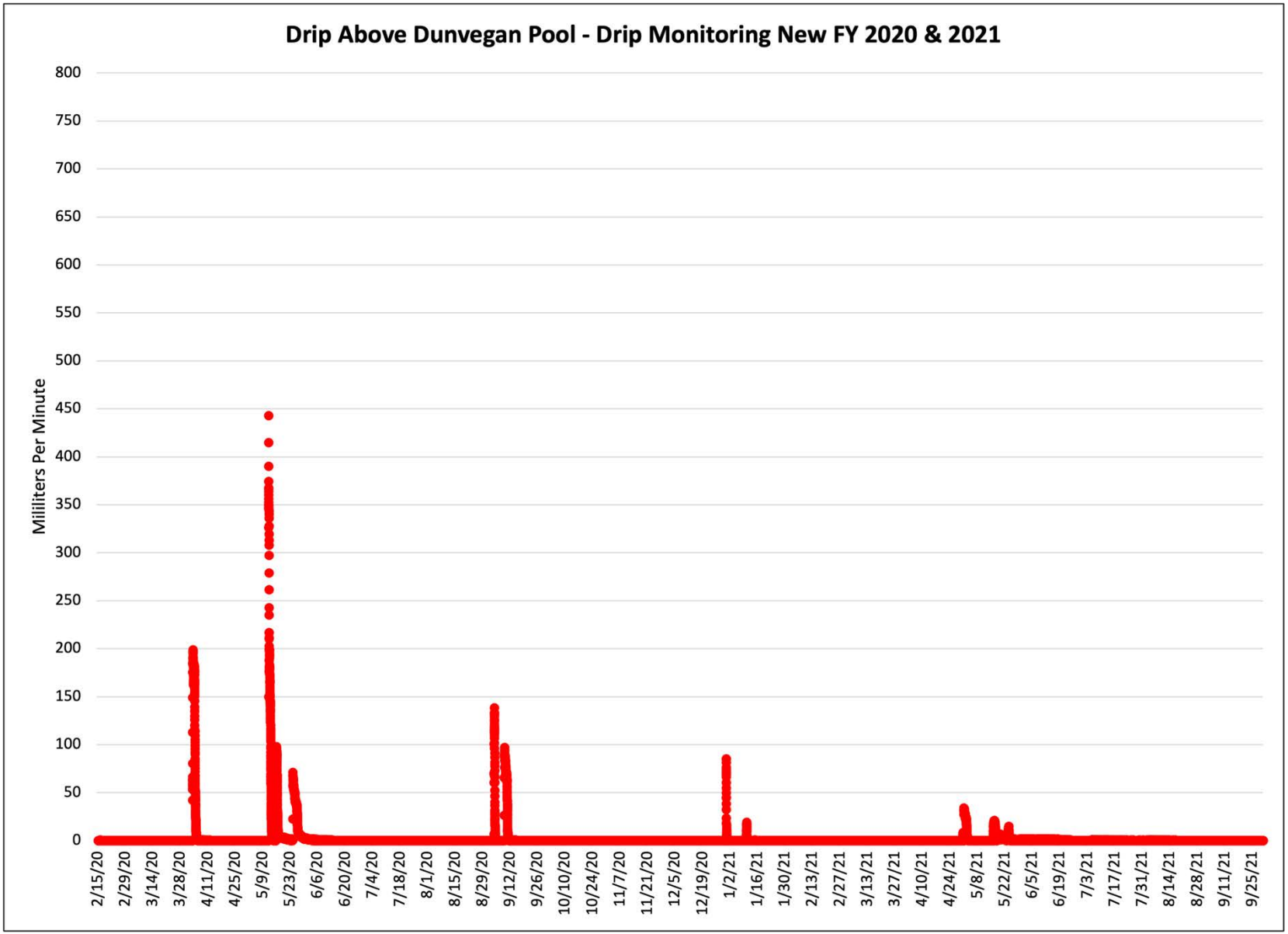
123,502 drip rate measurements since May 2017.
Mean 1.52 – Minimum – 0.00 – Maximum 789.60

Deviation of 2020 drip rates from complete record:
Mean +0.12 – Minimum 0.00 – Maximum -346.55

Good data collected February 15, 2020 through September 30, 2021.

Station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB


HOBO


Drip Above Dunvegan Pool - Drip Monitoring New FY 2020 & 2021
Milliliters Per Minute
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
2/15/20
2/29/20
3/14/20
3/28/20
4/11/20
4/25/20
5/9/20
5/23/20
6/6/20
6/20/20
7/4/20
7/18/20
8/1/20
8/15/20
8/29/20
9/12/20
9/26/20
10/10/20
10/24/20
11/7/20
11/21/20
12/5/20
12/19/20
1/2/21
1/16/21
1/30/21
2/13/21
2/27/21
3/13/21
3/27/21
4/10/21
4/24/21
5/8/21
5/22/21
6/5/21
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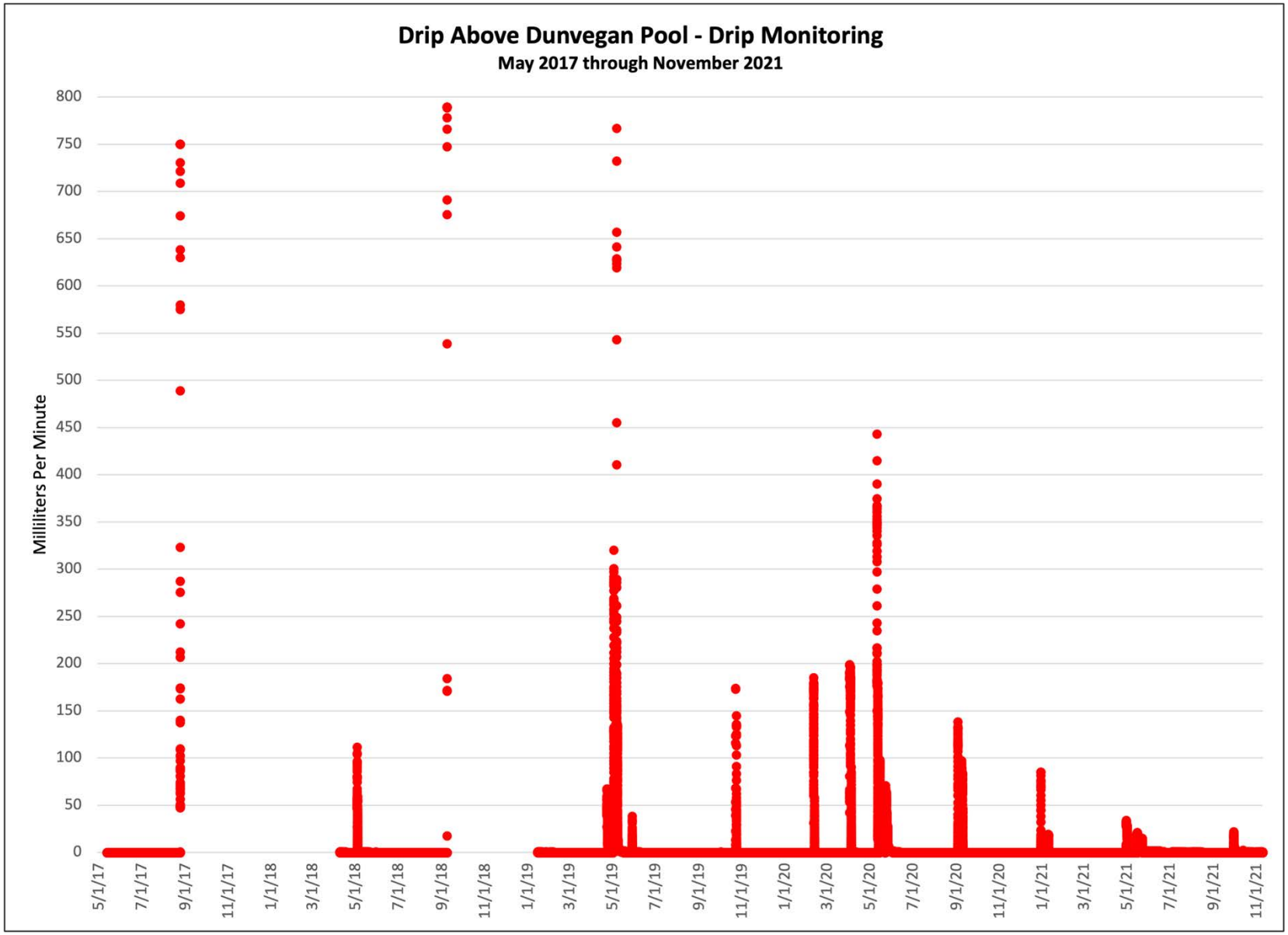
8/14/21
8/28/21
9/11/21
9/25/21


Drip Above Dunvegan Pool - Drip Monitoring
May 2017 through November 2021
Milliliters Per Minute
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
5/1/17
7/1/17
9/1/17
11/1/17
1/1/18
3/1/18
5/1/18
7/1/18
9/1/18
11/1/18
1/1/19
3/1/19
5/1/19
7/1/19
9/1/19
11/1/19
1/1/20
3/1/20
5/1/20
7/1/20
9/1/20
11/1/20
1/1/21
3/1/21
5/1/21
7/1/21
9/1/21
11/1/21

Dunvegan Drip
Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

30,607 drip rate measurements beginning February 15, 2020 through FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.79

142,925 drip rate measurements since May 2017.
Mean 0.14 – Minimum – 0.00 – Maximum 15.07

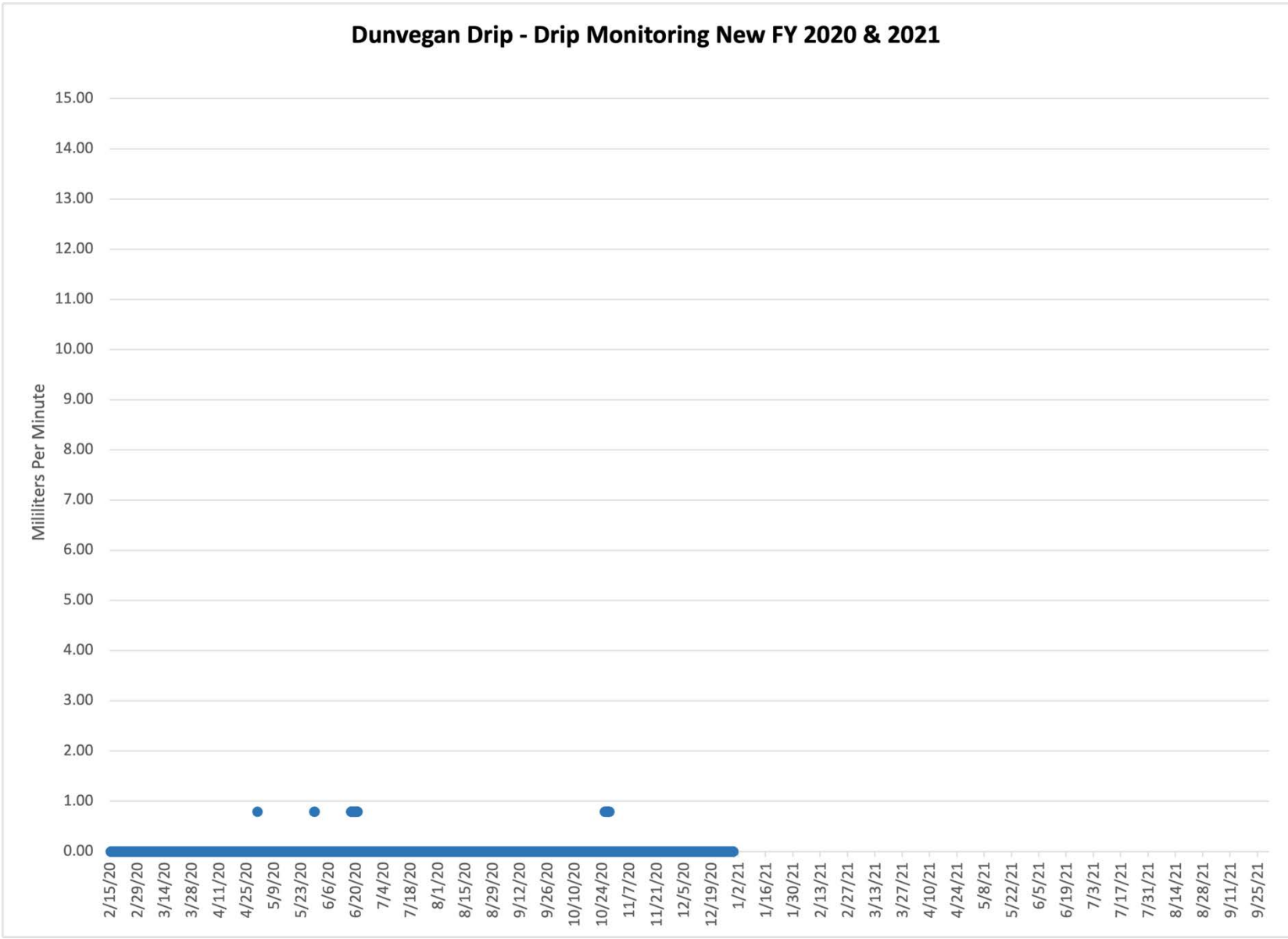
Deviation of 2020 drip rates from complete record:
Mean -0.14 – Minimum 0.00 – Maximum -331.48

Good data collected February 15, 2020 through December 30, 2020. Data gap beginning on December 30, 2020 due to data logger batter becoming depleted. This happened because of the bobcat keeping us out of the cave.

Station is currently deployed and operational. The current configuration is an Onset RG3 tipper connected to an Onset HOBO Pendant Event Data Logger UA-003-64




On the left is the entire setup of the Dunvegan Dungeon Drip monitoring station and on the right is a closeup of a small (~.4in x ~.4in) square hole from which the monitored drip water issues into the cave.


Dunvegan Drip - Drip Monitoring New FY 2020 & 2021
Milliliters Per Minute
15.00
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2/15/20
2/29/20
3/14/20
3/28/20
4/11/20
4/25/20
5/9/20
5/23/20
6/6/20
6/20/20
7/4/20
7/18/20
8/1/20
8/15/20
8/29/20
9/12/20
9/26/20
10/10/20
10/24/20
11/7/20
11/21/20
12/5/20
12/19/20
1/2/21
1/16/21
1/30/21
2/13/21
2/27/21
3/13/21
3/27/21
4/10/21
4/24/21
5/8/21
5/22/21
6/5/21
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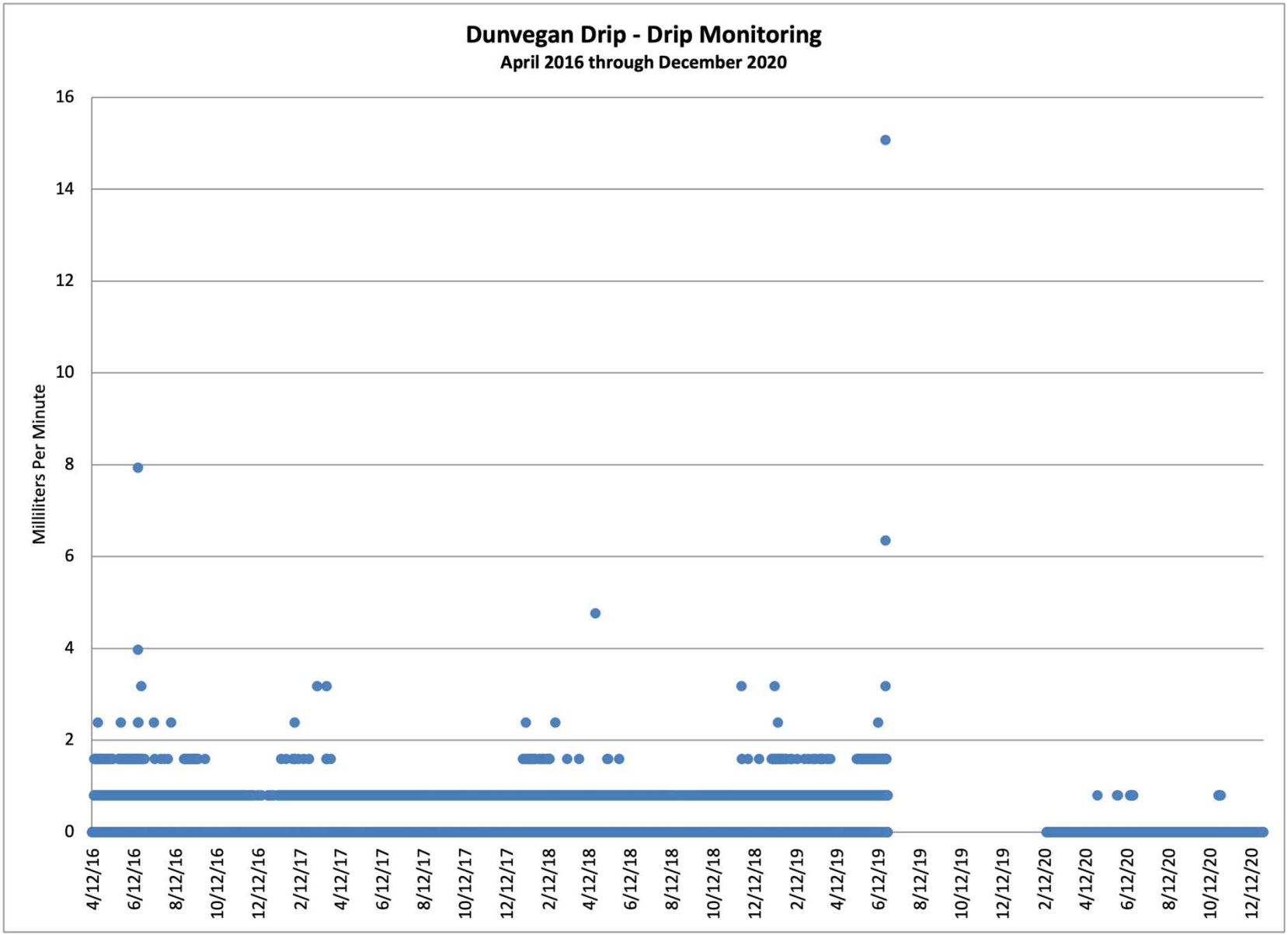
7/31/21
8/14/21
8/28/21
9/11/21
9/25/21

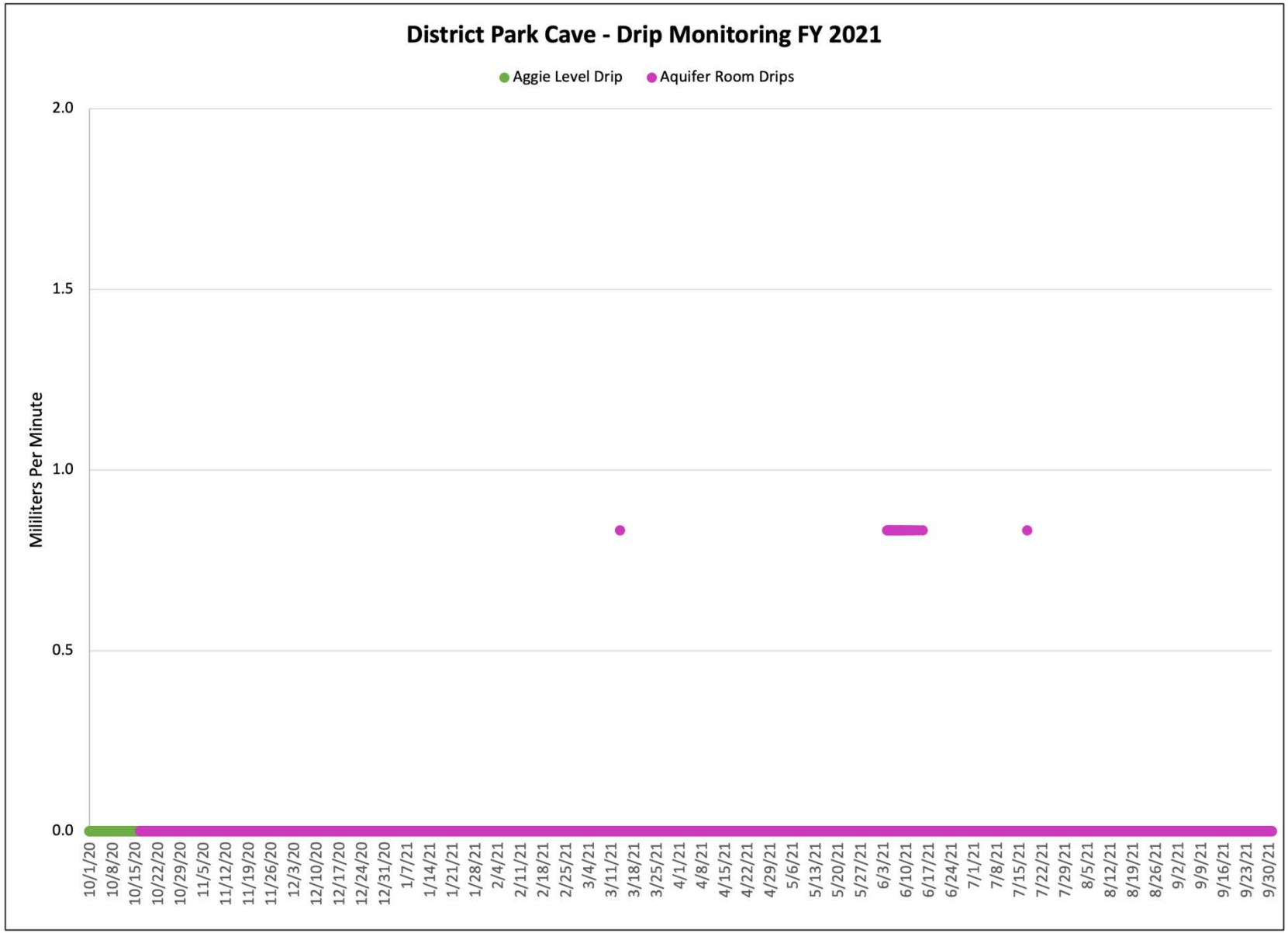

Dunvegan Drip - Drip Monitoring
April 2016 through December 2020
Milliliters Per Minute
16
14
12
10
8
6
4
2
0
4/12/16
6/12/16
8/12/16
10/12/16
12/12/16
2/12/17
4/12/17
6/12/17
8/12/17
10/12/17
12/12/17
2/12/18
4/12/18
6/12/18
8/12/18
10/12/18
12/12/18
2/12/19
4/12/19
6/12/19
8/12/19
10/12/19
12/12/19
2/12/20
4/12/20
6/12/20
8/12/20
10/12/20
12/12/20

District Park Cave

District Park Cave is a well decorated cave located within Dick Nicholas District Park. The first section of cave was initially discovered by members of the Underground Texas Grotto, during the fall of 1984, after removing rocks and dirt from the entrance. In the spring of 1987, they discovered the main section of the cave after removing washed in fill at the low point where the gate is currently located.

Despite the known extent of the cave being relatively small, the speleogenic evidence suggests District Park Cave connects to a substantially large volume of cave. The Aquifer Room contains very nice examples of Cave Rims, which are formed via aerosol speleothem development. Their presence indicates a large volume of undiscovered cave. Given that these features were formed by airflow, yet they don’t blow air today, one can conclude that the large volume of undiscovered cave is currently obscured by a recently formed plug.




District Park Cave - Drip Monitoring FY 2021
Aggie Level Drip
Aquifer Room Drips
Milliliters Per Minute
2.0
1.5
1.0
0.5
0.0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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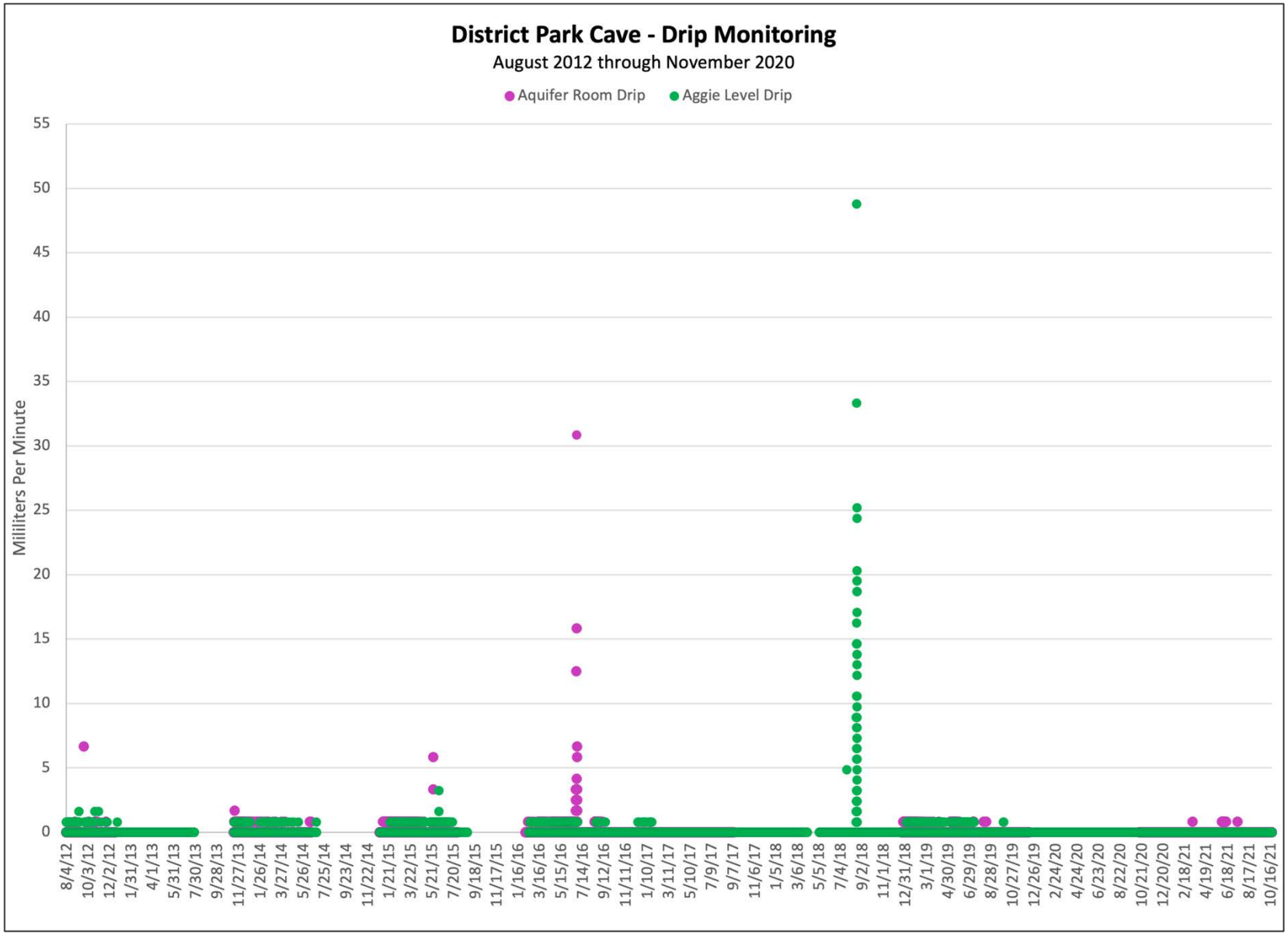
9/16/21
9/23/21
9/30/21


District Park Cave - Drip Monitoring
August 2012 through November 2020
Aquifer Room Drip
Aggie Level Drip
Milliliters Per Minute
55
50
45
40
35
30
25
20
15
10
5
0
8/4/12
10/3/12
12/2/12
1/31/13
4/1/13
5/31/13
7/30/13
9/28/13
11/27/13
1/26/14
3/27/14
5/26/14
7/25/14
9/23/14
11/22/14
1/21/15
3/22/15
5/21/15
7/20/15
9/18/15
11/17/15
1/16/16
3/16/16
5/15/16
7/14/16
9/12/16
11/11/16
1/10/17
3/11/17
5/10/17
7/9/17
9/7/17
11/6/17
1/5/18
3/6/18
5/5/18
7/4/18
9/2/18
11/1/18
12/31/18
3/1/19
4/30/19
6/29/19
8/28/19
10/27/19
12/26/19
2/24/20
4/24/20
6/23/20
8/22/20
10/21/20
12/20/20
2/18/21
4/19/21
6/18/21
8/17/21
10/16/21

Aquifer Room

Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

33,529 drip rate measurements during FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.83

182,415 drip rate measurements since August 2012.
Mean 0.01 – Minimum – 0.00 – Maximum 30.83

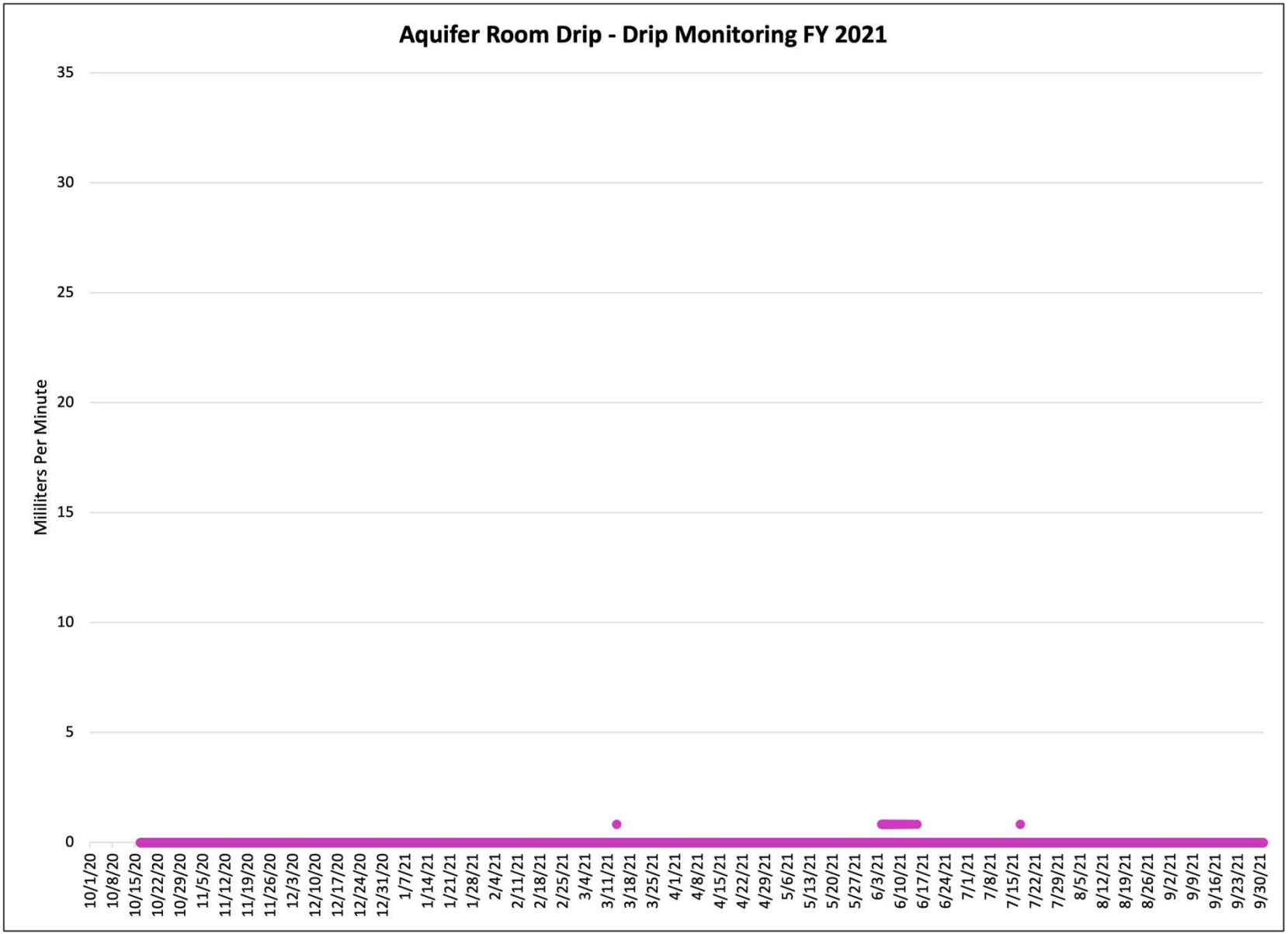
Deviation of 2020 drip rates from complete record:
Mean -0.01 – Minimum 0.00 – Maximum -30.00

Good Data collected from October 16, 2020 through September 30, 2021.

The station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB



Cave Specialist Justin Shaw next to the Aquifer Room drip monitoring station.


Aquifer Room Drip - Drip Monitoring FY 2021
Milliliters Per Minute
35
30
25
20
15
10
5
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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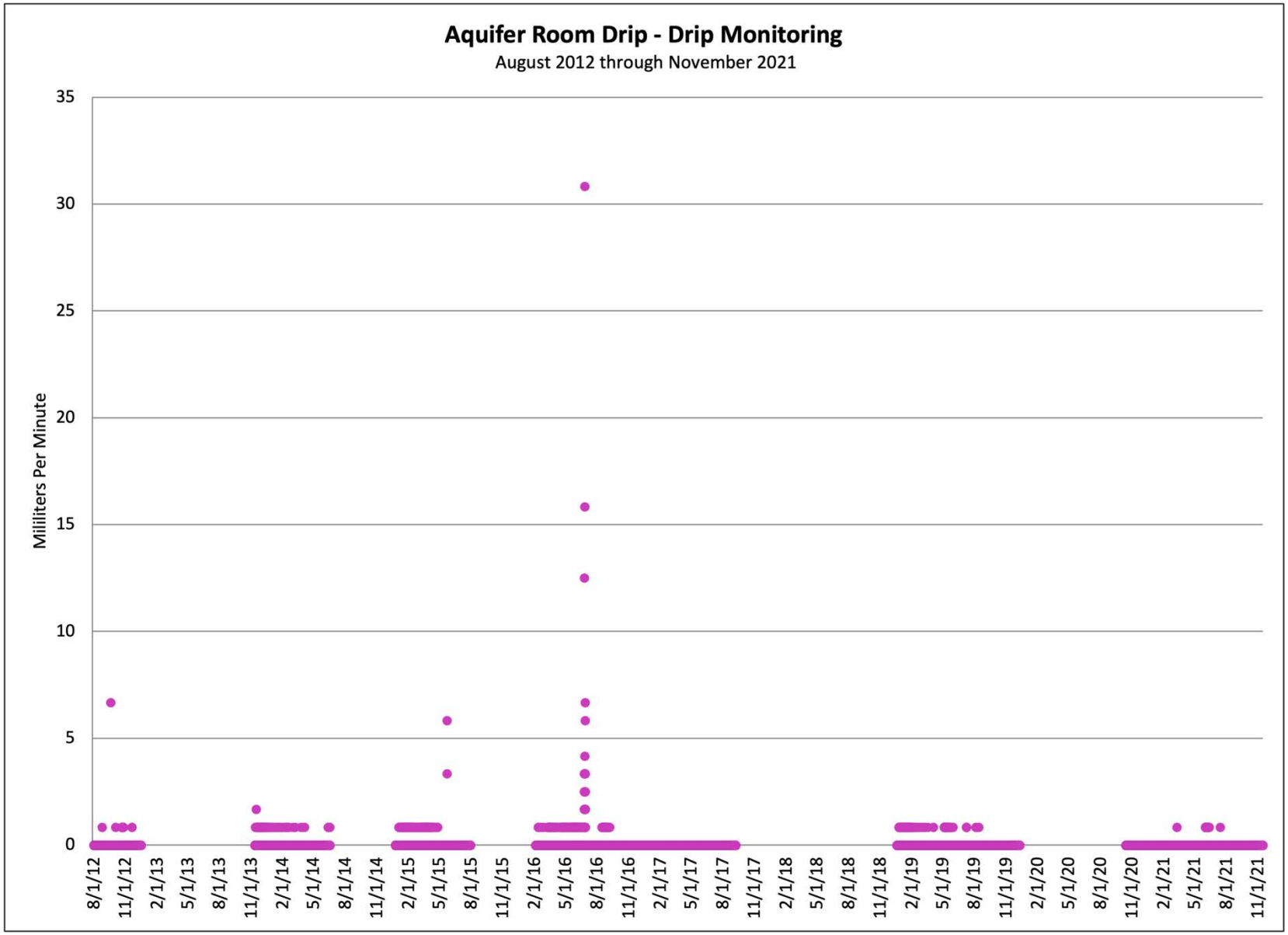
9/16/21
9/23/21
9/30/21


Aquifer Room Drip - Drip Monitoring
August 2012 through November 2021
Milliliters Per Minute
35
30
25
20
15
10
5
0
8/1/12
11/1/12
2/1/13
5/1/13
8/1/13
11/1/13
2/1/14
5/1/14
8/1/14
11/1/14
2/1/15
5/1/15
8/1/15
11/1/15
2/1/16
5/1/16
8/1/16
11/1/16
2/1/17
5/1/17
8/1/17
11/1/17
2/1/18
5/1/18
8/1/18
11/1/18
2/1/19
5/1/19
8/1/19
11/1/19
2/1/20
5/1/20
8/1/20
11/1/20
2/1/21
5/1/21
8/1/21
11/1/21

Aggie Level

Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

35,032 drip rate measurements during FY 2021.
Mean 0.00 – Minimum 0.00 – Maximum 0.00

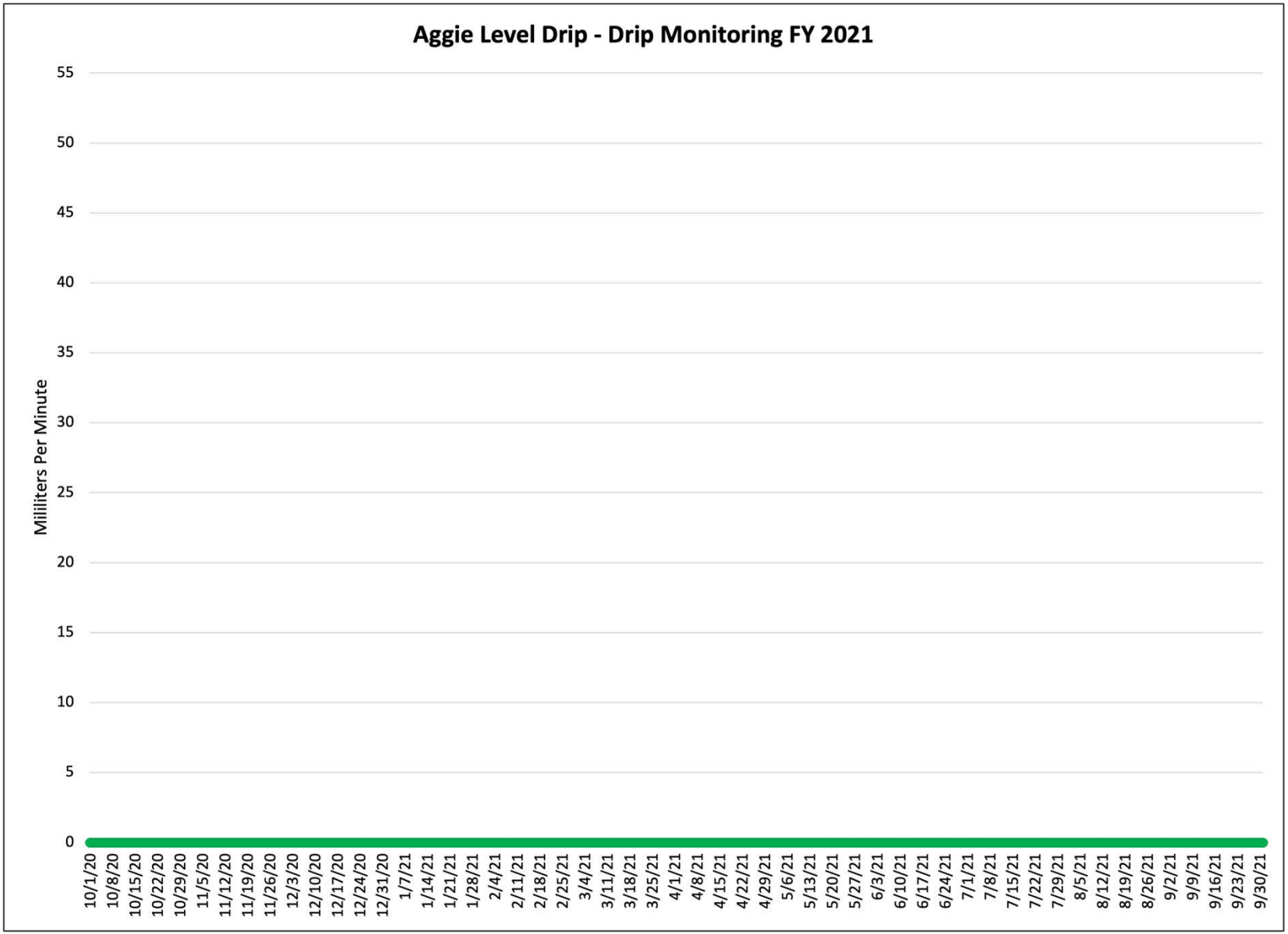
278,151 drip rate measurements since August 2012.
Mean 0.02 – Minimum – 0.00 – Maximum 48.80

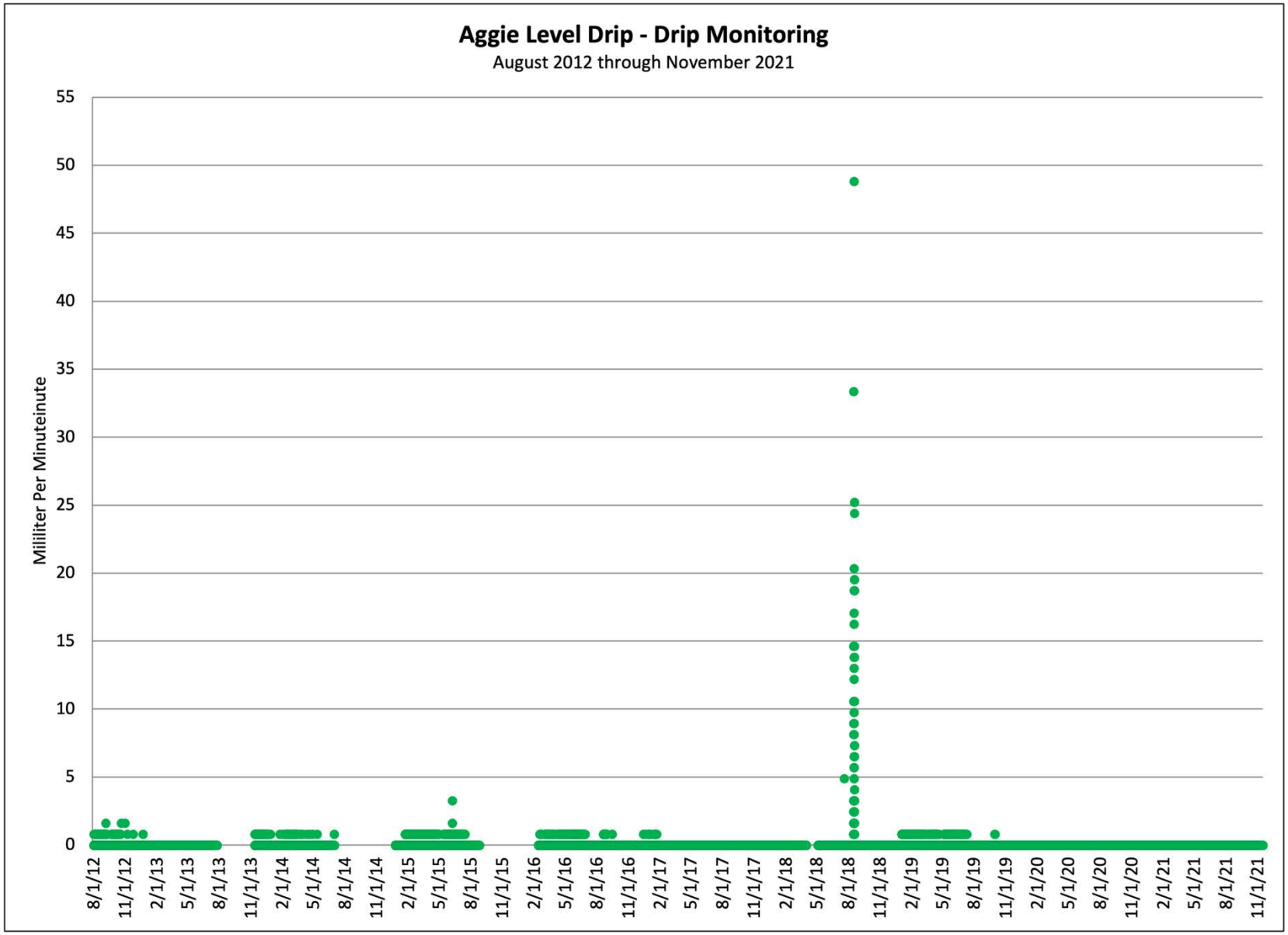
Deviation of 2020 drip rates from complete record:
Mean -0.02 – Minimum 0.00 – Maximum -48.80

Good Data collected all year.

The station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO Pendant Event Data Logger UA-003-64




Aggie Level Drip - Drip Monitoring FY 2021
Milliliters Per Minute
55
50
45
40
35
30
25
20
15
10
5
0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
8/12/21
8/19/21
8/26/21
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21


Aggie Level Drip - Drip Monitoring
August 2012 through November 2021
Milliliter Per Minuteinute
55
50
45
40
35
30
25
20
15
10
5
0
8/1/12
11/1/12
2/1/13
5/1/13
8/1/13
11/1/13
2/1/14
5/1/14
8/1/14
11/1/14
2/1/15
5/1/15
8/1/15
11/1/15
2/1/16
5/1/16
8/1/16
11/1/16
2/1/17
5/1/17
8/1/17
11/1/17
2/1/18
5/1/18
8/1/18
11/1/18
2/1/19
5/1/19
8/1/19
11/1/19
2/1/20
5/1/20
8/1/20
11/1/20
2/1/21
5/1/21
8/1/21
11/1/21

McNeil High School Courtyard Caves

Withing the courtyard of McNeil High School are two caves, Millipede Cave and Millipede Annex Cave. The hydrogeologic origin of these two caves is that of one cave; at some point long ago during its spelomorphology the system was separated into two caves by a collapsed sinkhole.



Speleothems crowding into the cave passage form the “dead end” of Millipede Cave

"MILLIPEDE" AND "MILLIPEDE ANNEX" CAVES

MILLIPEDE CAVE COMPLEX

MC NEIL HIGH SCHOOL R.R.I.S.D.
WILLIAMSON/TRAVIS COUNTY LINES;

TRAVIS COUNTY, TEXAS

DATE: OCTOBER 6, 1992

PREPARED BY: MIKE WARTON & ASSOCIATES

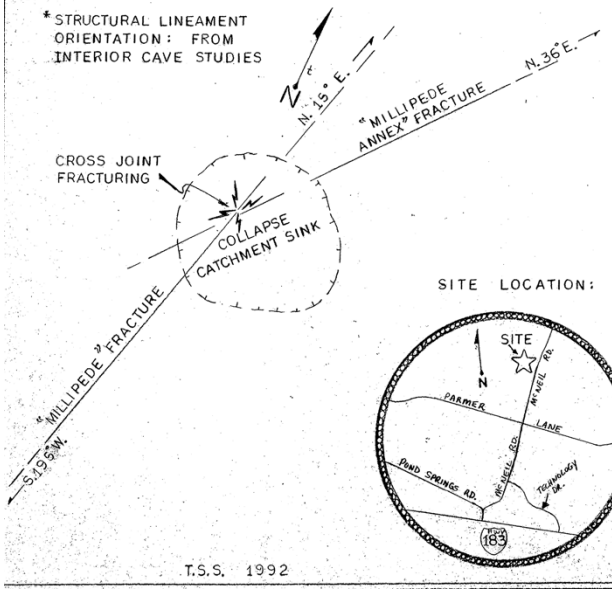
UNITS: SUUNTOS & TAPE SURVEYS / FEET & TENTHS

PERSONNEL:

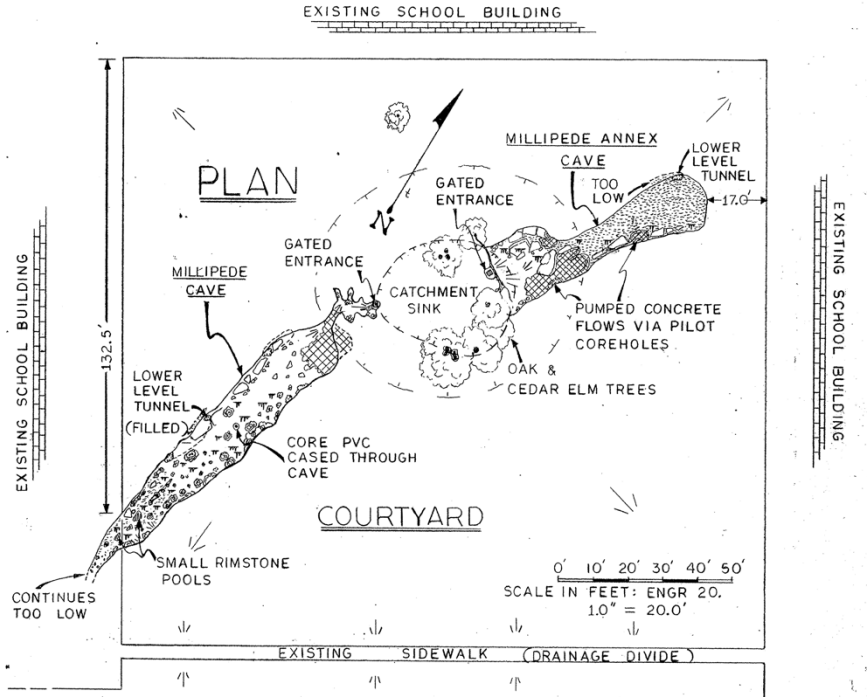
CHARLEY SAVVAS LEE JAY GRAVES

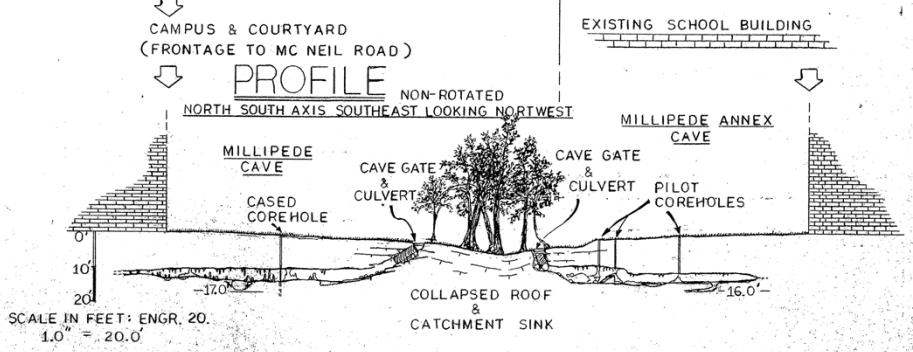
DOUG ALLEN MIKE WARTON

DRAFT BY: MIKE WARTON

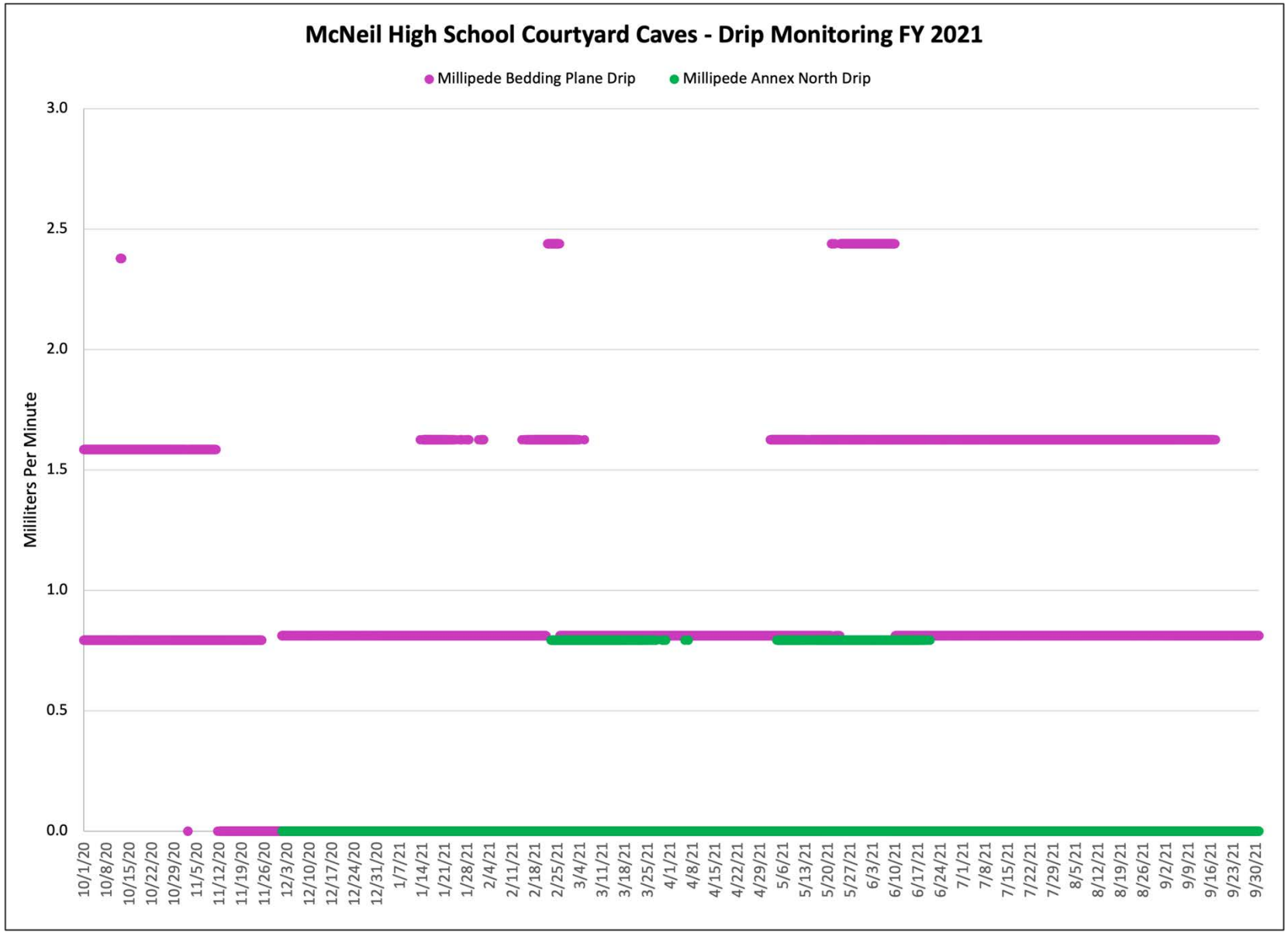


T.S.S. 1992





* EDWARDS LIMESTONE FM. (Ked) MEMBER NO.1 (BASAL UNIT)


McNeil High School Courtyard Caves - Drip Monitoring FY 2021
Millipede Bedding Plane Drip
Millipede Annex North Drip
Milliliters Per Minute
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
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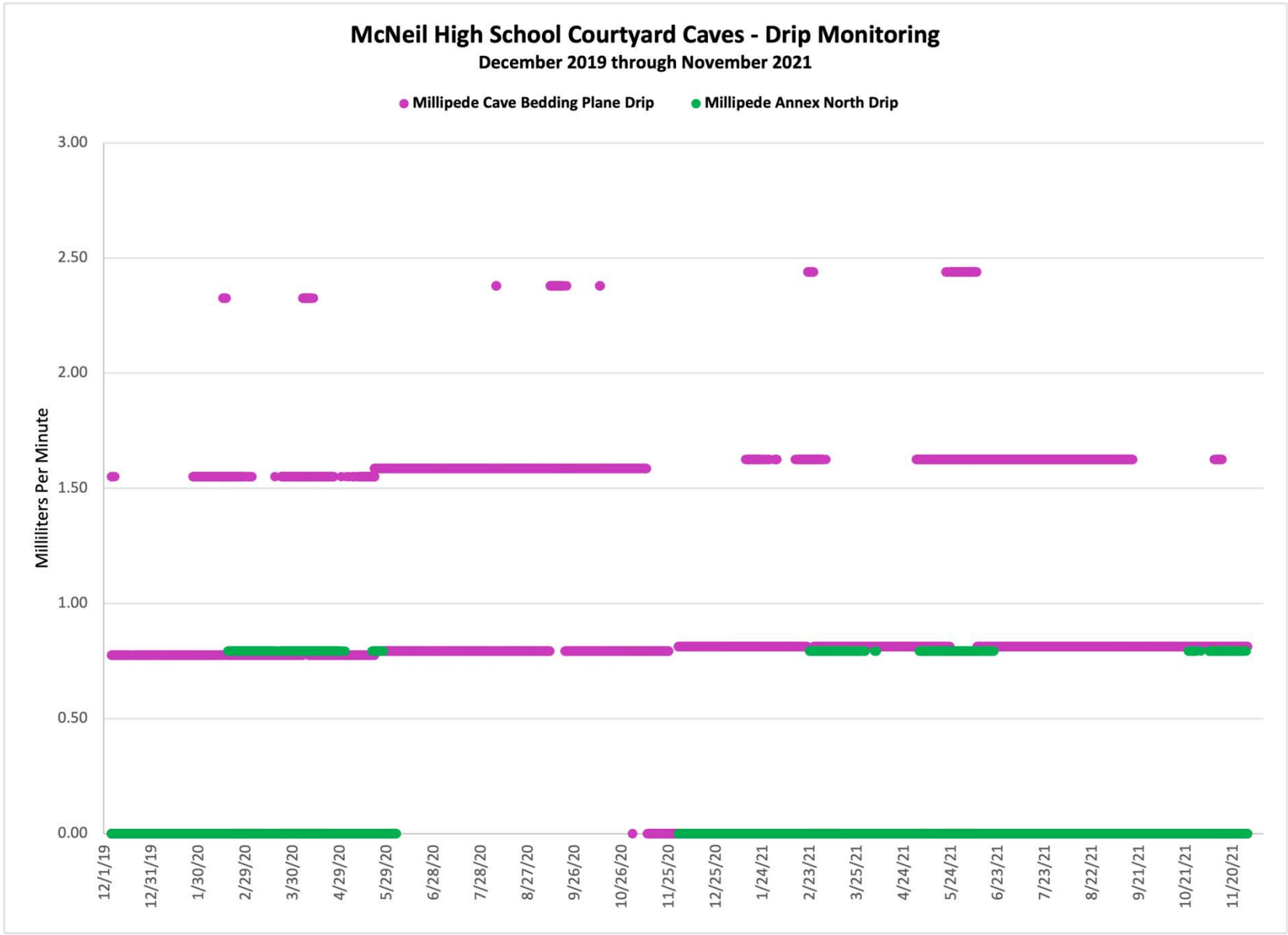
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21


McNeil High School Courtyard Caves - Drip Monitoring
December 2019 through November 2021
Millipede Cave Bedding Plane Drip
Millipede Annex North Drip
Milliliters Per Minute
3.00
2.50
2.00
1.50
1.00
0.50
0.00
12/1/19
12/31/19
1/30/20
2/29/20
3/30/20
4/29/20
5/29/20
6/28/20
7/28/20
8/27/20
9/26/20
10/26/20
11/25/20
12/25/20
1/24/21
2/23/21
3/25/21
4/24/21
5/24/21
6/23/21
7/23/21
8/22/21
9/21/21
10/21/21
11/20/21

Millipede Bedding Plane Drips

Discrete Cave Drip

This site is a discrete cave drip consisting of three dripping stalactites out of 42 actively dripping stalactites which all form hanging from a bedding plane; and is within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

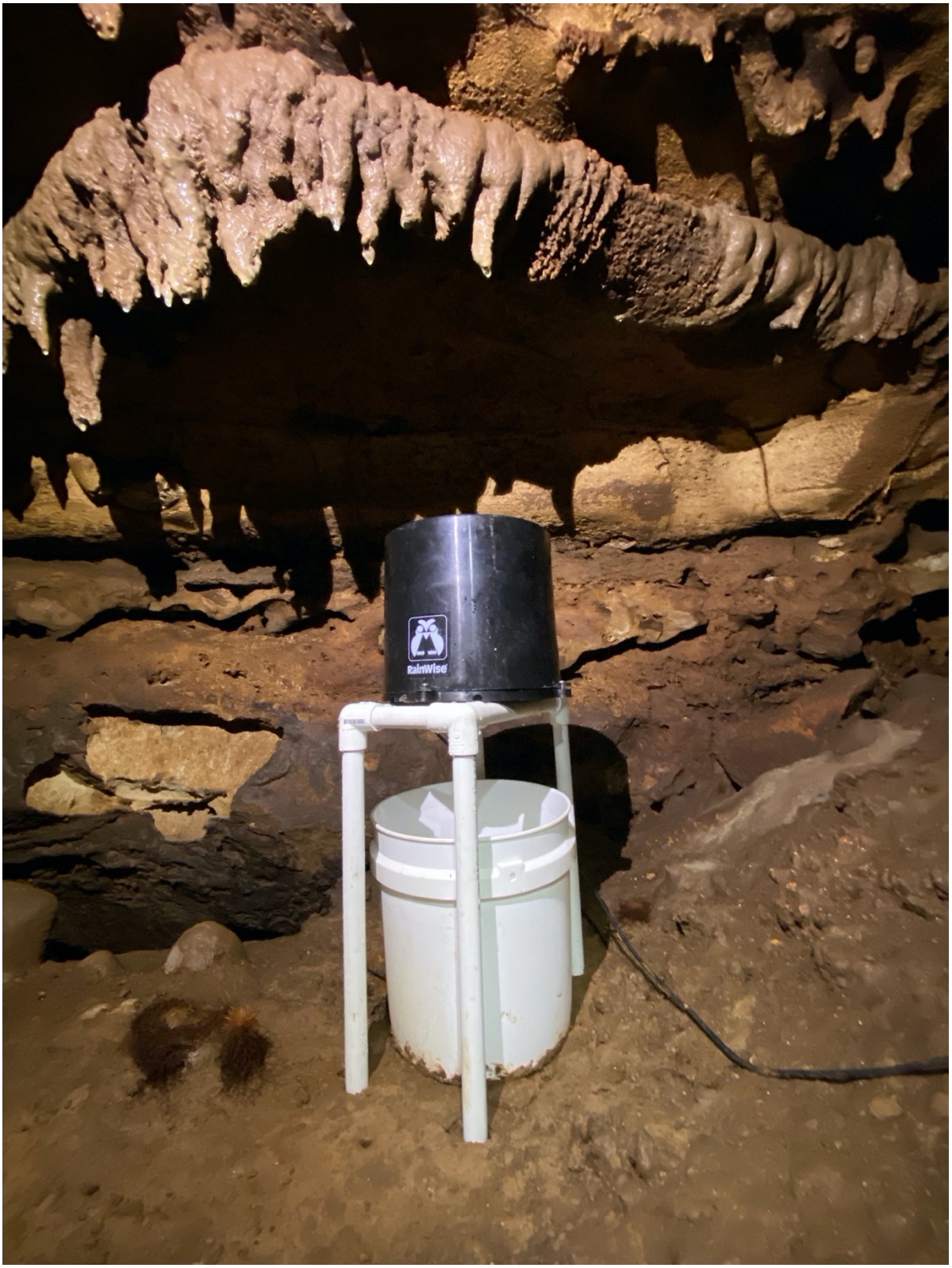
35,032 drip rate measurements during FY 2021.
Mean 0.93 – Minimum 0.00 – Maximum 2.44

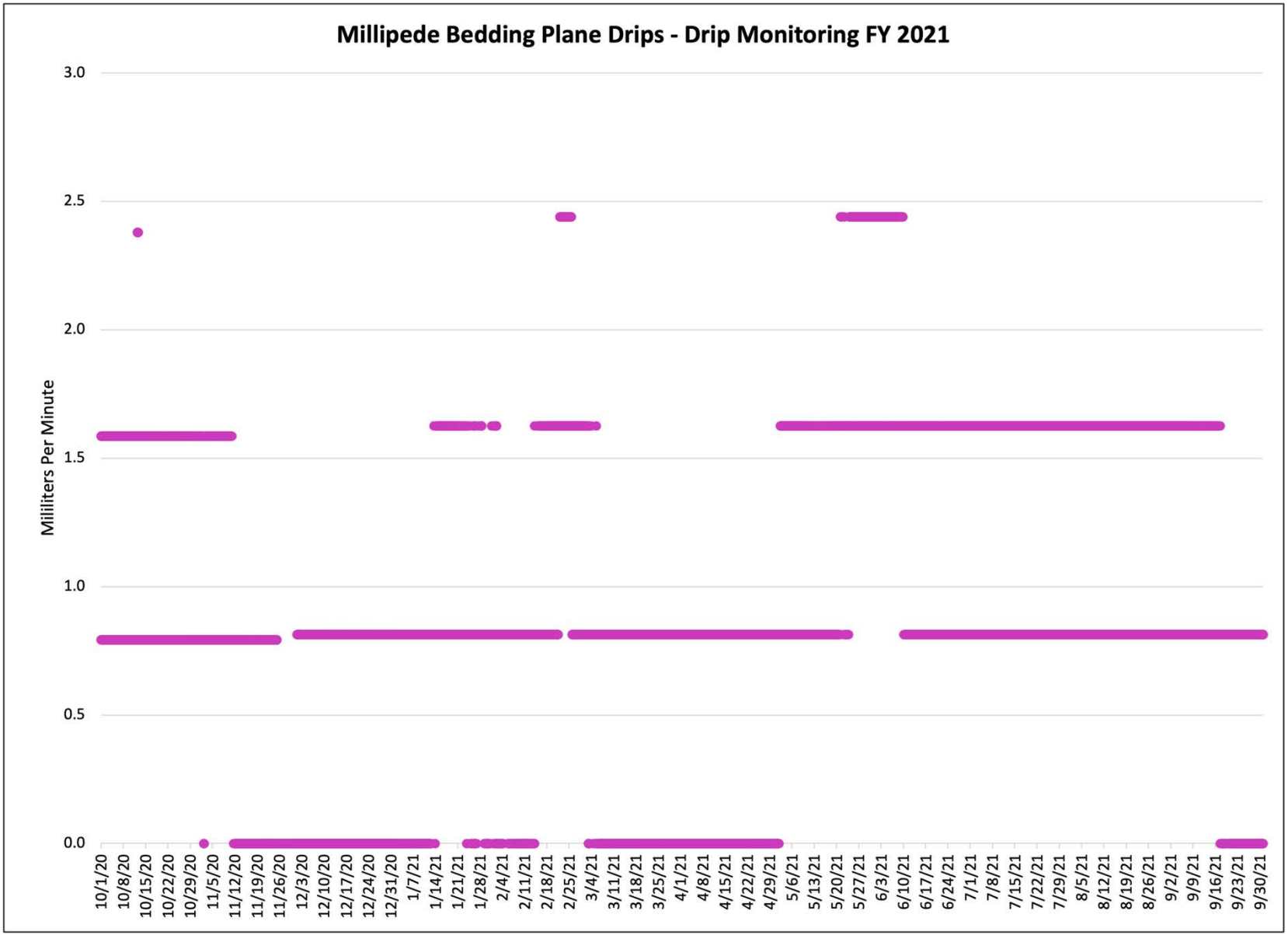
69,568 drip rate measurements since December 2019.
Mean 0.92 – Minimum – 0.00 – Maximum 2.44

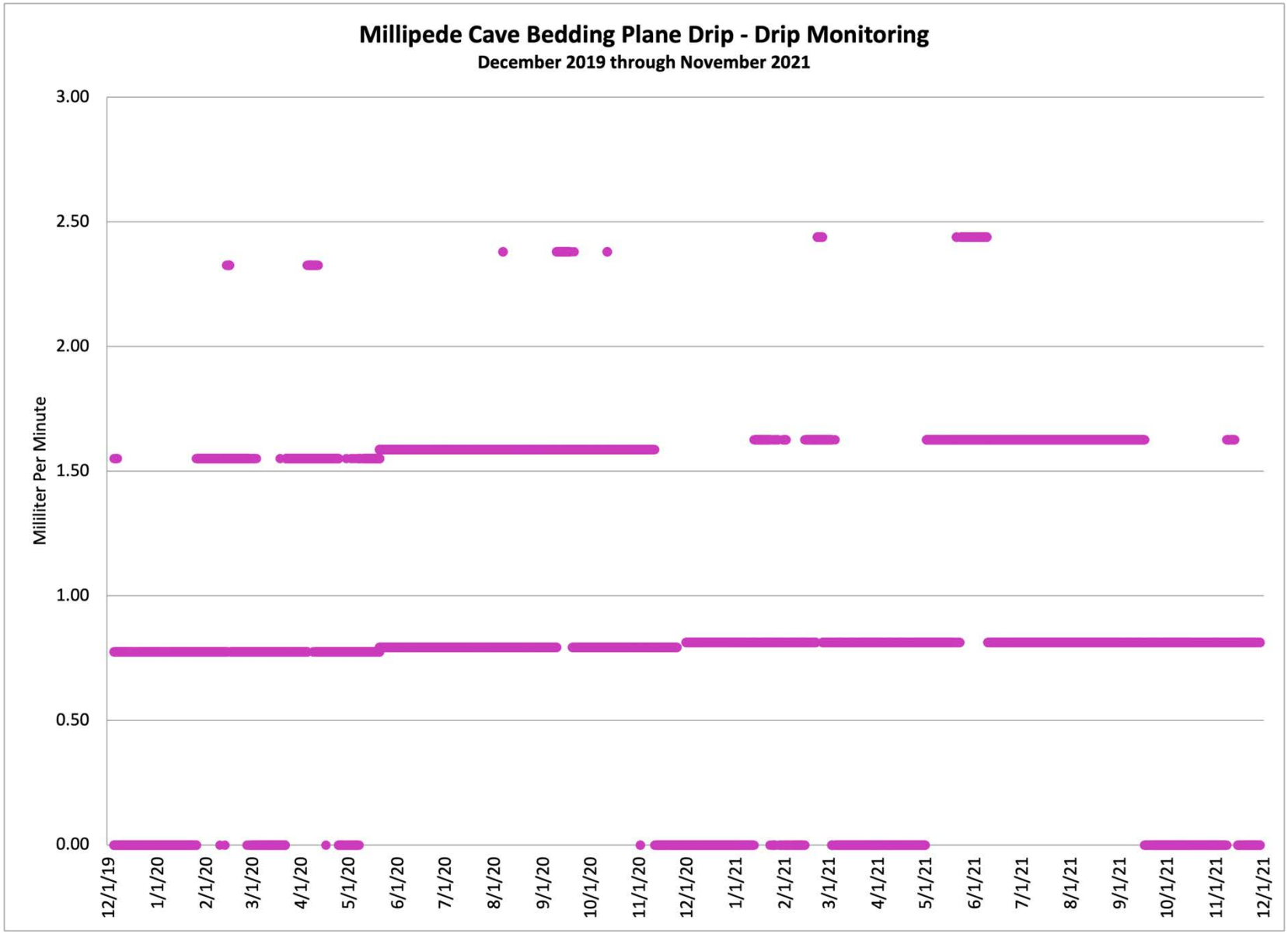
Deviation of 2020 drip rates from complete record:
Mean +0.01 – Minimum 0.00 – Maximum 0.00

Good Data collected all year.

Station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB


RainWise


Millipede Bedding Plane Drips - Drip Monitoring FY 2021
Milliliters Per Minute
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10/1/20
10/8/20
10/15/20
10/22/20
10/29/20
11/5/20
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
8/12/21
8/19/21
8/26/21
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21


Millipede Cave Bedding Plane Drip - Drip Monitoring
December 2019 through November 2021
Milliliter Per Minute
3.00
2.50
2.00
1.50
1.00
0.50
0.00
12/1/19
1/1/20
2/1/20
3/1/20
4/1/20
5/1/20
6/1/20
7/1/20
8/1/20
9/1/20
10/1/20
11/1/20
12/1/20
1/1/21
2/1/21
3/1/21
4/1/21
5/1/21
6/1/21
7/1/21
8/1/21
9/1/21
10/1/21
11/1/21
12/1/21

Millixpede Annex North Drip

Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg Member of the Edwards Group.

Statistical volumes below are in milliliters per minute.

29,121 drip rate measurements during FY 2021.
Mean 0.03 – Minimum 0.00 – Maximum 0.79

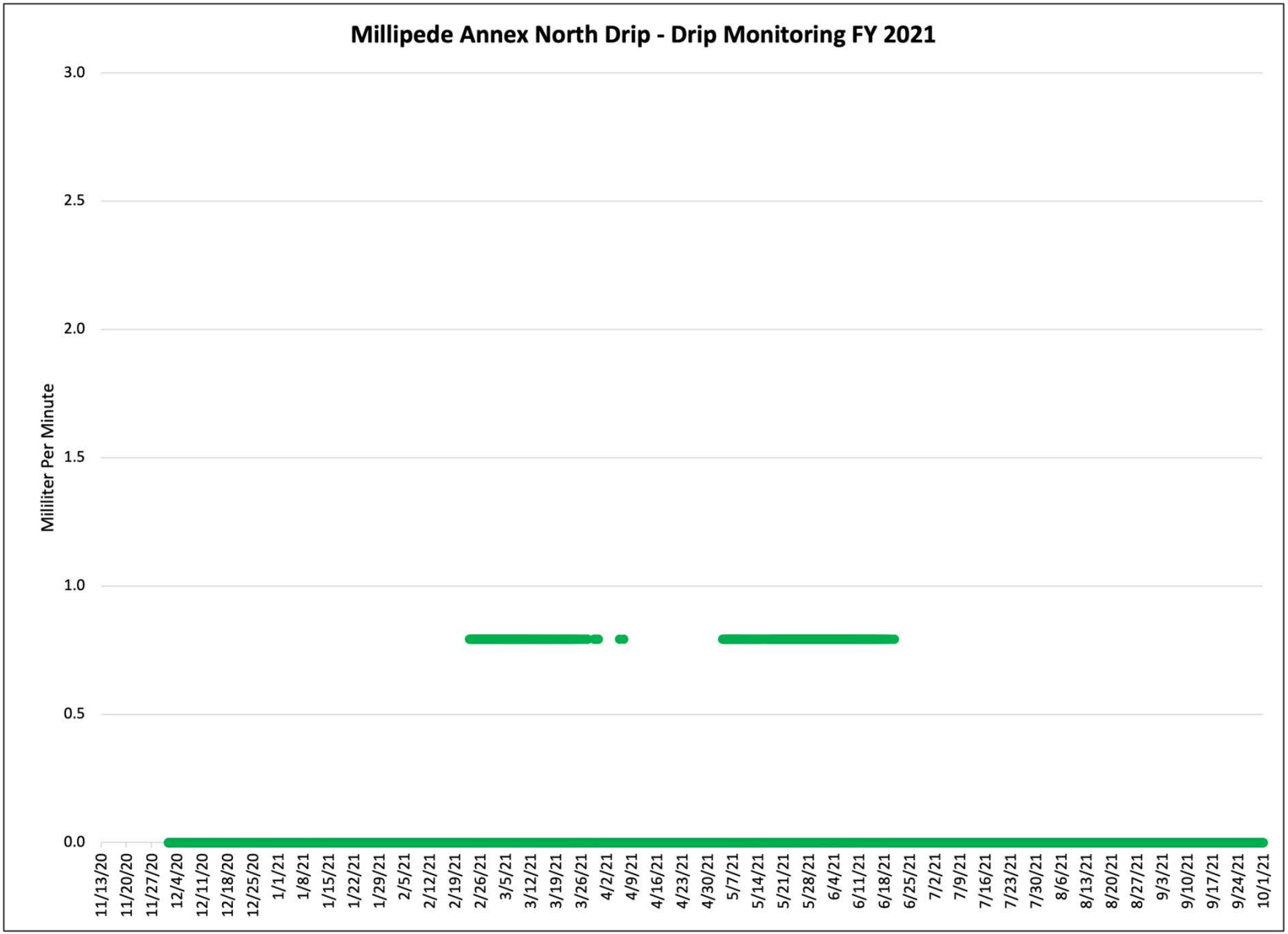
278,151 drip rate measurements since August 2012.
Mean 0.04 – Minimum – 0.00 – Maximum 0.79

Deviation of 2020 drip rates from complete record:
Mean -0.01 – Minimum 0.00 – Maximum 0.00

Good Data collected December 1, 2020 through September 30, 2021. Data gap is due to datalogger failure for unknown reasons

Station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB


RainWise


Millipede Annex North Drip - Drip Monitoring FY 2021
Milliliter Per Minute
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11/13/20
11/20/20
11/27/20
12/4/20
12/11/20
12/18/20
12/25/20
1/1/21
1/8/21
1/15/21
1/22/21
1/29/21
2/5/21
2/12/21
2/19/21
2/26/21
3/5/21
3/12/21
3/19/21
3/26/21
4/2/21
4/9/21
4/16/21
4/23/21
4/30/21
5/7/21
5/14/21
5/21/21
5/28/21
6/4/21
6/11/21
6/18/21
6/25/21
7/2/21
7/9/21
7/16/21
7/23/21
7/30/21
8/6/21
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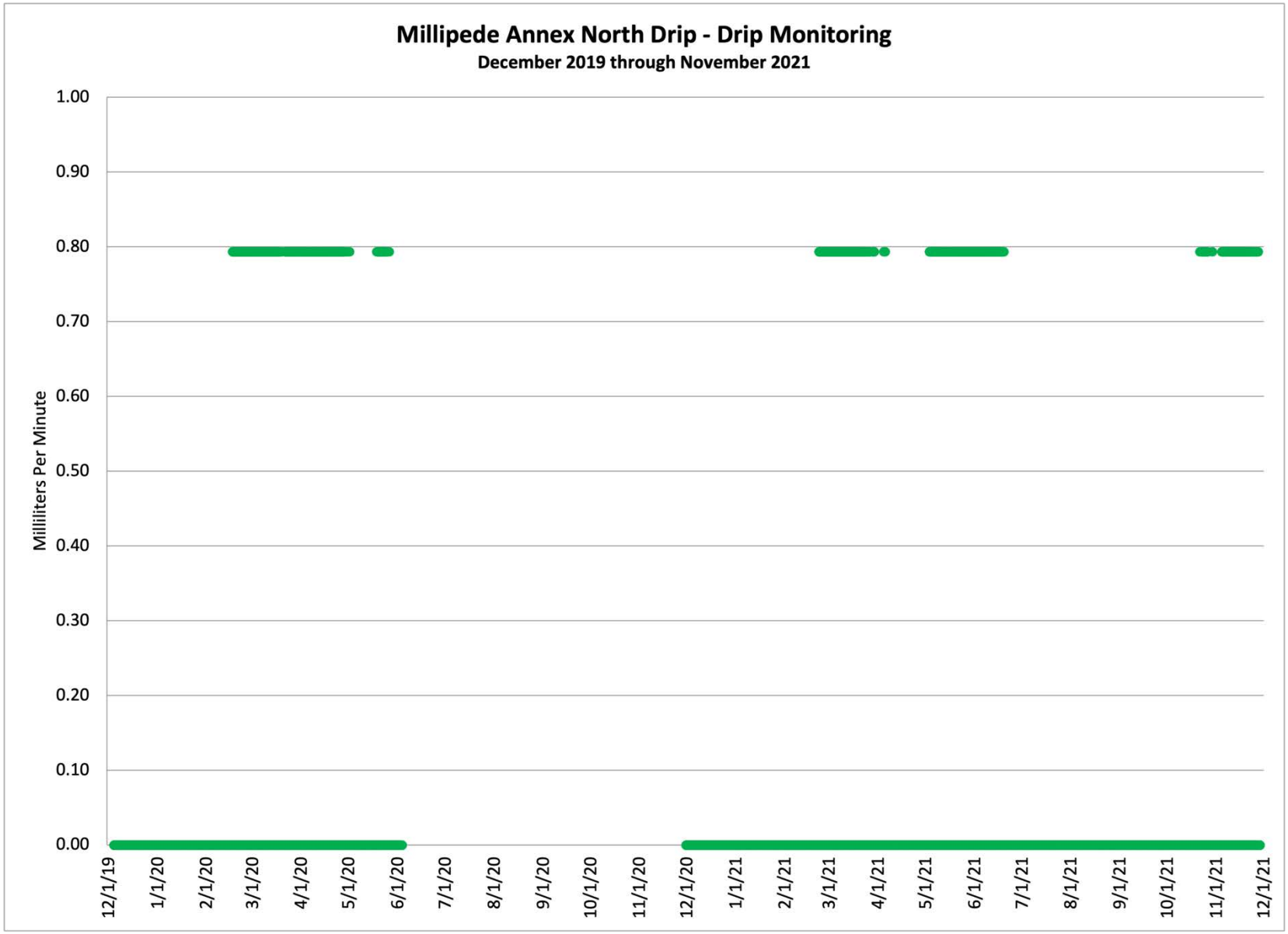
9/3/21
9/10/21
9/17/21
9/24/21
10/1/21

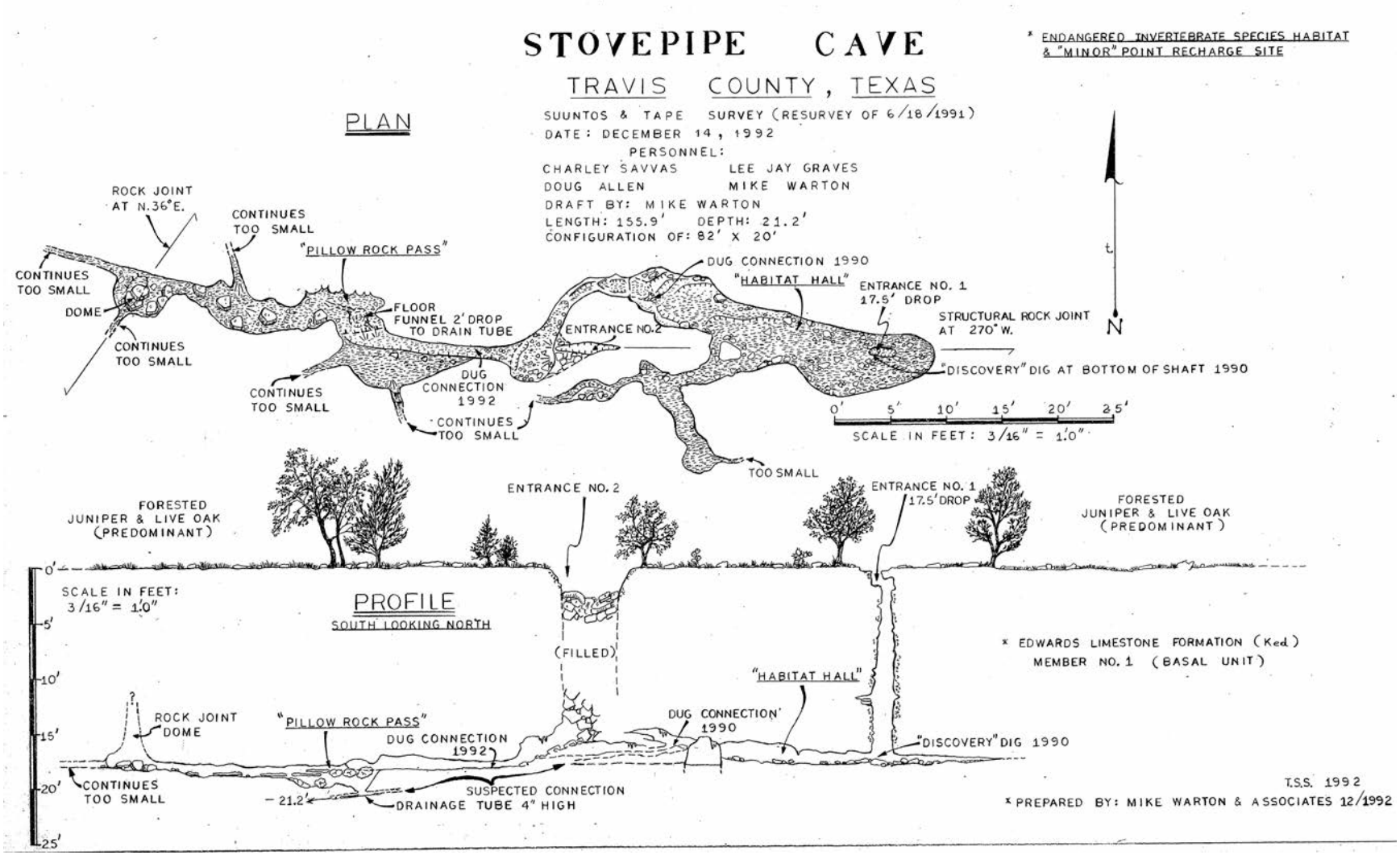

Millipede Annex North Drip - Drip Monitoring
December 2019 through November 2021
Milliliters Per Minute
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
12/1/19
1/1/20
2/1/20
3/1/20
4/1/20
5/1/20
6/1/20
7/1/20
8/1/20
9/1/20
10/1/20
11/1/20
12/1/20
1/1/21
2/1/21
3/1/21
4/1/21
5/1/21
6/1/21
7/1/21
8/1/21
9/1/21
10/1/21
11/1/21
12/1/21

Stovepipe Cave

Stovepipe Cave is located on the AW BCP Stovepipe Cave Preserve. It is named for its chimney like entrance. The cave was first explored in 1990 by Charley Savvas, Lee Jay Graves, Doug Allen, and Mike Warton when the excavated ranch fill material from the entrance pit and discovered 156 ft of cave extent.



Looking up and out of the Stovepipe Cave entrance.


STOVEPIPE CAVE
TRAVIS COUNTY, TEXAS
* ENDANGERED INVERTEBRATE SPECIES HABITAT & "MINOR" POINT RECHARGE SITE
PLAN
SUUNTOS & TAPE SURVEY (RESURVEY OF 6/18/1991)
DATE: DECEMBER 14, 1992
PERSONNEL:
CHARLEY SAVVAS LEE JAY GRAVES
DOUG ALLEN MIKE WARTON
DRAFT BY: MIKE WARTON
LENGTH: 155.9' DEPTH: 21.2'
CONFIGURATION OF: 82' X 20'
ROCK JOINT AT N.36°E.
CONTINUES TOO SMALL
"PILLOW ROCK PASS"
CONTINUES TOO SMALL
DOME
CONTINUES TOO SMALL
FLOOR FUNNEL 2' DROP TO DRAIN TUBE
DUG CONNECTION 1990
"HABITAT HALL"
ENTRANCE NO. 1 17.5' DROP
STRUCTURAL ROCK JOINT AT 270° W.
ENTRANCE NO. 2
"DISCOVERY" DIG AT BOTTOM OF SHAFT 1990
CONTINUES TOO SMALL
DUG CONNECTION 1992
CONTINUES TOO SMALL
TOO SMALL
0' 5' 10' 15' 20' 25'
SCALE IN FEET: 3/16" = 1'0"
N
FORESTED JUNIPER & LIVE OAK (PREDOMINANT)
ENTRANCE NO. 2
ENTRANCE NO. 1 17.5' DROP
FORESTED JUNIPER & LIVE OAK (PREDOMINANT)
PROFILE
SOUTH LOOKING NORTH
SCALE IN FEET: 3/16" = 1'0"
(FILLED)
"HABITAT HALL"
ROCK JOINT DOME
"PILLOW ROCK PASS"
DUG CONNECTION 1992
DUG CONNECTION 1990
"DISCOVERY" DIG 1990
CONTINUES TOO SMALL
- 21.2'
SUSPECTED CONNECTION DRAINAGE TUBE 4" HIGH
* EDWARDS LIMESTONE FORMATION (Ked) MEMBER NO. 1 (BASAL UNIT)
T.S.S. 1992
* PREPARED BY: MIKE WARTON & ASSOCIATES 12/1992

Stovepipe South Crawl Drip

Discrete Cave Drip

This site is a discrete cave drip and is within the Edwards Group.

Automated drip rate monitoring began on November 12, 2020.

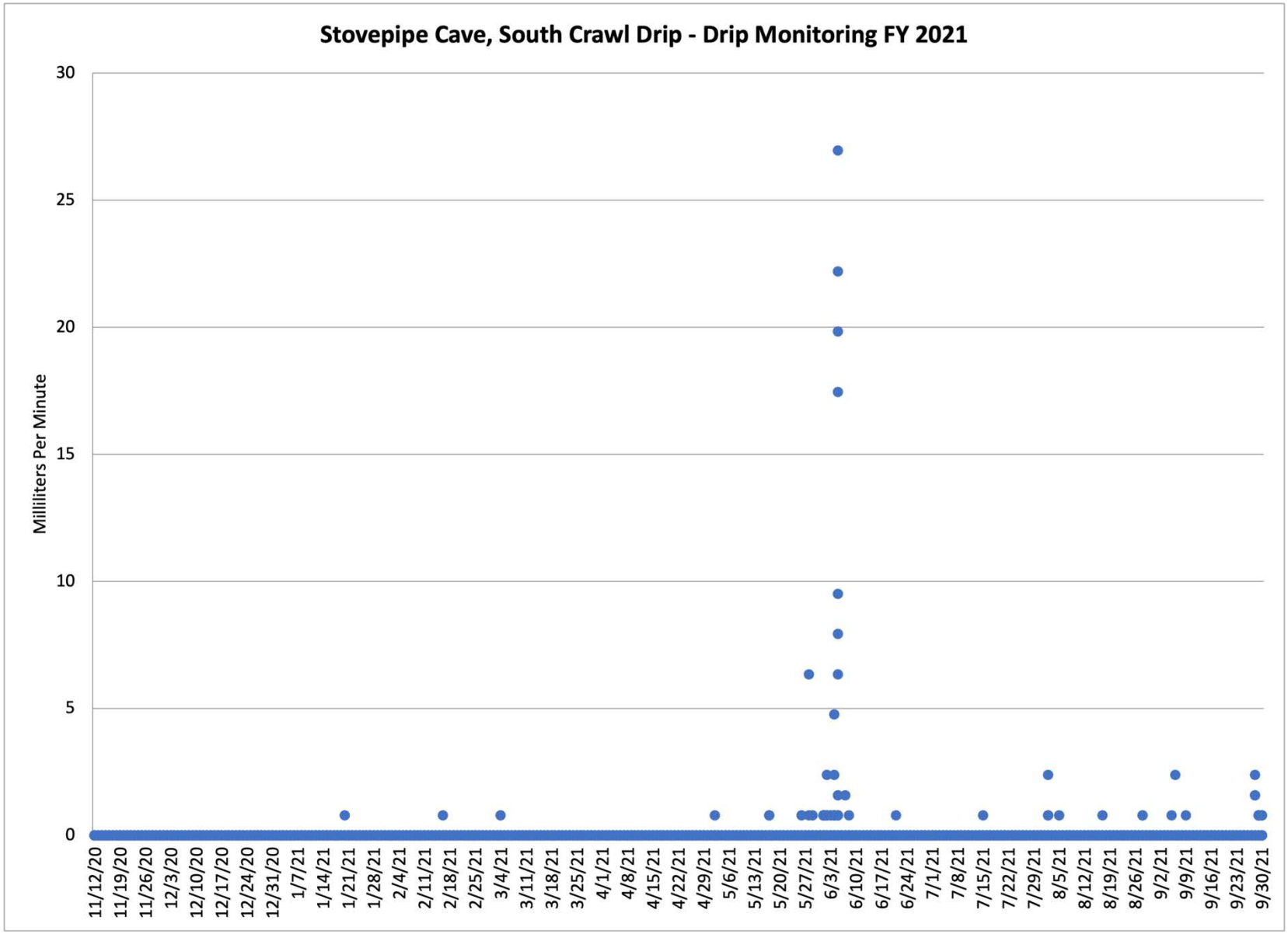
30,947 drip rate measurements.

Drip rate in Milliliters Per Minute: Mean 0.01 – Minimum 0.00 – Maximum 26.97

Good Data collected November 12, 2020 through September 30, 2021.

Station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB




Stovepipe Cave, South Crawl Drip - Drip Monitoring FY 2021
Milliliters Per Minute
30
25
20
15
10
5
0
11/12/20
11/19/20
11/26/20
12/3/20
12/10/20
12/17/20
12/24/20
12/31/20
1/7/21
1/14/21
1/21/21
1/28/21
2/4/21
2/11/21
2/18/21
2/25/21
3/4/21
3/11/21
3/18/21
3/25/21
4/1/21
4/8/21
4/15/21
4/22/21
4/29/21
5/6/21
5/13/21
5/20/21
5/27/21
6/3/21
6/10/21
6/17/21
6/24/21
7/1/21
7/8/21
7/15/21
7/22/21
7/29/21
8/5/21
8/12/21
8/19/21
8/26/21
9/2/21
9/9/21
9/16/21
9/23/21
9/30/21

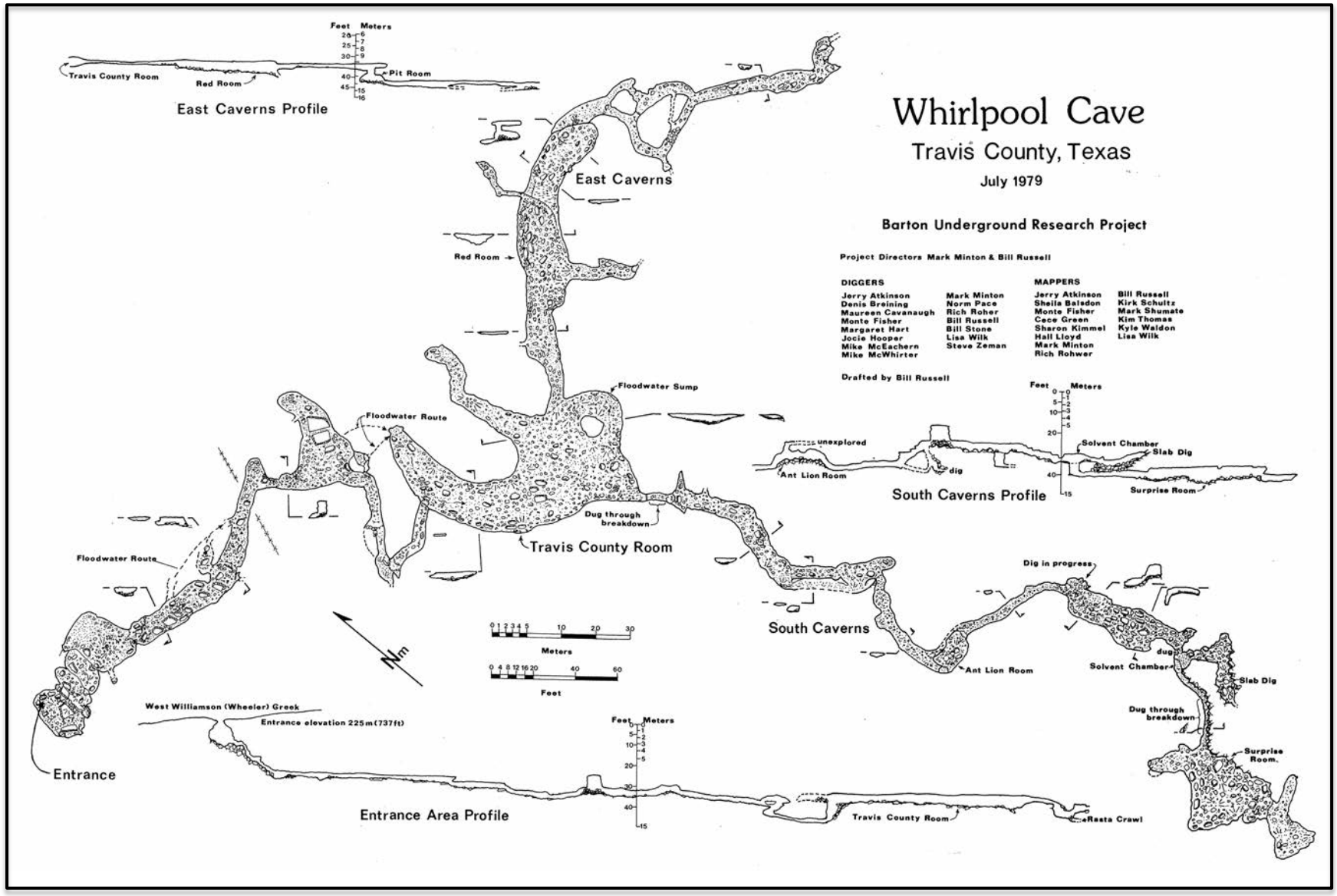
Whirlpool Cave

Whirlpool Cave is owned by the Texas Cave Management Association, a 501(c)(3) nonprofit. The main portion of the cave was discovered by Bill Russell in Summer of 1978 and as early as summer of 1979 the cave had become extremely popular to visit with an average of two trips per month (Mark Minton, *The Texas Caver* Vol 24, No.4, Whirlpool Cave, p55) In recent years it is the most frequently visited wild cave in the Austin area, averaging about 2,000 visitors per year. The cave entrance is within the bed of West Williamson Creek and serves as a significant point recharge feature. The cave appears resilient to high visitation, probably in part due to the effects of recharge events.

Despite the cave being a major recharge feature, with its passages at times completely inundated with water, the cave contains very few cave drips. Known cave drips were either directly in the trade-route or were in narrow bedding planes, making them unsuitable for monitoring. New cave drips were discovered in 2018 which are suitable for drip monitoring. Monitoring began during FY 2021.



Cave Specialist Randolph Colby and Dylan Beeler inside Whirlpool Cave.


Whirlpool Cave
Travis County, Texas
July 1979
Barton Underground Research Project
Project Directors Mark Minton & Bill Russell
DIGGERS
Jerry Atkinson
Denis Breining
Maureen Cavanaugh
Monte Fisher
Margaret Hart
Jocie Hooper
Mike McEachern
Mike McWhirter
Mark Minton
Norm Pace
Rich Roher
Bill Russell
Bill Stone
Lisa Wilk
Steve Zeman
MAPPERS
Jerry Atkinson
Sheila Baledon
Monte Fisher
Cece Green
Sharon Kimmel
Hall Lloyd
Mark Minton
Rich Rohwer
Bill Russell
Kirk Schultz
Mark Shumate
Kim Thomas
Kyle Waldon
Lisa Wilk
Drafted by Bill Russell
East Caverns Profile
Travis County Room
Red Room
Pit Room
East Caverns
Red Room
Floodwater Sump
Floodwater Route
Dug through breakdown
Travis County Room
Floodwater Route
South Caverns Profile
unexplored
Ant Lion Room
dig
Solvent Chamber
Slab Dig
Surprise Room
South Caverns
Dig in progress
Ant Lion Room
dug
Solvent Chamber
Slab Dig
Dug through breakdown
Surprise Room
Meters
Feet
West Williamson (Wheeler) Creek
Entrance elevation 225m(737ft)
Entrance
Entrance Area Profile
Travis County Room
Rasta Crawl

Lost Legends Drip

Discrete Cave Drip

This site is a discrete cave drip and is within the Kirschberg member of the Edwards Group.

Automated drip rate monitoring began on June 2, 2021.

622 drip rate measurements.

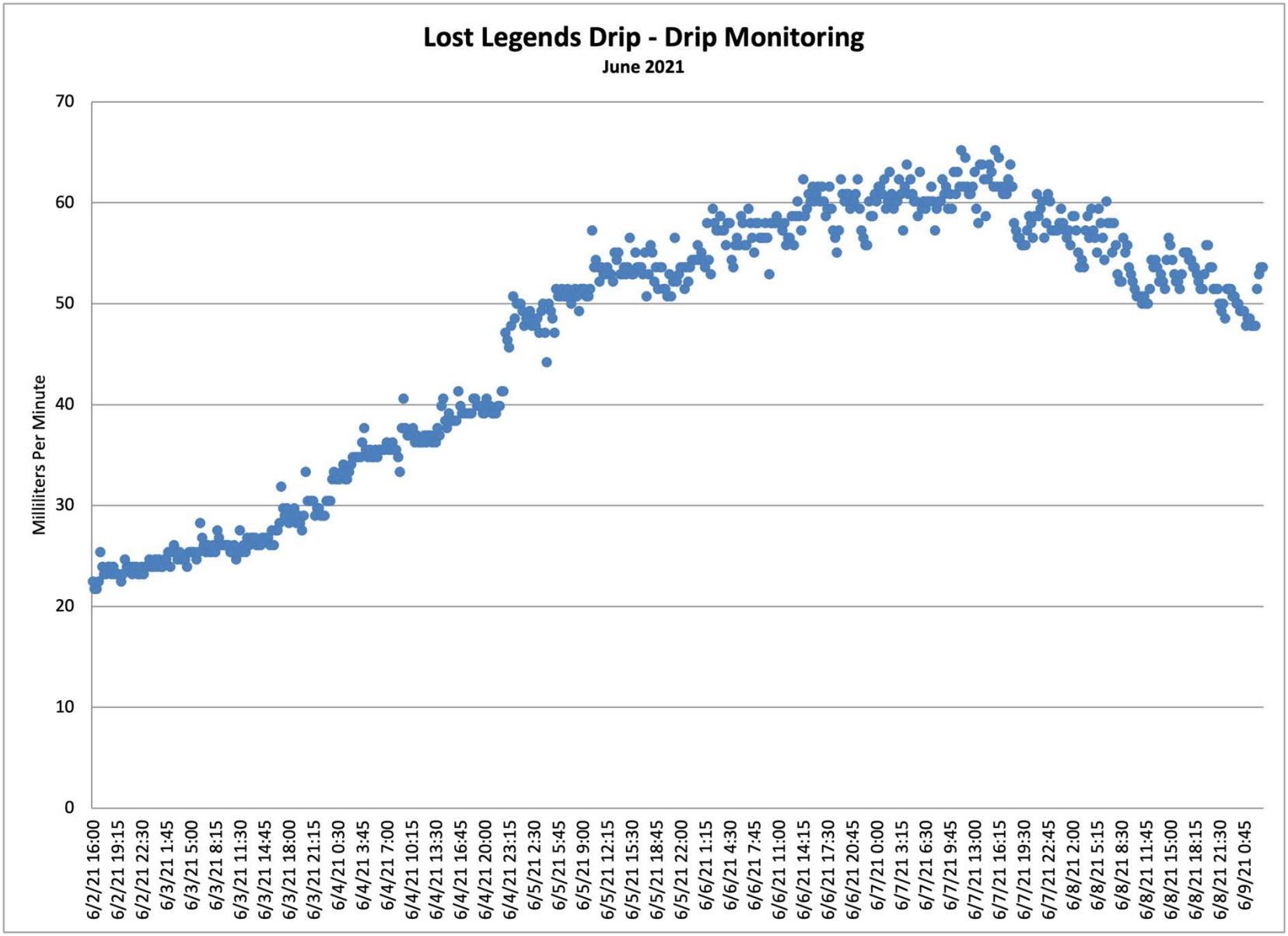
Drip rate in Milliliters Per Minute: Mean 46.90 – Minimum 21.74 – Maximum 65.22

Good Data collected June 2, 2021 through June 9, 2021.

The station is was originally deployed configured with is a RainWise tipper connected to an Onset HOBO Pendant Event Data Logger UA-003-64. This datalogger proved to have insufficient memory for the drip rate encountered at this site, and was replaced with an Onset HOBO USB Micro Station Data Logger H21-USB on September 15, 2021.

Station is currently deployed and operational. The current configuration is a RainWise tipper connected to an Onset HOBO USB Micro Station Data Logger H21-USB




Lost Legends Drip - Drip Monitoring
June 2021
Milliliters Per Minute
70
60
50
40
30
20
10
0
6/2/21 16:00
6/2/21 19:15
6/2/21 22:30
6/3/21 1:45
6/3/21 5:00
6/3/21 8:15
6/3/21 11:30
6/3/21 14:45
6/3/21 18:00
6/3/21 21:15
6/4/21 0:30
6/4/21 3:45
6/4/21 7:00
6/4/21 10:15
6/4/21 13:30
6/4/21 16:45
6/4/21 20:00
6/4/21 23:15
6/5/21 2:30
6/5/21 5:45
6/5/21 9:00
6/5/21 12:15
6/5/21 15:30
6/5/21 18:45
6/5/21 22:00
6/6/21 1:15
6/6/21 4:30
6/6/21 7:45
6/6/21 11:00
6/6/21 14:15
6/6/21 17:30
6/6/21 20:45
6/7/21 0:00
6/7/21 3:15
6/7/21 6:30
6/7/21 9:45
6/7/21 13:00
6/7/21 16:15
6/7/21 19:30
6/7/21 22:45
6/8/21 2:00
6/8/21 5:15
6/8/21 8:30
6/8/21 11:45
6/8/21 15:00
6/8/21 18:15
6/8/21 21:30
6/9/21 0:45