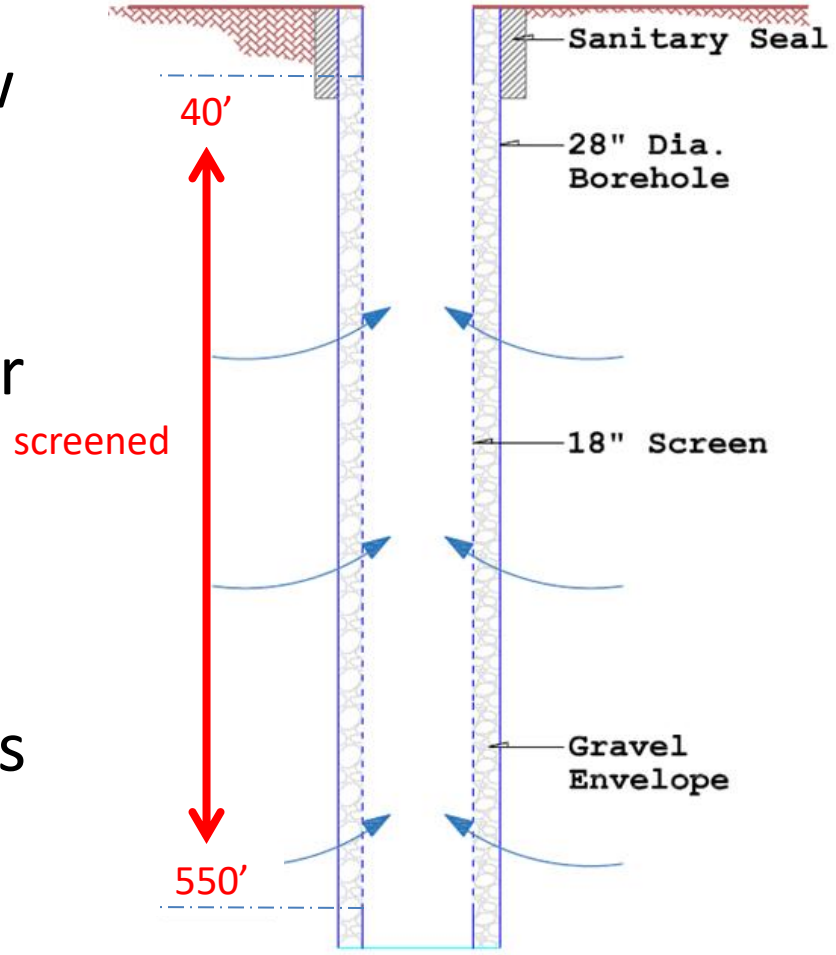
Well W385 Pumping Test
Laws Wellfield

May 6, 2020

Inyo County Water Department
Los Angeles Department of Water & Power

Original W385 Construction Design

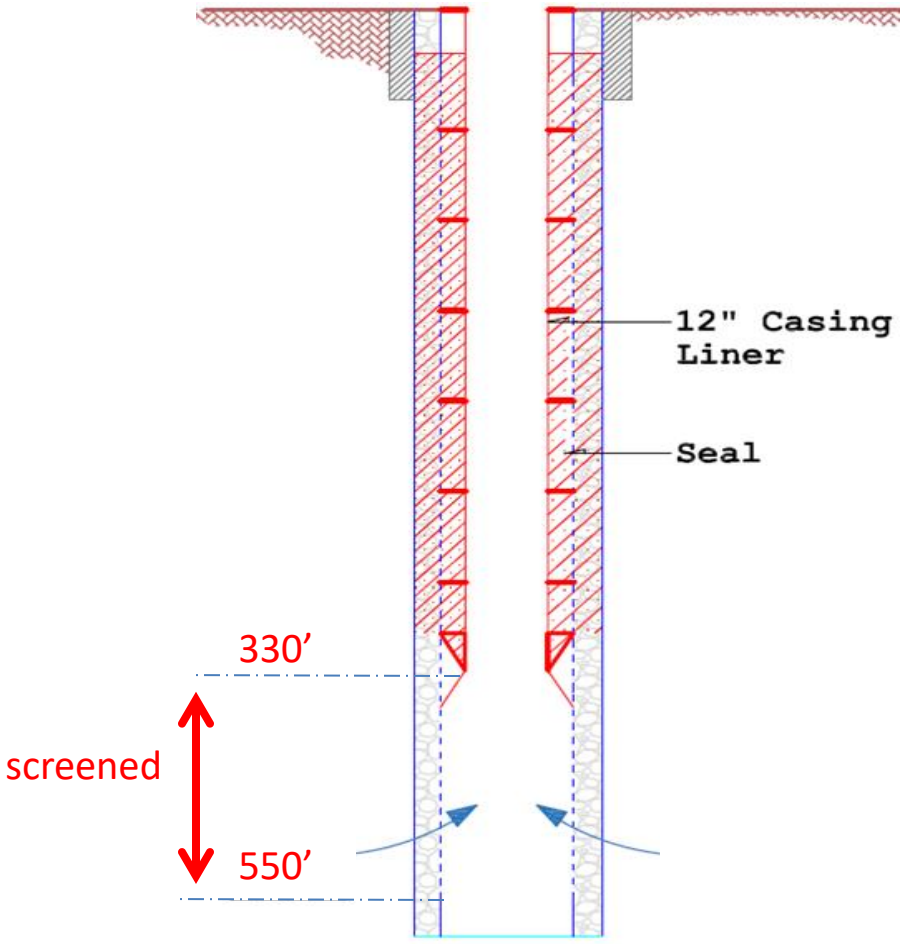
- Pumped from both shallow and deep aquifers
- Pumping impacted Five Bridges Area's groundwater dependent vegetation
- Conducted 1993-94 Pumping Test of combined W385 and W386 at 16.3 cfs
  - 10.1 cfs for W385 + 6.2 cfs for W386



Original W385 Construction Design

(W386 design is similar to W385)

W385 Construction Modification



W385 Construction Modification

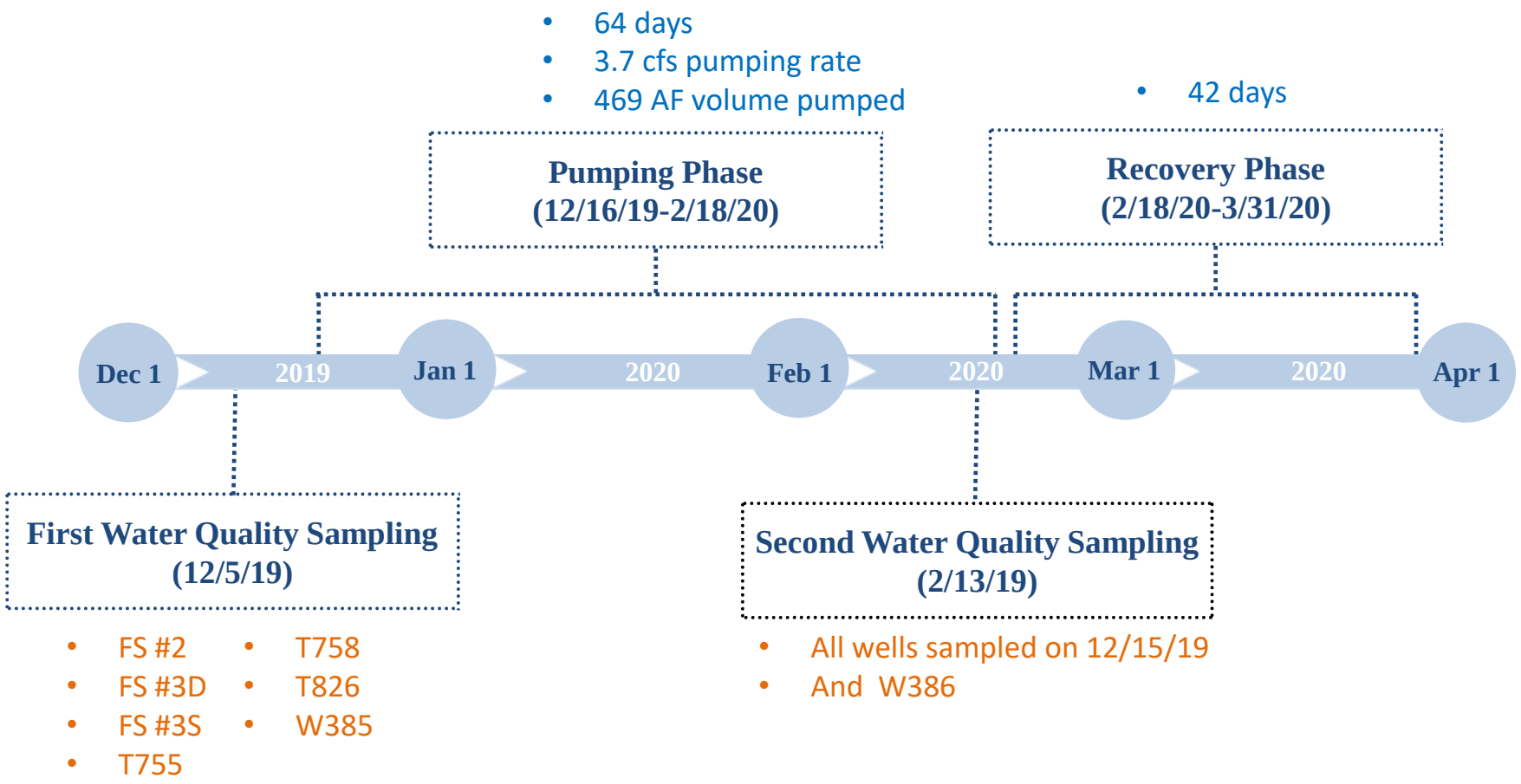
(W386 was modified similar to W385)

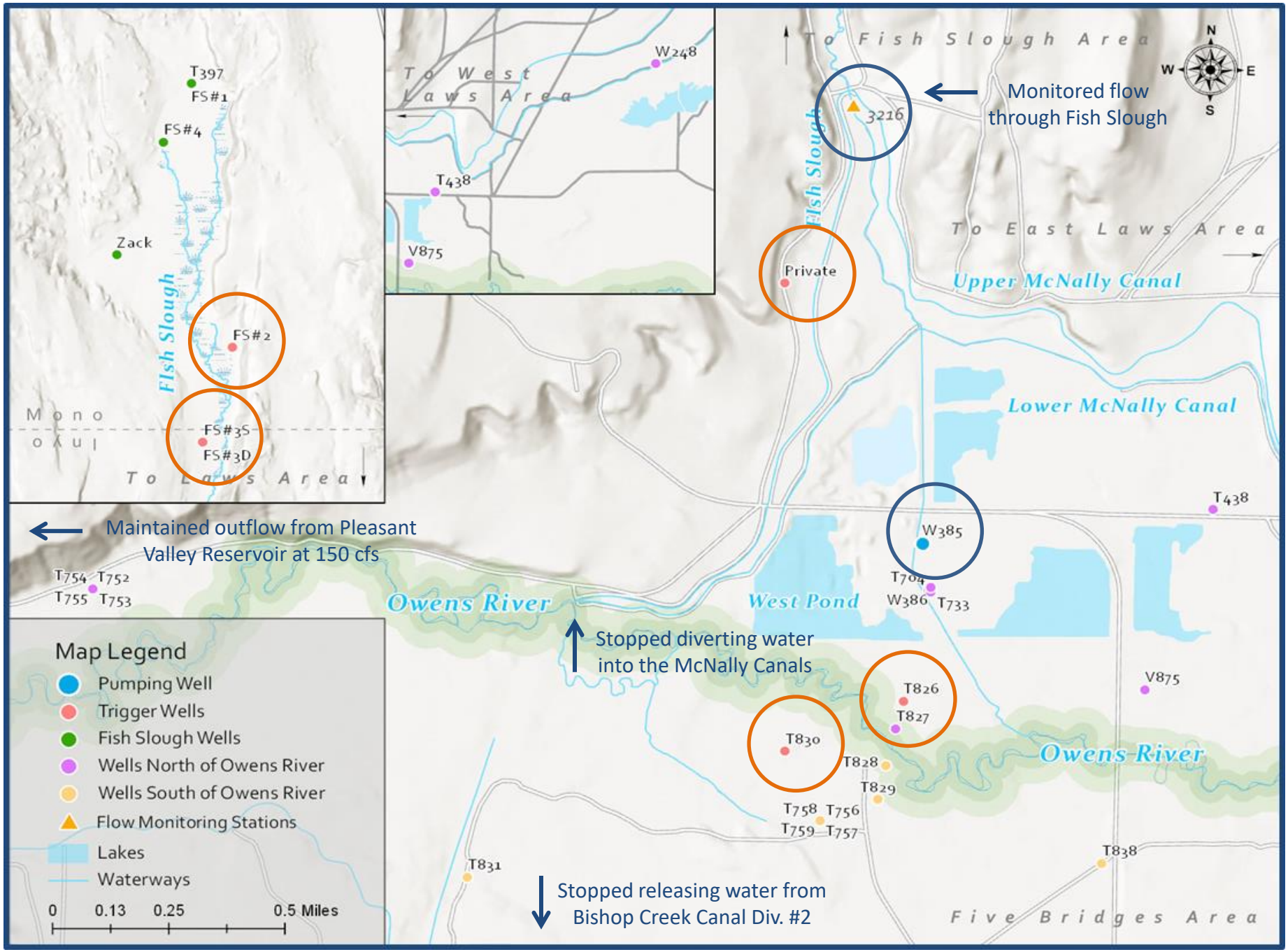
- Sealed portions screened to the shallow aquifer
- Pumps primarily from the deeper portion of aquifer
- Reduced pumping capacity to 3.7 cfs (by 64%)

Purpose of the Pumping Test

- Document the effectiveness of modifying W385 in minimizing potential pumping impacts on shallow groundwater levels
- Compare groundwater level measurements with the 1993-94 pumping test to provide an indication of effects on shallow groundwater level
- Recalibrate Bishop/Laws groundwater flow model to simulate the effect of potential operation

Hydrologic Monitoring Timeline

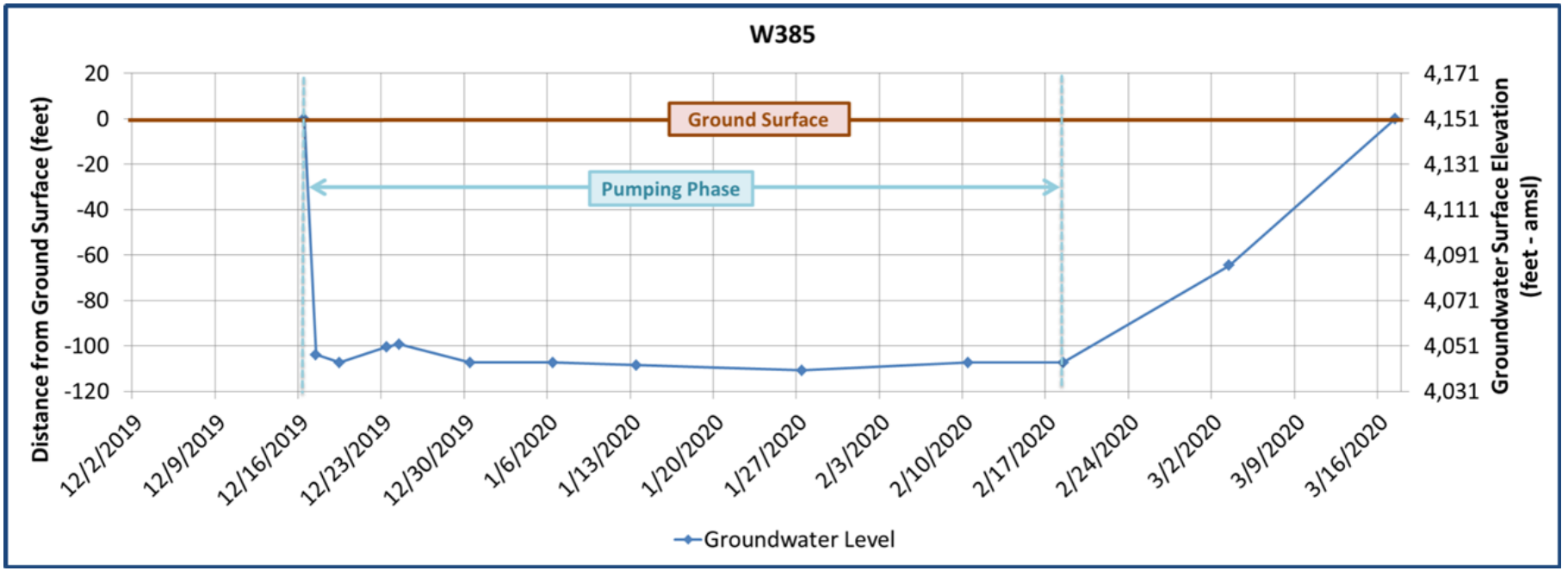


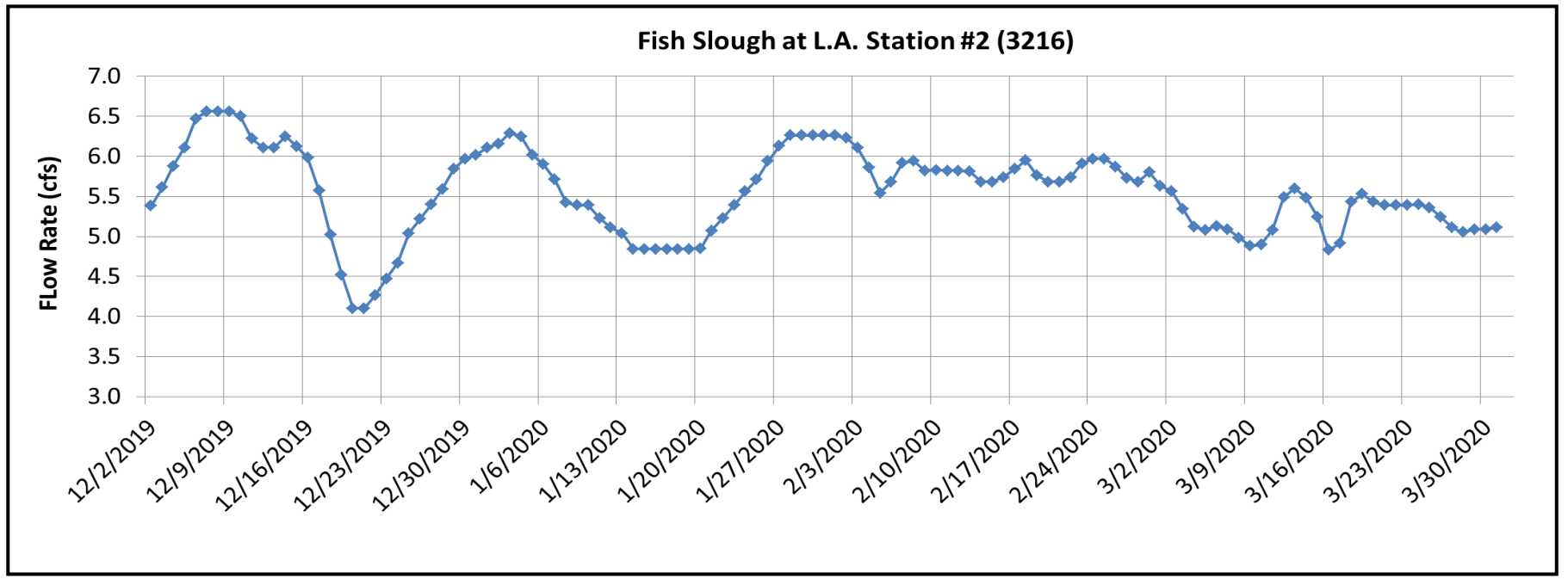

T397
FS#1
FS#4
Zack
Fish Slough
FS#2
Mono
Inyo
FS#3S
FS#3D
To Laws Area
To West Laws Area
W248
T438
V875
To Fish Slough Area
N
W
E
S
3216
Monitored flow through Fish Slough
Fish Slough
Private
To East Laws Area
Upper McNally Canal
Lower McNally Canal
T438
W385
T704
W386
T733
Maintained outflow from Pleasant Valley Reservoir at 150 cfs
T754
T752
T755
T753
Owens River
West Pond
Stopped diverting water into the McNally Canals
V875
T826
T827
T830
T828
T829
Owens River
T758
T756
T759
T757
T831
T838
Stopped releasing water from Bishop Creek Canal Div. #2
Five Bridges Area
Map Legend
Pumping Well
Trigger Wells
Fish Slough Wells
Wells North of Owens River
Wells South of Owens River
Flow Monitoring Stations
Lakes
Waterways
0
0.13
0.25
0.5 Miles

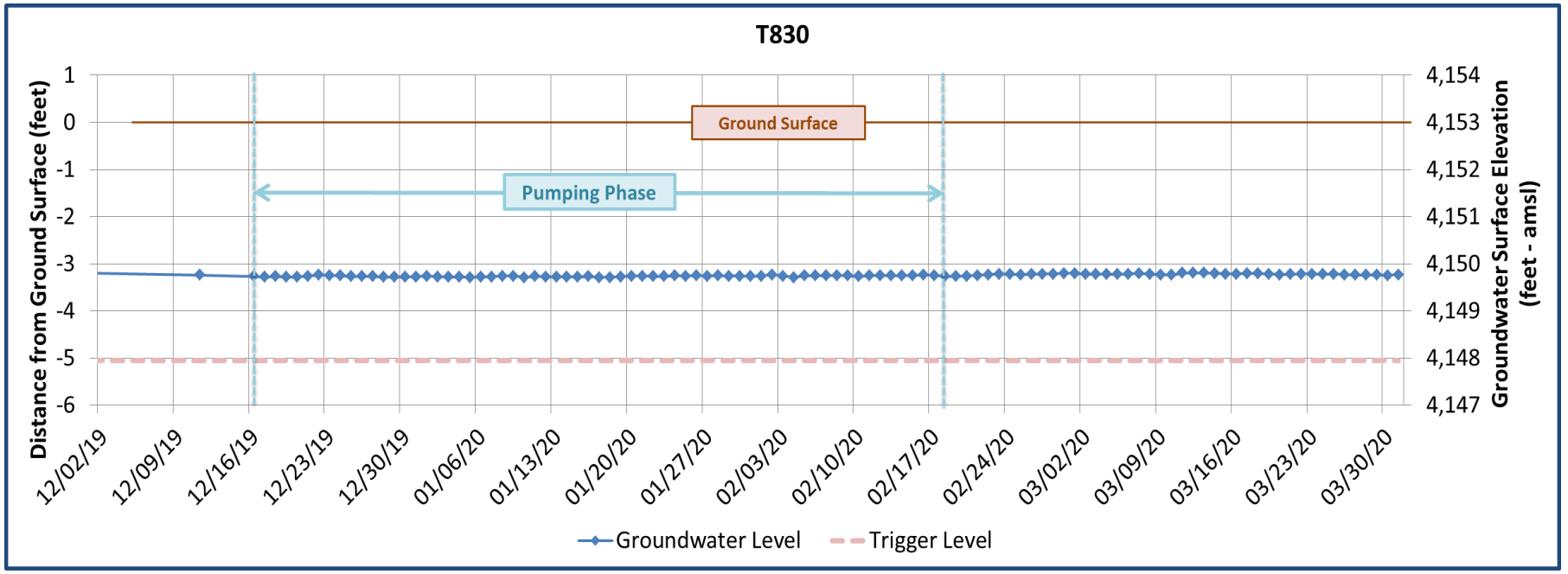
Trigger Wells and Trigger Levels

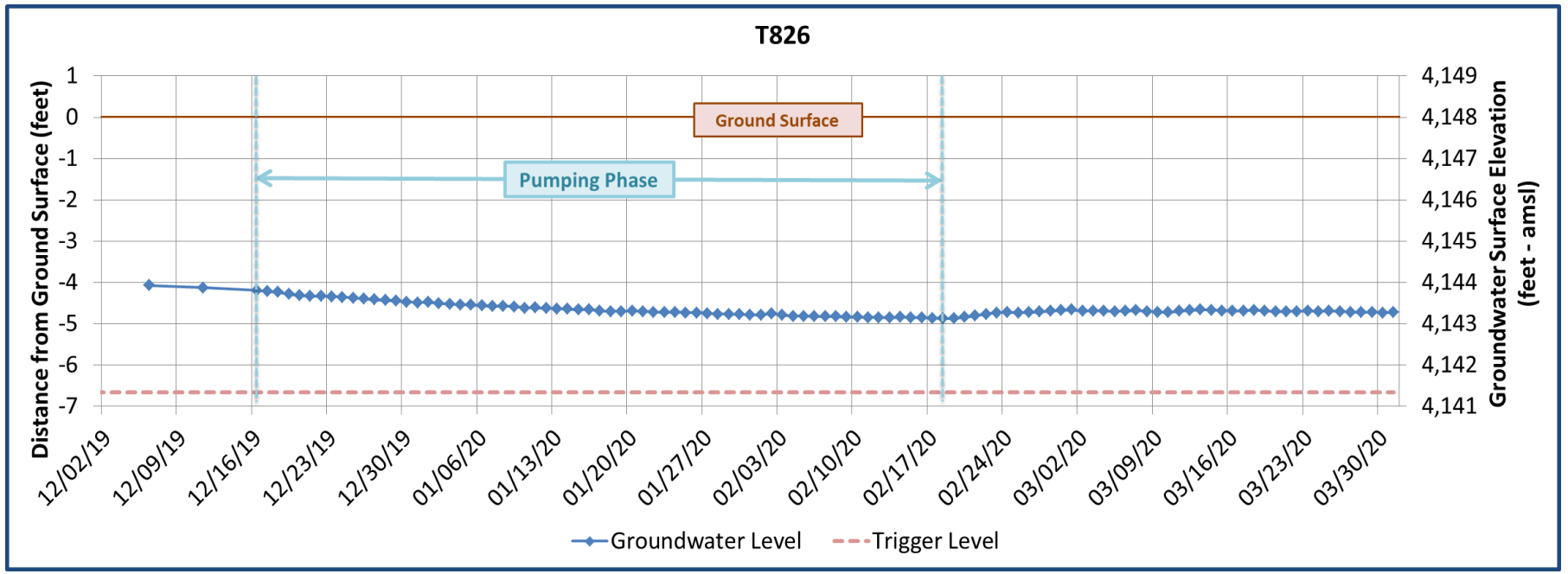
Well	Trigger Level from Ref. Point (ft)	Trigger Level AMSL (ft)
T830	6.10	4148.15
T826	7.60	4140.94
Private Well	21.40	4164.60
FS #2	4.70	4180.55
FS #3S	15.30	4178.92
FS #3D	16.00	4178.84

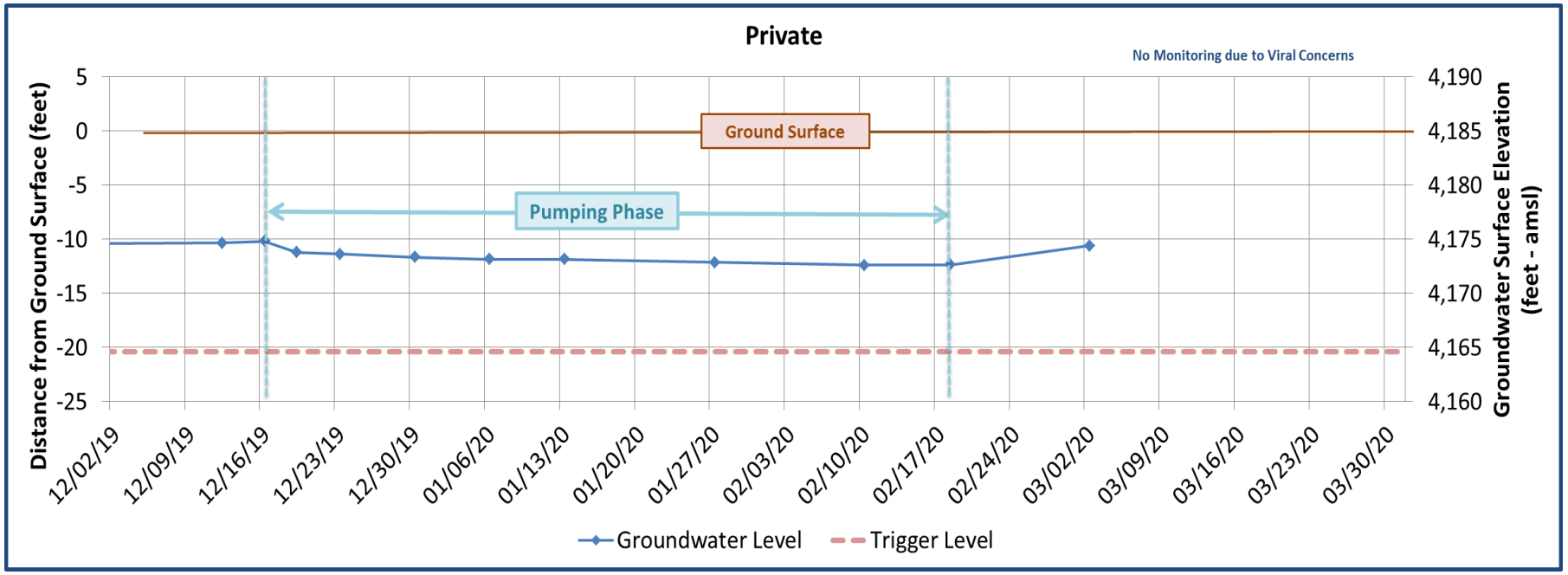
Stop pumping if groundwater in any trigger well falls below trigger level

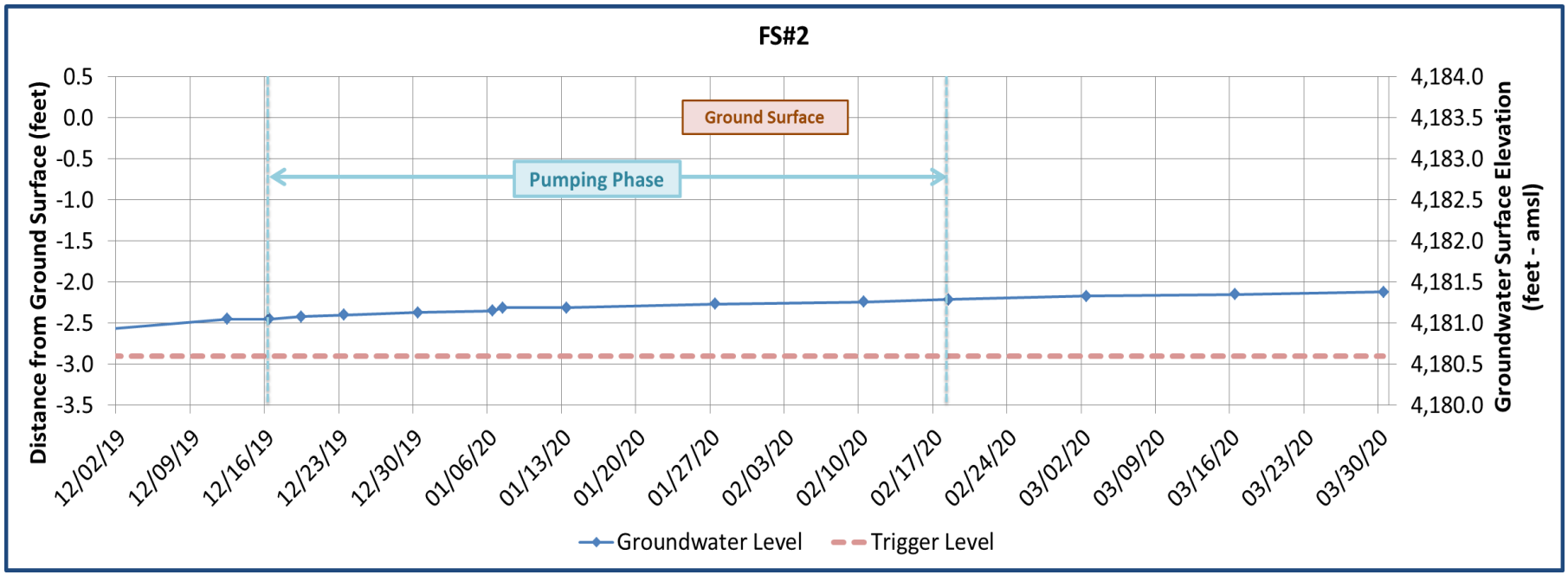

W385
Distance from Ground Surface (feet)
20
0
-20
-40
-60
-80
-100
-120
Ground Surface
Pumping Phase
4,171
4,151
4,131
4,111
4,091
4,071
4,051
4,031
Groundwater Surface Elevation (feet - amsl)
12/2/2019
12/9/2019
12/16/2019
12/23/2019
12/30/2019
1/6/2020
1/13/2020
1/20/2020
1/27/2020
2/3/2020
2/10/2020
2/17/2020
2/24/2020
3/2/2020
3/9/2020
3/16/2020
Groundwater Level

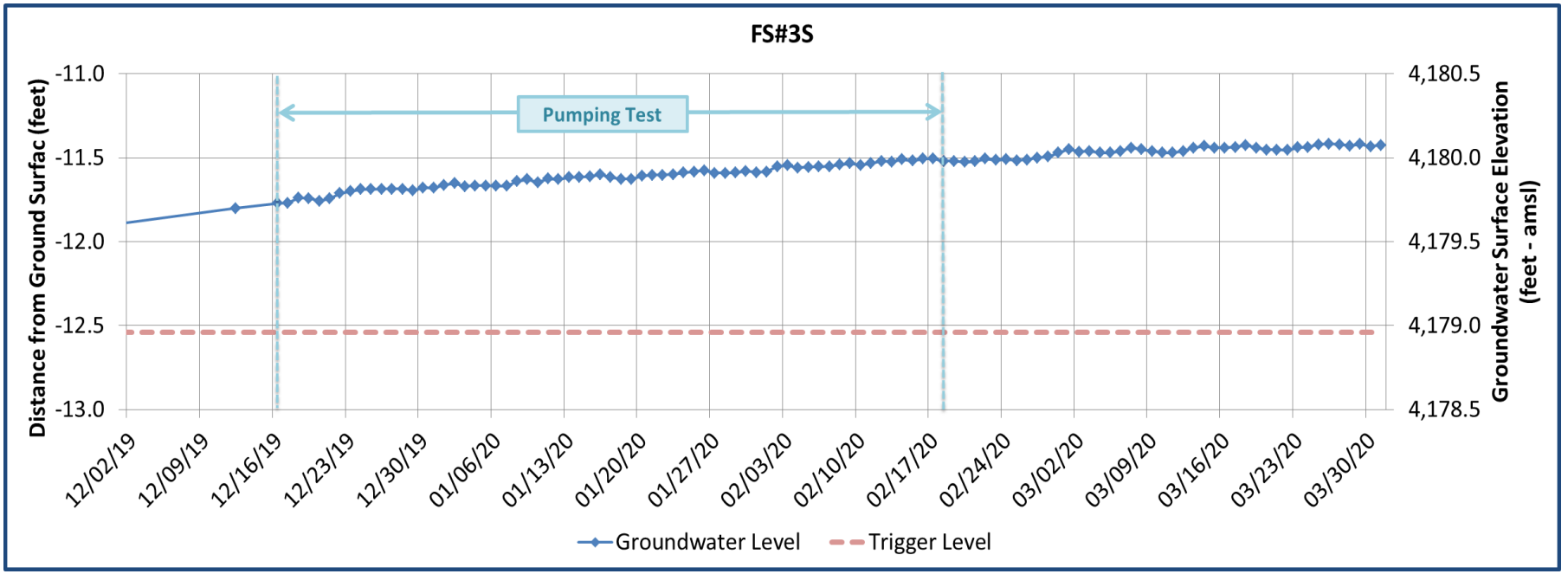

Fish Slough at L.A. Station #2 (3216)
FLow Rate (cfs)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
12/2/2019
12/9/2019
12/16/2019
12/23/2019
12/30/2019
1/6/2020
1/13/2020
1/20/2020
1/27/2020
2/3/2020
2/10/2020
2/17/2020
2/24/2020
3/2/2020
3/9/2020
3/16/2020
3/23/2020
3/30/2020

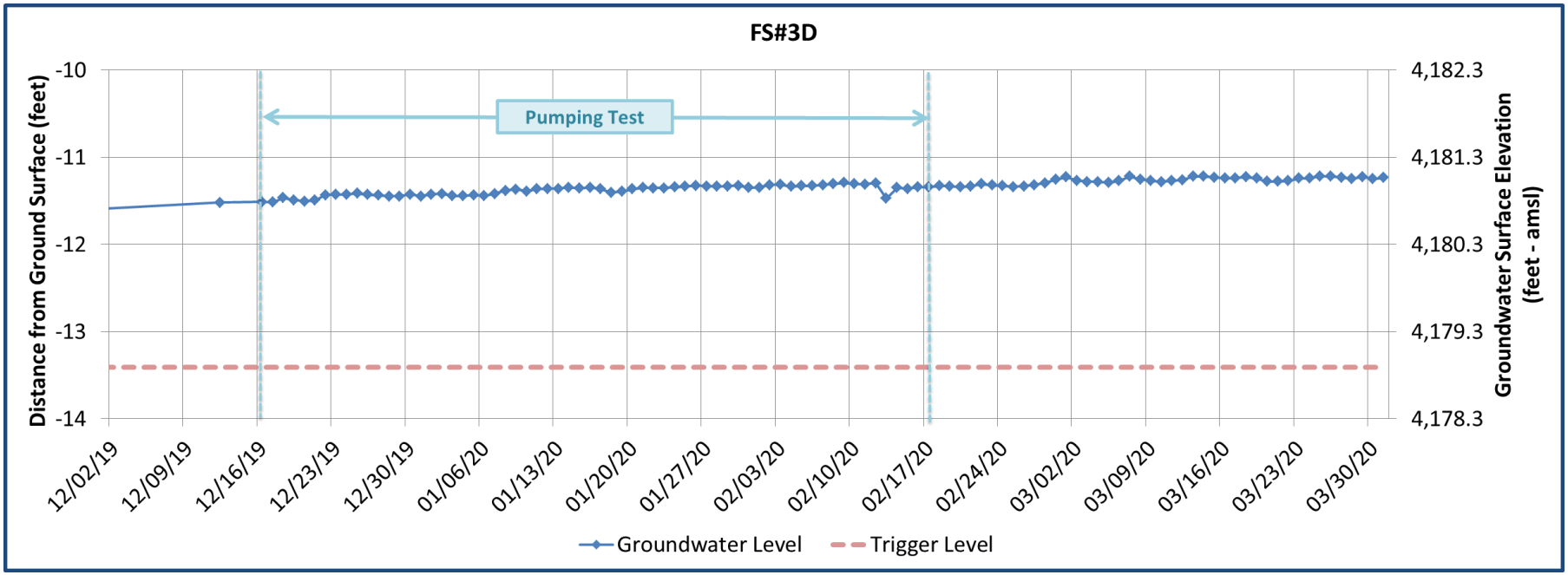

T830
Distance from Ground Surface (feet)
1
0
-1
-2
-3
-4
-5
-6
Ground Surface
Pumping Phase
4,154
4,153
4,152
4,151
4,150
4,149
4,148
4,147
Groundwater Surface Elevation (feet - amsl)
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level

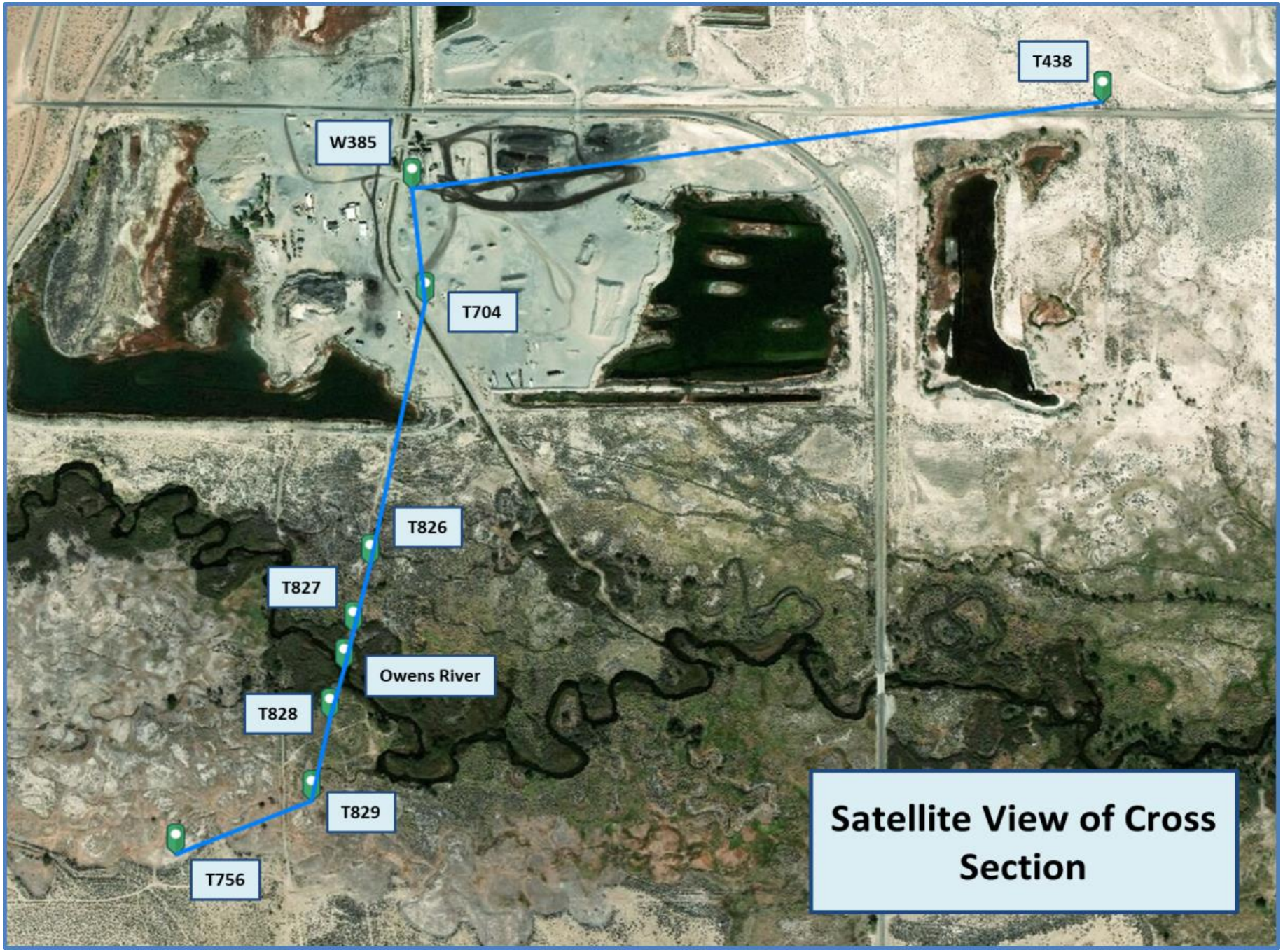

T826
Distance from Ground Surface (feet)
1
0
-1
-2
-3
-4
-5
-6
-7
Ground Surface
Pumping Phase
4,149
4,148
4,147
4,146
4,145
4,144
4,143
4,142
4,141
Groundwater Surface Elevation (feet - amsl)
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level

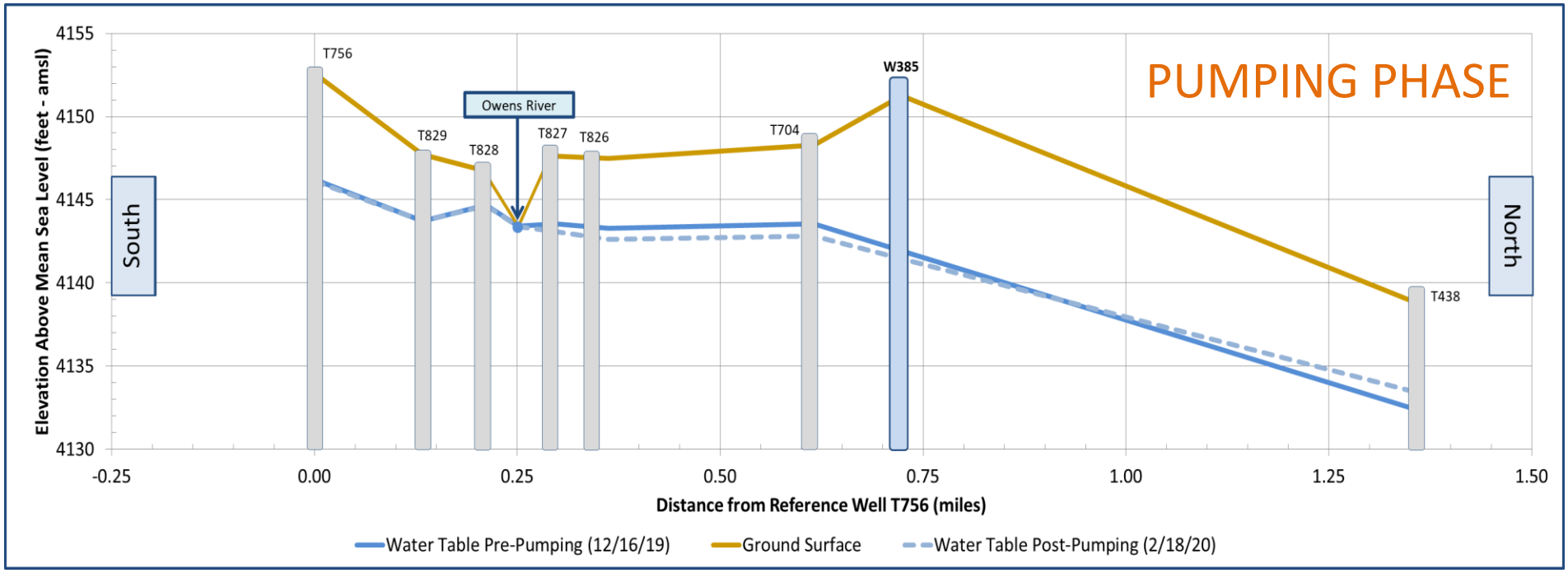

Private
No Monitoring due to Viral Concerns
Ground Surface
Pumping Phase
Distance from Ground Surface (feet)
Groundwater Surface Elevation (feet - amsl)
5
0
-5
-10
-15
-20
-25
4,190
4,185
4,180
4,175
4,170
4,165
4,160
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level

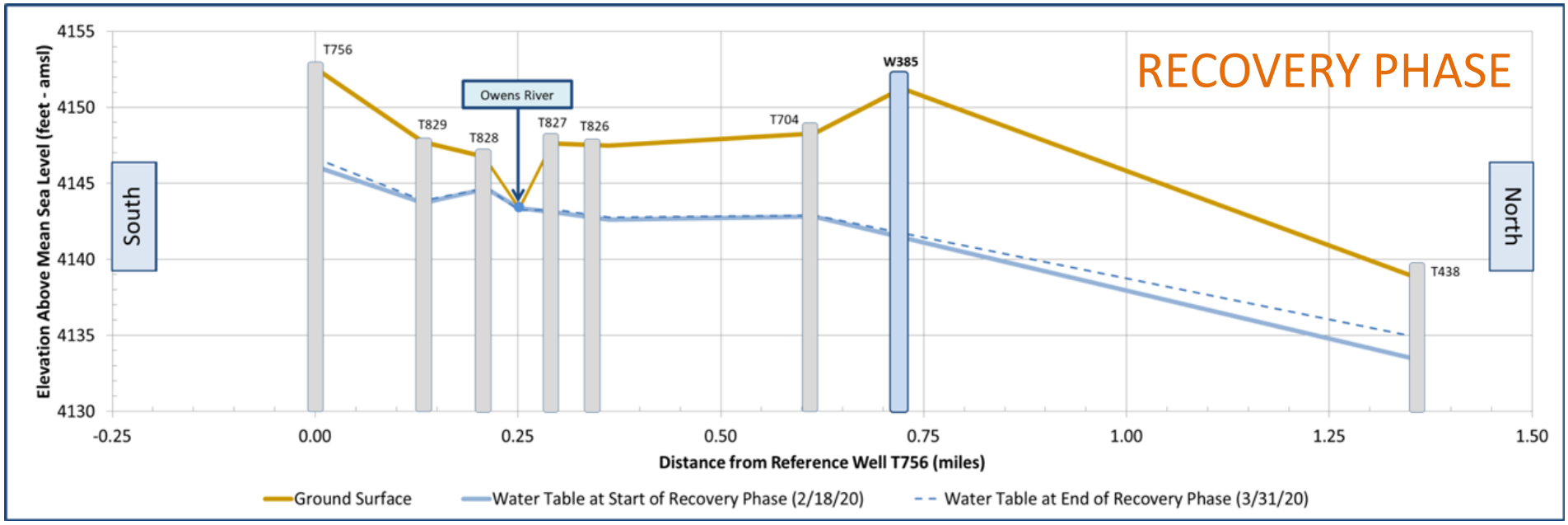

FS#2
Ground Surface
Pumping Phase
Distance from Ground Surface (feet)
Groundwater Surface Elevation (feet - amsl)
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
4,184.0
4,183.5
4,183.0
4,182.5
4,182.0
4,181.5
4,181.0
4,180.5
4,180.0
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level


FS#3S
Distance from Ground Surfac (feet)
-11.0
-11.5
-12.0
-12.5
-13.0
Pumping Test
4,180.5
4,180.0
4,179.5
4,179.0
4,178.5
Groundwater Surface Elevation (feet - amsl)
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level


FS#3D
Distance from Ground Surface (feet)
-10
-11
-12
-13
-14
Pumping Test
4,182.3
4,181.3
4,180.3
4,179.3
4,178.3
Groundwater Surface Elevation (feet - amsl)
12/02/19
12/09/19
12/16/19
12/23/19
12/30/19
01/06/20
01/13/20
01/20/20
01/27/20
02/03/20
02/10/20
02/17/20
02/24/20
03/02/20
03/09/20
03/16/20
03/23/20
03/30/20
Groundwater Level
Trigger Level


T438
W385
T704
T826
T827
Owens River
T828
T829
T756
Satellite View of Cross Section


PUMPING PHASE
Elevation Above Mean Sea Level (feet - amsl)
4155
4150
4145
4140
4135
4130
South
North
T756
T829
T828
Owens River
T827
T826
T704
W385
T438
-0.25
0.00
0.25
0.50
0.75
1.00
1.25
1.50
Distance from Reference Well T756 (miles)
Water Table Pre-Pumping (12/16/19)
Ground Surface
Water Table Post-Pumping (2/18/20)


RECOVERY PHASE
Elevation Above Mean Sea Level (feet - amsl)
4155
4150
4145
4140
4135
4130
South
North
T756
T829
T828
Owens River
T827
T826
T704
W385
T438
-0.25
0.00
0.25
0.50
0.75
1.00
1.25
1.50
Distance from Reference Well T756 (miles)
Ground Surface
Water Table at Start of Recovery Phase (2/18/20)
Water Table at End of Recovery Phase (3/31/20)

Water Quality Sampling

- In Situ Measurements
  - *Dissolved Oxygen Concentration, Fluid Turbidity, pH, etc.*
- Laboratory General Chemistry Measurements
  - *Arsenic, Bicarbonate, Calcium, etc.*
- Laboratory Isotope Measurements
  - *Oxygen-18, Deuterium, Tritium*

Next Steps

1. Compare groundwater measurements with those of the 1993-94 pumping test Analyze the effects of pumping W385 (and potentially W386) on shallow groundwater levels utilizing data gathered from the pumping test
2. Estimate aquifer characteristics using data collected
3. Recalibrate the Bishop/Laws groundwater flow model and simulate alternative operations