EXHIBIT G: WATER INFORMATION

Martin Marietta is amending the existing 112 Reclamation Permit No. M-1977-439 to change the final reclamation for Area G of the Home Office site from one open water lake to two sealed water storage reservoirs using compacted clay embankment liners.

1.0 INTRODUCTION AND BACKGROUND

Martin Marietta owns properties known as the "Home Office" site in Larimer County, Colorado. The properties are located on the west and east sides of North Taft Hill Road, approximately ½ mile south of Larimer County Road 54G, in Sections 33 and 34 of Township 8 North, Range 69 West of the 6th Principal Meridian, and Sections 3 and 4 of Township 7 North, Range 69 West of the 6th Principal Meridian.

This Groundwater Monitoring and Mitigation Plan presents the methods for monitoring groundwater during mining and reclamation, and for mitigating any potential groundwater impacts associated with permitted mining at the site. Martin Marietta is applying to the Colorado Division of Reclamation, Mining and Safety (DRMS) for an Amendment to the existing 112 Reclamation Permit No. N-1977-439 to change the final reclamation for Area G of this site from one open water lake to two sealed water storage reservoirs using a compacted clay embankment liner.

Exhibit B shows the location of the Affected Area and Area G. Exhibits F1 and F2 show all the Affected Area in the permit. Exhibit F3 details Area G, which is located in the northern portion of the Affected Area. The changes within the Affected Area are limited to Area G. Consequently, this discussion is limited to potential changes in the hydrologic balance as a result of the installation of compacted clay embankment liners in Area G-I and Area G-II. Figure G-1, enclosed, shows the Affected Area; Area G; adjacent parcels to Area G and property owners; and conceptual groundwater flows before and after the installation of the compacted clay liners.

1.1 HISTORIC USE

Area G mining and associated dewatering began in Spring 2016 and is currently underway. A compacted clay liner was installed in Area G-I in September 2020 upon completion of mining. A compacted clay liner will be installed in Area G-II upon completion of mining.

Figure G-1 shows the adjacent properties to Area G, lined cells, unlined cells, cells that will be lined in the future, and irrigation ditches in the vicinity of the Affected Area. Agricultural land uses are located north and east of Area G. Loveland Ready Mix owns properties to the north and east of Area G. Irrigation ditches in the area include the New Mercer Canal, the Larimer County Canal No. 2 Ditch, the Arthur Canal, and Taylor & Gill Lateral (owned by Martin Marietta).

Loveland Ready Mix irrigates fields north and east of Area G outside of the permit area. Irrigation field tiles are reported to have been installed in the properties owned by Constance A Fredman located southeast of Area G of the Affected Area (Figure G-2). After reports of poor drainage, the field tiles were repaired by Loveland Ready Mix. Flooding was reported to Martin Marietta on the PKR Farm LLC property located east of the Affected Area (Figure G-2) as part of the field tile issue. In response, Martin Marietta worked with Loveland Ready Mix and PKR Farm LLC and installed drainage ditches between Loveland Ready Mix and PKR Farms LLC and along the east side of Area G-I. The drainage ditches convey irrigation runoff from the area east of the Affected Area to the south to the Cache La Poudre River, similar to the historic drainage patterns. Since the installation of the ditches, there have not been further reports of flooding.

Based on discussions with Seaworth Properties LLC, water is rising on the east side of a parcel owned by Seaworth Properties LLC, on the west side of Area G-I during the irrigation season. Martin Marietta is working with Seaworth Properties LLC and installed a groundwater perimeter drain between January 10, 2022 and

February 4, 2022 to address the groundwater rise and irrigation return flow to the river. Figure F-3 presents the location and design drawings for the perimeter drain (See Section 2.1 Mining Plan). An additional section of perimeter drain is proposed along the north side of Area G-II. This section will connect to the installed perimeter drain at the northeast corner of Area G-II. A swale was installed on Martin Marietta's property on the west side of Area G-I to facilitate surface drainage for landowners located west of Area G-I. Figure G-3 shows the approximate locations of the perimeter drain and swale.

Chart 1 illustrates the mining cells in the vicinity of the Affected Area and the liner status of each cell.

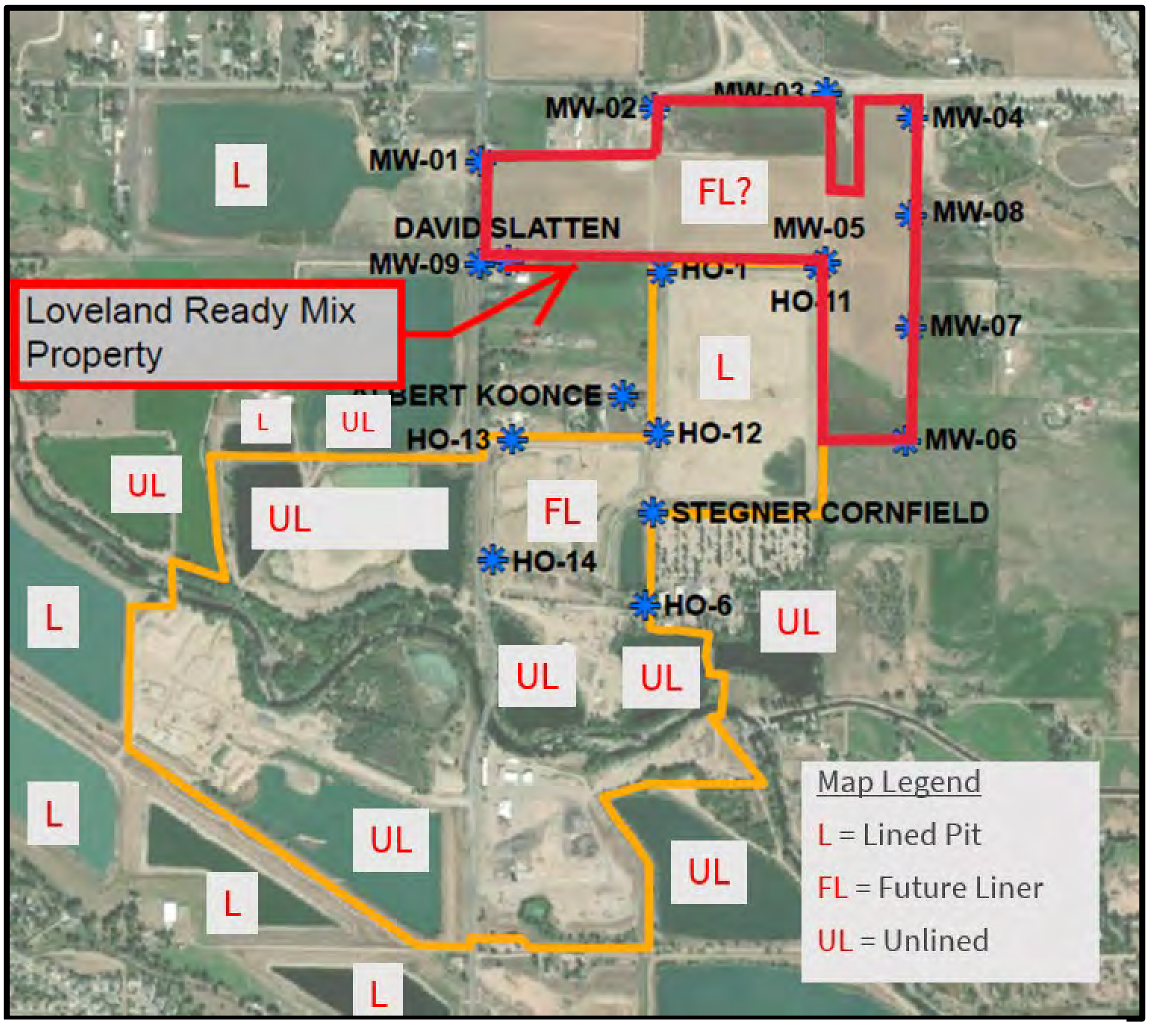

Chart 1: Mining Cells in the Vicinity & Liner Status

1.2 EXISTING WELLS

1.2.1 Monitoring Wells

Six monitoring wells (HO-1, 6, 11, 12, 13 and 14) were installed outside the limits of proposed mining, allowing for groundwater monitoring to occur during and after mining.

Monitoring well HO-1 was installed in the northwest corner of Area G-I. Monitoring well HO-6 was installed in the southeast corner of Area G-II. Both HO-1 and HO-6 were installed in 2018. Monthly groundwater monitoring for wells HO-1 and HO-6 began in May 2018. The well monitoring program documented pre-mining groundwater levels near the project area and seasonable fluctuations.

The following monitoring wells were installed in Area G in 2021:

- HO-11, in the northeast corner of Area G-I
- HO-12, near the southern portion of Area G-I, and near the northeast corner of Area G-II
- HO-13, near the northwest corner of Area G-II
- HO-14, near the southwest corner of Area G-II

Monthly groundwater monitoring for wells HO-11, HO-12, HO-13, and HO-14 began in May 2021. Exhibit F3, dated August 2021, and Figure G-3 show the locations of the wells.

Chart 1 shows water level measurements for HO-1 and HO-6. Chart 2 shows water level measurements for HO-11, HO-12, HO-13, and HO-14. Exhibit G, Attachment 1 shares the raw data for wells HO-1, HO-6, HO-11, HO-12, HO-13, and HO-14.

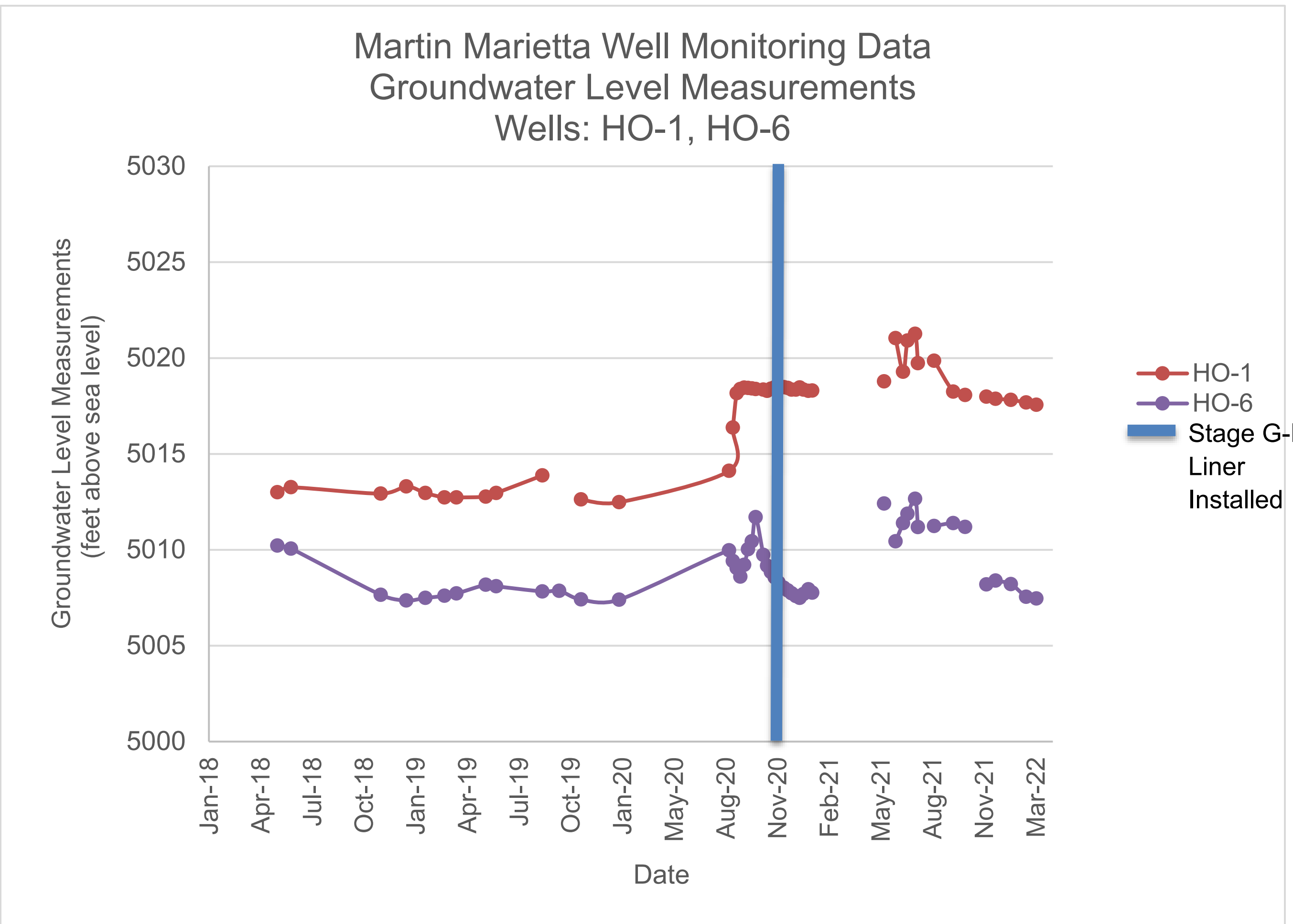

Chart 2: Martin Marietta Monitoring Data (HO-1 and HO-6)

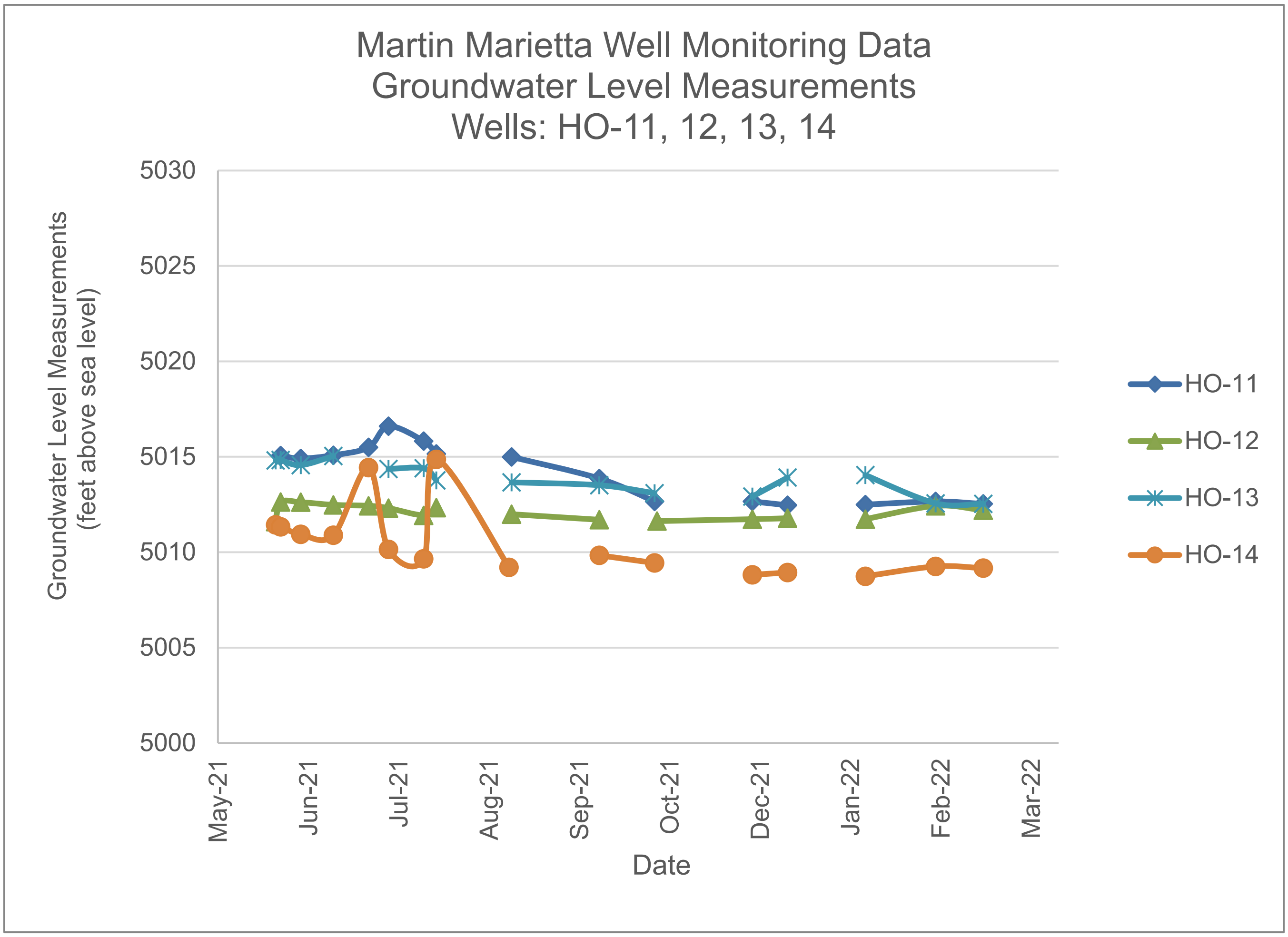

Chart 3: Well Monitoring Data (HO-11, 12, 13, 14)

Loveland Ready Mix installed monitoring wells on their lands in July 2016. Chart 4 and 5 show water level measurements that have been collected monthly since the wells were installed. Monitoring wells MW-02, MW-03 and MW-04 are located north of Area G-I. Monitoring wells MW-05, MW-06, MW-07 are located east of Area G-I. Groundwater monitoring for monitoring wells MW-02 through MW-07 began in July 2016. Groundwater levels fluctuate throughout the seasons. Exhibit G, Attachment 1 presents data provided by Loveland Ready Mix.

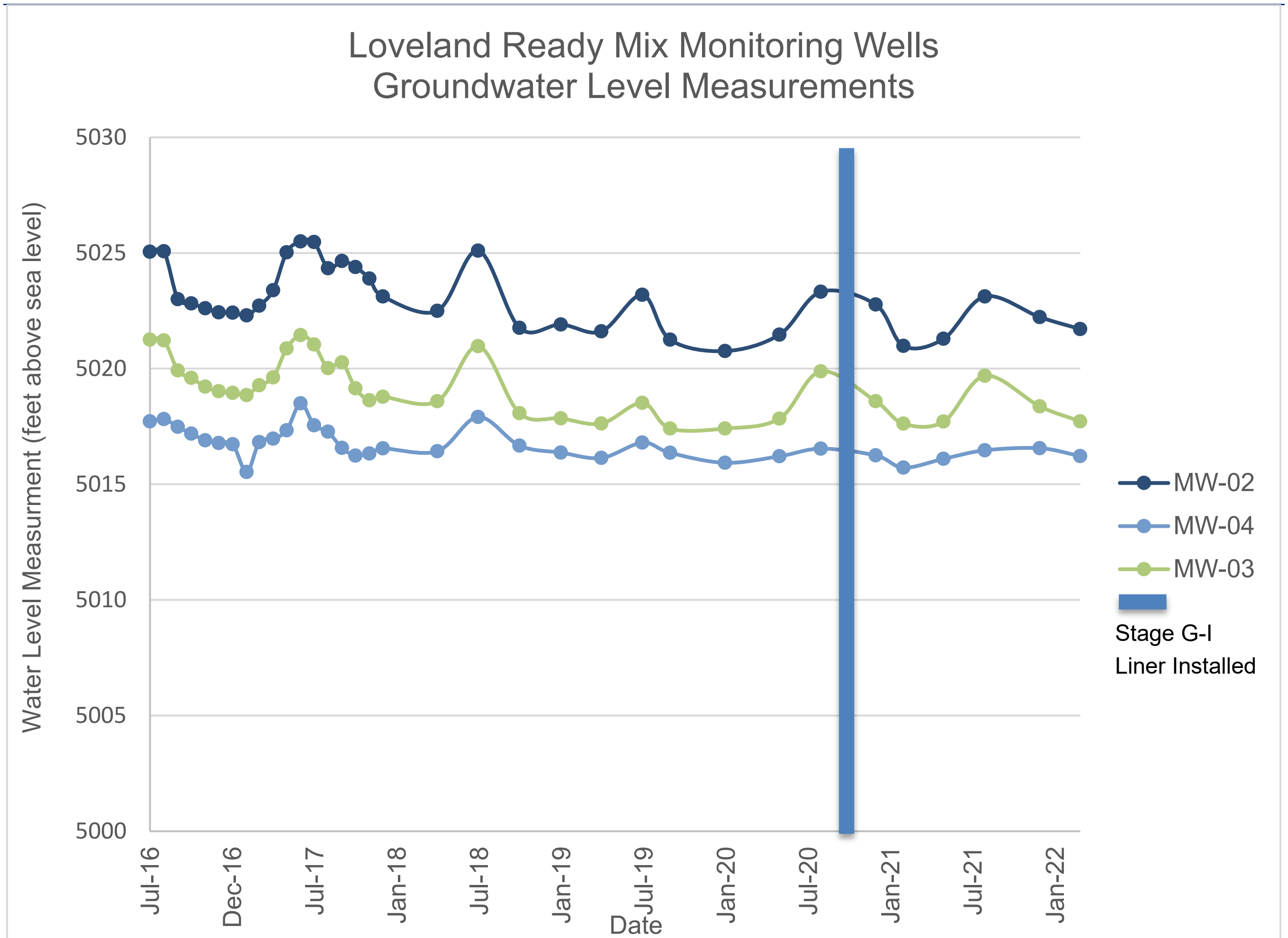

Chart 4: Loveland Ready Mix Monitoring Wells, MW-02, 03, 04

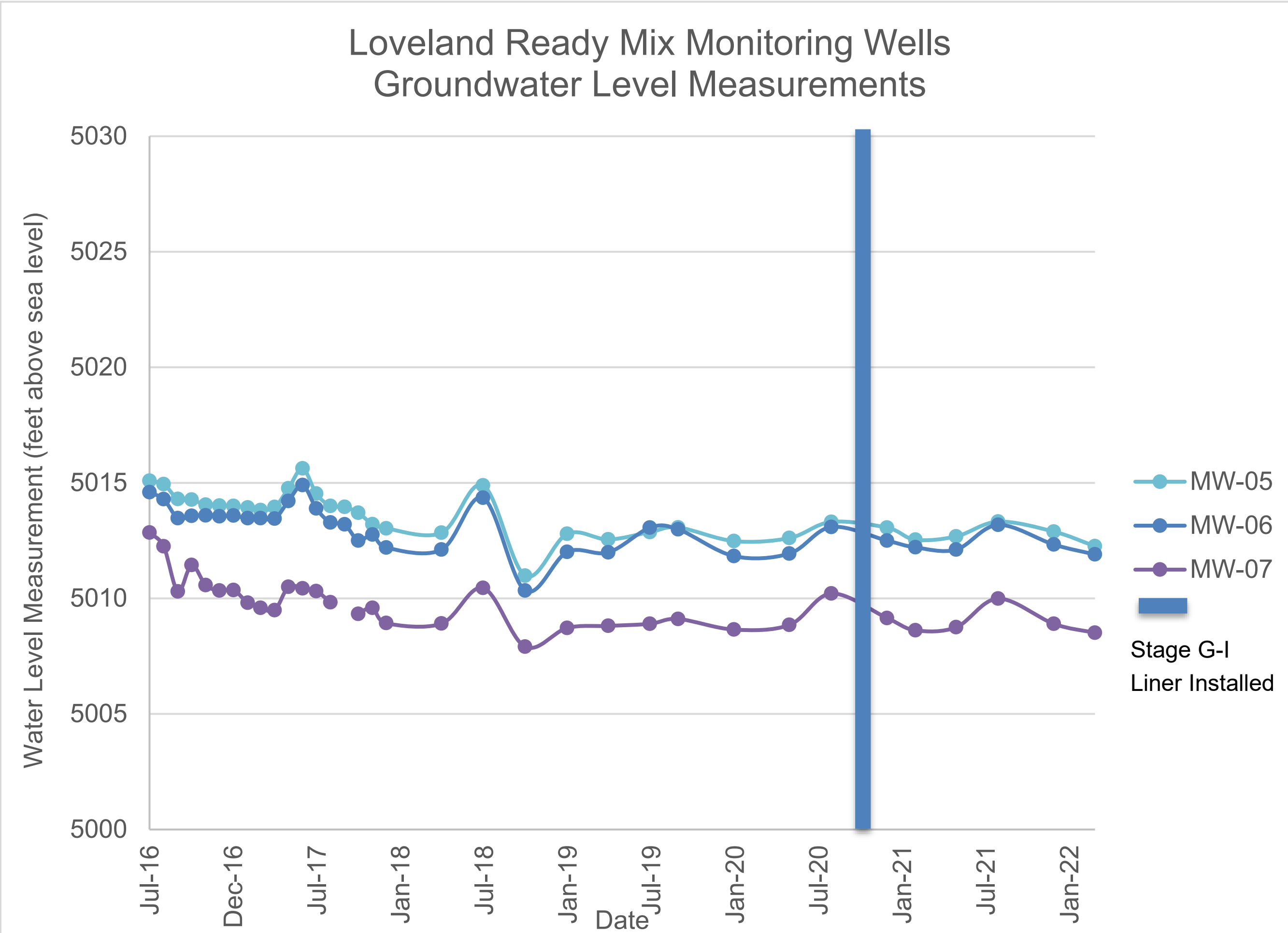

Chart 5: Loveland Ready Mix Monitoring Wells, MW-05, 06, 07

1.2.2 Nearby Wells

Numerous wells were installed in 2001 to establish groundwater baselines to monitor the groundwater conditions before, during, and after mining per the 2005 Well Monitoring Program Interim Report for Home Office. Water level measurements from 2004 and 2005 are included in the 2005 Well Monitoring Program Interim Report Well locations are shown on Figure G-3. Well owners, David L and Virginia S Slatten's property is located west of Area G-I at the northernmost portion of Area G-I (Figure G-1). Well Owners, Albert R and Sharon E Koonce's property is located west of Area G-I, just north of Area G-II. A well owned by Martin Marietta, referred to as "MM near KOA" is located east of Area G-II and south of Area G-I. Groundwater monitoring for the Slatten, Koonce and MM near KOA wells began in April 2007. Groundwater levels fluctuate throughout the seasons. The range of water level measurements for the Slatten well is 6.6 feet. The range of water level measurements for the Koonce well is 8.5 feet. The range of water level measurements for the MM near KOA well is 7.7 feet. Table 1 presents the maximum, minimum and average saturated thickness for the monitoring well data set. Mining and associated dewatering began in Spring 2016. A shift in water level measurements is shown in Chart 3, which presents historical well monitoring data from the Slatten, Koonce and MM near KOA wells. Exhibit G, Attachment 1 presents raw data for the nearby wells.

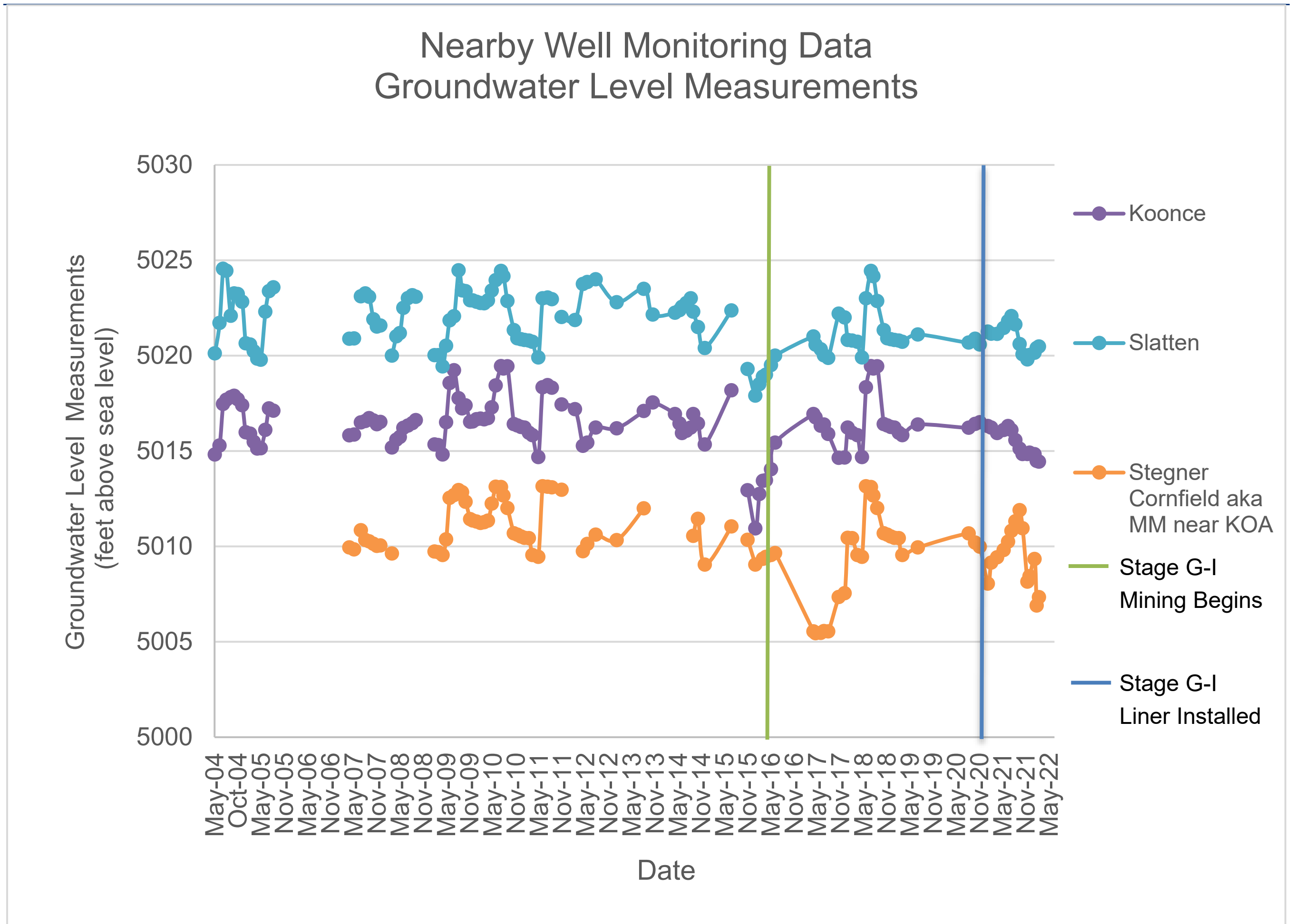

Chart 6: Nearby Well Monitoring Data

1.3 WELL INVENTORY

In December 2021, a well inventory of the Affected Area and adjacent areas was conducted to identify domestic wells near the project site. The inventory involved a review of constructed well records on file with the Colorado Division of Water Resources, located within ½ mile plus 200 feet of the Affected Area. The well inventory identified 98 constructed wells within ½ mile plus 200 feet, of the Affected Area. Figure G-2 enclosed shows the Affected Area and the constructed well locations on file with the Colorado Division of Water Resources.

1.4 HISTORIC AND FUTURE GROUND WATER LEVELS, AND IMPACTS TO WELLS

The presence of lined and unlined cells near Area G and previous dewatering of Area G demonstrates that the revised reclamation plan, i.e. lining of Area G cells will result in changes, but manageable changes, to the hydrologic balance.

The principal change to the hydrologic balance will be mounding on the upgradient (west) side of Area G. Martin Marietta has been preemptive in addressing the mounding on the east side by installing a perimeter drain. Exhibit G, Attachment 2 presents the location and design of the perimeter drain.

Regarding the down gradient impacts, monitoring well data demonstrates minimal impacts to wells will occur on the down gradient shadow effect (east and southeast) sides of Area G. Table 1 presents the historic range of saturated thickness in the monitoring wells. The period or record for the data includes the time when the Area G cells were being actively dewatered. The impacts from dewatering are greater than the shadow effect of the lined cells. Monitoring wells HO-6 and Stenger Cornfield/MM Near KOA are adjacent to the dewater cells yet they had minimum statured thickness of 6.9 feet and 4.6 feet respectively. Chart 7 presents the hydrograph of wells HO-6 and the Stegner Cornfield/MM Near KOA wells. The impacts of dewatering and subsequent recovery of the water levels after installation of the liner in the northern Area G cell.

The saturated thickness in the shadow zone after installation of the liner will be on the order of five to six feet. Water wells completed in sand and gravel aquifers typically provide approximately 25 to 30 gallons per minute per foot of drawdown or saturated thickness in the well. The wells on the down gradient side of Area G are domestic with permitted maximum pumping rates of 15 gallons per minute (gpm). Consequently, five to six feet of saturated thickness will provide the allowed pumping rates of 15 gpm. Wells located further from Area G will have even more saturated thickness and hence will be able to pump the permitted rates.

Table 1: Saturated Thickness

Saturated Thickness (feet)				
Well	**Minimum**	**Maximum**	**Delta**	**Average**
HO-1	5.8	14.6	8.8	10.3
HO-6	6.9	12.2	5.3	8.6
HO-11	10.0	14.2	4.1	11.7
HO-12	6.4	7.5	1.0	6.9
HO-13	5.8	8.3	2.5	7.1
HO-14	3.2	9.3	6.1	4.9
Koonce	5.5	14.0	8.51	10.8
Slaten	7.9	14.5	6.57	11.6
Stegner Cornfield/MM Near KOA	4.6	12.4	7.7	9.5
MW-01	9.1	16.8	7.7	11.4
MW-02	11.8	16.5	4.7	14.0
MW-03	10.4	14.4	4.0	12.1
MW-04	11.5	14.5	3.0	12.7
MW-05	7.5	12.1	4.6	10.0
MW-06	6.3	10.9	4.6	9.0
MW-07	8.9	13.9	4.9	10.7
MW-08	6.8	16.0	9.2	10.5
MW-09	6.0	12.8	6.8	8.2

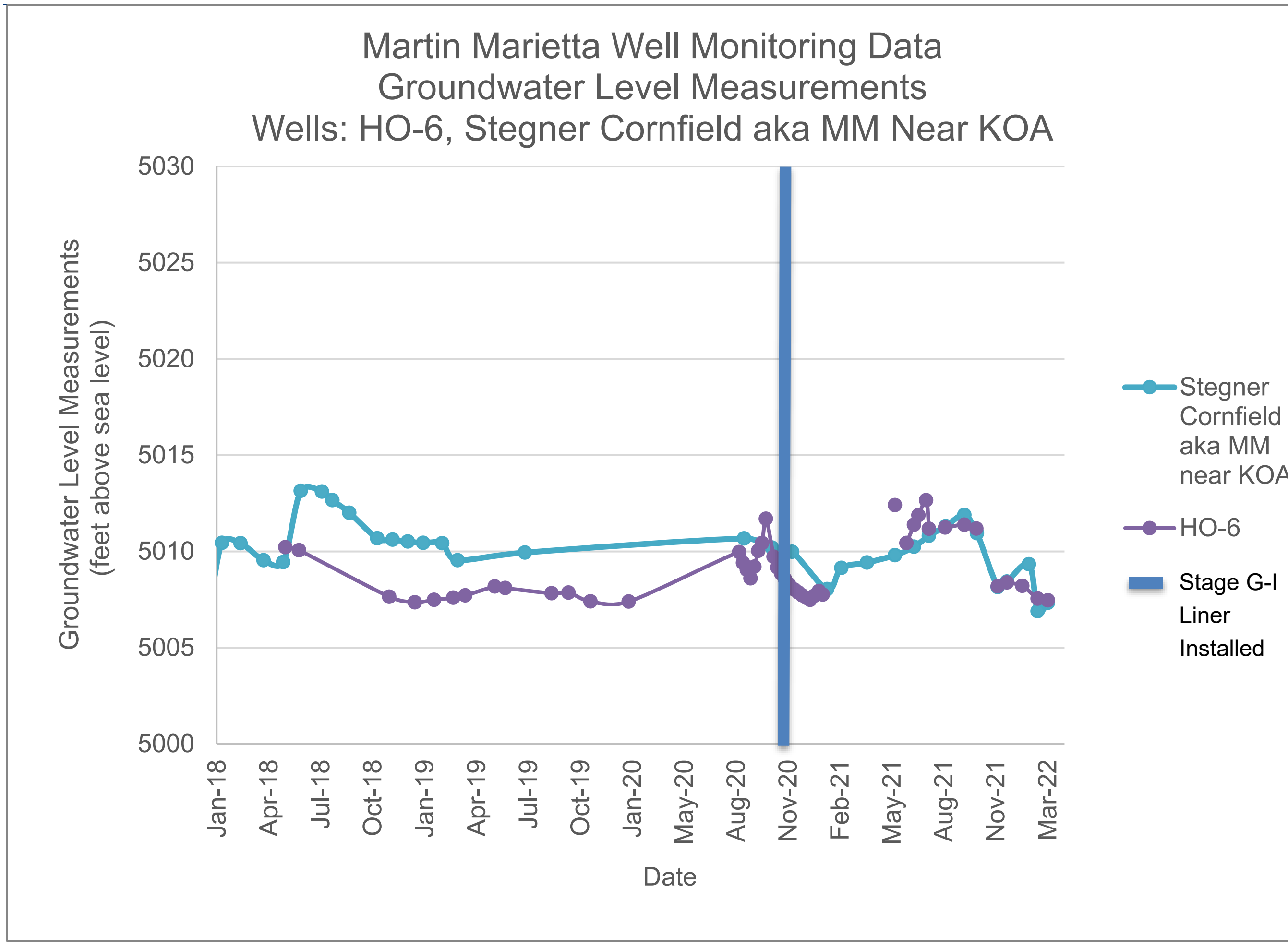

Chart 7: Monitoring Well Data (HO-6, Stegner Cornfield aka MM Near KOA)

2.0 MONITORING AND MANAGEMENT

2.1 MINING PLAN

The Reclamation Plan has been designed to reduce potential groundwater impacts to adjacent properties. A perimeter drain was designed by Deere and Ault to mitigate groundwater rise and to allow irrigation return flow off of the properties being irrigated west of Area G-I. The perimeter drain is installed along the west Area G-I. An additional portion of perimeter drain is proposed along the north side of Area G-II. Mining is expected to be completed in Area G-II by the end of 2022. The portion of the perimeter drain north of Area G-II will be installed upon completion of mining. The perimeter drain discharges through the berm between Area G-II and II to an unlined pond that is tributary to the Cache la Poudre River.

2.2 MONITORING

2.2.1 Martin Marietta Monitoring Wells

Monthly water level monitoring at HO-1, HO-6, HO-11, HO-12, HO-13, and HO-14 will continue during mining. When mining is complete, quarterly water level monitoring at HO-1, HO-6, HO-11, HO-12, HO-13, and HO-14 will continue until reclamation is complete and the DRMS releases the financial warranty bond.

2.2.2 Domestic Water Wells

Monthly water level monitoring at the Slatten and Koonce wells will continue during mining. When mining is complete, quarterly water level monitoring at the Slatten and Koonce wells will continue until reclamation is complete and the DRMS releases the financial warranty bond.

2.3 MITIGATION

The available monitoring well data will be used to identify changes in alluvial groundwater flow associated with mining and reclamation activities. Baseline data collected from the monitoring program will provide a range of relative water levels associated with pre-mining groundwater conditions. These data will be utilized to evaluate the nature and extent of the change to the prevailing hydrologic balance and if necessary, provide for the development of corrective actions.

In the event of a well owner complaint within 600 feet of the Affected Area, Martin Marietta will review the available monitoring information and submit a report to the DRMS within 30 days. The report will include discussions with any well owner who has contacted Martin Marietta regarding a concern and a review of baseline data from the well and vicinity to evaluate whether changes may be due to seasonal variations, climate, mining, or other factors. The report will identify the extent of potential or actual impacts associated with the changes. If the extent of groundwater changes due to mining or reclamation activities is determined to be a significant contributing factor that has or may create adverse impacts, the mining-associated impacts will be addressed to the satisfaction of the DRMS.

If the DRMS determines that the impact on a well for which temporary mitigation has been initiated is not a result of Martin Marietta's activities, or is not solely a result of Martin Marietta's activities, Martin Marietta will reduce or cease mitigation accordingly.

If a well goes dry due to mining or reclamation activities, Martin Marietta will implement mitigation measures within 7 days. Mitigation measures would include providing a temporary alternative water supply that meets the documented historic well production or need, until further investigation can be conducted to determine if the well condition is due to the mining operation.

Martin Marietta will begin to implement one or more mitigation measures if mining or reclamation activity is determined to be a significant contributing factor to groundwater changes requiring mitigation.

Temporary mitigation measures may include, but are not limited to:

- Compensation for well owners to use their existing treated water system to replace the well production loss.
- Provide a water tank and deliver water as necessary to meet documented historic well production or need.
- Other means acceptable to both the well owner and Martin Marietta.

Long-term mitigation measures may include, but are not limited to:

- Cleaning a well to improve efficiency.
- Providing an alternative source of water or purchasing additional water to support historic well use with respect to water quantity and quality. If needed, water quality parameters will be checked in affected wells to ensure alternative sources support the historic use.
- Modifying a well to operate under lower groundwater conditions. This could include deepening existing wells or lowering the pumps. All work would be done at Martin Marietta's expense with the exception of replacing equipment that was non-functional prior to mining.
- If existing wells cannot be retrofitted or repaired, replacing the impacted well with a new replacement well.
- Design and installation of a cistern.

If a groundwater mitigation action is required, Martin Marietta will notify the DRMS of the condition, action taken and report the results and present a plan for monitoring the mitigation.

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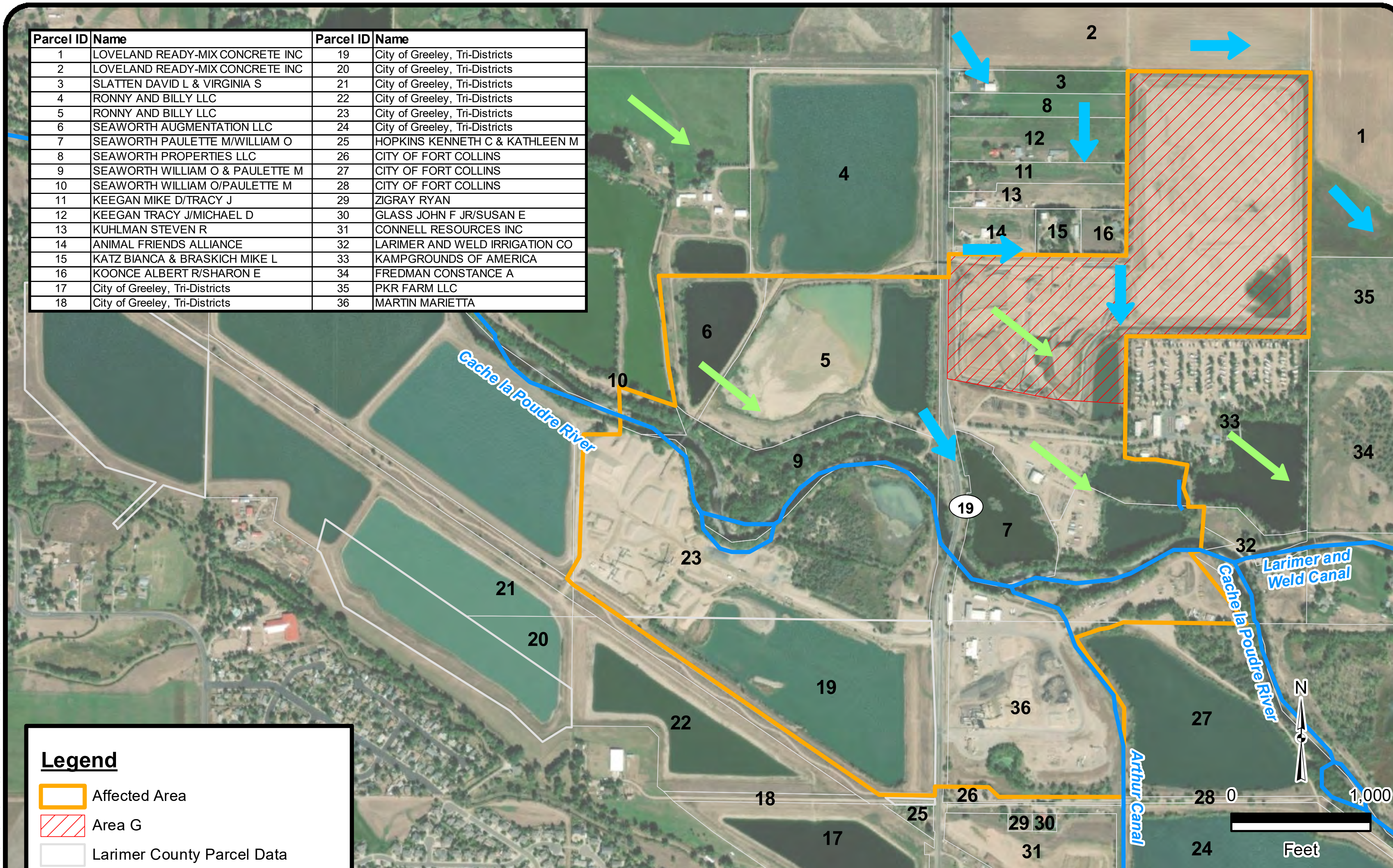
FIGURES

Parcel ID	Name	Parcel ID	Name
1	LOVELAND READY-MIX CONCRETE INC	19	City of Greeley, Tri-Districts
2	LOVELAND READY-MIX CONCRETE INC	20	City of Greeley, Tri-Districts
3	SLATTEN DAVID L & VIRGINIA S	21	City of Greeley, Tri-Districts
4	RONNY AND BILLY LLC	22	City of Greeley, Tri-Districts
5	RONNY AND BILLY LLC	23	City of Greeley, Tri-Districts
6	SEAWORTH AUGMENTATION LLC	24	City of Greeley, Tri-Districts
7	SEAWORTH PAULETTE M/WILLIAM O	25	HOPKINS KENNETH C & KATHLEEN M
8	SEAWORTH PROPERTIES LLC	26	CITY OF FORT COLLINS
9	SEAWORTH WILLIAM O & PAULETTE M	27	CITY OF FORT COLLINS
10	SEAWORTH WILLIAM O/PAULETTE M	28	CITY OF FORT COLLINS
11	KEEGAN MIKE D/TRACY J	29	ZIGRAY RYAN
12	KEEGAN TRACY J/MICHAEL D	30	GLASS JOHN F JR/SUSAN E
13	KUHLMAN STEVEN R	31	CONNELL RESOURCES INC
14	ANIMAL FRIENDS ALLIANCE	32	LARIMER AND WELD IRRIGATION CO
15	KATZ BIANCA & BRASKICH MIKE L	33	KAMPGROUNDS OF AMERICA
16	KOONCE ALBERT R/SHARON E	34	FREDMAN CONSTANCE A
17	City of Greeley, Tri-Districts	35	PKR FARM LLC
18	City of Greeley, Tri-Districts	36	MARTIN MARIETTA



Legend

- Affected Area
- Area G
- Larimer County Parcel Data
- Pre-Mining Groundwater Flow
- Post-Mining Groundwater Flow

TETRA TECH
www.tetratech.com
351 Coffman Street, Suite 200
Longmont, Colorado 80501
Tel: (303) 772-5282

MARTIN MARIETTA

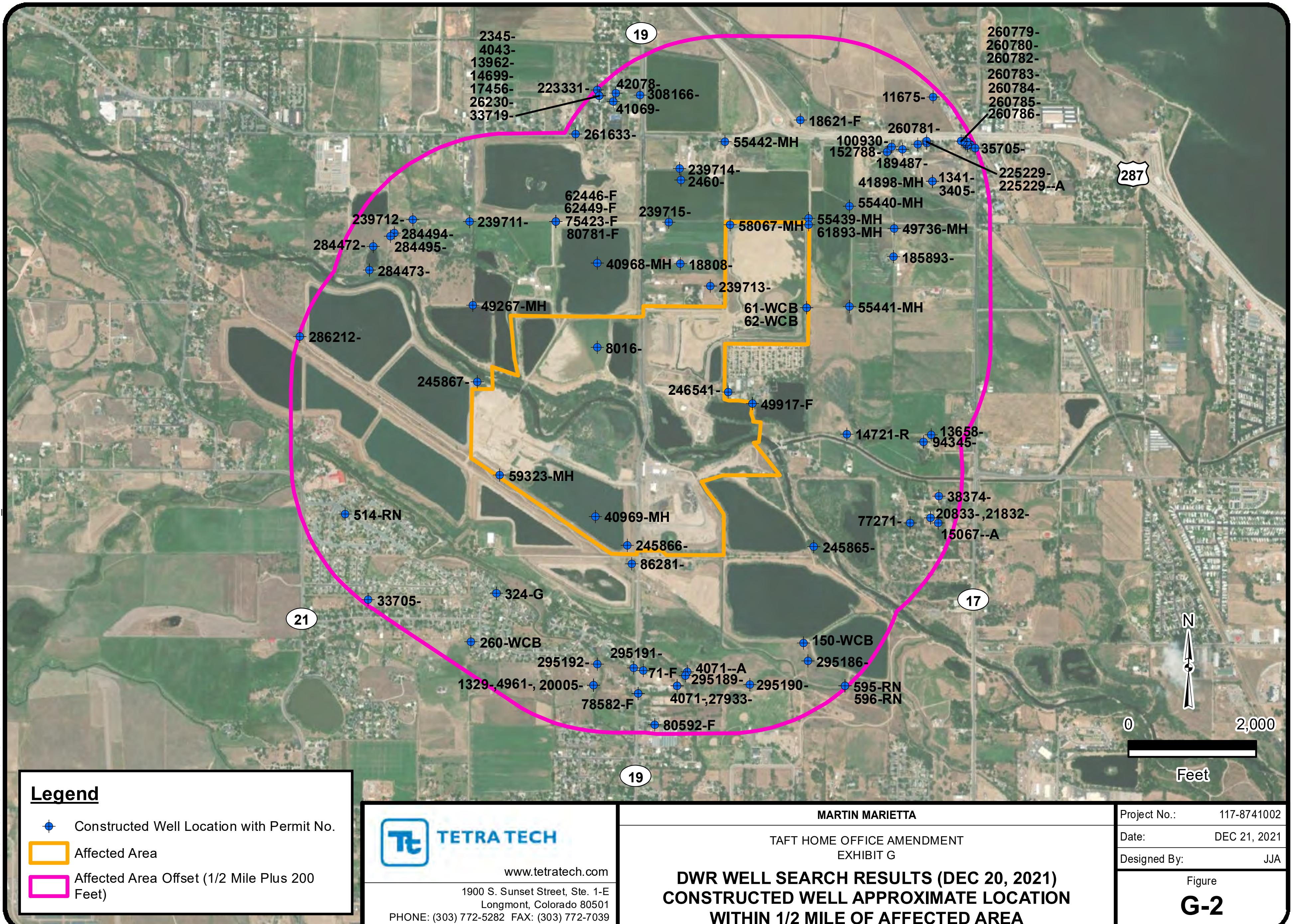
TAFT HOME OFFICE AMENDMENT
EXHIBIT G

GROUNDWATER FLOW MAP

Project No.: 117-8741002
Date: JUN 06, 2022
Designed By: JJA

Figure
G-1

6/6/2022 - O:\PROJECTS\LONGMONT\8741\117-8741002\GIS\MXD\GROUNDWATERMAP.MXD - JEREMY.ANDRYAUSKAS



Legend

- Constructed Well Location with Permit No.
- Affected Area
- Affected Area Offset (1/2 Mile Plus 200 Feet)

TETRA TECH
www.tetratech.com
1900 S. Sunset Street, Ste. 1-E
Longmont, Colorado 80501
PHONE: (303) 772-5282 FAX: (303) 772-7039

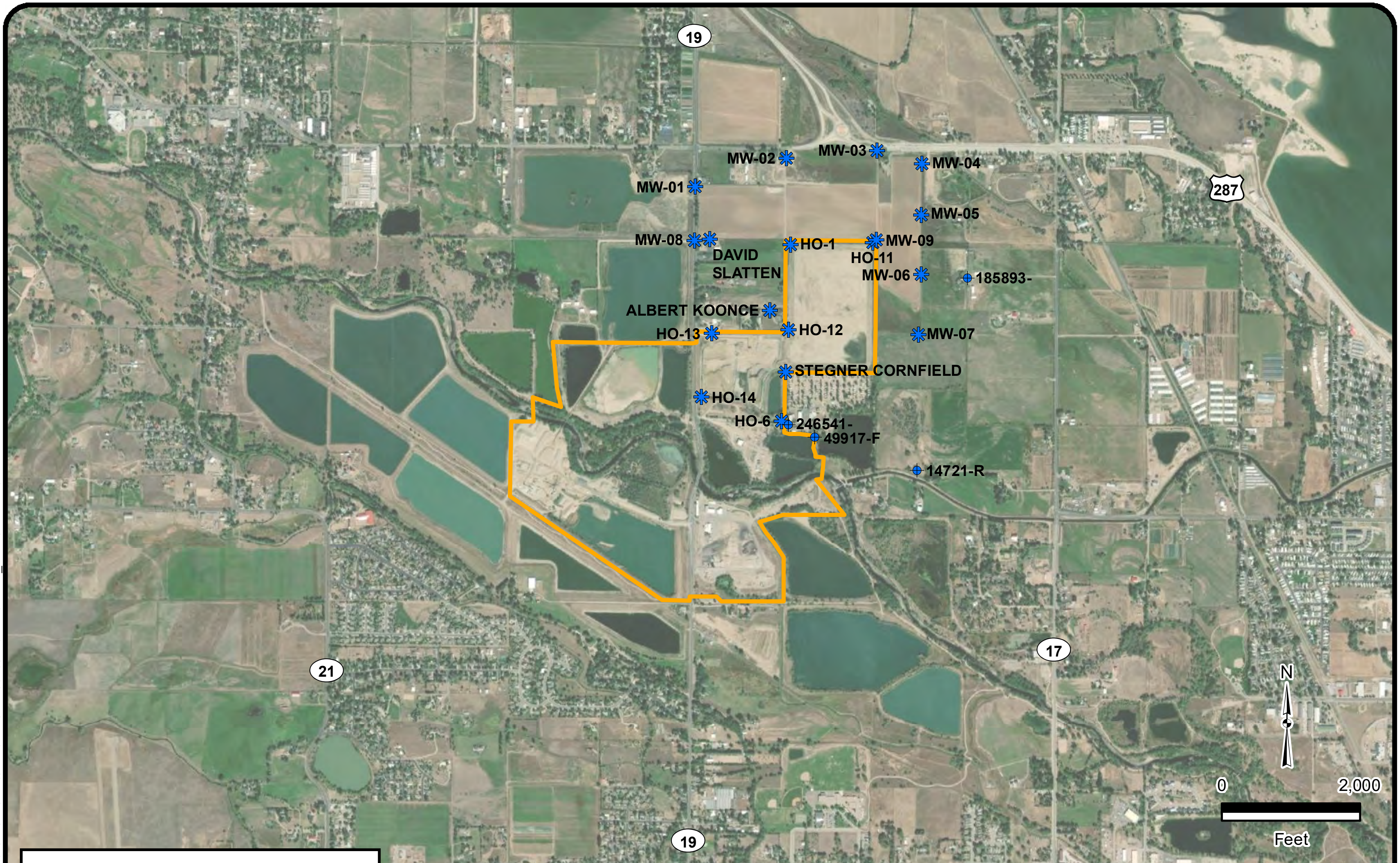
MARTIN MARIETTA

TAFT HOME OFFICE AMENDMENT
EXHIBIT G

**DWR WELL SEARCH RESULTS (DEC 20, 2021)
CONSTRUCTED WELL APPROXIMATE LOCATION
WITHIN 1/2 MILE OF AFFECTED AREA**

Project No.:	117-8741002
Date:	DEC 21, 2021
Designed By:	JJA

Figure
G-2



4/6/2022 - O:\PROJECTS\LONGMONT\8741\117-8741002\GIS\MXD\WELL_MAP3.MXD - JEREMY.ANDRYAUSKAS

Legend

- Estimated Well Location
- Constructed Well Location with Permit No.
- Affected Area

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Tel: (303) 772-5282

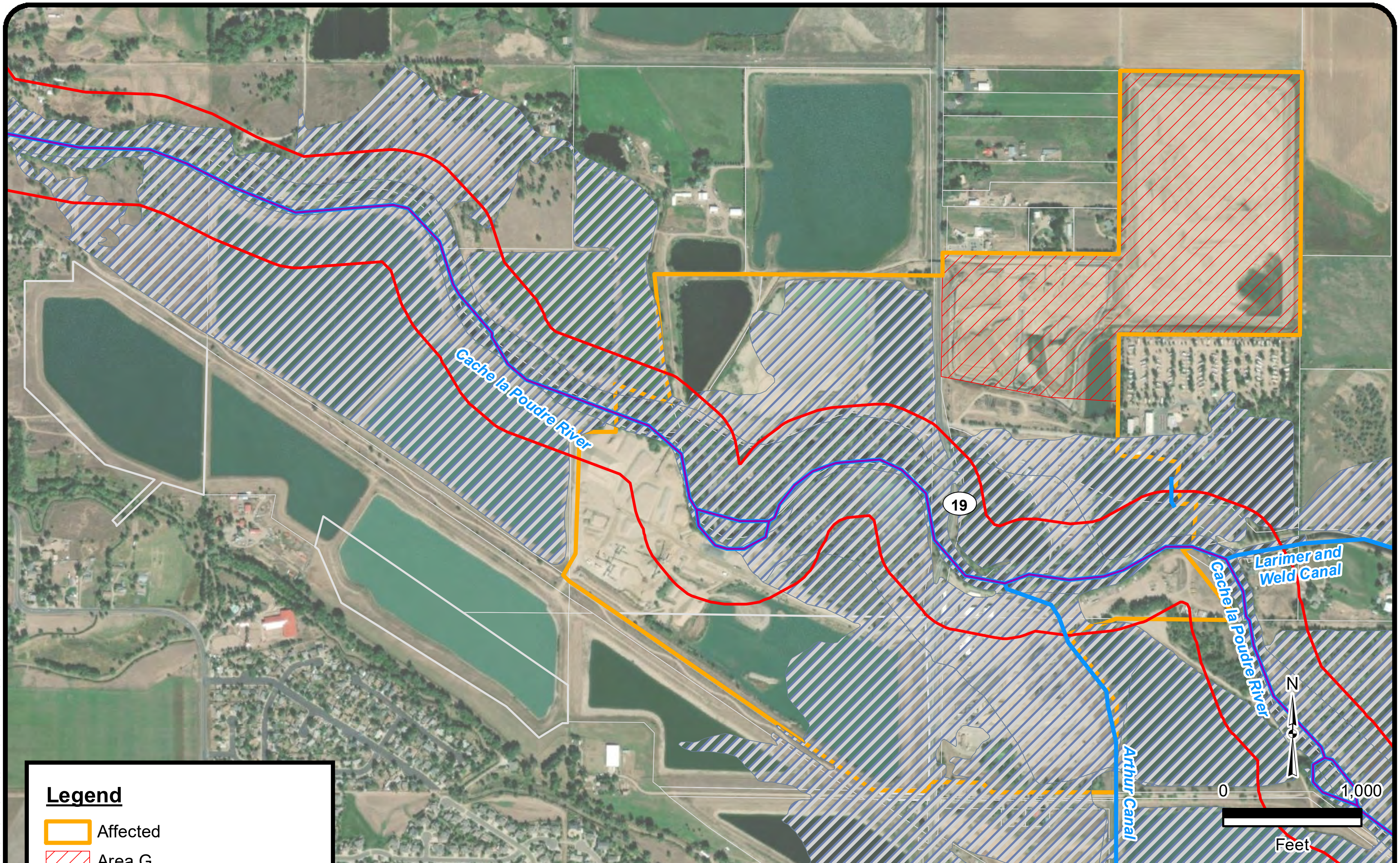
MARTIN MARIETTA

TAFT HOME OFFICE AMENDMENT
EXHIBIT G

ESTIMATED WELL LOCATIONS

Project No.:	117-8741002
Date:	APR 06, 2022
Designed By:	JJA

Figure
G-3



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MARTIN MARIETTA

TAFT HOME OFFICE AMENDMENT
EXHIBIT G

FLOODPLAIN MAP

Project No.:	117-8741002
Date:	JUN 06, 2022
Designed By:	JJA

Figure
G-4

6/6/2022 - O:\PROJECTS\LONGMONT\8741\117-8741002\GIS\MXD\FLOODPLAINMAP.MXD - JEREMY.ANDRYAUSKAS

ATTACHMENT 1
RAW MONITORING WELL DATA

HOME OFFICE MONITORING WELLS (COMBINED MEASUREMENTS PROVIDED BY DEERE & AULT AND MARTIN MARIETTA)

Monitoring Well Name	HO-1			HO-6			HO-11			HO-12			HO-13			HO-14*		
Well Location	1469960, 3109282			1467379, 3109131			1469954, 3110451			1468699, 3109239			1468646, 3108123			1467725, 3107980		
Top of PVC Casing Elevation (ft.)	*5024.08*			*5019.39*			*5021.36*			*5023.53*			*5026.66*			*5023.84*		
Ground Elevation of Well (ft.)	*5021.21*			*5016.45*			*5018.43*			*5021.17*			*5023.74*			*5021.58*		
PCV Stickup (approx.)	*2.87*			*2.94*			*2.93*			*2.36*			*2.92*			*2.20*		
Bottom Elevation of Well (ft.)	4996.21			4987.45			5004.43			5004.17			5008.74			5004.53		
Estimated Bedrock Elevation (ft)	5006.71			5000.45			5002.43			5005.17			5006.74			5005.58		
Total Well Depth Ground-Bottom (ft.)	25.00			29.00			14.00			17.00			15.00			17.00		
Date	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)	Water Depth from Top of PVC (ft.)	Saturated Thickness	Ground Water Elevation (ft.)
Monday, May 7, 2018	11.08	6.29	5013.00	9.17	9.77	5010.22												
Friday, June 1, 2018	10.82	6.55	5013.26	9.33	9.61	5010.06												
Tuesday, November 13, 2018	11.15	6.22	5012.93	11.74	7.20	5007.65												
Sunday, December 30, 2018	10.78	6.59	5013.30	12.03	6.91	5007.36												
Sunday, February 3, 2019	11.12	6.25	5012.96	11.90	7.04	5007.49												
Sunday, March 10, 2019	11.35	6.02	5012.73	11.79	7.15	5007.60												
Monday, April 1, 2019	11.35	6.02	5012.73	11.67	7.27	5007.72												
Saturday, May 25, 2019	11.31	6.06	5012.77	11.21	7.73	5008.18												
Thursday, June 13, 2019	11.12	6.25	5012.96	11.29	7.65	5008.10												
Friday, September 6, 2019	10.20	7.17	5013.88	11.56	7.38	5007.83												
Monday, October 7, 2019				11.53	7.41	5007.86												
Saturday, November 16, 2019	11.45	5.92	5012.63	11.98	6.96	5007.41												
Saturday, January 25, 2020	11.60	5.77	5012.48	11.99	6.95	5007.40												
Friday, August 14, 2020	9.96	7.41	5014.12	9.42	9.52	5009.97												
Friday, August 21, 2020	7.71	9.66	5016.37	9.98	8.96	5009.41												
Friday, August 28, 2020	5.91	11.46	5018.17	10.34	8.60	5009.05												
Friday, September 4, 2020	5.70	11.67	5018.38	10.79	8.15	5008.60												
Friday, September 11, 2020	5.63	11.74	5018.45	10.18	8.76	5009.21												
Friday, September 18, 2020	5.64	11.73	5018.44	9.36	9.58	5010.03												
Friday, September 25, 2020	5.67	11.70	5018.41	8.95	9.99	5010.44												
Friday, October 2, 2020	5.70	11.67	5018.38	7.69	11.25	5011.70												
Friday, October 16, 2020	5.73	11.64	5018.35	9.66	9.28	5009.73												
Friday, October 23, 2020	5.79	11.58	5018.29	10.22	8.72	5009.17												
Friday, October 30, 2020	5.68	11.69	5018.40	10.55	8.39	5008.84												
Friday, November 6, 2020	5.61	11.76	5018.47	10.83	8.11	5008.56												
Friday, November 13, 2020	5.61	11.76	5018.47	11.10	7.84	5008.29												
Monday, November 23, 2020	5.60	11.77	5018.48	11.37	7.57	5008.02												
Monday, November 30, 2020	5.64	11.73	5018.44	11.51	7.43	5007.88												
Monday, December 7, 2020	5.73	11.64	5018.35	11.66	7.28	5007.73												
Tuesday, December 15, 2020	5.73	11.64	5018.35	11.80	7.14	5007.59												
Tuesday, December 22, 2020	5.62	11.75	5018.46	11.90	7.04	5007.49												
Tuesday, December 29, 2020	5.73	11.64	5018.35	11.70	7.24	5007.69												
Thursday, January 7, 2021	5.79	11.58	5018.29	11.45	7.49	5007.94												
Thursday, January 14, 2021	5.78	11.59	5018.30	11.63	7.31	5007.76												
Monday, May 24, 2021										11.93	6.43	5011.60	11.85	8.07	5014.81	12.30	5.86	5011.43
Wednesday, May 26, 2021	5.3	12.07	5018.78	6.98	11.96	5012.41	6.3	12.63	5015.06	10.90	7.46	5012.63	11.83	8.09	5014.83	12.40	5.76	5011.33
Thursday, June 3, 2021							6.45	12.48	5014.91	10.91	7.45	5012.62	12.10	7.82	5014.56	12.79	5.36	5010.94
Wednesday, June 16, 2021	3.04	14.33	5021.04	8.95	9.99	5010.44	6.28	12.65	5015.08	11.05	7.31	5012.48	11.62	8.30	5015.04	12.84	5.32	5010.89
Wednesday, June 30, 2021	4.80	12.57	5019.28	8.00	10.94	5011.39	5.87	13.06	5015.49	11.10	7.26	5012.43				9.30	8.85	5014.43
Thursday, July 8, 2021	3.17	14.20	5020.91	7.51	11.43	5011.88	4.76	14.17	5016.60	11.22	7.14	5012.31	12.30	7.62	5014.36	13.58	4.57	5010.15
Thursday, July 22, 2021	2.82	14.55	5021.26	6.73	12.21	5012.66	5.54	13.39	5015.82	11.60	6.76	5011.93	12.26	7.66	5014.40	14.08	4.07	5009.65
Tuesday, July 27, 2021	4.35	13.02	5019.73	8.21	10.73	5011.18	6.21	12.72	5015.15	11.2	7.16	5012.33	12.9	7.02	5013.76	8.97	9.29	5014.87
Wednesday, August 25, 2021																14.63	3.63	5009.21
Thursday, August 26, 2021	4.22	13.15	5019.86	8.15	10.79	5011.24	6.37	12.56	5014.99	11.54	6.82	5011.99	13	6.92	5013.66			
Thursday, September 30, 2021	5.83	11.54	5018.25	8	10.94	5011.39	7.5	11.43	5013.86	11.83	6.53	5011.70	13.15	6.77	5013.51	14	4.26	5009.84
Friday, October 22, 2021	6.01	11.36	5018.07	8.2	10.74	5011.19	8.7	10.23	5012.66				13.57	6.35	5013.09	14.4	3.86	5009.44
Saturday, October 23, 2021										11.9	6.46	5011.63						
Tuesday, November 30, 2021	6.1	11.27	5017.98	11.2	7.74	5008.19	8.7	10.23	5012.66	11.8	6.56	5011.73	13.74	6.18	5012.92	15.02	3.24	5008.82
Tuesday, December 14, 2021							8.9	10.03	5012.46	11.75	6.61	5011.78	12.75	7.17	5013.91	14.9	3.36	5008.94
Friday, December 17, 2021	6.21	11.16	5017.87	11	7.94	5008.39												
Friday, January 14, 2022	6.26	11.11	5017.82	11.18	7.76	5008.21	8.87	10.06	5012.49	11.8	6.56	5011.73	12.62	7.30	5014.04	15.1	3.16	5008.74
Friday, February 11, 2022	6.4	10.97	5017.68	11.84	7.10	5007.55	8.7	10.23	5012.66	11.1	7.26	5012.43	14.1	5.82	5012.56	14.58	3.68	5009.26
Wednesday, March 2, 2022	6.52	10.85	5017.56	11.93	7.01	5007.46	8.83	10.10	5012.53	11.33	7.03	5012.20	14.13	5.79	5012.53	14.67	3.59	5009.17

Home Office Nearby Wells Water Level Monitoring									
LOCATION	ALBERT KOONCE			DAVID SLATTEN			STEGNER CORNFIELD/MM Near KOA		
LATTITUDE	40 37'08.6 N			40 37'18.8 N			40 36'59.8 N		
LONGTITUDE	105 06'37.4 W			105 06'48.6 W			105 06'34.5 W		
DESCRIPTION	2" CASE-BY NORTH FENCELINE			2"CASE-CENTER NORTH FENCE			PVC BY RV PARK		
ELEVATION OF BENCHMARK	5023.4			5028.0			5018.5		
ELEVATION OF GROUND SURFACE	5022.4			5027.0			5017.8		
ESTIMATED BEDROCK ELEVATION	5005.4			5010.0			5000.8		
DATE	READING (Measurement from Benchmark to Water Level, ft)	WATER ELEV	SATURATED THICKNESS (ft)	READING (Measurement from Benchmark to Water Level, ft)	WATER ELEV	SATURATED THICKNESS (ft)	READING (Measurement from Benchmark to Water Level, ft)	WATER ELEV	SATURATED THICKNESS (ft)
05/04/04	8.62	5014.82	9.4	7.88	5020.12	10.1			
06/10/04	8.15	5015.29	9.9	6.29	5021.71	11.7			
07/08/04	5.98	5017.46	12.0	3.45	5024.55	14.6			
08/03/04	5.75	5017.69	12.3	3.55	5024.45	14.4			
09/07/04	5.62	5017.82	12.4	5.91	5022.09	12.1			
10/04/04	5.55	5017.89	12.4	4.74	5023.26	13.3			
11/01/04	5.73	5017.71	12.3	4.77	5023.23	13.2			
12/06/04	6.04	5017.40	12.0	5.18	5022.82	12.8			
01/03/05	7.46	5015.98	10.5	7.36	5020.64	10.6			
02/07/05	7.53	5015.91	10.5	7.42	5020.58	10.6			
03/07/05	7.96	5015.48	10.0	7.77	5020.23	10.2			
04/04/05	8.31	5015.13	9.7	8.16	5019.84	9.8			
05/02/05	8.3	5015.14	9.7	8.22	5019.78	9.8			
06/07/05	7.33	5016.11	10.7	5.7	5022.3	12.3			
07/06/05	6.21	5017.23	11.8	4.62	5023.38	13.4			
08/10/05	6.33	5017.11	11.7	4.42	5023.58	13.6			
01/01/07									
02/01/07									
03/01/07									
04/02/07	7.62	5015.82	10.4	7.12	5020.88	10.9	8.6	5009.95	9.1
05/09/07	7.58	5015.86	10.4	7.1	5020.9	10.9	8.71	5009.84	9.0
06/01/07									
07/02/07	6.94	5016.50	11.1	4.89	5023.11	13.1	7.7	5010.85	10.1
08/06/07	6.87	5016.57	11.1	4.74	5023.26	13.3	8.21	5010.34	9.5
09/05/07	6.72	5016.72	11.3	4.92	5023.08	13.1	8.28	5010.27	9.5
10/08/07	6.84	5016.60	11.2	6.1	5021.9	11.9	8.41	5010.14	9.3
11/05/07	7.04	5016.40	11.0	6.48	5021.52	11.5	8.52	5010.03	9.2
12/03/07	6.92	5016.52	11.1	6.42	5021.58	11.6	8.5	5010.05	9.3
01/01/08									
02/01/08									
03/03/08	8.26	5015.18	9.7	8	5020	10.0	8.92	5009.63	8.8
04/07/08	7.85	5015.59	10.1	6.99	5021.01	11.0			
05/05/08	7.71	5015.73	10.3	6.82	5021.18	11.2			
06/01/08	7.23	5016.21	10.8	5.5	5022.5	12.5			
07/07/08	7.11	5016.33	10.9	4.99	5023.01	13.0			
08/11/08	6.98	5016.46	11.0	4.84	5023.16	13.2			
09/08/09	6.82	5016.62	11.2	4.92	5023.08	13.1			
10/01/08									
11/01/08									
12/01/08									
01/01/09									
02/03/09	8.1	5015.34	9.9	7.98	5020.02	10.0	8.82	5009.73	8.9
03/03/09	8.13	5015.31	9.9	7.98	5020.02	10.0	8.85	5009.70	8.9
04/07/09	8.62	5014.82	9.4	8.57	5019.43	9.4	9	5009.55	8.8
05/05/09	6.93	5016.51	11.1	7.48	5020.52	10.5	8.18	5010.37	9.6
06/02/09	4.88	5018.56	13.1	6.15	5021.85	11.9	6	5012.55	11.8
07/07/09	4.21	5019.23	13.8	5.94	5022.06	12.1	5.86	5012.69	11.9
08/12/09	5.67	5017.77	12.3	3.53	5024.47	14.5	5.6	5012.95	12.1
09/08/09	6.21	5017.23	11.8	4.58	5023.42	13.4	5.71	5012.84	12.0
10/06/09	6.05	5017.39	11.9	4.62	5023.38	13.4	6.21	5012.34	11.5
11/11/09	6.91	5016.53	11.1	5.1	5022.9	12.9	7.12	5011.43	10.6
12/01/09	6.89	5016.55	11.1	5.11	5022.89	12.9	7.19	5011.36	10.6
01/01/10	6.77	5016.67	11.2	5.18	5022.82	12.8	7.25	5011.30	10.5
2/1/2010	6.74	5016.70	11.3	5.24	5022.76	12.8	7.32	5011.23	10.4
3/1/2010	6.78	5016.66	11.2	5.26	5022.74	12.7	7.28	5011.27	10.5
4/1/2010	6.72	5016.72	11.3	5.11	5022.89	12.9	7.2	5011.35	10.6
5/1/2010	6.15	5017.29	11.9	4.59	5023.41	13.4	6.31	5012.24	11.4
6/1/2010	5	5018.44	13.0	4.05	5023.95	13.9	5.42	5013.13	12.3
7/13/2010	3.99	5019.45	14.0	3.56	5024.44	14.4	5.44	5013.11	12.3
8/1/2010	4.12	5019.32	13.9	3.84	5024.16	14.2	5.88	5012.67	11.9
9/1/2010	4	5019.44	14.0	5.14	5022.86	12.9	6.54	5012.01	11.2
10/22/2010	7.03	5016.41	11.0	6.66	5021.34	11.3	7.86	5010.69	9.9
11/19/2010	7.1	5016.34	10.9	7.09	5020.91	10.9	7.93	5010.62	9.8

12/17/2010	7.18	5016.26	10.8	7.14	5020.86	10.9	8.03	5010.52	9.7
1/14/2011	7.21	5016.23	10.8	7.18	5020.82	10.8	8.1	5010.45	9.6
2/18/2011	7.48	5015.96	10.5	7.21	5020.79	10.8	8.12	5010.43	9.6
3/18/2011	7.61	5015.83	10.4	7.28	5020.72	10.7	9	5009.55	8.8
5/3/2011	8.76	5014.68	9.2	8.1	5019.9	9.9	9.1	5009.45	8.6
6/6/2011	5.1	5018.34	12.9	5	5023	13.0	5.4	5013.15	12.4
7/16/2011	4.99	5018.45	13.0	4.96	5023.04	13.0	5.42	5013.13	12.3
8/19/2011	5.12	5018.32	12.9	5.04	5022.96	13.0	5.45	5013.10	12.3
9/30/2011									
11/4/2011	6	5017.44	12.0	5.98	5022.02	12.0	5.58	5012.97	12.2
2/17/2012	6.25	5017.19	11.8	6.14	5021.86	11.9			
4/20/2012	8.17	5015.27	9.8	4.25	5023.75	13.8	8.8	5009.75	8.9
5/25/2012	8	5015.44	10.0	4.14	5023.86	13.9	8.42	5010.13	9.3
7/30/2012	7.21	5016.23	10.8	4	5024	14.0	7.93	5010.62	9.8
1/11/2013	7.25	5016.19	10.8	5.2	5022.8	12.8	8.22	5010.33	9.5
8/13/2013	6.34	5017.10	11.7	4.5	5023.5	13.5	6.55	5012.00	11.2
10/23/2013	5.9	5017.54	12.1	5.85	5022.15	12.1			
4/17/2014	6.5	5016.94	11.5	5.75	5022.25	12.3			
5/23/2014	7	5016.44	11.0	5.62	5022.38	12.4			
6/11/2014	7.5	5015.94	10.5	5.44	5022.56	12.6			
7/16/2014	7.38	5016.06	10.6	5.24	5022.76	12.8			
8/20/2014	7.21	5016.23	10.8	5	5023	13.0			
9/8/2014	6.5	5016.94	11.5	5.7	5022.3	12.3	8	5010.55	9.8
10/16/2014	7	5016.44	11.0	6.5	5021.5	11.5	7.1	5011.45	10.6
12/9/2014	8.1	5015.34	9.9	7.6	5020.4	10.4	9.5	5009.05	8.3
7/7/2015	5.26	5018.18	12.7	5.63	5022.37	12.4	7.5	5011.05	10.3
8/18/2015									
11/12/2015	10.5	5012.94	7.5	8.7	5019.3	9.3	8.2	5010.35	9.6
1/12/2016	12.5	5010.94	5.5	10.1	5017.9	7.9	9.5	5009.05	8.3
2/12/2016	10.7	5012.74	7.3	9.5	5018.5	8.5			
3/12/2016	10	5013.44	8.0	9.1	5018.9	8.9	9.2	5009.35	8.6
4/5/2016	9.97	5013.47	8.0	9	5019	9.0	9.1	5009.45	8.6
5/15/2016	9.4	5014.04	8.6	8.5	5019.5	9.5	9	5009.55	8.8
6/16/2016	8	5015.44	10.0	8	5020	10.0	8.9	5009.65	8.9
4/15/2017	6.5	5016.94	11.5	7	5021	11.0	13	5005.55	4.8
5/2/2017	6.68	5016.76	11.3	7.43	5020.57	10.6	13.1	5005.45	4.6
6/12/2017	7.12	5016.32	10.9	7.67	5020.33	10.3	13.08	5005.47	4.7
7/7/2017	7.05	5016.39	10.9	7.99	5020.01	10.0	12.99	5005.56	4.8
8/10/2017	7.55	5015.89	10.4	8.12	5019.88	9.9	13	5005.55	4.8
11/1/2017	8.8	5014.64	9.2	5.8	5022.2	12.2	11.2	5007.35	6.6
12/17/2017	8.78	5014.66	9.2	6	5022	12.0	11	5007.55	6.8
1/11/2018	7.21	5016.23	10.8	7.18	5020.82	10.8	8.1	5010.45	9.6
2/14/2018	7.48	5015.96	10.5	7.21	5020.79	10.8	8.12	5010.43	9.6
3/28/2018	7.61	5015.83	10.4	7.28	5020.72	10.7	9	5009.55	8.8
5/3/2018	8.76	5014.68	9.2	8.1	5019.9	9.9	9.1	5009.45	8.6
6/4/2018	5.1	5018.34	12.9	5	5023	13.0	5.4	5013.15	12.4
7/13/2018	3.99	5019.45	14.0	3.56	5024.44	14.4	5.44	5013.11	12.3
8/1/2018	4.12	5019.32	13.9	3.84	5024.16	14.2	5.88	5012.67	11.9
9/1/2018	4	5019.44	14.0	5.14	5022.86	12.9	6.54	5012.01	11.2
10/22/2018	7.03	5016.41	11.0	6.66	5021.34	11.3	7.86	5010.69	9.9
11/19/2018	7.1	5016.34	10.9	7.09	5020.91	10.9	7.93	5010.62	9.8
12/17/2018	7.18	5016.26	10.8	7.14	5020.86	10.9	8.03	5010.52	9.7
1/14/2019	7.21	5016.23	10.8	7.18	5020.82	10.8	8.1	5010.45	9.6
2/18/2019	7.48	5015.96	10.5	7.21	5020.79	10.8	8.12	5010.43	9.6
3/18/2019	7.61	5015.83	10.4	7.28	5020.72	10.7	9	5009.55	8.8
7/19/2019	7.05	5016.39	10.9	6.89	5021.11	11.1	8.6	5009.95	9.1
8/23/2020	7.22	5016.22	10.8	7.32	5020.68	10.7	7.87	5010.68	9.9
10/13/2020	7.02	5016.42	11.0	7.12	5020.88	10.9	8.35	5010.20	9.4
11/19/2020	6.93	5016.51	11.1	7.42	5020.58	10.6	8.56	5009.99	9.2
1/22/2021	7.13	5016.31	10.9	6.74	5021.26	11.3	10.5	5008.05	7.3
2/17/2021	7.21	5016.23	10.8	6.85	5021.15	11.1	9.4	5009.15	8.4
4/5/2021	7.5	5015.94	10.5	6.86	5021.14	11.1	9.12	5009.43	8.6
5/26/2021	7.34	5016.10	10.7	6.55	5021.45	11.4	8.74	5009.81	9.0
6/30/2021	7.13	5016.31	10.9	6.19	5021.81	11.8	8.3	5010.25	9.4
7/27/2021	7.34	5016.10	10.7	5.93	5022.07	12.1	7.73	5010.82	10.0
8/27/2021	7.87	5015.57	10.1	6.37	5021.63	11.6	7.23	5011.32	10.5
9/30/2021	8.32	5015.12	9.7	7.4	5020.6	10.6	6.65	5011.90	11.1
10/23/2021	8.6	5014.84	9.4	7.93	5020.07	10.1	7.6	5010.95	10.1
11/30/2021	8.6	5014.84	9.4	8.2	5019.8	9.8	10.4	5008.15	7.4
12/17/2021	8.53	5014.91	9.5	7.97	5020.03	10.0	10.11	5008.44	7.6
1/26/2022	8.61	5014.83	9.4	7.85	5020.15	10.1	9.21	5009.34	8.5
2/11/2022	8.96	5014.48	9.0	7.6	5020.4	10.4	11.65	5006.90	6.1
3/2/2022	9	5014.44	9.0	7.52	5020.48	10.5	11.21	5007.34	6.5

Data Source Notes:
Coordinates provided by Martin Marietta, 2021-08-19
Elevations provided by Martin Marietta, 2021-08-19
Water level measurements provided by Martin Marietta
Ground Surface for Koonce and Slatten approximated as 1 foot below BM.
Bedrock depth estimated as 17 feet below ground surface

Stegner - Monitoring Well Measurements									
Depth To Water from Surface (Feet)									
Date Measured	MW-01	MW-02	MW-03	MW-04	MW-05	MW-06	MW-07	MW-08	MW-09
July-16	2.62	0.95	1.75	2.28	2.91	2.41	3.15	6.41	2.92
August-16	4.15	0.93	1.78	2.18	3.06	2.71	3.75	7.38	3.56
September-16	6.89	3.00	3.08	2.52	3.70	3.53	5.70	9.28	5.09
October-16	-0.29	3.18	3.40	2.81	3.73	3.43	4.56	9.99	5.27
November-16	7.01	3.39	3.78	3.10	3.95	3.41	5.43	10.23	5.37
December-16	7.21	3.57	3.98	3.22	3.99	3.45	5.66	10.56	5.45
January-17	7.18	3.58	4.05	3.27	4.00	3.42	5.64	10.63	5.42
February-17	7.19	3.70	4.15	4.47	4.07	3.53	6.19	10.73	5.57
March-17	7.16	3.28	3.72	3.18	4.18	3.53	6.41	10.62	5.62
April-17	5.56	2.61	3.38	3.03	4.05	3.55	6.51	8.95	5.53
May-17	1.76	0.97	2.13	2.67	3.24	2.79	5.50	3.11	3.41
June-17	0.44	0.50	1.55	1.50	2.38	2.10	5.57	1.51	2.20
July-17	1.75	0.53	1.96	2.45	3.47	3.11	5.69	2.18	3.64
August-17	2.60	1.66	2.98	2.73	4.00	3.72	6.17	3.07	6.25
September-17	2.31	1.35	2.73	3.43	4.04	3.80		3.64	6.44
October-17	2.62	1.61	3.85	3.76	4.30	4.50	6.67	4.26	7.81
November-17	2.72	2.11	4.37	3.67	4.79	4.24	6.41	5.23	8.42
December-17	5.63	2.88	4.22	3.45	4.97	4.80	7.07	7.18	8.57
April-18	6.69	3.50	4.41	3.57	5.16	4.89	7.09	8.93	8.74
July-18	2.67	0.90	2.03	2.09	3.11	2.65	5.55	4.71	6.49
October-18	6.94	4.24	4.93	3.33	7.02	6.66	8.09	3.87	8.98
January-19	6.14	4.09	5.15	3.63	5.21	4.99	7.28	7.85	8.84
April-19	6.98	4.39	5.37	3.86	5.45	5.01	7.19	9.31	8.94
July-19	5.84	2.81	4.48	3.20	5.13	3.94	7.10	6.63	8.76
September-19	6.32	4.75	5.59	3.64	4.93	4.01	6.89	6.58	8.39
January-20	7.43	5.24	5.59	4.07	5.52	5.17	7.35	9.59	8.97
May-20	7.03	4.53	5.16	3.79	5.39	5.06	7.15	9.24	8.78
August-20	4.59	2.68	3.12	3.46	4.69	3.91	5.79	4.16	7.18
December-20	6.45	3.23	4.41	3.75	4.94	4.50	6.85	5.78	7.73
February-21	6.69	5.02	5.38	4.28	5.46	4.79	7.38	8.07	8.56
May-21	6.94	4.71	5.29	3.90	5.32	4.89	7.25	9.04	8.74
August-21	4.58	2.88	3.31	3.53	4.68	3.82	6.01	4.06	7.28
December-21	6.51	3.77	4.63	3.44	5.11	4.67	7.10	6.86	8.46
March-22	6.96	4.29	5.28	3.78	5.74	5.10	7.49	7.61	8.98

Legend

- Stegner Monitoring Wells
- Stegner Parcels

0 400
SCALE IN FEET

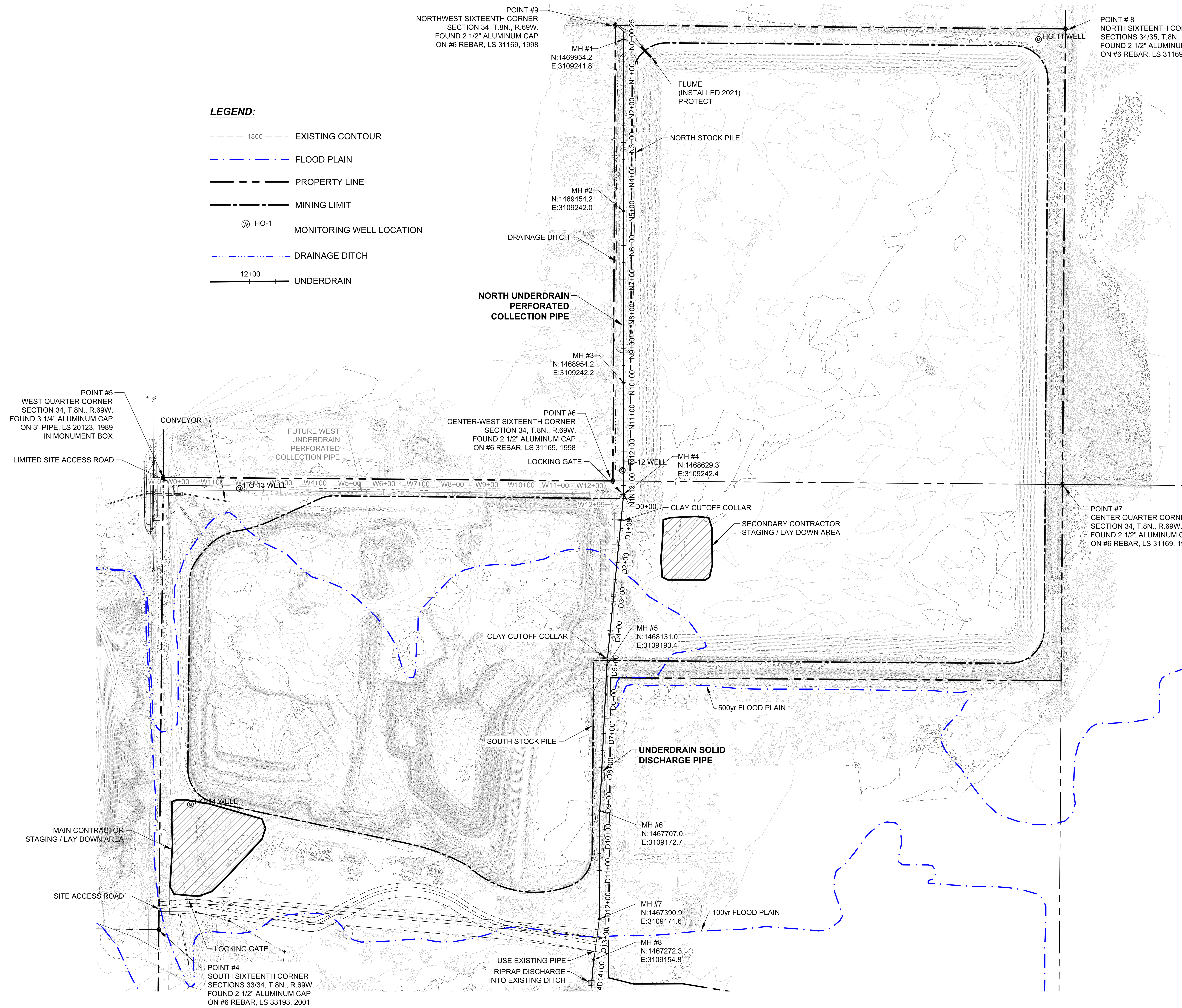
COORDINATE SYSTEM
NAD 83 COLORADO NORTH

STEGNER BASEMAP

TELESTO SOLUTIONS INCORPORATED

LOVELAND READY-MIX CONCRETE

ATTACHMENT 2
UNDERDRAIN DESIGN



NOTES:

1. ALL UTILITIES TO BE LOCATED, VERIFIED & POT HOLED AS NECESSARY BY CONTRACTOR.
2. TRAFFIC ON LIMITED SITE ACCESS ROAD TO BE COORDINATED WITH ADJACENT PROPERTY OWNERS & ONLY ALLOWED DURING STANDARD WORK HOURS.
3. SURVEY CONTROL PROVIDE BY KING SURVEYOR'S. COORDINATE VALUES ARE THAT OF THE COLORADO STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM 1983/92. TO CONVERT TO GROUND (MODIFIED) SCALE ABOUT POINT 0,0 AT A FACTOR OF 1.00026675 (0.99973332 CF) VERTICAL DATUM: NAVD 88.

EXISTING SURVEY POINT TABLE

POINT #	NORTHING	EASTING	DESCRIPTION
1	1466019.4650	3110502.4980	S. 1/4 COR, SEC
2	1466033.7797	3109189.4328	W. 1/16 COR, SEC34
3	1466042.3880	3107875.3510	SW. COR, SEC34
4	1467360.3495	3107888.3763	S. 1/16 COR, SEC 34
5	1468678.1520	3107901.4000	W. 1/4 COR, SEC 34
6	1468667.8170	3109210.9885	CENTER W. 1/16 COR, SEC 34
7	1468657.4820	3110520.5770	CENTER 1/4 COR, SEC 34
8	1469985.2060	3110529.0260	N. 1/16 COR, SEC 34
9	1469995.6070	3109218.1910	NW. 1/16 COR, SEC 34

NOTE: POINT # 1,2,3 ARE NOT SHOWN ON THIS PAGE. THEY ARE SOUTH OF THE SITE.

REV	DESCRIPTION	BY	DATE
1	60% DESIGN - NOT FOR CONSTRUCTION	WK	11-4-21
2	FOR CONSTRUCTION	SR	11-29-21

DESIGNED BY: SAR
DRAWN BY: ITR
CHECKED BY: CJH

SUSAN A. RAINEY
STATE PROFESSIONAL ENGINEER NO. XXXXX
DATE:

DEERE & AULT
A SCHNABEL ENGINEERING COMPANY
600 S. AIRPORT RD., BLDG. A, SUITE 205
LONGMONT, CO 80503
TEL 303.651.1468 FAX 303.651.1469

HOME OFFICE MINE
UNDERDRAIN CONSTRUCTION

GENERAL PLAN

PROJECT: 0494.019.00
DATE: 11/29/21
SHEET
5 OF 9

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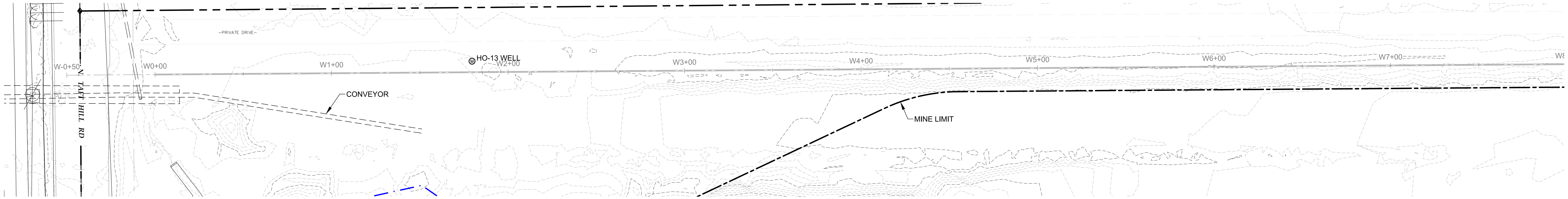

FUTURE WEST DRAIN PLAN (STA 0+00 TO 7+50)

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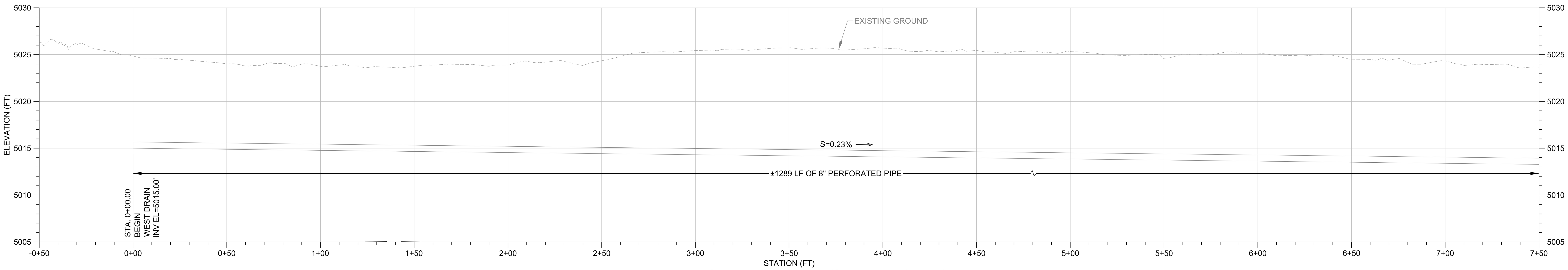
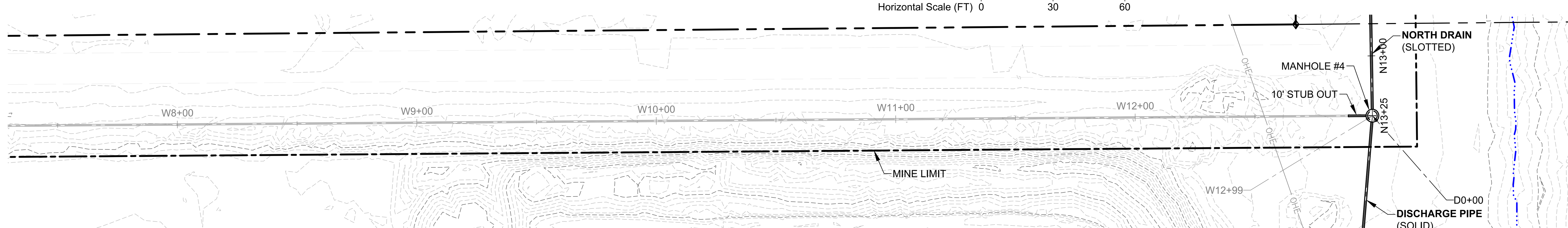
SCALE IN FEET



FUTURE WEST DRAIN PROFILE (STA 0+00 TO 7+50)

Vertical Scale (FT) 0 6 12
Horizontal Scale (FT) 0 30 60



FUTURE WEST DRAIN PLAN (STA 7+50 TO 13+00)

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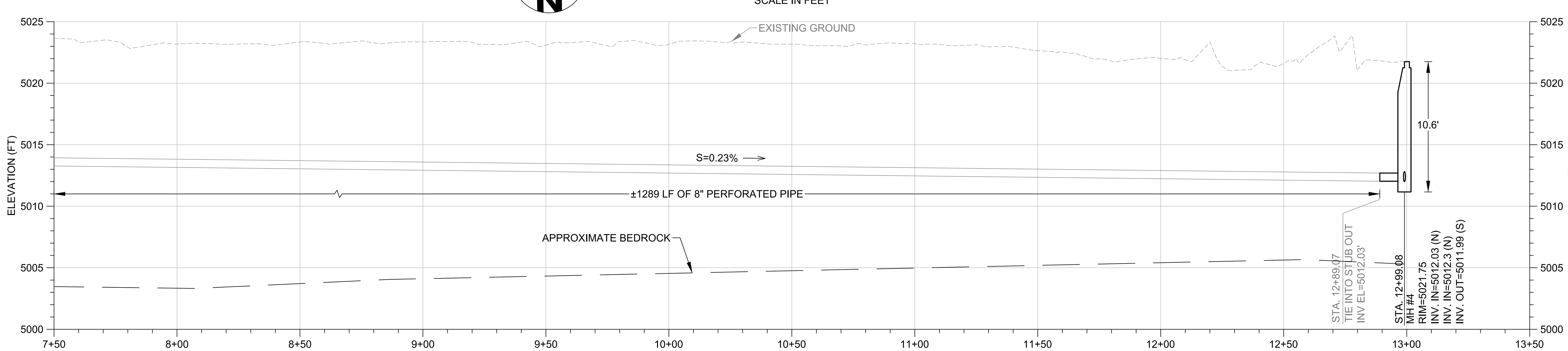
SCALE IN FEET



FUTURE WEST DRAIN PROFILE (STA 7+50 TO 13+00)

Vertical Scale (FT) 0 6 12
Horizontal Scale (FT) 0 30 60

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REV	DESCRIPTION	BY	DATE
1	60% DESIGN - NOT FOR CONSTRUCTION	WK	11-4-21
2	FOR CONSTRUCTION	SR	11-29-21

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CHECKED BY: CJH

SUSAN A. RAINEY
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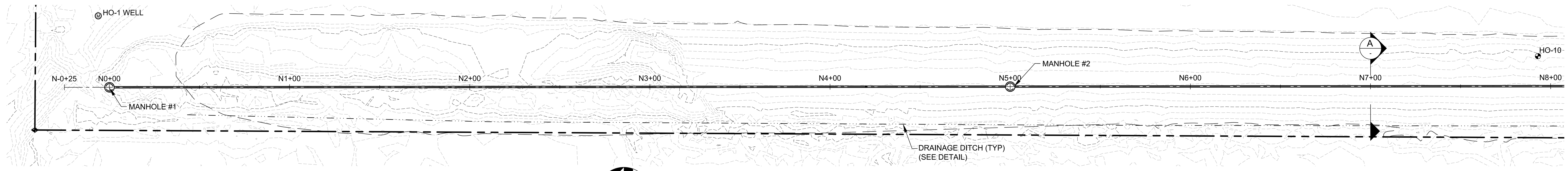
HOME OFFICE MINE
UNDERDRAIN CONSTRUCTION

WEST DRAIN PLAN AND PROFILE

PROJECT: 0494.019.00
DATE: 11/29/21
SHEET 6 OF 9



NORTH DRAIN PLAN (STA 0+00 TO 8+00)

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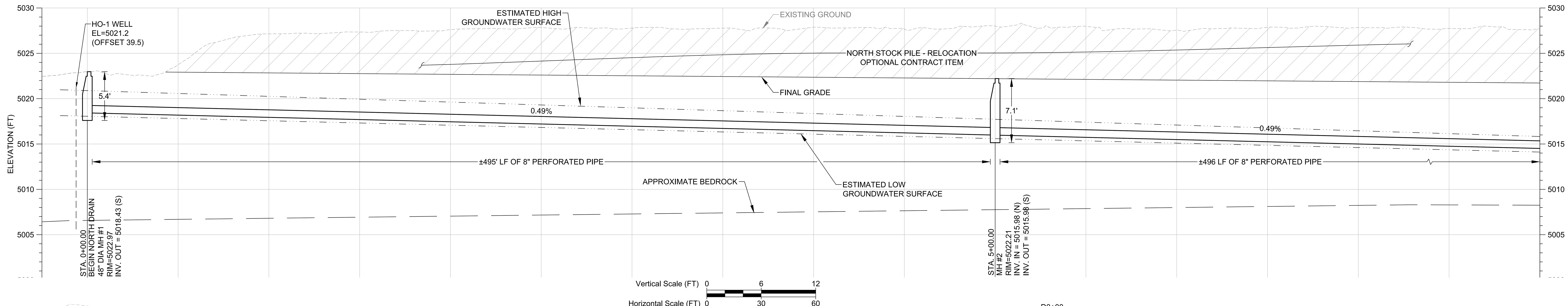
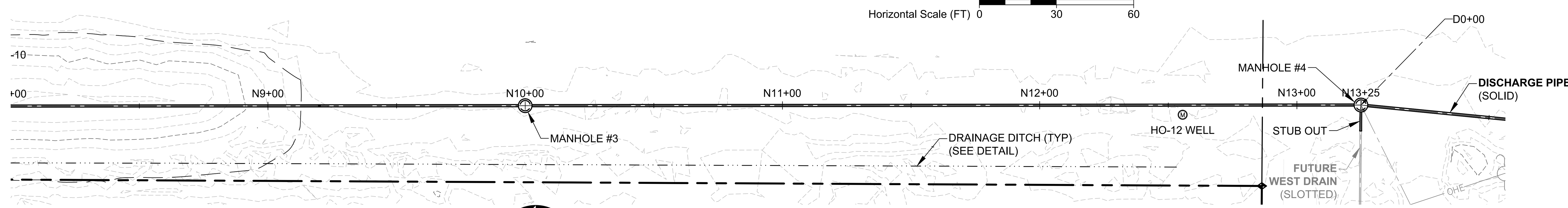
SCALE IN FEET





NORTH DRAIN PLAN (STA 8+00 TO 14+00)

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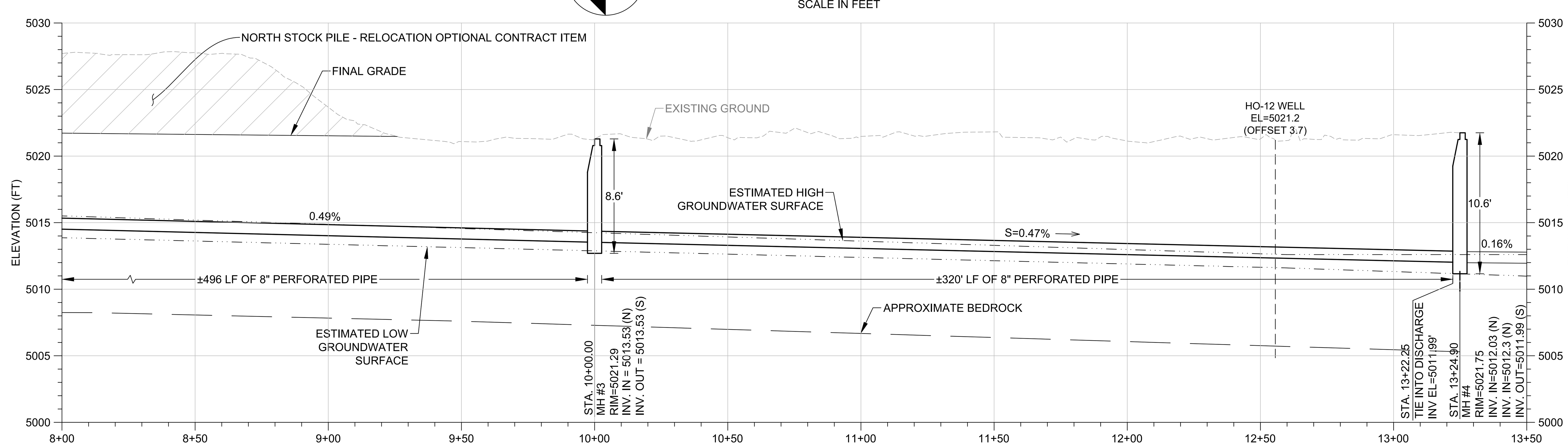
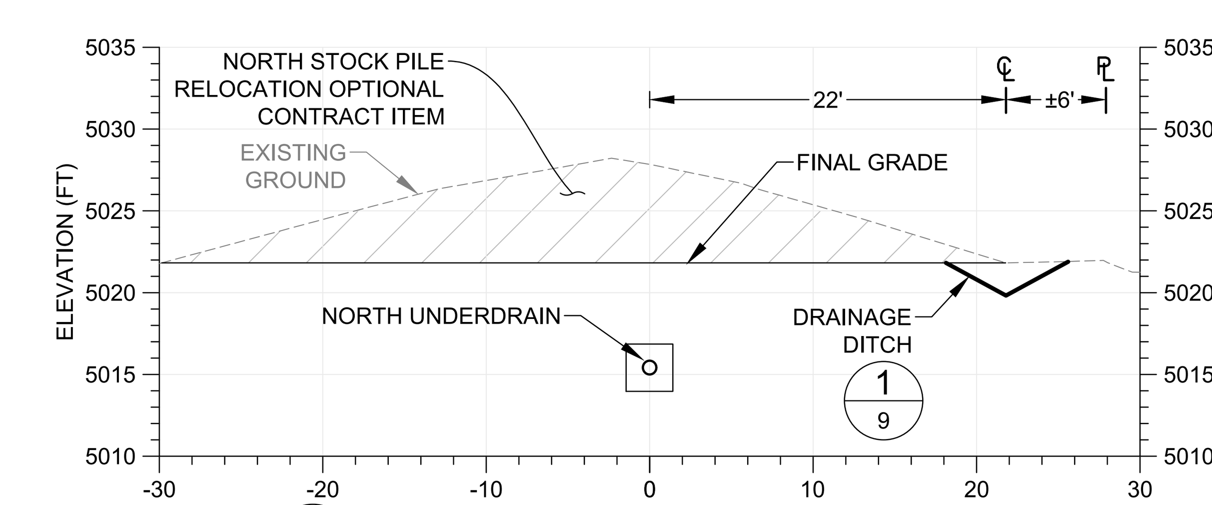
SCALE IN FEET



NORTH DRAIN PROFILE (STA 8+00 TO 13+50)

Vertical Scale (FT) 0 6 12
Horizontal Scale (FT) 0 30 60



A - DITCH SECTION STATION 7+00

0 10 20
SCALE IN FEET

REV	DESCRIPTION	BY	DATE
1	60% DESIGN - NOT FOR CONSTRUCTION	WK	11-4-21
2	FOR CONSTRUCTION	SR	11-29-21

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DESIGNED BY: SAR
DRAWN BY: ITR
CHECKED BY: CJH

SUSAN A. RAINEY

STATE PROFESSIONAL ENGINEER NO. XXXXX DATE:

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HOME OFFICE MINE
UNDERDRAIN CONSTRUCTION

NORTH DRAIN PLAN AND PROFILE

PROJECT: 0494.019.00
DATE: 11/29/21
SHEET
7 OF 9

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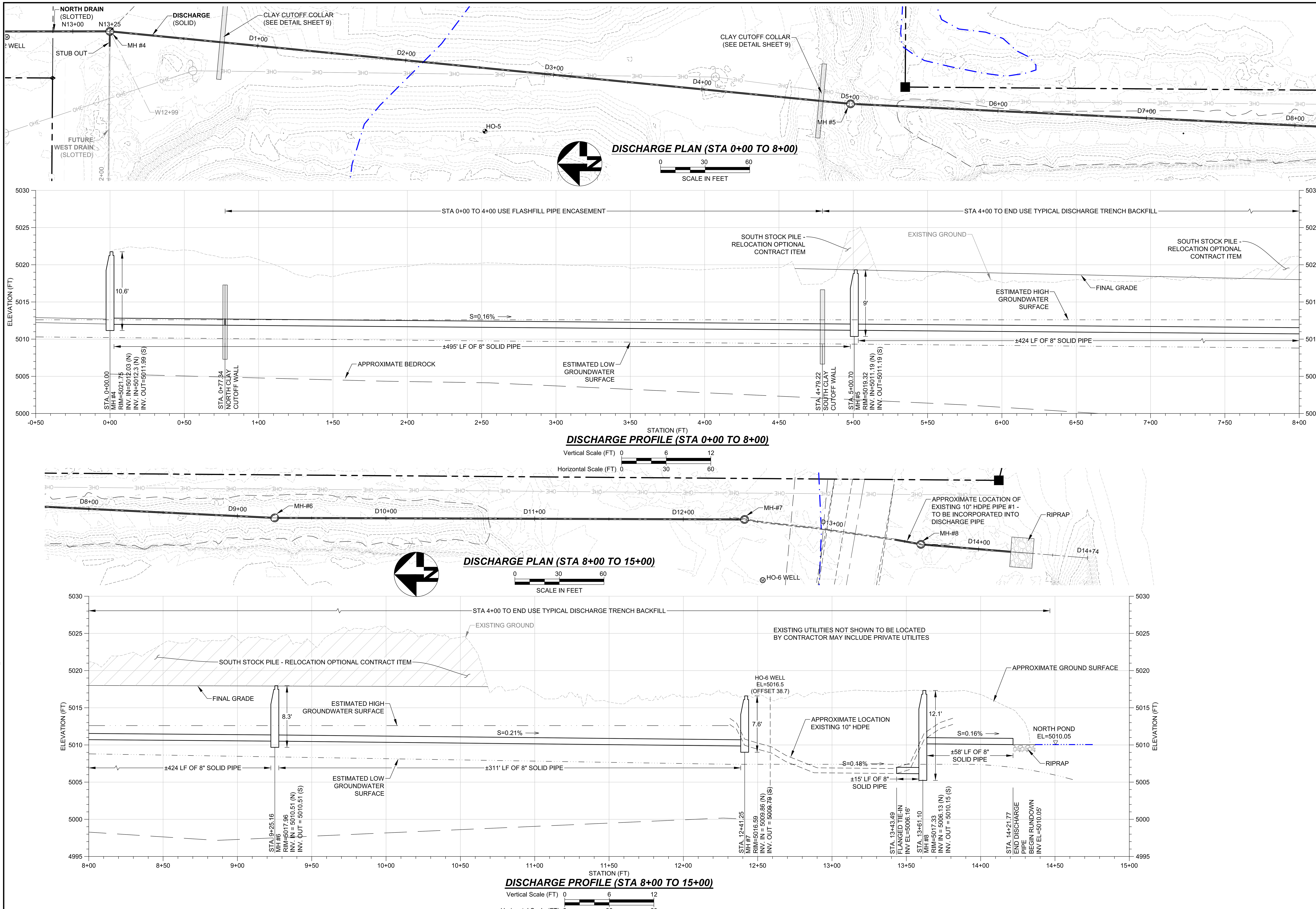

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REV	DESCRIPTION	BY	DATE
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2	FOR CONSTRUCTION	SR	11-29-21

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DESIGNED BY: SAR
DRAWN BY: ITR
CHECKED BY: CJH

SUSAN A. RAINEY
STATE PROFESSIONAL ENGINEER NO. XXXXX
DATE:

DEERE & AULT
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LONGMONT, CO 80503
TEL 303.651.1468 FAX 303.651.1469

HOME OFFICE MINE
UNDERDRAIN CONSTRUCTION

DISCHARGE PIPE PLAN AND PROFILE

PROJECT: 0494.019.00
DATE: 11/29/21
SHEET 8 OF 9

DEERE & AULT
A SCHNABEL ENGINEERING COMPANY

600 South Airport Road, Suite A-205
Longmont, Colorado 80503
T/ 303-651-1468
F/ 303-651-1469

TECHNICAL MEMORANDUM

TO:	Julie Mikulas Britney Guggisberg	**DATE:**	6/21/2022
COMPANY:	Martin Marietta	**SUBJECT:**	Underdrain Calculations
ADDRESS:	1800 North Taft Hill Road Fort Collins, CO 80521	**PROJECT NAME/NO.:**	Home Office DA494019.00
FROM:	Susan A. Rainey, PE	**CC:**	Pam Hora – Tetra Tech

This document presents the calculations performed as part of the groundwater underdrain design at the Home Office Mine.

PROJECT BACKGROUND

The Home Office Mine is located in Larimer County, Colorado in the northwest portion of the city of Fort Collins. As mining progressed at the site, Martin Marietta plans to construct a slope liner in stages around the perimeter of the mined area. The slope liner and berm in the center of the site will create two cells. Phase I, or the first cell and dividing berm, was constructed from August to October in 2020. Phase II is scheduled to be constructed in approximately the same time frame this year. Martin Marietta elected to construct a groundwater collection system or underdrain to deal with possible groundwater mounding that could occur due to the liner configuration. The first section of underdrain (the north drain and discharge) was constructed at the beginning of 2022. The remainder of the underdrain (the west drain) will be constructed as part of Phase II.

CALCULATIONS

Seepage analyses were performed using Seep/W, a finite element computer model software program, to estimate the possible groundwater flow into the underdrain. The seepage analyses were performed using two different K values for the native sand and gravel. The first value (2.54×10^{-3} cm/s) was selected using the NAVFAC DM 7.2 Table 1 typical coefficient of permeability for SW (well-graded sand) soil type as a guideline. This table lists a permeability of greater than 1×10^{-3} ft/min. We selected 5×10^{-3} ft/min or 2.54×10^{-3} cm/s for a possible lower end value, which is greater than the minimum (1×10^{-3} ft/min) typical permeability for well graded sand. This value was selected due to the presence of gravel and cobble on the site. A second seepage analysis was performed with a considerably higher permeability (1×10^{-2} cm/s) for a possible higher end value. This value was selected based off the typical permeability on the NAVFAC DM 7.2 Table 1 for GW (well-graded gravel) of 5×10^{-2} ft/min. Our value of 1.00×10^{-2} cm/s or 1.97×10^{-2} ft/min is less than this maximum permeability.

We performed analyses for each K value with two different groundwater heights for a range of possible flows into the underdrain system. The resulting flows were entered into FlowMaster, a general purpose 1D computational fluid dynamics simulation software, along with other design parameters (pipe size, slope, length, etc.) to calculate how full the pipe would be. An additional flow of 100 gallons per minute or more than double the highest Seep/W flow rate was entered into FlowMaster, as a high-end extreme flow. This was done for the two sections of perforated pipe (north and west drain). A cumulative flow of 200 gallons per minute for the discharge section was also entered into FlowMaster. The resulting percent of pipe full of flow is shown on the attached calculations summary table.

A final check of water velocity through the slots in the perforated pipe was performed for the anticipated flows to confirm the open area of the perforated pipe was sufficient for the estimated possible, and high-end extreme flows.

Home Office Underdrain
Seep W Analysis
Drain pipe sizing.

North Drain

Inputs

Length:	1370	ft. - from drawings	
Slope	0.0047	ft./ft.	
Pipe Diame	8	in	
Manning's	0.0009		
Slots	1.5	in2/ft	specified minimum slot area

Outputs

		Seep W Input				Seep W Results				Pipe	
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter	Water velocity through slots
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in		ft/sec
2.54E-03	5,024	5,019	5	5017	7	8.77E-06	1.20E-02	5.392287	0.6	7.1%	8.42E-04
2.54E-03	5,024	5,021	3	5017	7	1.85E-05	2.53E-02	11.37484	0.8	10.1%	1.78E-03
1.00E-02	5,024	5,019	5	5017	7	3.50E-05	4.80E-02	21.51996	1.1	13.7%	3.36E-03
1.00E-02	5,024	5,021	3	5017	7	7.39E-05	1.01E-01	45.43786	1.6	19.6%	7.09E-03
High flow check - 100 gpm, greater than 200% of model						1.63E-04	2.23E-01	100	2.3	29.3	1.56E-02

West Drain

Inputs

Length:	1326	ft. - from drawings	
Slope	0.0023	ft./ft.	
Pipe Diame	8	in	
Manning's	0.0009		
Slots	1.5	in2/ft	specified minimum slot area

Outputs

		Seep W Input				Seep W Results				Pipe	
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter	Water velocity through slots
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in		ft/sec
2.54E-03	5,024	5,019	5	5017	7	8.77E-06	1.16E-02	5.219104	0.7	8.2%	8.42E-04
2.54E-03	5,024	5,021	3	5017	7	1.85E-05	2.45E-02	11.00951	0.9	11.8%	1.78E-03
1.00E-02	5,024	5,019	5	5017	7	3.50E-05	4.64E-02	20.82881	1.3	16.0%	3.36E-03
1.00E-02	5,024	5,021	3	5017	7	7.39E-05	9.80E-02	43.97854	1.8	23.1%	7.09E-03
High flow check - 100 gpm, greater than 200% of model						1.68E-04	2.23E-01	100	2.8	35.3%	1.61E-02

Discharge

Length:	1400	ft. - from drawings
Slope	0.0012	ft./ft.
Pipe Diame	8	in
Manning's	0.0009	

Seep W Input						Seep W Results				Pipe
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in	
2.54E-03	5,024	5,019	5	5017	7		2.36E-02	10.61139	1.1	13.5%
2.54E-03	5,024	5,021	3	5017	7		4.99E-02	22.38435	1.6	19.4%
1.00E-02	5,024	5,019	5	5017	7		9.44E-02	42.34877	2.1	26.7%
1.00E-02	5,024	5,021	3	5017	7		1.99E-01	89.4164	3.2	39.5%
High flow check - 200 gpm, greater than 200% of model							4.46E-01	200	5.1	63.9%

Notes:

See USBR DS-15(5) - Filter Drsign. Paragraph 5.5.2 - "Drains sould be sized so that the depth of water in the drain pipe is less than 50% of the inside diameter.

Slot velocity not specified by design standard. Calculated to check, maintin below 0.06 ft/sec, which the maximum orfice velocity at 100 gpm as calculated in Flow Master

CALCULATION COVER SHEET

Project	**Project Number**
Home Office Mine Underdrain	DA0494.019

Title
Toe drain filter selection and pipe selection

Computer Programs Used	**Version/Release No.**
Excel Flow Master Geostudio - SeepW	

Purpose and Objective

Select toe drain filter that is compatible with native soils at the depth of the toe drain. Using USBR Deign Standard No. 13, Embankment Dams, Chapter 5: Protective Filters
Select toe drain pipe slot size that is compatible with filter material.
Select pipe size based on anticipated toe drain flow and pipe slope that meets USBR criteria.
Check water velocity through toe drain slots based on area per foot in specifications.

Summary of Conclusions

Use of ASTM C33 #67 aggregate will be an acceptable filter for the native soils at this site.
A maximum slot size of 1/4 inch is acceptable for the selected filter material.
8 inch slotted pipe will not flow more than 50% full for drains at design slopes, meets USBR.
8 inch solid discharge pipe will discharge anticipated flow from both toe drains without pressurizing.
Acceptable velocity across slots using a minimum opening of 1.5 sq.in. per foot.

Originator

Print	Sign	Date
Walter Kramb		Dec 14, 2021

Checked

Print	Sign	Date

Base Material

Determine the gradation curves of the base soil. Use enough samples to define the range of grain size for the base soil. Design the filter gradation based on the base soil that requires the smallest D_{15F} size. If soil has particles larger than the #4 sieve, an adjusted gradation is calculated. Input values below for the base soil (original) gradation (in red):

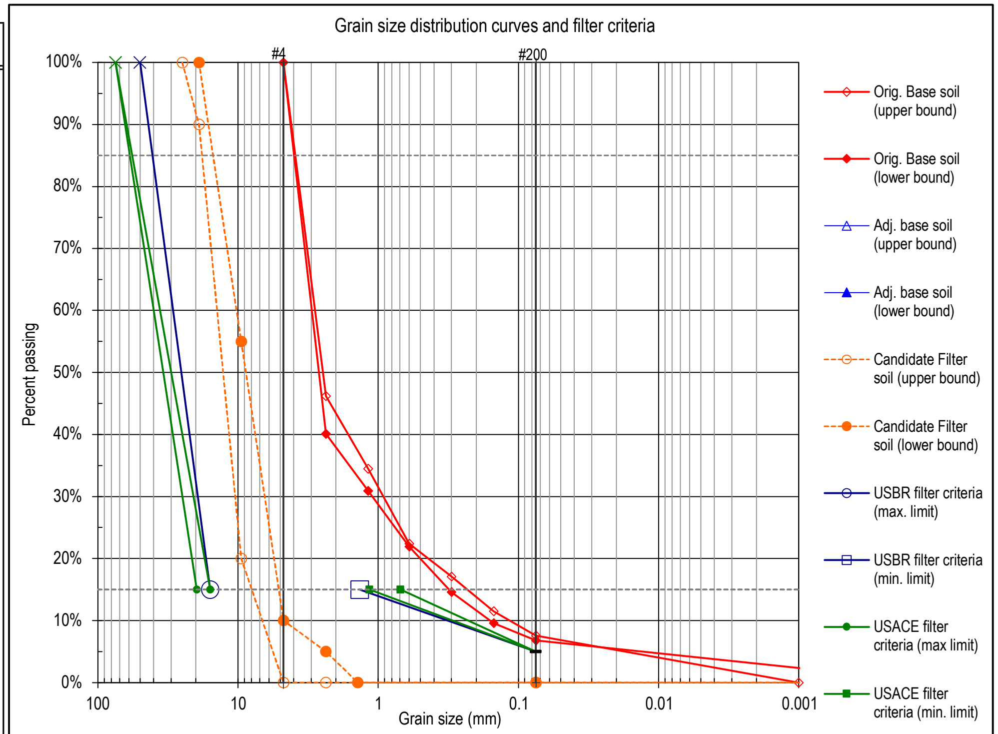
Project: Home Office Underdrain
ASTM #67 Gravel Filter

Name: W. Kramb
Date: 10/5/2021

Particle size (mm)	Sieve #	Base soil (original), % passing (upper bound)	Base soil (original), % passing (lower bound)	Adjusted gradation, % passing upper bound	Adjusted gradation, % passing lower bound
75	-				
37.5	-			*(No adjustment needed)*	
19.0	-				
9.5	-				
4.75	4	100.0%	100.0%		
4.00	5				
3.35	6				
2.80	7				
2.36	8	46.2%	40.1%		
2.00	10				
1.70	12				
1.40	14				
1.18	16	34.5%	30.9%		
1.00	18				
0.850	20				
0.710	25				
0.600	30	22.4%	21.9%		
0.500	35				
0.425	40				
0.300	50	17.1%	14.6%		
0.250	60				
0.212	70				
0.180	80				
0.150	100	11.5%	9.6%		
0.125	120				
0.106	140				
0.090	170				
0.075	200	7.6%	6.8%		
0.053	270				
0.037	-				
0.019	-				
0.009	-				
0.005	-				
0.002	-				
0.001	-	0.0%			
0.0001	-	0.0%	0.0%		

Required entry values are defined below. *

Average % passing #200 after regarding (if any) = A =	7.2%



Properties of base soil	Upper bound	Lower bound
D_{85B} of original base soil =	3.908 mm	3.987 mm
D_{85B} of adjusted base soil =	--- mm	--- mm
D_{15B} of original base soil =	0.2313 mm	0.3116 mm
D_{15B} of adjusted base soil =	--- mm	--- mm
D_{60B} of original base soil =	2.824 mm	2.977 mm
D_{10B} of original base soil =	0.1149 mm	0.1586 mm
C_u of original base soil =	24.6	18.8

Fixed points on graph:
- — <5% passing #200
- × 50mm max. grain size (USBR)
- × 75mm max. grain size (USACE)

Filter Material

Filter criteria required by the USBR as published in *Design Standards - Embankment Dams No. 13 (1994):*

D_{85B} used in filter design	3.948
Average Passing #200 sieve of base soil	7.2%
Base soil category	4
Base soil description	Sands and gravels
Filter criteria (mm)	Maximum: $D_{15F} \leq$ 15.79 To ensure sufficient permeability: Minimum: $D_{15F} \geq$ 1.36
Maximum particle size of filter (mm)	50
Maximum % passing # 200 sieve	5%
PI of material passing #40	0 when tested in accordance with USBR 5360, Earth Manual, on material passing #40

Filter criteria required by the US Army Corps of Engineers as published in EM 1110-2-2300 (31 Jul 94):

D_{85B} used in filter design	3.948
Average Passing #200 sieve of base soil	7.2%
Base soil category	4**
Filter criteria (mm)	Maximum: $D_{15F} \leq$ 15.79 to 19.74 To ensure sufficient permeability: Minimum: $D_{15F} \geq$ 0.69 to 1.16
Maximum particle size of filter (mm)	75
Maximum % passing # 200 sieve	5%
PI of material passing #40	0 when tested in accordance with EM 1110-2-1906

**If the base soil is in category 4, use the lower of the two 'max. D_{15F}' values when the filter is beneath riprap subject to wave action or beneath drains which may be subject to violent surging and/or vibration.

*Required entry values for base soil & candidate filter gradations:

1. Particle size for 100% passing.
2. % Passing the #4 sieve.
3. % Passing the #200 sieve.
4. One point in the 85% - 90% range and another point in the 80% - 85% range, or the 85% point.
5. One point in the 15% - 20% range and another point in the 10% - 15% range, or the 15% point.
6. No duplicate entries; if D100<#4, enter 101% for #4 and 100% for appropriate size.

USBR filter gradation limits:

Maximum limit	
Grain size (mm)	% Passing
50.00	100.0%
15.79	15.0%

Minimum limit	
Grain size (mm)	% Passing
1.36	15.0%
0.075	5.0%

USACE filter gradation limits:

Maximum limit	
Grain size (mm)	% Passing
75.00	100.0%
19.74	15.0%
15.79	15.0%

Minimum limit	
Grain size (mm)	% Passing
0.69	15.0%
1.16	15.0%
0.075	5.0%

Candidate filter soil gradation. Values shown in red in the left column, and all values in the two right columns, can be changed.

Particle size mm	Sieve #	% Passing (upper bound)	% Passing (lower bound)
150.0	-		
100.0	-		
90.0	-		
75.0	-		
63.0	-		
50.0	-		
37.5	-		
25.0	-	100.0%	
19.0	-	90.0%	100.0%
12.5	-		
9.5	-	20.0%	55.0%
4.75	4	0.0%	10.0%
3.35	6		
2.36	8	0.0%	5.0%
2.00	10		
1.70	12		
1.40	14		(0.0%)
1.18	16		
0.850	20		
0.600	30		
0.425	40		
0.300	50		
0.250	60		
0.212	70		
0.180	80		
0.150	100		
0.125	120		
0.106	140		
0.090	170		
0.075	200	(0.0%)	(0.0%)
0.053	270		
0.037	-		
0.019	-		
0.009	-		
0.0001	-	0.0%	0.0%

Required entry values are defined above. *

Properties of candidate filter soil (CF). D sizes are in mm:	D_{85CF}	D_{15CF}	D_{60CF}	D_{10CF}	C_u
upper bound	18.08	7.99	14.12	6.72	2.10
lower bound	15.08	5.13	10.26	4.75	2.16

Acceptibility of candidate filter (CF) soil:

USBR criteria	Upper bound	Lower bound
Max % passing #200:	OK	OK
Max particle size (mm):	OK	OK
Maximum D_{15CF}:	OK	OK
Minimum D_{15CF}:	OK	OK
To minimize segregation (from *Table 2*)***		
Max allowable D_{90CF} =	40	OK
Max D_{90CF} =	19.00	

USACE criteria	Upper bound	Lower bound
Max % passing #200:	OK	OK
Max particle size (mm):	OK	OK
Maximum D_{15CF}:	OK	OK
Minimum D_{15CF} ($3{\times}D_{15B}$):	OK	OK
Minimum D_{15CF} ($5{\times}D_{15B}$):	OK	OK
To minimize segregation (from *Table B-3*)***		
Max allowable D_{90CF} =	40	OK
Max D_{90CF} =	19.00	

Filters should be relatively uniform (see the C_U value of the candidate filter soil.). Also, filters should not be gap-graded.

*** Generally, this requirement is only necessary for coarse filters and gravel zones that serve as both filters and drains. For sand filters with D_{90} < ~20mm, these limitations are usually not necessary.

of D15F to D85B over that used for protecting a natural or unprocessed soil. The ratio can be as high as 9, but 5 is generally found to meet the practical requirements of the situation. This increase is sometimes possible because the first-stage filter: (1) is a material processed to stringent gradation requirements and placed and compacted under controlled conditions, (2) is inspected and tested to verify that material properties conform to those that are specified, (3) usually has seepage gradients that are much less than those of a foundation material or impervious zone that needs filter protection, and (4) has D_{85} particles in the first stage filter material that are larger than those in materials that are usually being protected and, therefore, less likely to move. However, this increase should be made with caution.

5.5.2 Drain Pipe Perforation Size

The maximum pipe perforation dimension[19] should be no larger than the finer side of the $D_{50}E$ where $D_{50}E$ is taken from the gradation of the envelope (drain) material that surrounds the drainpipe. That is:

$$\text{Max Perforation Dimension} \leq D_{50}E$$

It is emphasized that inaccessible drainpipes beneath embankment dams should be avoided. Drainpipes should be sized and located, and inspection wells should be provided so that access for inspection, maintenance, and repair, if necessary, is easy. It is recommended that each pipe segment be accessible from both ends. In order to provide a margin of safety for the pipe capacity, drains should be sized so that the depth of water in the drainpipe is less than 50 percent of the inside diameter of the drainpipe at the maximum expected discharge. If it is anticipated that the drainpipe will collect a large amount of flow from a pervious foundation or embankment, the maximum depth of water should not exceed 25 percent of the inside pipe diameter due to uncertainties in predicting the amount of flow.

5.6 Laboratory Test Procedures

In the following section, test procedures for laboratory tests are presented. The procedures have been separated into two categories: particle retention and material quality. The particle retention tests evolved from the original test procedures used during research into particle movement. The material quality tests come mainly from industry standard tests, although one stems from research work.

[19] The maximum dimension as used in this standard is the width for a slot and the diameter for a hole.

Home Office Underdrain
Seep W Analysis
Drain pipe sizing.

North Drain

Inputs

Length:	1370	ft. - from drawings	
Slope	0.0047	ft./ft.	
Pipe Diame	8	in	
Manning's	0.0009		
Slots	1.5	in2/ft	specified minimum slot area

Outputs

Seep W Input						Seep W Results			Pipe		
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter	Water velocity through slots
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in		ft/sec
2.54E-03	5,024	5,019	5	5017	7	8.77E-06	1.20E-02	5.392287	0.6	7.1%	8.42E-04
2.54E-03	5,024	5,021	3	5017	7	1.85E-05	2.53E-02	11.37484	0.8	10.1%	1.78E-03
1.00E-02	5,024	5,019	5	5017	7	3.50E-05	4.80E-02	21.51996	1.1	13.7%	3.36E-03
1.00E-02	5,024	5,021	3	5017	7	7.39E-05	1.01E-01	45.43786	1.6	19.6%	7.09E-03
High flow check - 100 gpm, greater than 200% of model						1.63E-04	2.23E-01	100	2.3	29.3	1.56E-02

West Drain

Inputs

Length:	1326	ft. - from drawings	
Slope	0.0023	ft./ft.	
Pipe Diame	8	in	
Manning's	0.0009		
Slots	1.5	in2/ft	specified minimum slot area

Outputs

Seep W Input						Seep W Results			Pipe		
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter	Water velocity through slots
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in		ft/sec
2.54E-03	5,024	5,019	5	5017	7	8.77E-06	1.16E-02	5.219104	0.7	8.2%	8.42E-04
2.54E-03	5,024	5,021	3	5017	7	1.85E-05	2.45E-02	11.00951	0.9	11.8%	1.78E-03
1.00E-02	5,024	5,019	5	5017	7	3.50E-05	4.64E-02	20.82881	1.3	16.0%	3.36E-03
1.00E-02	5,024	5,021	3	5017	7	7.39E-05	9.80E-02	43.97854	1.8	23.1%	7.09E-03
High flow check - 100 gpm, greater than 200% of model						1.68E-04	2.23E-01	100	2.8	35.3%	1.61E-02

Discharge

Length:	1400	ft. - from drawings
Slope	0.0012	ft./ft.
Pipe Diame	8	in
Manning's	0.0009	

	Seep W Input					Seep W Results				Pipe
Sand and Gravel (k)	Model Ground Surface	Model Groundwater Elevation	Groundwater depth below ground	Drain Elevation	Drain Depth	q	Total flow	Total flow	Flow height - solved in Flowmaster	% of diameter
cm/sec	ft.	ft.	ft.	ft.	ft.	cfs/ft.	cfs	gpm	in	
2.54E-03	5,024	5,019	5	5017	7		2.36E-02	10.61139	1.1	13.5%
2.54E-03	5,024	5,021	3	5017	7		4.99E-02	22.38435	1.6	19.4%
1.00E-02	5,024	5,019	5	5017	7		9.44E-02	42.34877	2.1	26.7%
1.00E-02	5,024	5,021	3	5017	7		1.99E-01	89.4164	3.2	39.5%
High flow check - 200 gpm, greater than 200% of model							4.46E-01	200	5.1	63.9%

Notes:

See USBR DS-15(5) - Filter Drsign. Paragraph 5.5.2 - "Drains sould be sized so that the depth of water in the drain pipe is less than 50% of the inside diameter.

Slot velocity not specified by design standard. Calculated to check, maintin below 0.06 ft/sec, which the maximum offce velocity at 100 gpm as calculated in Flow Master

TABLE 5.5 Coarse Aggregate Grading Requirements for Concrete (Reprinted, with permission, from ASTM C33, Table 2, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428).

		Amounts Finer Than Each Laboratory Sieve (Square Openings), Weight Percent												
Size No.	Nominal Size	4 in. (100 mm)	3 1/2 in. (90 mm)	3 in. (75 mm)	2 1/2 in. (63 mm)	2 in. (50 mm)	1 1/2 in. (37.5 mm)	1 in. (25.0 mm)	3/4 in. (19.0 mm)	1/2 in. (12.5 mm)	3/8 in. (9.5 mm)	No. 4 (4.75 mm)	No. 8 (2.36 mm)	No. 16 (1.18 mm)
1	3 1/2 to 1 1/2 in. (90 to 37.5 mm)	100	90 to 100	...	25 to 60	...	0 to 15	...	0 to 5	...	...	...	...	...
2	2 1/2 to 1 1/2 in. (63 to 37.5 mm)	...	...	100	90 to 100	35 to 70	0 to 15	...	0 to 5	...	...	...	...	...
3	2 to 1 in. (50 to 25.0 mm)	...	...	...	100	90 to 100	35 to 70	0 to 15	...	0 to 5	...	...	...	...
357	2 in. to No. 4 (50 to 4.75 mm)	...	...	...	100	95 to 100	...	35 to 70	...	10 to 30	...	0 to 5	...	...
4	1 1/2 to 3/4 in. (37.5 to 19 mm)	...	...	...	...	100	90 to 100	20 to 55	0 to 15	...	0 to 5	...	...	...
467	1 1/2 in. to No. 4 (37.5 to 4.75 mm)	...	...	...	...	100	95 to 100	...	35 to 70	...	10 to 30	0 to 5	...	...
5	1 to 1/2 in. (25.0 to 12.5 mm)	...	...	...	...	...	100	90 to 100	20 to 55	0 to 10	0 to 5	...	...	...
56	1 to 3/8 in. (25.0 to 9.5 mm)	...	...	...	...	...	100	90 to 100	40 to 85	10 to 40	0 to 15	0 to 5	...	...
57	1 in. to No. 4 (25.0 to 4.75 mm)	...	...	...	...	...	100	95 to 100	...	25 to 60	...	0 to 10	0 to 5	...
6	3/4 in. to 3/8 in. (19.0 to 9.5 mm)	...	...	...	...	...	...	100	90 to 100	20 to 55	0 to 15	0 to 5	...	...
67	3/4 in. to No. 4 (19.0 to 4.75 mm)	...	...	...	...	...	...	100	90 to 100	...	20 to 55	0 to 10	0 to 5	...
7	1/2 in. to No. 4 (12.5 to 4.75 mm)	...	...	...	...	...	...	...	100	90 to 100	40 to 70	0 to 15	0 to 5	...
8	3/8 in. to No. 8 (9.5 to 2.36 mm)	...	...	...	...	...	...	...	...	100	85 to 100	10 to 30	0 to 10	0 to 5