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date: February 7, 2024

to: Records Center

from: Orlando Reyna and Tricia Johnson, SNL Contractors

subject: 2023 Calculated Densities

The groundwater densities for the WIPP Culebra monitoring wells were calculated for 2023 as described in the Activity/Project Specific Procedure (SP) 9-11 *Calculation of Densities for Groundwater in WIPP Wells, Revision 3*. The derivation of the data is explained in the following sections and supporting data are attached.

1. Calculation Process:

As stated in SP 9-11, for each calculation the observed water pressure is divided by the height of the water column. Specifically, the measured pressure value minus the closest corresponding barometric pressure value was divided by the pressure gauge install depth minus the closest corresponding depth to water (from or adjusted to the same measurement point elevation), and that result was then divided by 0.4335 (psi to feet of water conversion at 4°C, at which temperature the density of pure water is 1.000 g/cm^3). The individual calculated density results for each well were then averaged for a final density value.

The density data are included in the *2023 Calculated Densities.xlsx* workbook file created in Excel. Within that workbook, the worksheet *2023 Calc Dens* summarizes the resulting density values and supporting information for the calculated densities, and the worksheet *2023 Calc Dens Formulas* provides the formulas in the worksheet. In addition, the Excel file contains individual well worksheets that include the data used for the calculations and plots of the pressure gauge pressure data. The columns in the worksheets and their contents are described below:

- A – Monitor Well – Well name
- B – 2023 Avg Calc Dens (g/cm^3) – Average calculated density value for 2023
- C – 2023 Specific Gravity (Reference: Freshwater at 70°F) – Average calculated density value for 2023 divided by 0.998 g/cm^3 to represent specific gravity in reference to freshwater at 70°F
- D – 2022 Avg Calc Dens (g/cm^3) – Average calculated density value for 2022
- E – 2023 - 2022 Difference (g/cm^3) – Difference between 2023 and 2022 calculated densities (Column B - Column D)
- F – # of Dens Averaged – number of density values averaged to get the final value

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- G – 2023 Timeframe of Data – Time period for pressure data used in calculations
- H – Pressure Gauge File Name (Gauge SN) – File name for pressure data and INW or In-Situ gauge serial number
- I – Pressure Gauge Install Depth (ft BTOC/BTEC/BTOT) – Depth below primary measuring point at which the pressure gauge was installed
- J – Pressure Gauge Ideal Install Depth (ft BTOC/BTEC/BTOT) – Mid-Culebra depth below top of referenced casing
- K – Length Off Ideal Depth (ft) – Depth in feet that the pressure gauge is installed below or above the ideal (Column I - Column J)
- L – Date of Install – Date(s) the pressure gauge(s) was/were installed
- M – Installation Logbook Page – Reference to scientific notebook(s) and page(s) where the pressure gauge installation(s) is/are documented
- N – Comments/Explanations – Comments and/or explanations regarding data, as needed

The spreadsheet entries were verified by Justin Kirkes (8882) and Shelly Nielsen (8880).

2. Identification/Listing of Input, Input sources, and Output:

- Excel workbook including the data – 2023 Calculated Densities.xlsx
  - Worksheet 1 – 2023 Calc Dens
  - Worksheet 2 – 2023 Calc Dens Formulas
  - Worksheet 3 – Baro Data
  - Worksheet 4 – AEC-7R
  - Worksheet 5 – C-2737
  - Worksheet 6 – H-4bR
  - Worksheet 7 – H-5bR
  - Worksheet 8 – H-6bR
  - Worksheet 9 – H-9bR
  - Worksheet 10 – H-10cR
  - Worksheet 11 – H-11b4R
  - Worksheet 12 – H-12R
  - Worksheet 13 – H-15R
  - Worksheet 14 – H-16
  - Worksheet 15 – H-19b0
  - Worksheet 16 – IMC-461
  - Worksheet 17 – SNL-1
  - Worksheet 18 – SNL-2
  - Worksheet 19 – SNL-3
  - Worksheet 20 – SNL-5
  - Worksheet 21 – SNL-6
  - Worksheet 22 – SNL-8
  - Worksheet 23 – SNL-9
  - Worksheet 24 – SNL-10
  - Worksheet 25 – SNL-12
  - Worksheet 26 – SNL-13
  - Worksheet 27 – SNL-14
  - Worksheet 28 – SNL-15
  - Worksheet 29 – SNL-16
  - Worksheet 30 – SNL-17a
  - Worksheet 31 – SNL-18
  - Worksheet 32 – SNL-19
  - Worksheet 33 – WIPP-11R
  - Worksheet 34 – WQSP-1
  - Worksheet 35 – WQSP-2
  - Worksheet 36 – WQSP-3
  - Worksheet 37 – WQSP-4
  - Worksheet 38 – WQSP-5
  - Worksheet 39 – WQSP-6

3. Data Qualification for Compliance Decision Analysis:

Data sources are documented in Column H (Pressure Gauge File Name (Gauge SN)), Column M (Installation Logbook Page), and in the References Section of this memorandum.

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4. Software Used:
Dell Precision 3460, Intel® vPRO i7, Windows 11 Enterprise, Microsoft Excel for Microsoft 365 Apps

5. Reviews:
Technical: Justin Kirkes, 8882
QA: Shelly Nielsen, 8880

6. References:

- Pressure gauge installation data and SNL water level data from the following scientific notebooks (package ERMS 543277):
  Long-Term Monitoring Notebook (LTM)-36
  Long-Term Monitoring Notebook (LTM)-37
  Long-Term Monitoring Notebook (LTM)-38
  Long-Term Monitoring Notebook (LTM)-39
- LATA (M&O Contractor) Water Level Data submitted to SNL in monthly memoranda (package ERMS 525178)
- Johnson, Patricia B., Culebra Center Depths for Use in Calculating Equivalent Freshwater Heads of the Culebra Dolomite Member of the Rustler Formation near the WIPP Site, Revision 3, June 10, 2010 (ERMS 553781)
- Pressure Transducer Calibration Certificates (INW Certificates package ERMS 558531, Troll Certificates package ERMS 506685)

7. List of Attachments:

1. Printout of Excel file worksheet 2023 Calc Dens.xls
2. Printout of Excel file worksheet 2023 Calc Dens Formulas.xls
3. Electronic files are archived at /data/cvs/CVSLIB/WIPP_EXTERNAL/SP911_2023

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2023 Calculated Densities

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A	B	C	D	E	F	G	H	I	J	K	L	M	N
Monitor Well	2023 Avg Calc Dens (g/cm^3)	2023 Specific Gravity (Reference: Freshwater at 70°F)	2022 Avg Calc Dens (g/cm^3)	2023 - 2022 Difference (g/cm^3)	# of Dens Averaged	2023 Timeframe of Data	Pressure Gauge File Name (Gauge SN)	Pressure Gauge Install Depth (ft BTOC/BTEC/ BTOT)	Pressure Gauge Ideal Install Depth (ft BTOC/BTEC/ BTOT)	Length Off Ideal Depth (ft)	Date of Install(s)	Installation Logbook Page	Comments/Explanations
AEC-7R	1.070	1.072	1.070	0.000	8	June, Sept - Nov	AEC-7R C29 041323 (03220066), AEC-7R C31 081523 (06221763), AEC-7R C32 092723 (06221763)	868.98	868.98	0.00	4/13/2023, 8/15/2023, 9/27/2023	LTM-38 pg. 30, LTM-39 pg. 12, LTM-39 pg. 47	Adjusted install depth to ideal install depth as of 4/13/2023. Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
C-2737	1.027	1.029	1.025	0.002	8	July, Oct - Dec	C-2737 C42 020723 (21534009), C-2737 C43 091423_Append_2023-11-17_11-03-08-811 (1054365), C-2737 C44 111723_2023-12-18_13-17-55-762 (1054365)	688.85	689.78	-0.93	2/7/2023, 9/14/2023, 11/17/2023	LTM-37 pg. 130, LTM-39 pg. 40, LTM-39 pg. 90	Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
H-4bR	1.021	1.023	1.019	0.002	8	Aug - Nov	H-4BR C28 051523 (21741068), H-4BR C29 110123 (21741068)	507.90	507.72	0.18	5/15/2023, 11/1/2023	LTM-38 pg. 61, LTM-39 pg. 73	
H-5bR	1.090	1.092	1.089	0.001	8	Aug - Nov	H-5BR C13 070323_Append_2023-12-12_13-38-36-828 (994026)	910.15	908	2.15	7/3/2023	LTM-38 pg. 102	
H-6bR	1.037	1.039	1.038	-0.001	8	June - July, Nov - Dec	H-6BR C29 080922 (03220062), H-6BR C30 062823 (03220062), H-6BR C31 080423 (03220067), H-6BR C32 100923_2023-12-11_10-55-28-589 (1054354)	616.60	616.58	0.02	8/9/2022, 6/28/2023, 8/4/2023, 10/09/2023	LTM-37 pg. 8, LTM-38 pg. 98, LTM-38 pg. 128, LTM-39 pg. 51	Due to equipment failures during the targeted time frame, a more representative data timeframe was utilized.
H-9bR	1.002	1.004	1.002	0.000	8	Aug - Nov	H-9BR C24 031423 (21830038), H-9BR C25 081523 (03220062), H-9BR C26 082423 (03220062), H-9BR C27 101723 (03220062)	660.54	660.47	0.07	3/14/2023, 8/15/2023, 8/24/2023, 10/17/2023	LTM-38 pg. 12, LTM-39 pg. 9, LTM-39 pg. 25, LTM-39 pg. 67	
H-10cR	1.092	1.094	1.090	0.002	8	Aug - Nov	H-10CR C21 030723_Append_2023-12-12_11-46-39-479 (995695)	1374.10	1368.38	5.72	7/3/2023	LTM-38 pg. 99	
H-11b4R	1.074	1.076	1.078	-0.004	8	Aug - Nov	H-11B4R C26 050223 (21918010), H-11B4R C27 101323 (01221919), H-11B4R C28 110123 (01221919)	735.85	736.72	-0.87	5/2/2023, 10/13/2023, 11/1/2023	LTM-38 pg. 51, LTM-39 pg. 64, LTM-39 pg. 73	
H-12R	1.094	1.096	1.103	-0.009	8	Aug - Nov	H-12R C21 070323_Append_2023-08-21_09-05-35-148 (993993), H-12R C22 082423_Append_2023-12-12_12-31-23-088 (993993)	835.80	834.69	1.11	7/3/2023, 8/24/2023	LTM-38 pg. 100, LTM-39, pg. 26	
H-15R	1.125	1.127	1.125	0.000	8	Aug - Nov	H-15R C32 070323_Append_2023-12-18_12-57-58-752 (810453)	872.50	872.57	-0.07	7/3/2023	LTM-38 pg. 103	
H-16	1.033	1.035	1.031	0.002	8	Aug - Nov	H-16 C19 013123 (06202175), H-16 C20 111523_2023-12-19_09-36-29-426 (995698)	715.10	714.50	0.60	1/31/2023, 11/15/2023	LTM-37 pg. 123, LTM-39 pg. 84	
H-19b0	1.062	1.064	1.065	-0.003	8	Aug - Nov	H-19B0 C35 121322 (21741069), H-19B0 C36 082423 (21741069), H-19B0 C37 103023_2023-12-18_11-55-13-993 (1053236)	754.00 & 753.49	753.49	0.51 & 0.00	12/13/2022, 8/24/2023, 10/30/2023	LTM-37 pg. 93, LTM-39 pg. 26, LTM-39 pg. 71	Installed new cable and adjusted install depth to ideal install depth as of 10/30/2023 11:00 AM.
IMC-461	1.010	1.012	1.002	0.008	8	Aug - Nov	IMC-461 C43 062723 (03200496), IMC-461 C44 100923_2023-11-14_09-44-36-595 (1054369), IMC-461 C45 111423_2023-12-11_10-17-00-032 (1054351)	376.50	376.10	0.40	6/27/2023, 10/09/2023, 11/14/2023	LTM-38 pg. 97, LTM-39 pg. 50, LTM-39 pg. 76	
SNL-1	1.033	1.035	1.032	0.001	4	Jan - Feb	SNL-1 C42 020822 (21534009), SNL-1 C43 011223 (08200113)	612.90	612.23	0.67	2/8/2022, 1/12/2023	LTM-36 pg. 7, LTM-37 pg. 107	Data later in the year is inconsistent with historical trends, so early year data were used for calculation.
SNL-2	1.011	1.013	1.007	0.004	8	Aug - Nov	SNL-2 C51 072023 (03220066)	470.70	470.69	0.01	7/20/2023	LTM-38 pg. 126	
SNL-3	1.026	1.028	1.025	0.001	8	July, Oct - Dec	SNL-3 C37 061423 (06202177), SNL-3 C38 082123 (06221758)	766.50 & 766.19	766.19	0.31 & 0.00	6/14/2023, 8/21/2023	LTM-38 pg. 84, LTM-39 pg. 24	Adjusted install depth to ideal install depth as of 8/21/2023. Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
SNL-5	1.005	1.007	1.006	-0.001	8	Aug - Nov	SNL-5 C48 071223_Append_2023-09-25_08-52-04-339 (810456), SNL-5 C49 092723_2023-12-15_09-38-56-761 (810456)	649.00	648.84	0.16	7/21/2023, 9/27/2023	LTM-38 pg. 116, LTM-39 pg. 47	
SNL-6	1.260	1.263	1.260	0.000	8	Aug - Nov	SNL-6 C34 020223_Append_2023-09-15_09-16-51-780 (793273), SNL-6 C35 091523_2023-12-12_14-30-19-489 (995693)	1288.02	1288.02	0.00	2/2/2023, 9/15/2023	LTM-37 pg. 127, LTM-39 pg. 42	
SNL-8	1.096	1.098	1.090	0.006	8	Aug - Nov	SNL-8 C63 051623 (10210603)	969.70	968.56	1.14	5/16/2023	LTM-38 pg. 66	
SNL-9	1.016	1.018	1.015	0.001	8	Aug - Nov	SNL-9 C52 072023 (03220064)	567.20	566.07	1.13	7/20/2023	LTM-38 pg. 127	
SNL-10	1.006	1.008	1.003	0.003	8	Aug - Nov	SNL-10 C39 071023_Append_2023-08-21_11-09-13-002 (995690), SNL-10 C40 082423_Append_2023-12-11_11-23-51-316 (995690)	613.50	612.53	0.97	7/10/2023, 8/24/2023	LTM-38 pg. 106, LTM-39 pg. 25	
SNL-12	1.011	1.013	1.012	-0.001	8	Aug - Nov	SNL-12 C37 110122 (06221761), SNL-12 C38 080823 (06202169), SNL-12 C39 092623 (06202169)	570.90	570.68	0.22	11/1/2022, 8/8/2023, 9/26/2023	LTM-37 pg. 59, LTM-38 pg. 129, LTM-39 pg. 46	
SNL-13	1.025	1.027	1.025	0.000	8	Aug - Nov	SNL-13 C40 050223 (01221918), SNL-13 C41 103123 (01221918)	401.00	400.62	0.38	5/2/2023, 10/31/2023	LTM-38 pg. 52, LTM-39 pg. 72	
SNL-14	1.046	1.048	1.046	0.000	8	Aug - Nov	SNL-14 C51 072023_2023-08-16_10-09-23-988 (539743), SNL-14 C52 081623_Append_2023-12-18_11-08-18-848 (539743)	668.95	668.95	0.00	7/20/2023, 8/16/2023	LTM-38 pg. 126, LTM-39 pg. 16	
SNL-15	1.232	1.234	1.228	0.004	8	Aug - Nov	SNL-15 C43 070323_Append_2023-12-12_13-06-31-912 (994017)	922.18	922.18	0.00	7/3/2023	LTM-38 pg. 101	
SNL-16	1.009	1.011	1.018	-0.009	8	Aug - Nov	SNL-16 C43 071023 (06202173), SNL-16 C44 100923 (21830020)	207.86	207.86	0.00	7/10/2023, 10/09/2023	LTM-38 pg. 104, LTM-39 pg. 49	
SNL-17a	1.002	1.004	0.999	0.003	8	Aug - Nov	SNL-17A C43 062823 (07212651), SNL-17A C44 110123 (07212651)	349.93	349.93	0.00	6/28/2023, 11/1/2023	LTM-38 pg. 98, LTM-39 pg. 73	Remeasured and adjusted install depth to ideal install depth as of 2/3/2023 1:00 PM.
SNL-18	0.999	1.001	1.000	-0.001	8	Aug - Nov	SNL-18 C48 072023_Append_2023-12-15_10-08-51-027 (791388)	549.30	549.30	0.00	7/20/2023	LTM-38 pg. 126	
SNL-19	1.004	1.006	1.004	0.000	8	Aug - Nov	SNL-19 C37 072023 (06202197)	355.10	354.19	0.91	7/20/2023	LTM-38 pg. 126	
WIPP-11R	1.026	1.028	1.023	0.003	8	Aug - Nov	WIPP-11R C9 051723 (21918011), WIPP-11R C10 092723 (21918011), WIPP-11R C11 110123 (06221753)	853.14	849.50	3.64	5/17/2023, 9/27/2023, 11/1/2023	LTM-38 pg. 69, LTM-39 pg. 47, LTM-39 pg. 74	
WQSP-1	1.040	1.042	1.054	-0.014	8	Apr - Nov	WQSP-1 C9 032123_Append_2023-12-11_11-50-46-021 (996121)	707.00	710.68	-3.68	3/21/2023	LTM-38 pg. 25	
WQSP-2	1.032	1.034	1.031	0.001	8	Apr - Nov	WQSP-2 C7 081822 (06221763), WQSP-2 C8 080923 (06221756)	814.00	822.20	-8.20	8/18/2022, 8/9/2023	LTM-37 pg. 22, LTM-38 pg. 131	

WQSP-3	1.140	1.142	1.139	0.001	8	Apr - Nov	WQSP-3 C7 081822 (06221760), WQSP-3 C8 080923 (06221761)	849.00	857.39	-8.39	8/18/2022, 8/9/2023	LTM-37 pg. 23, LTM-38 pg. 132	
WQSP-4	1.067	1.069	1.068	-0.001	3	Jan - March	WQSP-4 C2 070622 (06202169)	771.69	780.81	-9.12	7/6/2022	LTM-36 pg. 121	Due to ongoing maintenance throughout 2023, there is limited psi and water level data so a more representative data timeframe was utilized
WQSP-5	1.026	1.028	1.022	0.004	8	Mar - Oct	WQSP-5 C3 022123_Append_2023-04-19_11-41-29-020 (993997), WQSP-5 C4 050923 (06202168), WQSP-5 C5 080923 (06202168)	653.99	658.73	-4.74	2/21/2023, 5/9/2023, 8/9/2023	LTM-37 pg. 145, LTM-38 pg. 54, LTM-38 pg. 133	Due to questionable psi data in November - Decemeber, a more representative data timeframe was utilized.
WQSP-6	1.003	1.005	1.008	-0.005	8	Apr - Nov	WQSP-6 C2 022123_Append_2023-07-14_13-09-51-108 (994008), WQSP-6 C3 080923_Append_2023-12-18_12-19-21-797 (994008)	589.09	597.09	-8.00	2/21/2023, 8/9/2023	LTM-37 pg. 146, LTM-38 pg. 133	

Notes:

INW brand pressure gauges used at AEC-7R, H-11b4R, H-4bR, H-9bR, SNL-1, SNL-2, SNL-3, SNL-8, SNL-9, SNL-12, SNL-13, SNL-16, SNL-17a, SNL-19, WIPP-11R, WQSP-2, WQSP-3, & WQSP-4

In-Situ brand pressure gauges used at H-10cR, H-12R, H-15R, H-5bR, SNL-5, SNL-6, SNL-10, SNL-14, SNL-15, SNL-18, WQSP-1, & WQSP-6

Pressure data utilizes both In-Situ and INW brand pressure gauges at C-2737, H-16, H-19b0, H-6bR, IMC-461, & WQSP-5

All cables are In-Situ brand and non-vented

Barometric data are from INW gauges - SN 21237001 and SN 21237002

ft BTOC = feet below top of casing

ft BTEC = feet below top of environmental casing

ft BTOT = feet below top of tubing

LTM = Long-Term Monitoring

PT = Pressure Transducer

NA = Not available

Mid Depths are from ERMS 553781, except for AEC-7R, H-9bR, H-11b4R, H-5bR, WIPP-11R, and H-12R, which are from M&O Contractor (currently LATA) BDRs and/or construction diagrams, and WQSP wells which are from DOE-WIPP-95-2154

Information Only

2023 Calculated Densities

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Monitor Well	2023 Avg Calc Dens (g/cm³)	2023 Specific Gravity (Reference: Freshwater at 70°F)	2022 Avg Calc Dens (g/cm³)	2023 - 2022 Difference (g/cm³)	# of Dens Averaged	2023 Timeframe of Data	Pressure Gauge File Name (Gauge SN)	Pressure Gauge Install Depth (ft BTOC/BTEC/ BTOT)	Pressure Gauge Ideal Install Depth (ft BTOC/BTEC/ BTOT)	Length Off Ideal Depth (ft)	Date of Install(s)	Installation Logbook Page	Comments/Explanations
AEC-7R	1.07	+84/0.998	1.07	+84-D4	8	June, Sept - Nov	AEC-7R C29 041323 (03220066), AEC-7R C31 081523 (06221763); AEC-7R C32 092723 (06221763)	868.98	868.98	+44-44	4/13/2023, 8/15/2023, 9/27/2023	LTM-38 pg. 30, LTM-39 pg. 17, LTM-39 pg. 47	Adjusted install depth to ideal install depth as of 4/13/2023. Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
C-2737	1.027	+85/0.998	1.025	+85-D5	8	July, Oct - Dec	C-2737 C42 020723 (2153k009), C-2737 C43 091423_Append_2023-11-17_11-03-08-811 (10543651; C-2737 C44 111723_2023-12-18_13-17-55-762 (10543651	688.65	689.78	+15-15	2/7/2023, 9/14/2023, 11/17/2023	LTM-37 pg. 130, LTM-39 pg. 40; LTM-39 pg. 90	Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
H-6bR	1.021	+86/0.998	1.019	+86-D6	8	Aug - Nov	H-6BR C28 051523 (21741068); H-6BR C29 110123 (21741068)	507.9	507.72	+16-16	5/15/2023, 11/1/2023	LTM-38 pg. 61, LTM-39 pg. 73	
H-5bR	1.09	+87/0.998	1.089	+87-D7	8	Aug - Nov	H-5BR C13 070323_Append_2023-12-12_13-38-36-878 (9940216)	910.15	908	+17-17	45110	LTM-38 pg. 102	
H-6bR	1.037	+88/0.998	1.038	+88-D8	8	June - July, Nov - Dec	H-6BR C29 080922 (03220062), H-6BR C30 062823 (03220062), H-6BR C31 080423 (03220067), H-6BR C32 100923_2023-12-11_10-55-28-589 (1054354)	616.6	616.58	+18-18	8/3/2022, 6/28/2023, 8/4/2023, 10/09/2023	LTM-37 pg. 8, LTM-38 pg. 98, LTM-38 pg. 128, LTM-39 pg. 51	Due to equipment failures during the targeted time frame, a more representative data timeframe was utilized.
H-9bR	1.002	+89/0.998	1.002	+89-D9	8	Aug - Nov	H-9BR C24 031423 (21830038); H-9BR C25 081523 (03220062); H-9BR C26 082423 (03220062); H-9BR C27 101723 (03220062)	660.54	660.47	+19-19	3/14/2023, 8/15/2023, 8/24/2023, 10/17/2023	LTM-38 pg. 12, LTM-39 pg. 9, LTM-39 pg. 25, LTM-39 pg. 67	
H-10cR	1.092	+810/0.998	1.09	+810-D10	8	Aug - Nov	H-10CR C21 030723_Append_2023-12-12_11-46-39-479 (9956915)	1374.1	1368.38	+110-110	45110	LTM-38 pg. 99	
H-11b4R	1.074	+811/0.998	1.078	+811-D11	8	Aug - Nov	H-11B4R C26 050223 (21918010); H-11B4R C27 101323 (01221919); H-11B4R C28 110123 (01221919)	735.85	736.72	+111-111	5/2/2023, 10/13/2023, 11/1/2023	LTM-38 pg. 51, LTM-39 pg. 64, LTM-39 pg. 73	
H-12R	1.094	+812/0.998	1.103	+812-D12	8	Aug - Nov	H-12R C21 070323_Append_2023-08-21_09-05-35-148 (9939993), H-12R C22 082423_Append_2023-12-12_12-31-23-088 (9939993)	835.8	834.99	+112-112	7/3/2023, 8/24/2023	LTM-38 pg. 100, LTM-39, pg. 26	
H-15R	1.125	+813/0.998	1.125	+813-D13	8	Aug - Nov	H-15R C32 070323_Append_2023-12-18_12-57-58-752 (810453)	872.5	872.57	+113-113	45110	LTM-38 pg. 103	
H-16	1.033	+814/0.998	1.031	+814-D14	8	Aug - Nov	H-16 C19 013123 (06202175); H-16 C20 111523_2023-12-19_09-36-29-426 (9956918)	715.1	714.5	+114-114	1/31/2023, 11/15/2023	LTM-37 pg. 123, LTM-39 pg. 84	
H-19b0	1.062	+815/0.998	1.065	+815-D15	8	Aug - Nov	H-19B0 C35 121322 (21741069), H-19B0 C36 082423 (21741069), H-19B0 C37 103023_2023-12-18_11-55-13-993 (1053236)	754.00 & 753.49	753.49	0.51 & 0.00	12/13/2022, 8/24/2023, 10/30/2023	LTM-37 pg. 93, LTM-39 pg. 26, LTM-39 pg. 71	Installed new cable and adjusted install depth to ideal install depth as of 10/30/2023 11:00 AM.
IMC-461	1.01	+816/0.998	1.002	+816-D16	8	Aug - Nov	IMC-461 C43 082723 (03220496), IMC-461 C44 100923_2023-11-14_09-44-36-595 (1054369), IMC-461 C45 111423_2023-12-11_10-17-00-032 (1054351)	376.5	376.1	+116-116	6/27/2023, 10/09/2023, 11/14/2023	LTM-38 pg. 97, LTM-39 pg. 50, LTM-39 pg. 76	
SNL-1	1.033	+817/0.998	1.032	+817-D17	6	Jan - Feb	SNL-1 C42 070822 (2153k009); SNL-1 C43 011223 (GB200113)	612.9	612.23	+117-117	2/8/2022, 1/12/2023	LTM-36 pg. 7, LTM-37 pg. 107	Data later in the year is inconsistent with historical trends, so early year data were used for calculation.
SNL-2	1.011	+818/0.998	1.007	+818-D18	8	Aug - Nov	SNL-2 CS1 072023 (03220066)	470.7	470.69	+118-118	45127	LTM-38 pg. 126	
SNL-3	1.026	+819/0.998	1.025	+819-D19	8	July, Oct - Dec	SNL-3 C37 061423 (06202177), SNL-3 C38 082123 (06221758)	766.50 & 766.19	766.19	0.31 & 0.00	6/14/2023, 8/21/2023	LTM-38 pg. 84, LTM-39 pg. 24	Adjusted install depth to ideal install depth as of 8/21/2023. Due to equipment failure during the targeted timeframe, a more representative data timeframe was utilized.
SNL-5	1.005	+820/0.998	1.006	+820-D20	8	Aug - Nov	SNL-5 C48 071223_Append_2023-09-25_08-52-04-339 (810456), SNL-5 C49 092723_2023-12-15_09-38-56-761 (810456)	649	648.84	+120-120	7/21/2023, 9/27/2023	LTM-38 pg. 116, LTM-39 pg. 47	
SNL-6	1.26	+821/0.998	1.26	+821-D21	8	Aug - Nov	SNL-6 C34 020223_Append_2023-09-15_09-16-51-780 (793273), SNL-6 C35 091523_2023-12-12_14-30-19-489 (9956913)	1288.02	1288.02	+121-121	2/2/2023, 9/15/2023	LTM-37 pg. 127, LTM-39 pg. 42	
SNL-8	1.096	+822/0.998	1.09	+822-D22	8	Aug - Nov	SNL-8 C63 051623 (10210603)	969.7	968.55	+122-122	45062	LTM-38 pg. 66	
SNL-9	1.018	+823/0.998	1.015	+823-D23	8	Aug - Nov	SNL-9 CS2 072023 (03220064)	567.2	566.07	+123-123	45127	LTM-38 pg. 127	
SNL-10	1.006	+824/0.998	1.003	+824-D24	8	Aug - Nov	SNL-10 C39 071023_Append_2023-08-21_11-09-13-002 (9956990), SNL-10 C40 082423_Append_2023-12-11_11-23-51-316 (9956990)	613.5	612.53	+124-124	7/10/2023, 8/24/2023	LTM-38 pg. 106, LTM-39 pg. 25	
SNL-12	1.011	+825/0.998	1.012	+825-D25	8	Aug - Nov	SNL-12 C37 110122 (06221761), SNL-12 C38 080823 (06202169), SNL-12 C39 092623 (06202169)	570.9	570.68	+125-125	11/1/2022, 8/8/2023, 9/26/2023	LTM-37 pg. 59, LTM-38 pg. 129, LTM-39 pg. 46	
SNL-13	1.025	+826/0.998	1.025	+826-D26	8	Aug - Nov	SNL-13 C40 050223 (01221918), SNL-13 C41 103123 (01221918)	401	400.62	+126-126	5/2/2023, 10/31/2023	LTM-38 pg. 52, LTM-39 pg. 72	
SNL-14	1.046	+827/0.998	1.046	+827-D27	8	Aug - Nov	SNL-14 CS1 072023_2023-08-16_10-09-23-988 (539743), SNL-14 CS2 081623_Append_2023-12-18_11-08-18-848 (539743)	668.95	668.95	+127-127	7/20/2023, 8/18/2023	LTM-38 pg. 126, LTM-39 pg. 16	
SNL-15	1.232	+828/0.998	1.228	+828-D28	8	Aug - Nov	SNL-15 C43 070323_Append_2023-12-12_13-06-31-912 (994017)	922.18	922.18	+128-128	45110	LTM-38 pg. 101	
SNL-16	1.009	+829/0.998	1.018	+829-D29	8	Aug - Nov	SNL-16 C43 071023 (06202173), SNL-16 C44 100923 (21830020)	207.86	207.86	+129-129	7/10/2023, 10/09/2023	LTM-38 pg. 104, LTM-39 pg. 49	
SNL-17a	1.002	+830/0.998	0.999	+830-D30	8	Aug - Nov	SNL-17A C43 062823 (07212651), SNL-17A C44 110123 (07212651)	349.93	349.93	+130-130	6/28/2023, 11/1/2023	LTM-38 pg. 98, LTM-39 pg. 73	Remeasured and adjusted install depth to ideal install depth as of 2/3/2023 1:00 PM.
SNL-18	0.999	+831/0.998	1	+831-D31	8	Aug - Nov	SNL-18 C48 072023_Append_2023-12-15_10-08-51-027 (791388)	549.3	549.3	+131-131	45127	LTM-38 pg. 126	
SNL-19	1.004	+832/0.998	1.004	+832-D32	8	Aug - Nov	SNL-19 C37 072023 (06202197)	355.1	354.19	+132-132	45127	LTM-38 pg. 126	
WIPP-11R	1.026	+833/0.998	1.023	+833-D33	8	Aug - Nov	WIPP-11R C9 051723 (2191801); WIPP-11R C10 092723 (2191801); WIPP-11R C11 110123 (06221753)	853.14	849.5	+133-133	5/17/2023, 9/27/2023, 11/1/2023	LTM-38 pg. 69, LTM-39 pg. 47, LTM-39 pg. 74	
WQSP-1	1.04	+834/0.998	1.054	+834-D34	8	Apr - Nov	WQSP-1 C9 032123_Append_2023-12-11_11-50-46-021 (9956121)	707	710.68	+134-134	45006	LTM-38 pg. 25	
WQSP-2	1.032	+835/0.998	1.031	+835-D35	8	Apr - Nov	WQSP-2 C7 081822 (06221763); WQSP-2 C8 080923 (06221756)	814	822.2	+135-135	8/18/2022, 8/9/2023	LTM-37 pg. 22, LTM-38 pg. 131	
WQSP-3	1.14	+836/0.998	1.139	+836-D36	8	Apr - Nov	WQSP-3 C7 081822 (06221760), WQSP-3 C8 080923 (06221761)	849	857.39	+136-136	8/18/2022, 8/9/2023	LTM-37 pg. 23, LTM-38 pg. 132	
WQSP-4	1.067	+837/0.998	1.068	+837-D37	3	Jan - March	WQSP-4 C2 070622 (06202169)	771.69	780.81	+137-137	46748	LTM-36 pg. 121	Due to ongoing maintenance throughout 2023, there is limited psi and water level data so a more representative data timeframe was utilized
WQSP-5	1.026	+838/0.998	1.022	+838-D38	8	Mar - Oct	WQSP-5 C3 022123_Append_2023-04-19_11-41-29-020 (9939971), WQSP-5 C4 050923 (06702168), WQSP-5 C5 080923 (06702168)	653.99	658.73	+138-138	2/21/2023, 5/9/2023, 8/9/2023	LTM-37 pg. 145, LTM-38 pg. 54, LTM-38 pg. 133	Due to questionable psi data in November - Decemeber, a more representative data timeframe was utilized.
WQSP-6	1.003	+839/0.998	1.008	+839-D39	8	Apr - Nov	WQSP-6 C2 022123_Append_2023-07-14_13-09-51-108 (9960088), WQSP-6 C3 080923_Append_2023-12-18_12-19-21-797 (9960088)	589.09	597.09	+139-139	2/21/2023, 8/9/2023	LTM-37 pg. 148, LTM-38 pg. 133	

Notes:
INW brand pressure gauges used at AEC-7R, H-11b4R, H-6bR, H-9bR, SNL-1, SNL-2, SNL-3, SNL-8, SNL-9, SNL-12, SNL-13, SNL-16, SNL-17a, SNL-19, WIPP-11R, WQSP-2, WQSP-3, & WQSP-4
In-Situ brand pressure gauges used at H-10cR, H-12R, H-15R, H-5bR, SNL-5, SNL-6, SNL-10, SNL-14, SNL-15, SNL-18, WQSP-1, & WQSP-6
Pressure data utilizes both In-Situ and INW brand pressure gauges at C-2737, H-16, H-19b0, H-6bR, IMC-461, & WQSP-5
All cables are In-Situ brand and non-vented
Barometric data are from INW gauges - SN 21237001 and SN 21237002
ft BTOC = feet below top of casing
ft BTEC = feet below top of environmental casing
ft BTOT = feet below top of tubing
LTM = Long-Term Monitoring
PT = Pressure Transducer
NA = Not available
Mid Depths are from ERMS 553781, ea

Information Only