



Groundwater Monitoring Plan
Chester Greenfield Site
Chester, Chester County, South Carolina
S&ME Project No. 4261-19-029

PREPARED FOR:

Luck Companies
Post Office Box 29682
Richmond, Virginia 23242

PREPARED BY:

S&ME, Inc.
134 Suber Road
Columbia, South Carolina 29210

December 18, 2019



December 18, 2019

Luck Companies
Post Office Box 29862
Richmond, Virginia 23242

Attention: Mr. Bruce Smith

via email: brucesmith@luckcompanies.com

Reference: **Groundwater Monitoring Plan
Chester Greenfield Site**
Chester, Chester County South Carolina
S&ME Project No. 4261-19-029

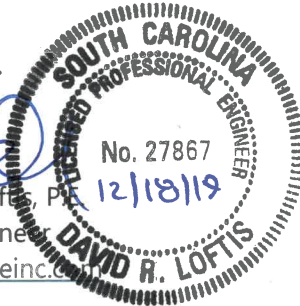
Dear Mr. Smith:


S&ME, Inc. (S&ME) has prepared the Groundwater Monitoring Plan in association with the proposed Luck Companies aggregate mine in Chester, South Carolina. The Plan provides details as to how Luck Companies will monitor groundwater prior to and during operation of the proposed mine. The approved Plan will be considered and evolve into the Groundwater Monitoring Program for the Chester mine.

Please contact us at your convenience if there are questions regarding the information contained in this document.

Sincerely,
S&ME, Inc.


David R. Loftis, PE
Senior Engineer
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Edmund Q.B. Henriques, LG
Principal Geologist
ehenriques@smeinc.com



cc: South Carolina Department of Health and Environmental Control
Mining Reclamation
2600 Bull Street
Columbia, South Carolina 29201
Attention: Mr. Joe Koon (via email koonjm@dhec.sc.gov)



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1.0 INTRODUCTION

S&ME has prepared the Groundwater Monitoring Plan (Plan) on behalf of Luck Companies in association with the proposed aggregate mine located north of S.C. Highway 9 (Lancaster Highway) near Chester in Chester County, South Carolina. The Plan was prepared and being submitted to the Mining Reclamation Section of South Carolina Department of Health and Environmental Control (SCDHEC) to supplement the previously-submitted Application For A Mine Operating Permit (Form MR-400). The purpose of the Plan is to measure static groundwater levels on a regular basis to establish a pre-mining baseline for groundwater levels and document any changes to groundwater levels during the mining operations. The information gathered will provide a basis to assess if observed changes indicate a potential to impact water supply wells on neighboring properties.

2.0 GROUNDWATER MONITORING

2.1 Proposed Well Installations

The Plan includes installation of five monitoring wells to a maximum depth of 450 feet and serve as points to monitor the groundwater within the bedrock aquifer. The planned bedrock wells are identified as monitoring wells MW-1D, MW-2D, MW-3D, MW-4D, and MW-5D and their approximate locations are depicted on **Figure 1, Monitoring Wells – Groundwater Monitoring Plan**. Where applicable, available geophysical data will be used to target potential water bearing fractures. The wells will be constructed with a surface casing from near ground surface to the top of bedrock. The remaining portions of each well will be open borehole within the bedrock – no well screen will be installed.

One shallow monitoring well, MW-4S, will be installed in the approximate location depicted on **Figure 1, Monitoring Wells – Groundwater Monitoring Plan**. The target depth of monitoring well MW-4S will be the top of bedrock and the well screen will span the entire length of the saturated soil zone within the surficial aquifer.

2.2 Proposed Monitoring Locations

The following monitoring wells will be included as part of the Plan: MW-1D, MW-2D, MW-3D, MW-4S, MW-4D, MW-5D, and RW-2 (existing). As noted previously, monitoring well MW-4S, a well to be screened within the surficial aquifer, will serve as monitoring point for the surficial aquifer north of the planned mining area. The remaining monitoring wells, MW-1D, MW-2D, MW-3D, MW-4D, MW-5D, and RW-2 will be used as points to monitor groundwater within the bedrock aquifer. This well set for purposes of the Plan are referred moving forward as the Plan wells.

As was detailed in S&ME's *Hydrogeologic Assessment* report dated September 19, 2019, the bedrock fractures, as identified by the geophysical survey, tend to be oriented in a north-south direction. The Plan wells are located north and south of the planned mining operation and should be sufficient in providing a monitoring tool for the aquifer along these identified factures.



2.3 Monitoring Intervals and Data Collection

The monitoring locations detailed in Section 2.2 will be monitored for depth to water to determine the groundwater elevation. The depth to water will be measured with an electronic water probe and relative to the top of the well casing. The depth to water to water measurements will be obtained on a monthly basis and reported to SCDHEC on a quarterly basis.

The groundwater elevation will be calculated by subtracting the depth to water measurement from the top of casing elevation. The locations of the Plan wells and top of casing elevations will be measured by a South Carolina licensed surveyor.

Each quarterly report will be submitted to SCDHEC within 30 days and will summarize the current and historical groundwater elevation dataset. If a statistically significant decrease in groundwater elevation occurs, which is determined by a South Carolina licensed geologist or professional engineer to be an indicator that potential impacts to neighboring wells has occurred, the licensed professional will prepare and submit a written report to SCDHEC within five business days from when the determination is made.

Table 2-1 – Plan Sampling Summary

Well ID	Casing Length (feet)	Total Depth (feet)	Estimated Yield (gpm)	Monitoring Parameters <i>Monthly up to one year prior to operations; Monthly after operations begin</i>	Elevation
RW-2	42	450	40	Depth to water	Requires Survey
MW-1D	TBD	Proposed up to 450	TBD	Depth to water	Requires Survey
MW-2D	TBD	Proposed up to 450	TBD	Depth to water	Requires Survey
MW-3D	TBD	Proposed up to 450	TBD	Depth to water	Requires Survey
MW-4S	TBD	Top of bedrock	TBD	Depth to water	Requires Survey
MW-4D	TBD	Proposed up to 450	TBD	Depth to water	Requires Survey
MW-5D	TBD	Proposed up to 450	TBD	Depth to water	Requires Survey

TBD = to be determined

gpm = gallons per minute

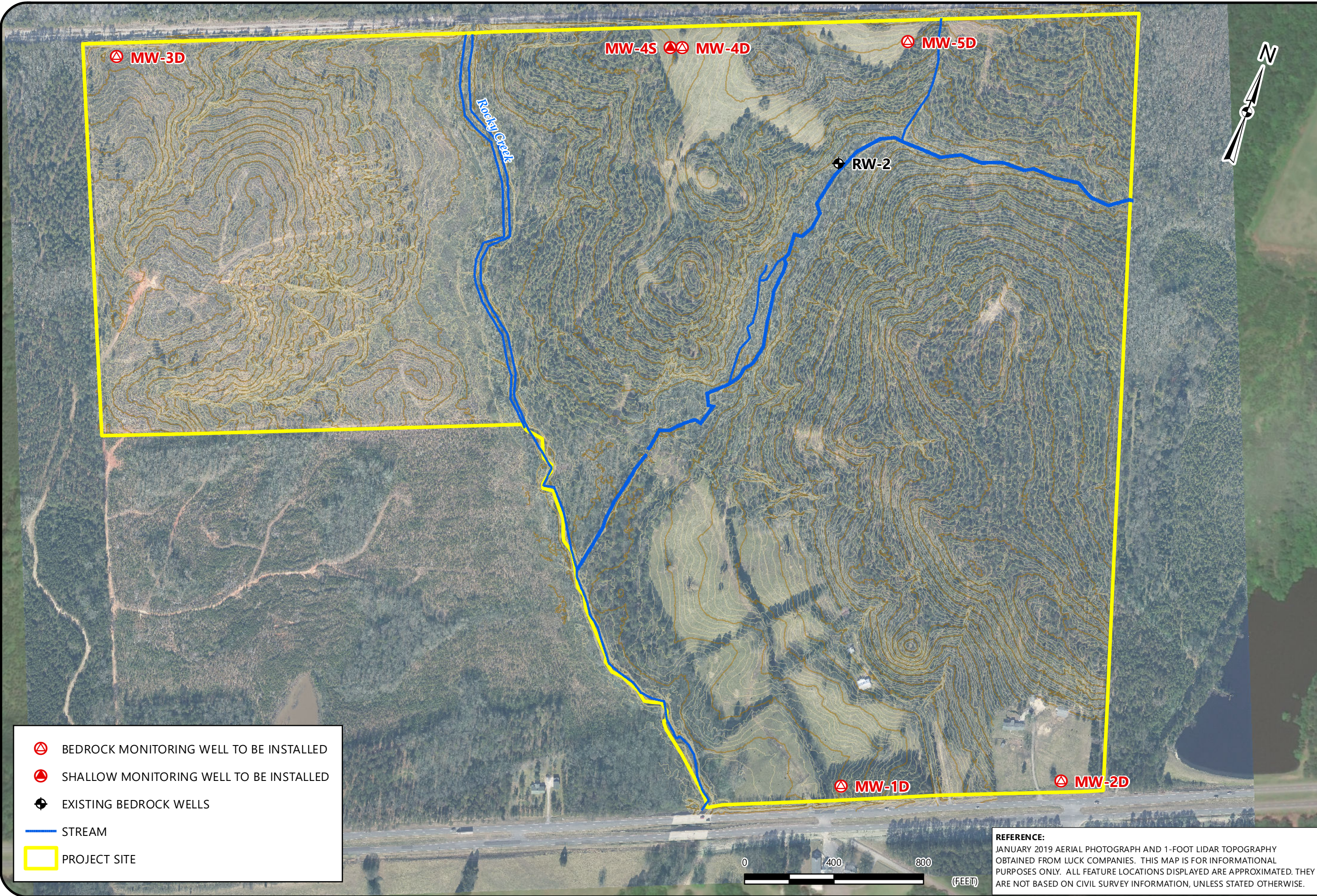
2.4 Future Monitoring Considerations






As was discussed in the *Hydrogeologic Assessment*, the planned mining operations at year 37 will likely include an expansion of the mine pit as it transitions from Phase 1 to Phase 2. During that transition, the area of monitoring well RW-2 will be excavated, RW-2 will be eliminated from the plan, and monitoring will cease.

Appendices

Appendix I – Figures

Drawing Path: O:\4261\19\029 Luck.stone\gis\01_PROPOSED GW MONITORING PLAN.mxd plotted by DHomans 12-18-2019



-  BEDROCK MONITORING WELL TO BE INSTALLED
-  SHALLOW MONITORING WELL TO BE INSTALLED
-  EXISTING BEDROCK WELLS
-  STREAM
-  PROJECT SITE

REFERENCE:
 JANUARY 2019 AERIAL PHOTOGRAPH AND 1-FOOT LIDAR TOPOGRAPHY OBTAINED FROM LUCK COMPANIES. THIS MAP IS FOR INFORMATIONAL PURPOSES ONLY. ALL FEATURE LOCATIONS DISPLAYED ARE APPROXIMATED. THEY ARE NOT BASED ON CIVIL SURVEY INFORMATION, UNLESS STATED OTHERWISE.



MONITORING WELLS - GROUNDWATER MONITORING PLAN

LUCK STONE
CHESTER COUNTY, SOUTH CAROLINA

SCALE:
1" = 400'

DATE:
12-18-19

PROJECT NUMBER
4261-19-029

FIGURE NO.

1