



Sand Management Site Monitoring Well Discussion

Boone, Iowa

February 2026

Prepared by



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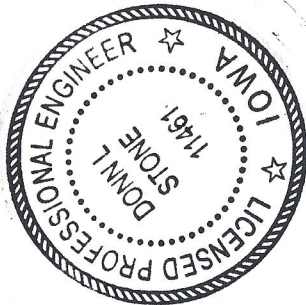
SEE-001-026-390

ENGINEERING CERTIFICATION

Sand Management Site Monitoring Well Discussion

Besser Quinn Sand Management Site

Boone, Iowa
February 2026



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Iowa.

 10 Feb 26
Donna L. Stone, P.E. Date

License Number: 11461
My license renewal date is December 31, 2026

Sand Management Site Monitoring Well Discussion

1.0 INTRODUCTION

IDNR has requested discussion regarding the placement of new groundwater monitoring wells at the Besser Quinn Sand Management site near Boone, Iowa.

The intent of the installation of the new wells is to situate the wells in areas that can intercept the movement of groundwater through the site without interference from offsite influences. The site currently has six active monitoring wells, four of which are not providing samples considered representative of the actual groundwater conditions. The other two wells have provided questionable groundwater samples at times.

1.1 PROPOSED LOCATIONS

Proposed locations for the monitoring wells will consider the area filled with the foundry sand and then place the wells in natural soils adjacent to the fill area. Figure 1 notes the proposed locations. It is anticipated that all the wells will be bedded in the clayey soils noted in the current monitoring wells other than MW QN.

These locations were determined by reviewing historic aerial photographs that note the placement of the foundry sand over the years and topographic maps developed prior to the sand placement in the disposal area. The aeriels follow Figure 1.

From review of the historic documents, five wells can be situated around the deposited sand to address groundwater movement in any direction to determine the groundwater flow patterns and also collect downgradient and upgradient groundwater samples. The foundry that was producing the sand for deposition has closed and the site is no longer receiving material and has been capped.

Currently there are six monitoring wells at the Sand Management site, five wells are proposed to replace the current monitoring wells. The noted proposed locations are presented in a general area adjacent to the deposited sand. Final field locations of the monitoring wells will be respective of access to the location and ability to position a drill rig for the advancement of borings and the installations of the wells. Once the wells are installed, they will be mapped both horizontally and vertically. The vertical mapping will associate the nearby Des Moines River bridge with the sand management site to facilitate height of river measurements along with the depth to groundwater measurements of each future sampling event.

1.2 PROPOSED DEPTHS

The current wells are all approximately fifty feet deep, with thirty feet of screen initiating at the bottom, and are noted to have limited free water for sampling at that depth. Based on a well log, for a neighboring property, on file with the Iowa Geologic Survey, it appears that a well on a neighboring property hit bedrock at an approximate depth of seventy-five feet. The depths of the proposed monitoring wells is a nominal seventy-five feet or bedrock.

The seventy-five foot deep will place the bottom of the well at approximately elevation 840 feet above sea level. The bottom of the sand fill is noted as approximately elevation 888 feet above sea level. The intent of the extra depth is to provide for elevation changes in the groundwater level and to provide a sufficient water column for obtaining samples without high solid concentrations.

1.3 WELL CONSTRUCTION AND DEVELOPMENT

The monitoring wells will be constructed of PVC pipe with a nominal inside diameter of two inches. The well screen is anticipated to be placed from the bottom of the boring to fifteen to twenty feet below surface. Field activities during boring may suggest a different screening scenario. The backfill for the screen section of the wells will be appropriate for the slot thickness of the screen. The annuls above the well screen will be filled with a bentonite material and the wells will be encased in metal, lockable, guards.

Once installed, the wells will be developed, initiating with a groundwater depth measurement prior to the purging of the well development process. Once the wells are developed, they will sit idle for a few weeks prior to initiation of the first sampling event.

2.0 FUTURE ACTIONS AND SCHEDULE

Besser is committed to having new wells installed to bottom at seventy-five feet or bedrock in early 2026 to allow for well development and two sampling events during this year.

2.1 SCHEDULE

The following schedule is presented as Besser Quinn's desired schedule to allow for corporate financing and procurement of an appropriate firm for the installation and development of the monitoring wells.

Determine locations and install new monitoring wells by April 30, 2026
Purge and Develop wells by May 31, 2026
Conduct first semi-annual sampling by June 30, 2026
Conduct second semi-annual sampling by November 30, 2026
Submit AWQR by March 1, 2027.



Proposed well locations in red. ●



1990



2002



2008



2011

Response to IDNR Comment letter of January 7, 2026

A.1 Reporting

The DNR acknowledges the statistical analysis of the data. However, the two times the standard deviation does not follow the statistical methodology requirements set forth in Special Condition 9 of the Beneficial Use Determination (BUD) (Doc #95772). Please submit the proposed statistical methodology on or before February 15, 2026

Statistical Analysis Review

Klingner & Associates, P.C. (Klingner) performed the Shapiro-Wilk test for normality on the existing data sets for the groundwater data collected to date. Data sets with fewer than 3 detections above laboratory reporting limits were not analyzed for normality. When QN is excluded as a background well, the data for the following constituents is normally distributed with a logarithmic transformation: aluminum, COD, chloride, cobalt, iron, magnesium, nickel, ammonia, sulphate, and TSS. For the constituents which are not normally distributed by definition under Shapiro-Wilk, most yielded a W-statistic of at least 0.75, suggesting only minor departures from normality. The exceptions being copper, manganese, molybdenum, and zinc. Copper and zinc each have greater than 50% non-detects. Manganese and molybdenum each have a few significant outliers in the data sets.

We proposed to evaluate the groundwater data using a parametric one-way f-test analysis of variance to determine if there are statistically significant differences in mean concentrations between upgradient and downgradient wells. QN will be excluded as a background well for the analysis. The parametric one-way f-test is reasonably robust to small departures from normality which is believed to be appropriate for the majority of the data for the site.