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Shaw® Shaw Environmental, Inc.

October 5, 2005

Mr. Subhash Pal
Project Manager
Superfund Cleanup Section
Texas Commission on Environmental Quality
12100 Park 35 Circle, Bldg. D
Austin, Texas 78753

Re: Final Groundwater Elevation Data Report
Reporting Period; October 2004 – August 2005
Jones Road Superfund Site
Houston, Texas

Dear Mr. Pal:

Shaw Environmental, Inc. (Shaw) is pleased to present to the Texas Commission on Environmental Quality (TCEQ) this report which summarizes the field activities and observations from the data collected from five In-Situ miniTROLLs installed in selected private wells within the Jones Road study area over the past year, specifically the period October 2004 to August 2005. The In-Situ miniTROLLs were installed in four inactive private wells and one active well in the fall of 2004. All wells are believed to be completed within the Chicot Aquifer. The In-Situ miniTROLLs have been programmed to collect groundwater elevations at fifteen minute intervals, on a continuous basis. This report is an accumulation of data collected and observed throughout this time period. It is not intended to serve in the place of the Remedial Investigation Technical Memorandum; rather, this Final Groundwater Elevation Report provides a summary of activities and findings based upon Shaw's observations in the field during the past month (July 2005 – August 2005) plus all the data presented and observed in the previous quarterly reports for the period October 2004 - July 2005.

The objectives of the field activities were to:

- Continuously measure groundwater fluctuations at fifteen minute intervals in the Chicot Aquifer,
- To determine the effects of private well pumpage on the Chicot Aquifer,
- To observe the seasonal impact on groundwater levels in the Chicot Aquifer,
- To determine the groundwater flow direction and gradient of the Chicot Aquifer in this area, and

- To provide recommendations that would better utilize the data collected from the miniTROLLs.

Prior to conducting this data collection, representatives from Shaw, the TCEQ, and Wellco (a water well drilling subcontractor) visited the area and selected the wells to be used as data gathering points. The final selection of wells to be used were based upon the following factors: well owner access to the property and their consent to use the well for data collection, the accessibility of getting equipment to the well head, the current status of the well (active or inactive), the location of the well with respect to the groundwater plume, and the costs involved to retrofit the well for proper data collection. Attachment A contains a copy of the report "Remedial Investigation – Water Well Inspections to Support Planning for Water Level Measurement Collection", dated June 30, 2004. In addition, each selected well had to be retrofitted so that it could accommodate the In-Situ miniTROLL and provide undisturbed data collection. The procedures that were taken to assure quality data are presented in the report "Interim Report for Well Head Retrofit/Cleanout", dated December 8, 2004. Attachment B of this report contains a copy of this report.

The following five private domestic well locations were chosen for data gathering points:

- 11619 Advance
- 11622 Jones Road
- 11634 Oak Valley
- 11103 Timber Crest
- 11234 Jones Road West

Please refer to Figure 1 for the exact locations of each of these five wells.

The private well located at 11234 Jones Road West was the only well used in this study that was an active pumping well. The other four locations utilized inactive wells located on their respective properties, near an active pumping well. The well at 11619 Advance was observed (during the video taping of the inside of the well) to have a break in the well casing at approximately 43 feet below ground surface (bgs). This break in the casing allowed water from shallow water bearing units to flow down the inside of the well casing. As a result, the data collected from this well has not been incorporated in the figures presented in this report because water levels appear erroneously high. Table 1 provides completion information on each of these five selected wells including the total depth of the well (if known), it's approximate screen interval, the approximate depth of the miniTROLL (in mean sea level), and the static water level (in mean sea level) from the top-of-casing in each well.

**Summary of Data Collection**

On October 4, 2004, In-Situ miniTROLLs were set in four of the five selected wells (11234 Jones Road West, 11622 Jones Road, 11634 Oak Valley, and 11103 Timber Crest) and the In-Situ

miniTROLL was installed in the fifth well (located at 11619 Advance) on November 18, 2004. The In-Situ miniTROLLs were programmed to collect water level measurements above the transducer every fifteen minutes. This data is collected and stored in the unit's data logger and can be easily downloaded to a laptop computer in the field. Initially, every week for the first four weeks of operation, the In-Situ miniTROLLs were checked by a Shaw technician to verify that they were operating correctly and the cumulative data for each well location was downloaded to a laptop computer. In addition, the technician would take water level readings at each well location using an electronic water probe to verify the data. At each location (with the exception of the pumping well located at 11234 Jones Road West), an extra access port was added in the well top flange so that the water probe could be lowered down into the well adjacent to the drop tube with the In-Situ miniTROLL in it so that water levels could be checked without disturbing the transducer. At the end of each week a brief status report showing the collected data was submitted to the TCEQ. After four weeks of downloading data, the frequency of site visits, data downloading, and reporting was increased to once every two weeks, and then collected monthly until the remainder of the fiscal year. Status reports were prepared on the same frequency of the site visits. Table 2 identifies the dates of each site visit and the corresponding date on which a report was prepared. Attachment C contains the "First Three-Month Water Level Measuring Event Report", dated February 22, 2005 and includes a copy of each of the initial weekly reports, the initial two biweekly reports, and the first initial monthly report.

Data was then collected on a monthly basis for the remainder of the fiscal year, and the corresponding reporting was conducted quarterly. Attachment D and Attachment E contain copies of the "Second Quarterly Groundwater Elevation Data Report" and the "Third Quarterly Groundwater Elevation Data Report", respectively.

**Observations**

All five In-Situ miniTROLLs have been collecting data at 15 minute intervals since their initial installation and appear to have been operating with no problems. Individual cumulative graphs were plotted for each well from the In-Situ miniTROLL data (Figures 2 – 6). Each graph shows the relationship of the water level in the Chicot Aquifer above the In-Situ miniTROLL over time. The left side of the graph (0 Days from Start of Test) represents the date (October 4, 2004) when the In-Situ miniTROLLs were installed with the exception of the In-Situ miniTROLL located at 11619 Advance which was installed on November 18, 2004.

In all cases there is a gradual increase in the water level of the Chicot aquifer in these wells over the majority of the study period until the end of March 2005. However at approximately 176 days into the study period (March 30, 2005) the water levels in each of the wells (with the exception of the well at AD11619) starts to decline and then around 212 days into the study period (May 4, 2005), there is an abrupt decline (approximately 1.5 feet) for about three days before the water levels begin to rebound. After approximately two weeks of water levels climbing and stabilizing there is another abrupt decline (approximately 1.5 feet) in water levels at approximately 228 days (May 20, 2005) into the test. Six days later (May 26, 2005) water levels began to rise again before declining again on June 5, 2005 (approximately 244 days into the study period). This decline continues for about one month (average water levels declined approximately 4.5 feet) before the water levels begin to rebound around July 6, 2005. Water levels continue to rise and stabilize once again before falling off one more time around

296 days into the study period (July 27, 2005). Assumptions could be made that the decline in water levels occurs during the weekend days when water usage would likely be higher; however this was not the case. There was no particular correlation of the water levels in the aquifer and the day of the week. Comparing these dates with rainfall data for the area did provide some correlation to the rise and fall of the aquifer. Significant rainfall amounts (3.11 inches) on May 8, 2005 (216 days) and again (1.02 inches) on May 29th fall within the rebounding periods of the water levels in the aquifer. This may not be a directly associated with the recharge of the aquifer (at least not in the study area) but may be more related to the amount of water not used during these heavy rain periods, thereby allowing the aquifer time to stabilize and recover. One observation that should be noted is that the water levels of the Chicot Aquifer in these wells when the study began in October 2004 compared to the current water levels (August 1, 2005) are very similar. This would indicate that the aquifer is generally in a state of recharge during the winter months and is declining during the summer, declining back to where it was during the beginning of the previous winter.

Figure 7 depicts a comparison of the water levels from each well plotted on the same graph. Please note that the water levels measured in the wells located at JRW11234 and AD11619 have been adjusted on this plot so that they overlay better in relation to the other wells. All wells are plotted on mean sea level and in order to present all wells graphically on a scale representative of all water level deflections, 15 feet of water level elevation was added to all values for JRW11234 and 30 feet of elevation was subtracted from all water level elevations for AD11619. Because all the wells (with the exception of the well located at AD11619) follow a similar trend as presented on Figure 7, an assumption could be made that all wells are producing from coalescing sands units with pinched out clay layers allowing hydraulic communication between sand units.

**Site Hydrology**

Groundwater elevation data were plotted for the 15th of July, 2005 (see Table 3 for gauging elevation data). This plotted data is represented on Figure 9. The data points were selected as close to each other in reference to the time of the day that they were recorded. The only requirement was to select a time period when the pumping well at 11234 Jones Road West was not pumping and the aquifer appeared to be stable. The data presented on July 15, 2005 (Figure 9) indicated that the groundwater flow was generally towards the south which is consistent with data plotted for the three previous quarters. Although there were data for the well located at 11619 Advance, it was not used in the construction of these groundwater gradient maps. The reason for this was because a hole in the upper casing of the well was observed at approximately 43 feet bgs during the video taping of the well. This water was likely flowing into the well from an upper water bearing zone which could account for the higher groundwater elevation observed in this well.

**Conclusions and Recommendations**

Based upon the objectives of the field activities, the following conclusions can be made:

- The In-Situ miniTROLLs were operating properly and were continuously measuring water level fluctuations at fifteen minute intervals in each of the five wells.

- The Chicot Aquifer is very prolific and the general trend of water fluctuations across the study area follow a comparable pattern for each well, regardless of whether or not it is an inactive well or an active pumping well. Over a span of approximately 300 days (the study period) the level of the Chicot Aquifer appears to increase as you go into the winter months (increased rainfall amounts) and then in the late spring start to decline going into the summer months with the increased water usage and reduced rainfall amounts.

- The atmospheric pressure does not appear to be affecting the water levels in the study wells based upon the current data.

- Based upon the survey elevations of the study wells, the groundwater flow direction in the Chicot Aquifer is to the south. This apparent groundwater flow direction has been consistent throughout the study period. Using the water level data for TC11103 and JRW11234 plotted on Figure 9 (July 15, 2005), a groundwater gradient of 0.011827 foot/foot can be established. Using similar data from figures plotted for the dates April 15, May 15, and June 15, 2005, the average gradient observed between these two wells for a four month period would be 0.011032 foot/foot.

- Groundwater elevations in the 11619 Advance well appear to remain anomalously high due to the break observed in the casing at 43 feet bgs which is allowing water to flow inside the well casing from above.

Shaw has recently completed the drilling of nine Chicot Aquifer monitor wells (MW-10, MW-11R, MW-12, MW-13, MW-14, MW-15, MW-16, MW-18, and MW-19) and one upper Evangeline Aquifer well (MW-17) located strategically within and along the perimeter of the affected neighborhood. Nine of these monitor wells has been completed within correlative sand zones within the Chicot based upon the interpretations of geophysical logs. Each screened interval in the monitor wells were also selected using the interpretation of the geophysical logs. Monitor well MW-17 located on Neeshaw Drive is completed in a deeper sand unit approximately 100 feet deeper than the nine Chicot monitor wells. Therefore, Shaw recommends one of the following options:

- Remove the five miniTROLLS from their current locations and reinstall them along with five more miniTROLLS in each of the ten recently drilled monitor wells. With the exception of monitor well MW-17, all nine monitor wells were screened in a comparable lithologic zone which is prevalent across the site. By using all ten wells, the water level data collected should provide a better spatial distribution then what was previously obtained. Also by monitoring water level fluctuations in monitor well MW-17 and MW-18 (which are located only 15 feet apart), the data may indicate the vertical hydrologic relationship between the upper Evangeline and the Chicot aquifer.

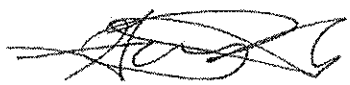
- Remove the miniTROLLS from the private wells located at 11619 Advance, 11622 Jones Road, and 11234 Jones Road West and reinstall them in monitor wells MW-11R, MW16, and MW-19. In addition install the five new miniTROLLS in monitor wells MW-10, MW-12, MW14, MW-17, and MW-18, and leave the miniTROLLS currently deployed in the private wells located at 11634 Oak Valley and 11103 Timber Crest. By doing this, a good spatial

coverage is maintained across the neighborhood. In addition, this option will continue to monitor the effect of area pumpage from a shallower zone by keeping the miniTROLLS in the private wells located at 11634 Oak Valley and 11103 Timber Crest.

However, two issues should be addressed regarding the miniTROLL equipment setup and the future frequency of data collection. The five new models of the miniTROLLS currently deployed in the private wells have cables that run from the transducer located in the well to the surface, allowing data to be collected without effecting the integrity of the transducer. The other five transducers are an older model that does not have cables running from the transducer to the surface and have to be pulled from the well every time data is to be collected and downloaded. Therefore it is recommended that the miniTROLLS be pulled each quarter so that the data can be collected and groundwater sampling can occur. Upon the completion of groundwater sampling, each miniTROLL will be reset and deployed back into its respective well. Also, because the Chicot aquifer is so prolific, it is recommended that the data collection frequency on the miniTROLLS be changed from every 15 minutes to every hour.

If you have any questions, please contact either me at 713-996-4519 or Bill Hardmant at 713-996-4599.

Sincerely,
**Shaw Environmental, Inc.**



Gregory Park Long, P.G.
Project Manager

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Attachments