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Project Status Report:

Sunrise Beach Village, TX – Phase 2: Water System Improvements Design

September 18, 2024

HR Green is pleased to provide an update on the progress of Phase 2: Conceptual Design for the water system improvements project. Below is a summary of the key activities and findings to date:

- **Field Data Monitoring:** *Reference Monitoring Locations Exhibit*
 - At 11 locations, identified by HRG, pressure monitoring devices were installed by SBV to measure 24-hour data for seven+ days per location across the system, with data collected by HRG through online access.
 - SCADA data was provided by SBV to HRG (with the assistance of Council Member Mike Byrd to coincide with the pressure monitoring data for comparison and analysis.
 - Data for both pressure monitoring and SCADA was collected and applied for the months of July and August.
 - The analysis of data received validated observations in the field operations and were confirmed in the model.
- **Hydraulic Modeling:**
 - The hydraulic model from Phase 1 was re-built due to the numerous locations in the water system that were identified through field findings by SBV as a function of the field monitoring and operations & maintenance.
 - The topographic survey data collected at both the WTP site, and the GST site was reviewed, and corrections applied in the model accordingly.
 - Discussions with SBV and a site visit on August 8th served as a review of system connectivity, with further findings applied in the model accordingly to correct system connectivity issues and validate model results.
- **System Performance Analysis:**
 - The analysis of data received from the field monitoring revealed that many of the issues observed in field operations were confirmed in HRG model simulations.
 - System inefficiencies identified in both the model and experienced in field operations are driven by a combination of factors, including:
 - Pipe age and material
 - Hydraulic bottlenecks at transition points (changes in pipe size, bends, etc.)
 - PRV placement and setting
 - System valve operations, and;
 - Calcification of pipe interior due to water source mineral content.
 - The identified system inefficiencies factors have been validated through our model simulations of system operations and applied field monitoring data.
 - The comparison of field monitoring pressures with system Hydraulic Grade Lines (HGLs) across the system has assisted in verifying applied system performance factors including pipe roughness (measure of degree of interior pipe roughness), head losses, and overall water system functionality.
- **Modeled System Results:** *Reference Monitoring Locations Exhibit*
 - Medium Pressure Plane Operations: The system served directly from the WTP (and not from the GST), which HRG identifies as the medium pressure plane, experiences higher pressures due to existing system operations, the result of the required pump head to push water to the GST.
 - High Service Pump Operations:
 - The pump operations and 6-inch main distributing the flow to the GST is a system bottleneck and results in excessive system head loss.
 - The higher head to be overcome in the system operations results in a higher required pressure.
 - The 6-inch, which due to its size, can only support a finite flow and experiences excessive head loss as a result.
 - Higher pressures on pipes that are not designed and constructed to withstand such conditions result in inefficient operations and cause the system to experience issues and failures.

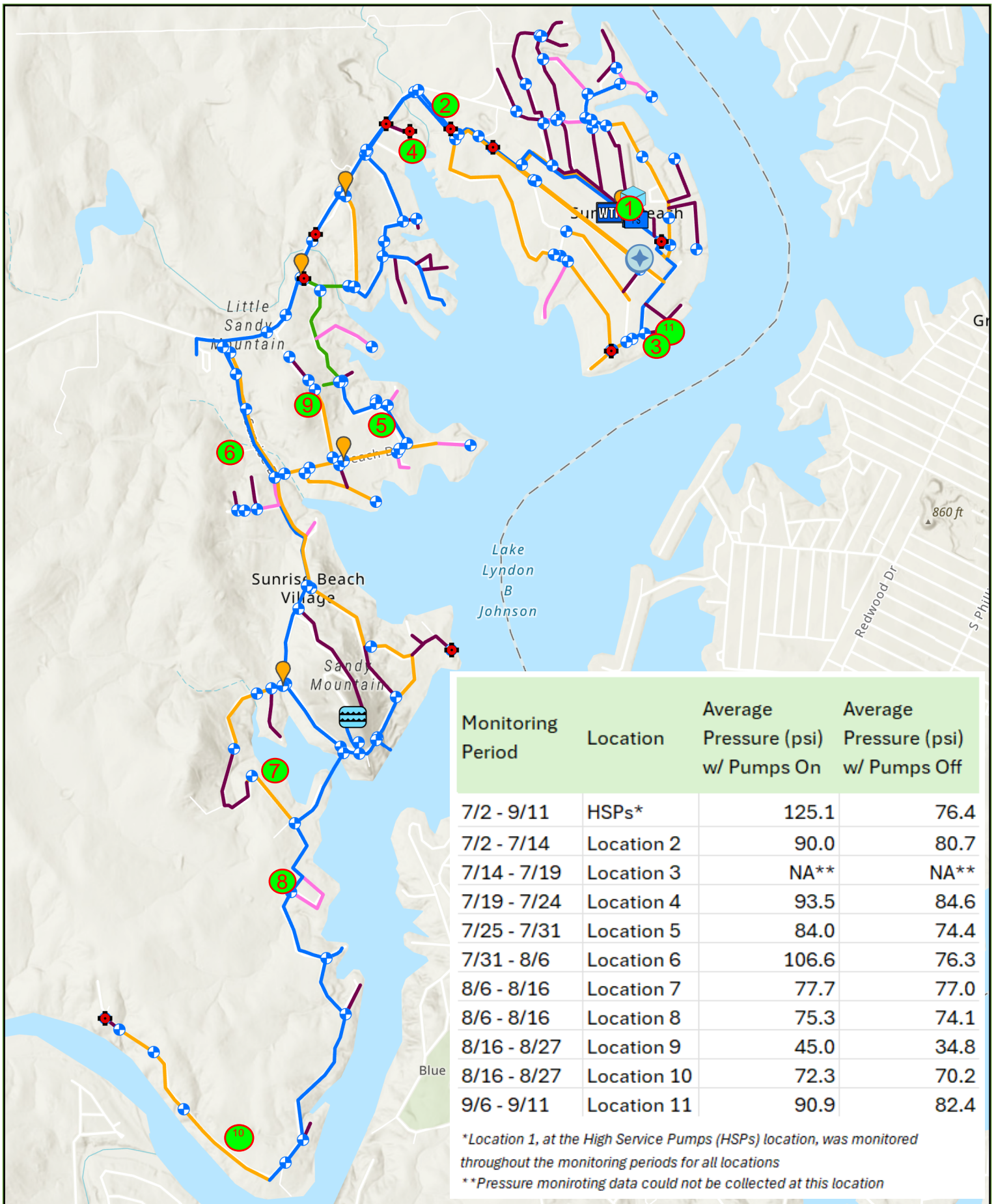


- Water System Modeled Operations:
 - The model, validated by collected field data, demonstrates that the system is operating under excessive stress, with pumps working to maintain high flow levels at the GST highest hydraulic grade line (HGL) to meet the demands of both services close to the GST as well as at the lowest point in the water system.
 - The result of these operational conditions is strain on the system, especially during times of maximum demand when pressures drop below the desired threshold of 35 psi for homes served close to the GST.
 - Recommended operating pressures in a water system are typically in a range of 50 to 80 psi, as regulated by the Texas Commission on Environmental Quality (TCEQ).
 - The consistently high pressures measured through system pressure monitoring are likely to contribute to long-term system stress, which could lead to pipe failures, which have been experienced in the system frequently, as reported by SBV.
 - Pipe materials and fittings, when new, have maximum pressure ratings, with material resilience decreasing over time where pressures are consistently pushed and/or oscillate between highs and lows frequently, which leads to more frequent leaks and joint failures.
 - Current maintained levels of the Clearwell and the GST are a function of meeting the pressure requirements of the system and set points by others prior to the current operations team. Conversations with operations in comparing and validating the model results have highlighted a need to modify these levels in the interest of reducing the stress on the system required to meet this previously set operating levels.
- **Current and Next Steps**
 - A model analysis of conceptual system improvements is underway to simulate the impact each improvement will have on the system such that a maximum benefit can be achieved in Phase 1. This includes:
 - Combination of storage enhancements, pressure maintenance solutions at GST through a small package booster pump and Hydropneumatic tank addition.
 - High service pump replacements and associated improvements.
 - Storage improvements at the WTP (Clearwell replacement/addition)
 - Transmission line, parallel to existing 6-inch distribution line.
 - Operational system improvements associated with pipes and valving in the system, pump operations, and tank operating levels.
 - Achieving system resiliency and redundancy is key to improving system improvements, which is being evaluated in the model in phases. The focus is to evaluate how the system could ideally operate compared to its current operation, with required monetized improvements.
 - Maintaining high GST levels to support adequate pressure in one area can place unnecessary strain on both pumps and pipes over time. A more balanced system operations approach is being identified to ensure long-term system reliability without overburdening these components.
 - Drafting of the Conceptual Design Report to outline what is to be designed in Phase 1 improvements and estimates for constructed improvements.
 - HRG and SBV are working collaboratively through sharing of model results vs. field findings to identify areas of the system in which operations can be improved through modifications to operating levels, valves, etc.

Please let us know if you wish to discuss anything further or require more information.

A handwritten signature in black ink that reads 'Leigh Thomas'.

Leigh Thomas, PE
Regional Manager - Water



Sunrise Beach Village, TX
 Field Monitor Pressure Testing Locations

