CASE STUDY: Known Depths Against New Studies - Dickinson, North Dakota

Geophysical Survey for Optimal Groundwater Targeting: Existing Wells Surpassed By 272 GPM

Willowstick LLC

Site Location of Dickinson, North Dakota

Introduction

This report presents the results of a groundwater well-siting investigation. Our patented technology gives owners and managers of properties such as this their best chance to find and study possible drilling locations. Although geophysical tools cannot guarantee groundwater production or quality, they are effective in identifying subsurface patterns and conditions associated with above-average well yield. The purpose of this study is to provide targeted drill guidance that reduces the financial and operational risks of exploratory drilling. The report outlines the investigative approach, describes the geophysical methods used, and presents specific drill target recommendations derived from the data. **This study was drilled on the recommended targets and produced a 280 GPM well using the data provided.**

The site's drilling history highlights the complexity of the local hydro-geologic setting. Four wells have previously been constructed within the property boundaries, with three drilled between 1992 and 1993 to depths of 200–280 feet and ultimately abandoned as dry wells. The remaining well, drilled to 120 feet, produced approximately 8 gallons per minute and was the only location where drill logs noted the presence of sand—a potential indicator of a productive water-bearing zone. In settings like Dickinson, successful wells often intercept permeable sand bodies or fracture systems that are difficult to identify through surface mapping alone. Small surface-water features within the property further suggest subsurface variability worth evaluating.

SUMMARY

LOCATION

Dickinson, North Dakota - USA

CHALLENGE

All current wells on site had been plugged, sand filled or had a maximum of 8 GPM. Willowstick was tasked with finding a new location that surpassed this in order to secure water on the property.

SOLUTION

The survey integrates MSR & Radiometric Gamma techniques to pinpoint optimal well sites accurately, enabling informed decision-making for efficient selection

BENEFIT

Allows for a more optimal step by step path to getting to available water, ultimately resulting in the ability to drill with peace of mind that you're in the right area.

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Investigative Approach

The investigative approach began with a desktop assessment of the 146.6-acre property, including review of regional geology, structural trends, historical lineaments, and existing well records. Prior drilling on the property showed three deep dry wells and one low-yielding well, underscoring the need for a geophysical method capable of detecting subtle permeability pathways not visible in surface mapping. Fieldwork incorporated both gamma surveying and Micro-Seismic Resonance (MSR), allowing Guardian/Willowstick to evaluate lithologic variability, structural lineaments, and deeper stress-relief zones associated with groundwater movement.

Gamma data were collected across the study area to detect changes in soil and rock composition and to identify lineaments that may relate to deeper fractures or dike-like features. Gamma readings ranged broadly across the site—values influenced by clay, silt, sand, and gravel as well as by underlying structural trends. While gamma alone does not indicate depth to groundwater, its patterns help determine where MSR acquisition should be concentrated. In this study, gamma trends guided the placement of 34 MSR survey lines, ensuring that resonance measurements were aligned with zones of highest structural significance.

MSR data collection occurred along these 34 lines at a 5-meter (16.4-ft) interval spacing. Each MSR measurement captured resonance generated by continuous tidal microseismic energy—stress pulses induced by lunar and solar gravitational forces that propagate deep into the crust. These stresses are preferentially released along subvertical fracture networks, extensional weaknesses, and high-porosity gravel bodies. Such features emit stronger resonance signals, allowing MSR to delineate deeply rooted zones conducive to groundwater flow, even in semi-consolidated or alluvial environments.

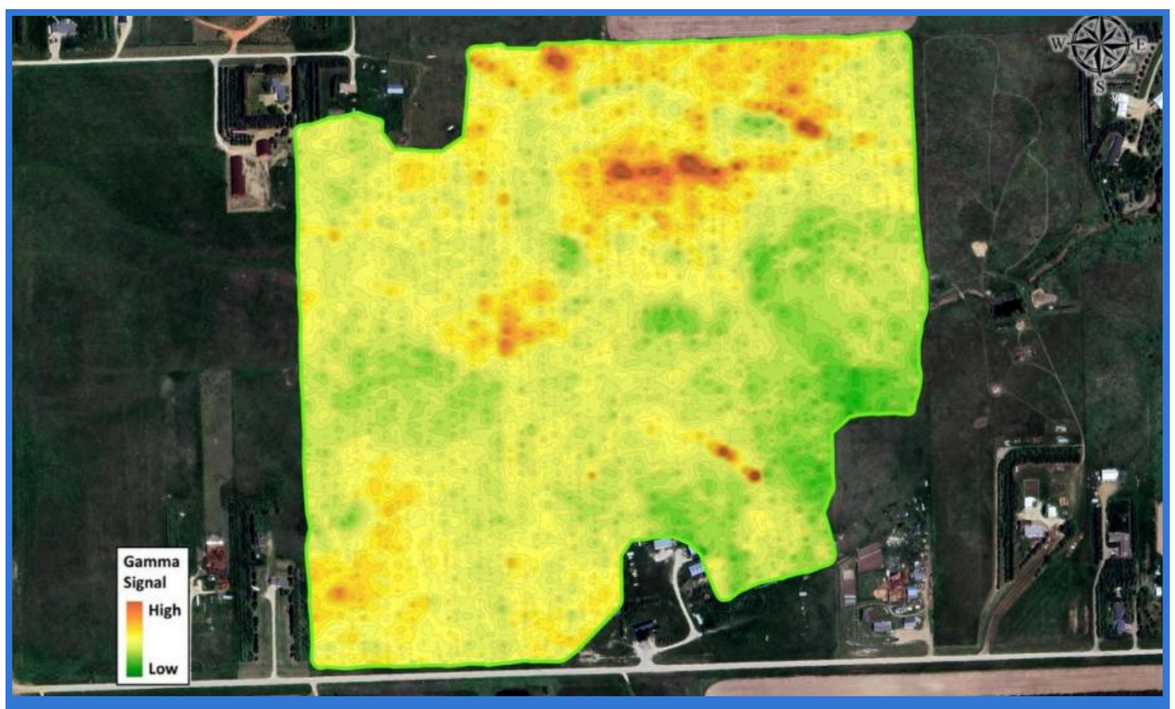

Fig. 1 - Gamma Results

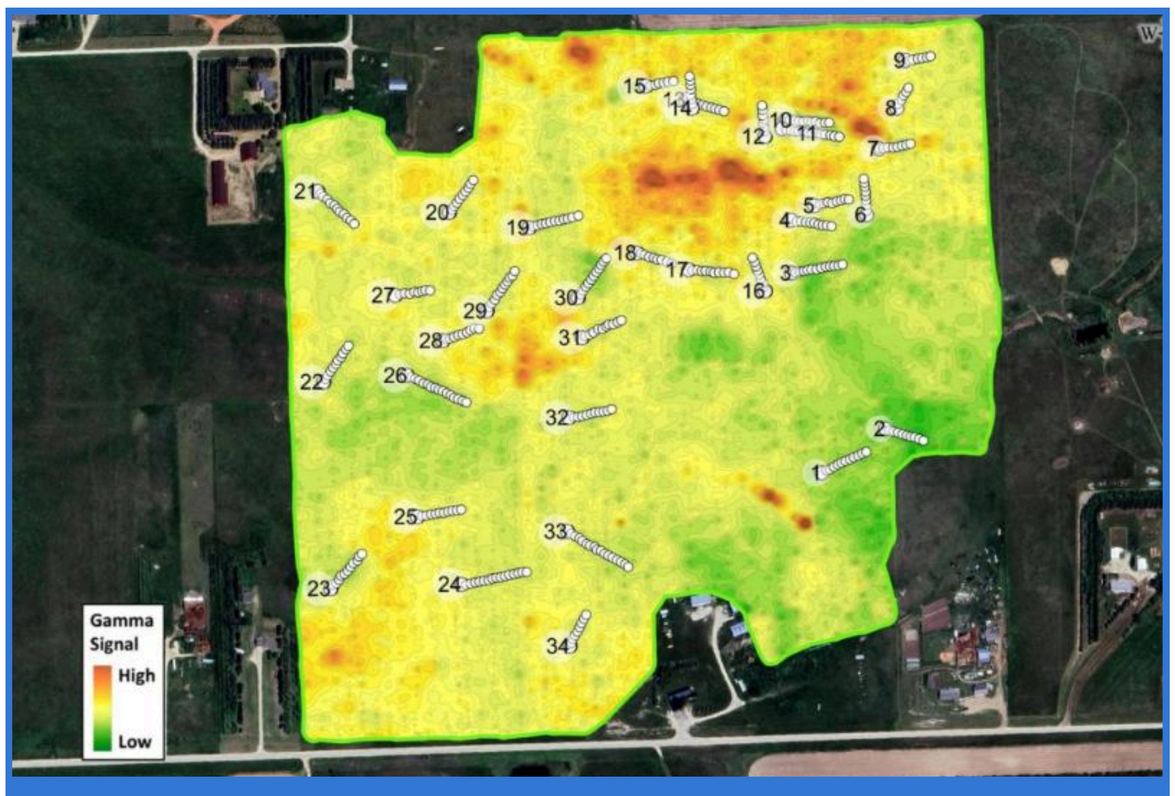

Fig. 2 - MSR Line Locations

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All MSR data were compiled with GPS coordinates into a GIS database for integrated analysis. Resonance profiles were then correlated with gamma trends to identify the most coherent, vertically persistent anomalies. Two locations stood out as the most favorable prospects, designated T1 and T2. Both exhibited stronger-than-average resonance intensities with deep "roots," suggesting fracture-enhanced permeability and increased potential for above-average groundwater yield. T1 showed pronounced resonance between an estimated 175 and 500+ feet, while T2 showed strong response between approximately 225 and 375+ feet. These deeper resonance zones are typically more reliable for sustained groundwater production, though shallower water may also exist depending on local seismic velocities and lithology.

Together, the MSR and gamma results provide a high-resolution understanding of subsurface conditions and narrow the search to two well-defined drill targets with the strongest geophysical indicators of groundwater potential.

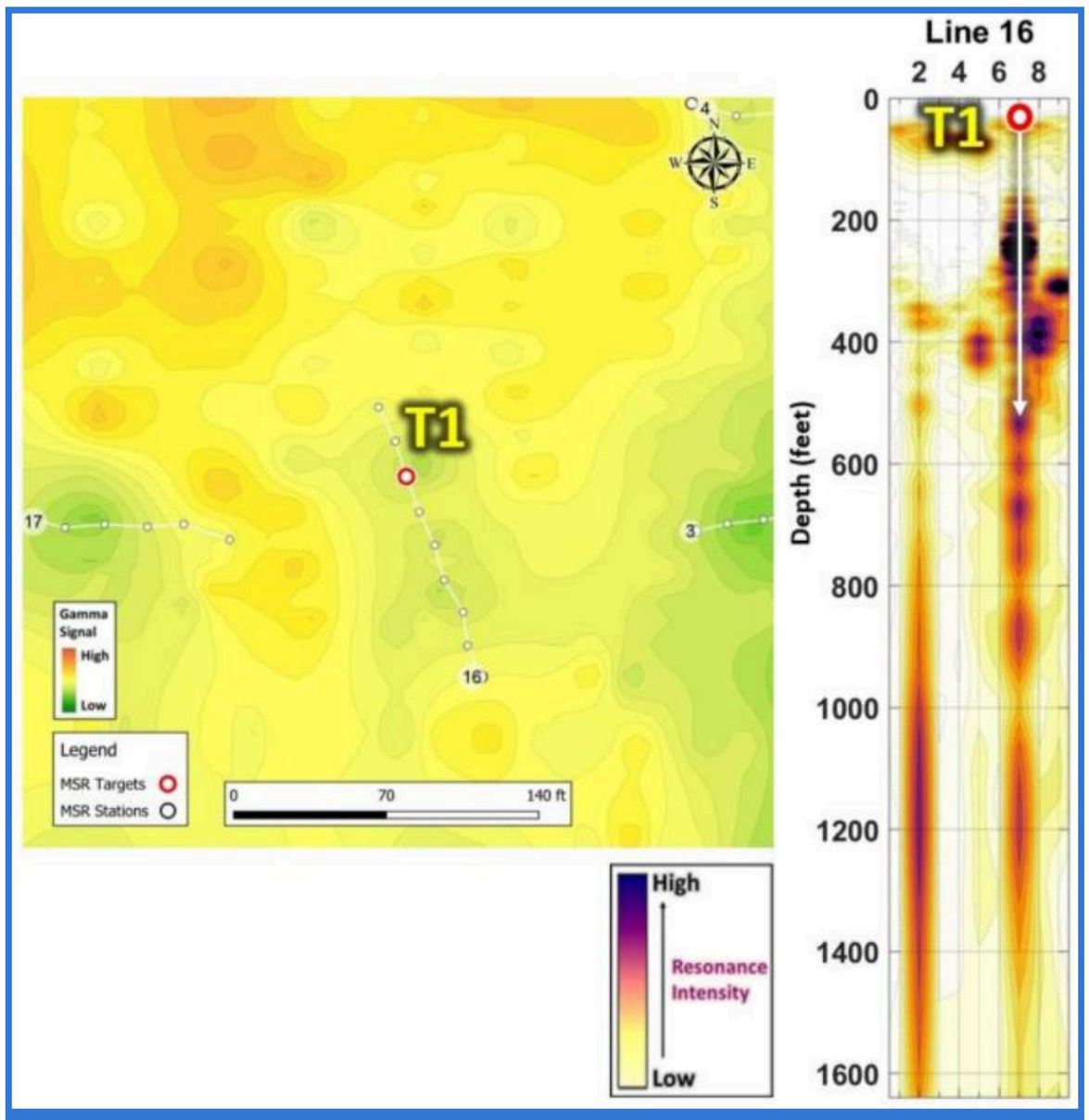


Fig 3. Gamma coverage results with MSR section for target T1

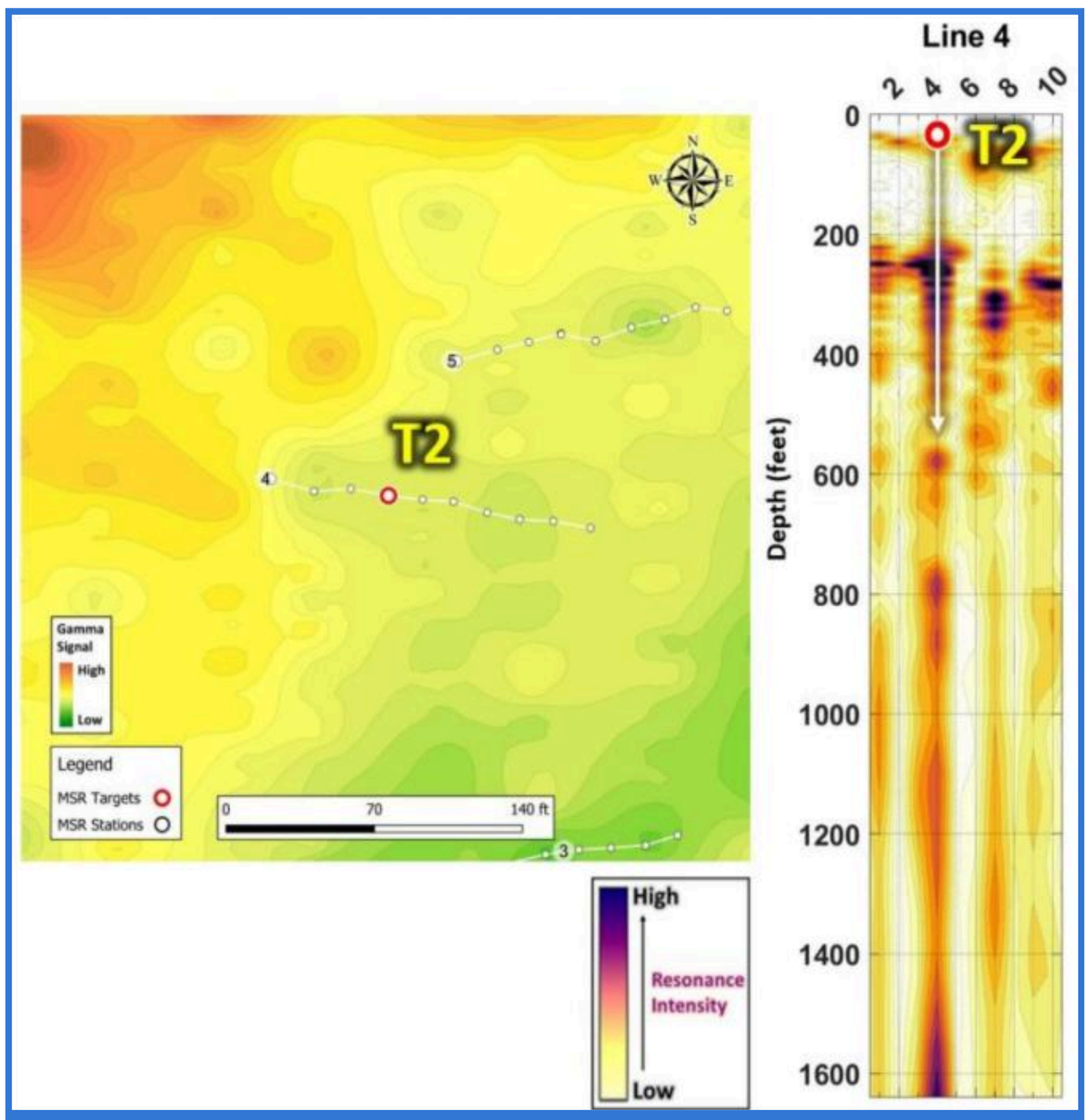


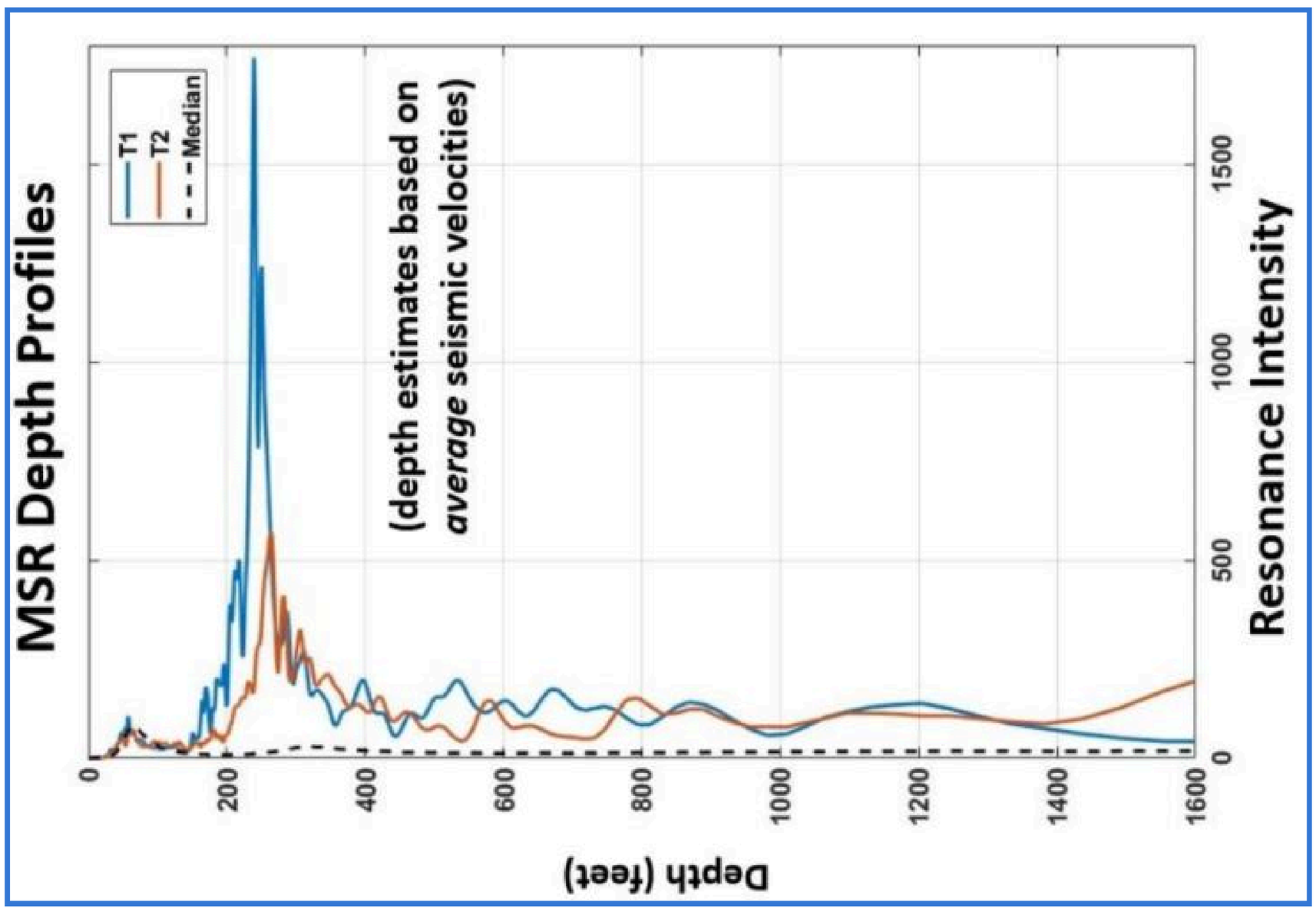
Fig 4. Gamma coverage results with MSR section for target T2

Conclusion

This investigation combined Micro-Seismic Resonance (MSR), radiometric gamma measurements, and traditional geological evaluation to pinpoint the most promising groundwater targets within the 146.6-acre study area. MSR proved particularly effective in identifying deeply rooted stress-relief zones and subvertical fracture networks—features frequently associated with above-average groundwater production. When integrated with gamma trends that refine structural and lithologic interpretation, the combined dataset provided a clear, defensible basis for recommending two primary drill targets, T1 and T2, with T1 exhibiting the strongest resonance intensity and the most persistent deep-root expression.
Although geophysical tools cannot directly guarantee groundwater production, they significantly reduce drilling uncertainty by identifying subsurface conditions that correlate with high-yield wells. Drilling at the recommended target confirmed the MSR interpretation with exceptional accuracy. The well encountered substantial permeable intervals consistent with projected depths and structural character, resulting in one of the most productive wells in the surrounding region.

As the property manager noted:
“We did, however, make one error: we secured casing in this well that limits us to pumping 100 GPM. This well would easily allow us to pump 280 GPM.”

This outcome represents a resounding success, especially on a property where multiple past wells had been abandoned as dry. The results reinforce a consistent pattern observed in Guardian/Willowstick well-siting projects: drill targets exhibiting the MSR and gamma characteristics identified in this study routinely outperform average boreholes. While drilling risks can never be fully eliminated, the MSR–Gamma methodology significantly improved confidence in target selection and directly contributed to the development of a high-yield groundwater source on this property.



TESTIMONIAL OF CLIENT →

Testimonials:

Please find the well log for this project attached. Nathan Sickler with ND Water Wells drilled the well.

This was our first time utilizing Willowstick technology. Your team scanned 130 acres for us and provided us with a drill site recommendation. Nathan and I were initially skeptical, but given the knowledge and experience your team brought to the table, we decided to proceed. This turned out to be one of my best decisions.

The well drill log was right on track with the Willowstick projections, and we found porosity/water with mind-blowing accuracy. This particular piece of property had five abandoned wells and one existing well that did not produce enough water for any application. In Nathan's words, the Willowstick well "is the best well in the area by a long shot."

We did, however, make one error: we secured casing in this well that limits us to pumping 100 GPM. This well would easily allow us to pump 280 GPM.

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