BRAND-AGNOSTIC STUDY

Customer Test of AGI Passive Resistivity Cables Compared To Third-Party Cables

AGI Advanced Geosciences, Inc

CASE HISTORY

Objective: For troubleshooting purposes, a customer wanted to make an objective comparison between two brands of passive-resistivity cables—AGI and an undisclosed third party.

Survey site: A site in the Pacific Northwest, USA. This comparison was made in April 2016.

Instruments Used: SuperSting™ R1 with SwitchBox56™, fully-charged deep-cycle marine battery, stainless-steel stakes, and AGI EarthImager™ 2D software for data inversion.

Passive Cables Used:

AGI: Four-year-old proprietary cables from our rental pool at SAGA Geophysics. 56 total electrodes spaced at 10ft/3.05m

Undisclosed Third-Party: Five-year-old cables with 56 total electrodes spaced at 10 ft/3.05m

BACKGROUND & PROCESS:

Please note that in order to respect the customer's privacy and ongoing projects—both the AGI customer and third-party cable manufacturer will remain undisclosed.

A consulting company who used third-party passive cables had ongoing data quality issues after a recent repair. The cables were repaired at the original manufacturer's factory and passed all quality control tests. The customer requested a rental set of AGI cables from SAGA Geophysics to compare. The AGI rental cables were four years old and heavily used—but passed all of the quality control methods at SAGA Geophysics.

The customer compared the cables over the same electrode stakes, instrument, command file and contact resistance. All comparison inversion models used the same parameter sets with identical stop criteria and histogram data removal thresholds. Any variations in RMS, L2 or numbers of iterations are related to the amount of noise and spikes.

AGI Passive Cable secured to the stainless-steel electrode stake with a rubber band.

Third-Party Passive Cable secured to the stainless-steel electrode stake with a rubber band.

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RESULTS:

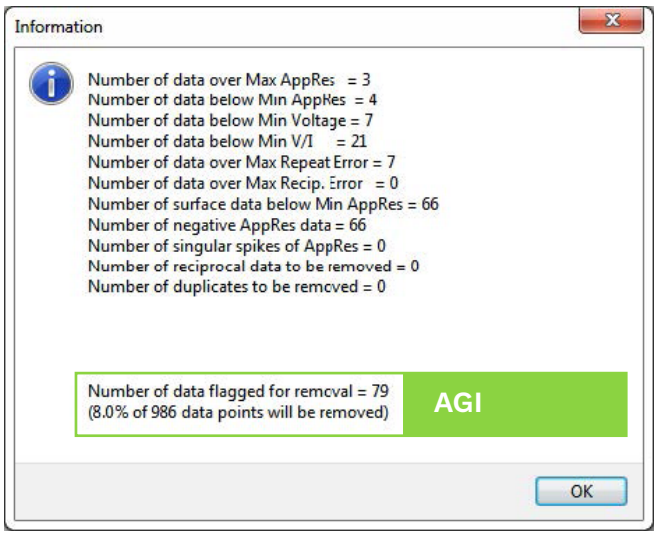
The customer found that **AGI cables measured significantly cleaner raw data with less spikes.**

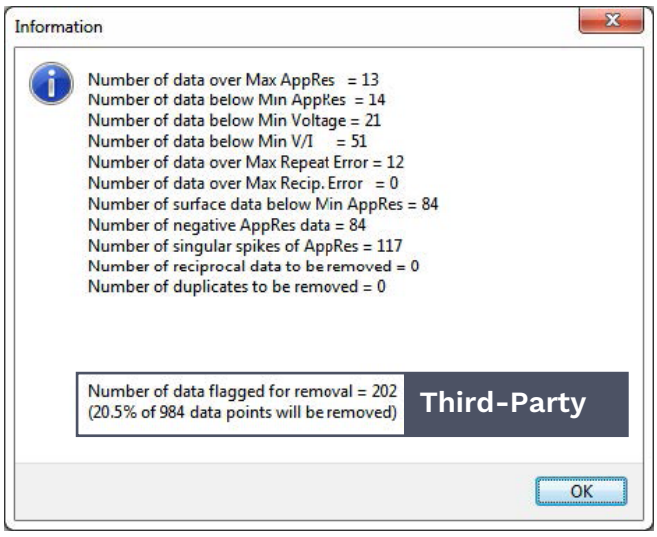
Models from the AGI data also **converged faster and with lower RMS error and better L2-Norm and contained more good data in the final model.**

Significantly more data needed to be removed with the Third-Party Passive Cables to fit a good model. The two final models shared similar features, but **there were many more clear artifacts in the Third-Party Passive Cables data.**

The likely cause for the differences in data quality were related to higher electrical leakage or cross-talk noise in the Third-Party Passive Cable. Further details are below.

Pre-Measurement Comparison	
AGI	**Third-Party**
Multi-stranded conductors with proprietary connectors. The take outs are sealed 100% into the jacket. This is a higher-cost build method with a longer lead time for purchase.	Solid-core conductor with off-the-shelf connectors. The take outs use a molding method that is a lower cost and shorter lead time for purchase.





These plots show the amount of data that needed to be removed before inversion. Both criteria were the same, but significantly more data needed to be removed with the Third-Party Passive Resistivity Cables. The resulting models using AGI data converged faster and solved for similar structures on each run while needing less misfit data removal filters to reach the final model. AGI also produced far less singular spikes (0 vs 117).

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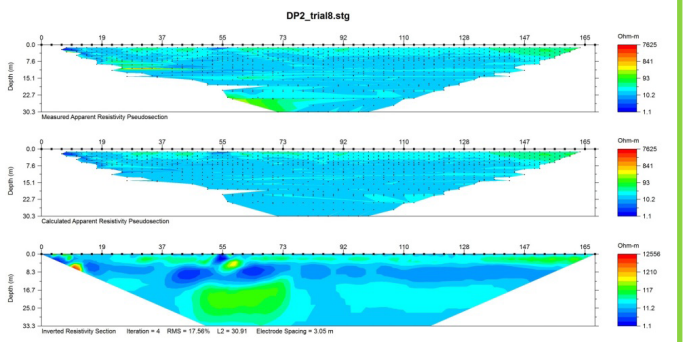
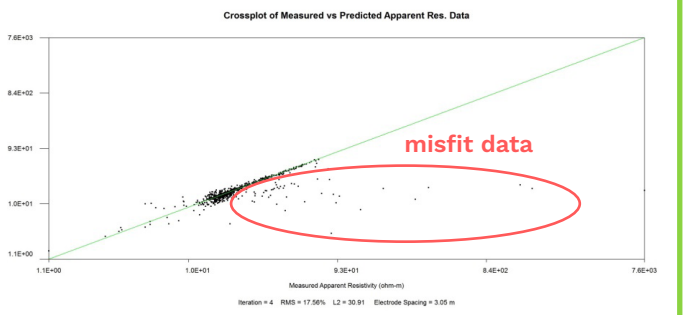
RESULTS (CONT'D):

AGI Cables:

First model before data filtering



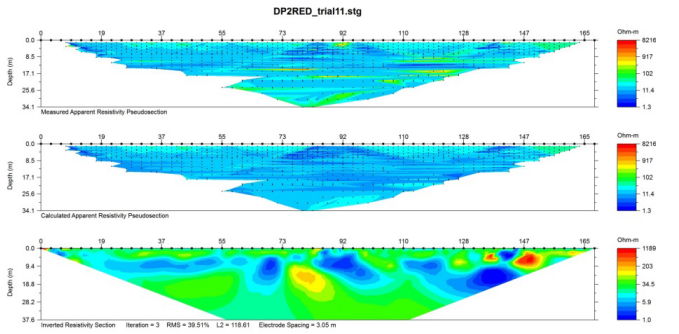


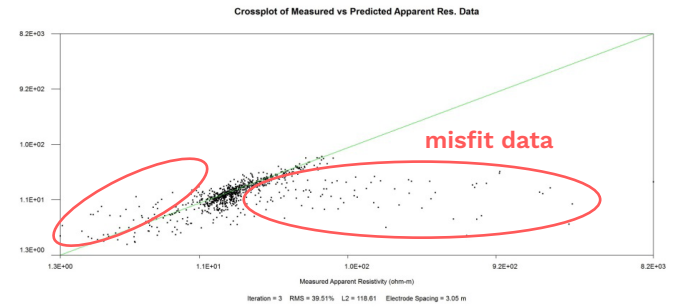
RMS = 17.56%

Misfit Data to Remove: 79 Points

Third-Party Cables:

First model before data filtering





RMS = 39.51%

Misfit Data to Remove: 202 Points

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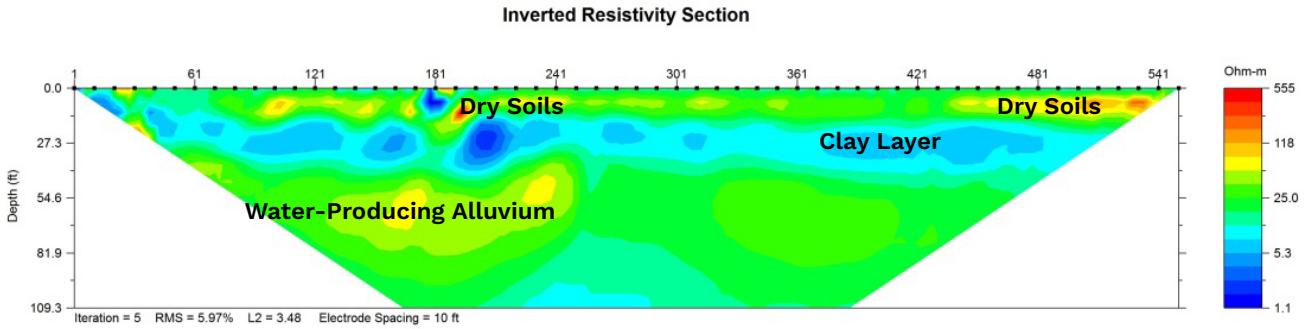
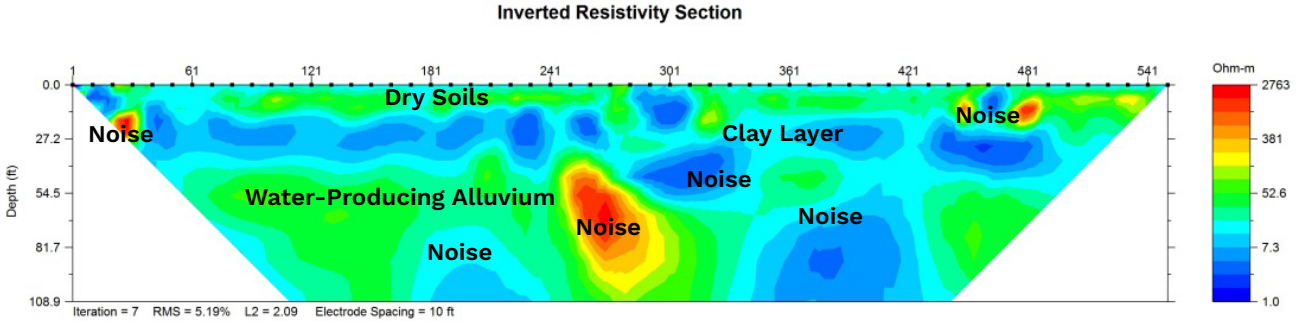
RESULTS (CONT'D):

Both models had a good numerical fit, but showed clear differences in the image of the subsurface. The smoothness constrained modeling method will eventually produce a good solution numerically if you remove noisy data. Unfortunately, some noise will remain and be fitted with structures that do not exist.

AGI Cables - Final Model



Third-Party Cables - Final Model



Final Model Data Comparison		
	AGI	Third-Party
Total Data Points (Final # / Starting #)	907 / 986	691 / 984
% Data Rejected Initially Due To Low-Quality Signal	8%	20.5%
% Raw Data Used In Final Model	92%	70%

The resulting Third-Party Passive Resistivity Cable model had features which were likely coherent noise artifacts (sharp high/low resistivity near each other), despite showing a good RMS error. This noise was difficult to remove from the true signal.

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