

## **APPENDIX 19**

### **CLASSIFICATION AND REGRESSION TREE (CART) ANALYSIS**

## Table of Contents

CART Figures using Cross-Sectional Data.....	4
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CART Figures using Well Data.....	10
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### List of Figures

Figure 1.	Predicting Temperature using all parameters.....	4
Figure 2.	Predicting Temperature using Vp, MT, and Lithology.....	5
Figure 3.	Predicting Lithology using all parameters except vertical stress.....	6
Figure 4.	Predicting Lithology using all parameters.....	7
Figure 5.	Predicting Lithology using MT, Vp, and Temperature.....	8
Figure 6.	Predicting Lithology using Vp.....	9
Figure 7.	Predicting Temperature using Vp.....	10
Figure 8.	Predicting Temperature using Vp with edited well data set.....	11
Figure 9.	Predicting Temperature using Vp and MT with edited well data set.....	12
Figure 10.	Predicting Temperature using Vp, MT and Lithology with edited well data set.....	13
Figure 11.	Predicting Productive vs. Non-Productive Cells using all parameters.....	14
Figure 12.	Predicting Productive vs. Non-Productive Cells using all parameters except litholog.....	15
Figure 13.	Predicting Productive vs. Non-Productive Cells using Lith., Vp, MT, Fault presence.....	16
Figure 14.	Predicting Productive vs. Non-Productive Cells using Lith., Temp., Vp, MT, Fault presence.....	17

### List of Tables

Table 1.	Preliminary Summary of CART Analyses.....	3
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**Table 1.** Preliminary Summary of CART Analyses Conducted

Description of Analysis Conducted	Data Type	Selected Geoscience Parameters Considered (X) and Used (X) in the Data Splitting Process								r <sup>2</sup> -value	Summary
		T <sup>a</sup>	Vp	Resist. (MT)	CSC	Dilat-ation	Fault Presence	Vertical Stress <sup>f</sup>	Lith-ology <sup>bc</sup>		
Predicting Temperature	section	---	X	---	---	X	---	X	X	0.91	
Predicting Temperature		---	X	X	---	---	---	---	X	0.8	
Predicting Lithology <sup>d</sup>		X	X	X	X	X	---	X	---	0.82	
Predicting Lithology <sup>d</sup>		X	X	X	X	X	---	---	---	0.54	Removing VertStress dropped R <sup>2</sup> value by 34%
Predicting Productive (hydrothermal) Wells for the productive and non-productive well data set	well	X	X	X	X	X	X	X	X	0.66	
		X	X	X	X	X	X	X	---	0.52	R <sup>2</sup> -value dropped 21% when Lithology was removed and Dilatation was considered
		---	X	X	---	---	X	---	X	0.62	Vp, MT and Lithology accounts for 94% of the 0.66 r <sup>2</sup> -value above
		X	X	X	---	---	X	---	X	0.54	
Predicting Temperature	well	---	X	---	---	---	---	---	---	0.62	
Predicting Temperature <sup>e</sup>		---	X	---	---	---	---	---	---	0.75	R <sup>2</sup> -valued increased by ~21%
Predicting Temperature <sup>e</sup>		---	X	X	---	---	---	---	X	0.75	Adding Resistivity (MT) and Lithology does not change R <sup>2</sup> -value relative to using Vp alone
Predicting Temperature <sup>e</sup>		---	X	X	---	---	---	---	---	0.78	Highest R <sup>2</sup> value using Vp and Resistivity (MT)

<sup>a</sup>Temperature; <sup>b</sup>Lithologic Density is a parameter that is directly related to the various lithology identified in this investigation; <sup>c</sup>Gravity-magnetic data was found to be highly correlated to lithology and as such is not shown as a separate parameter; <sup>d</sup>Fracture Intensity was also considered in some of these analysis but not used; <sup>e</sup>Uses all data except wells with a low seismic trust (i.e., 66-21, 45-14, 76-28); <sup>f</sup>Vertical Stress

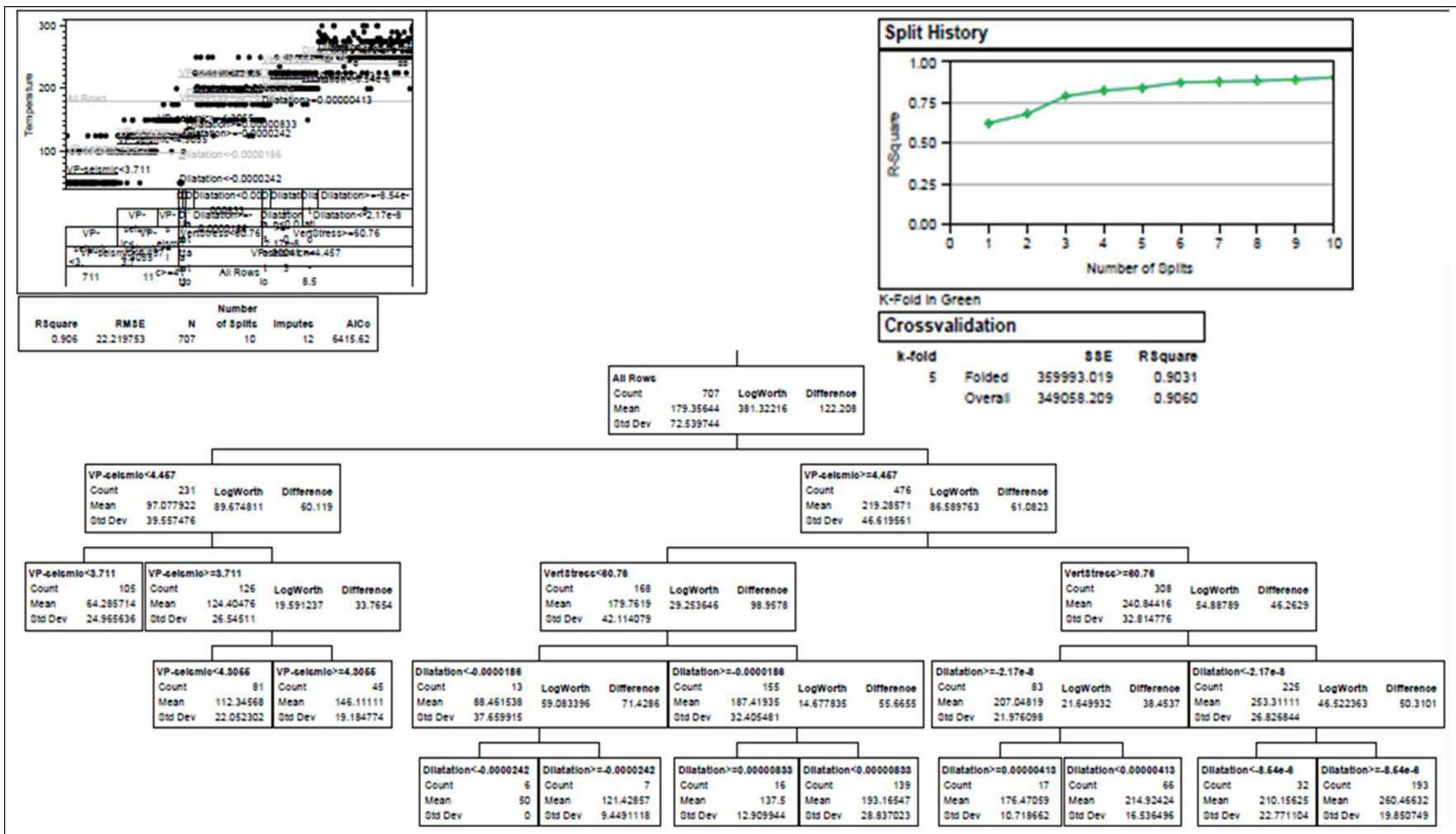


Figure 1. CART Analysis with Section Data for predicting temperature using all parameters. The analysis split on Vp, VertStress, and Dilatation with an  $r^2$  value of 0.91. See Table 1, row 1.



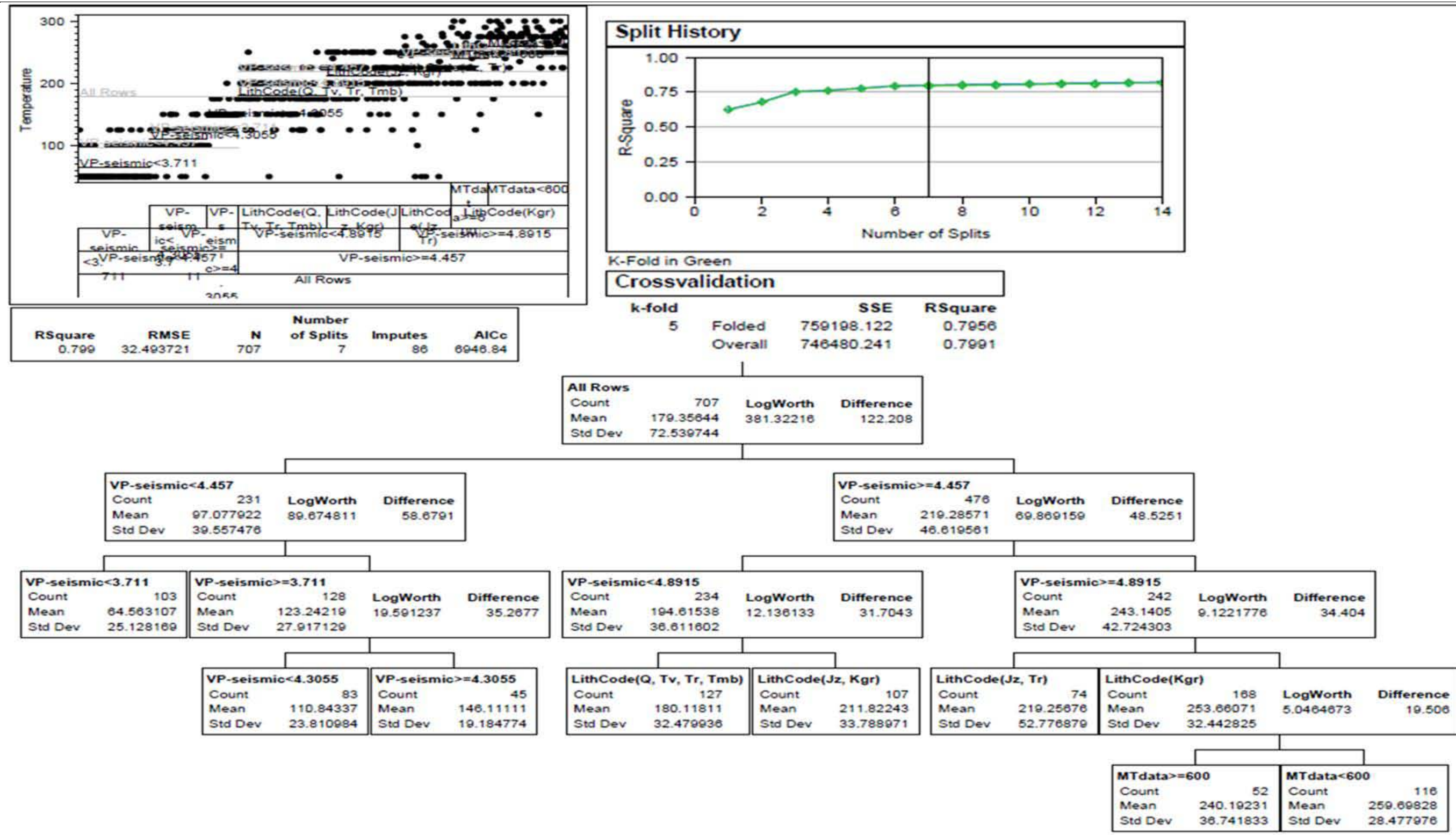


Figure 2. CART Analysis with section data predicting temperature using Vp, MT and lithology;  $R^2 = 0.80$ . See Table 1, row 2.

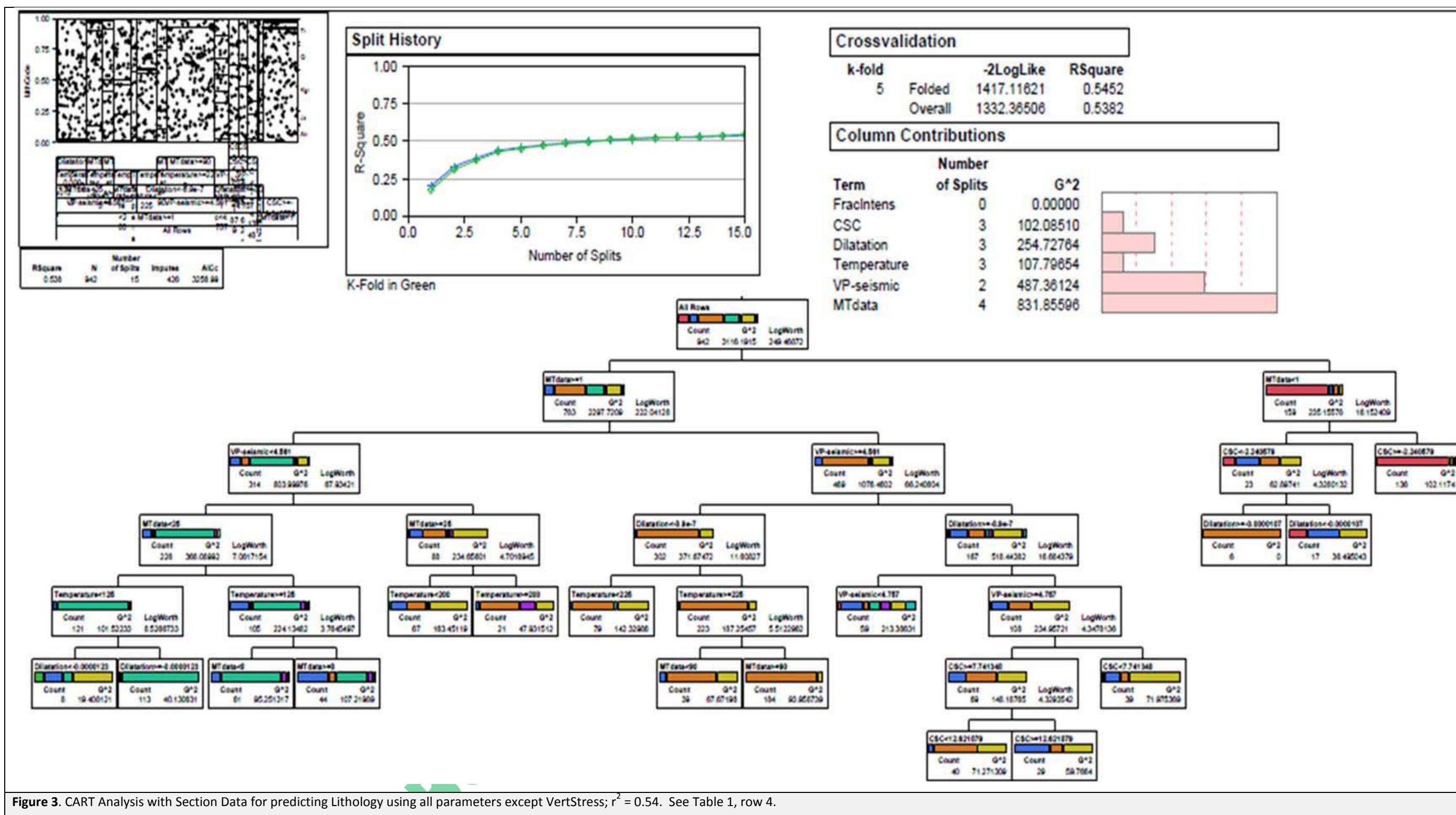


Figure 3. CART Analysis with Section Data for predicting Lithology using all parameters except VertStress;  $r^2 = 0.54$ . See Table 1, row 4.









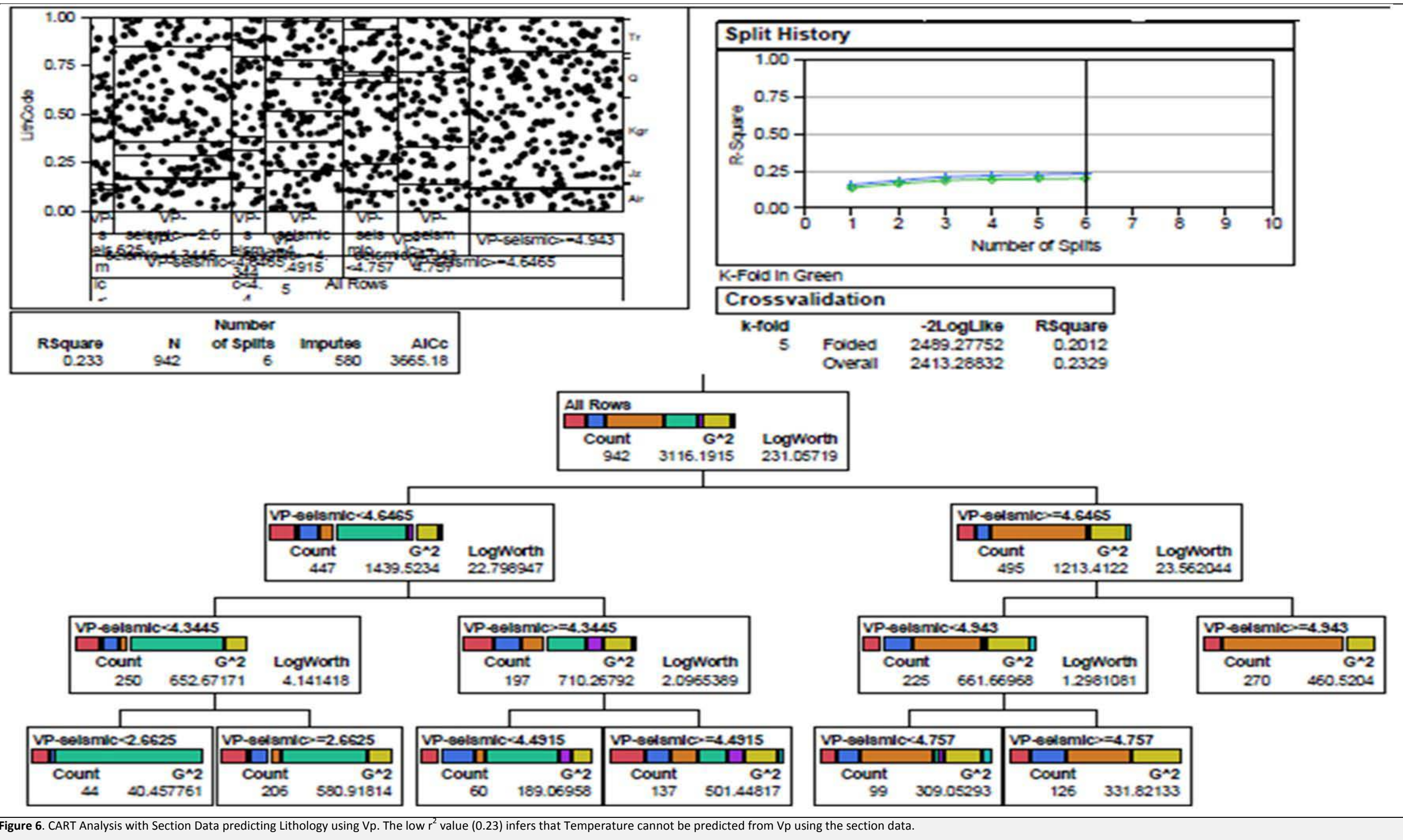
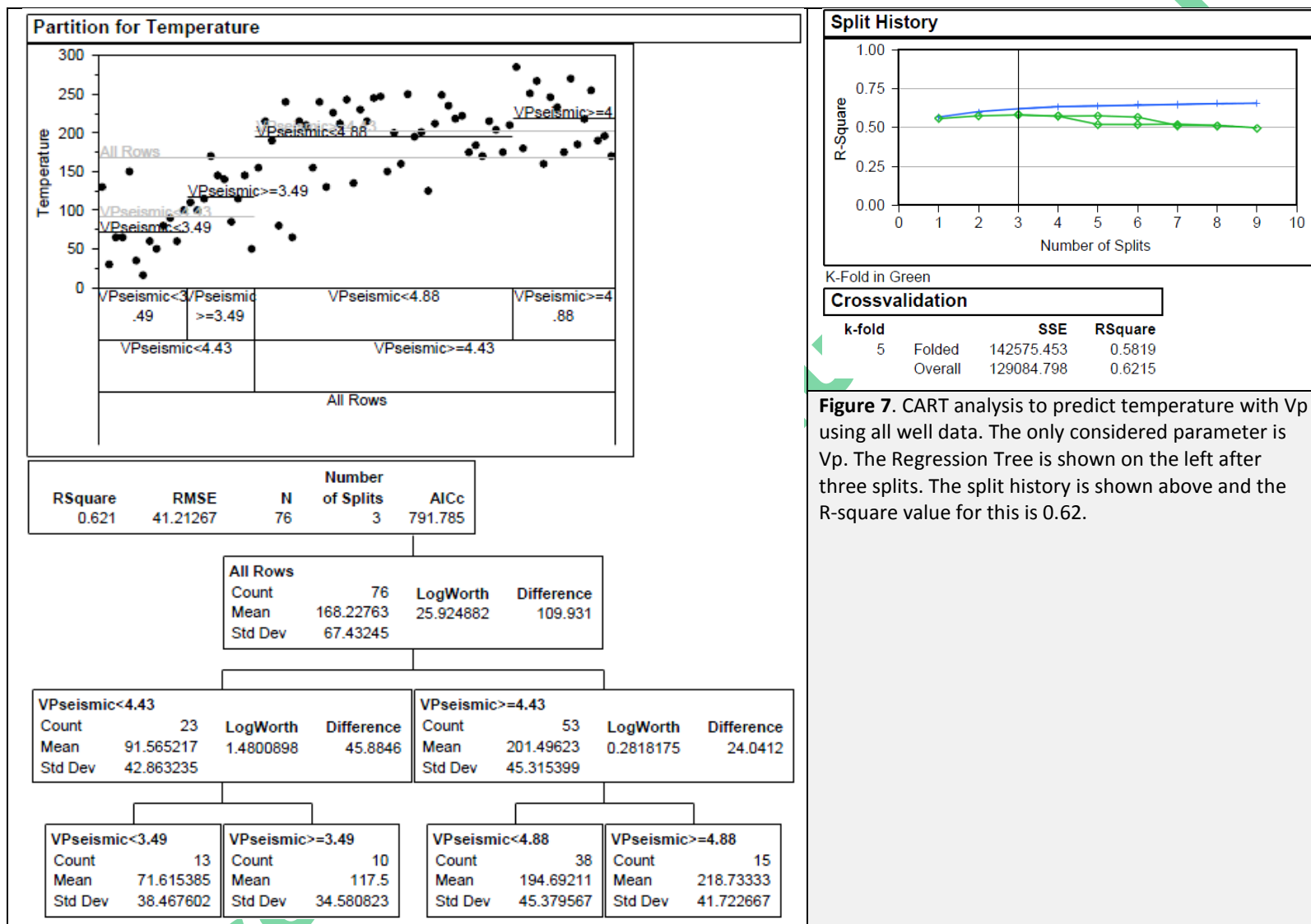
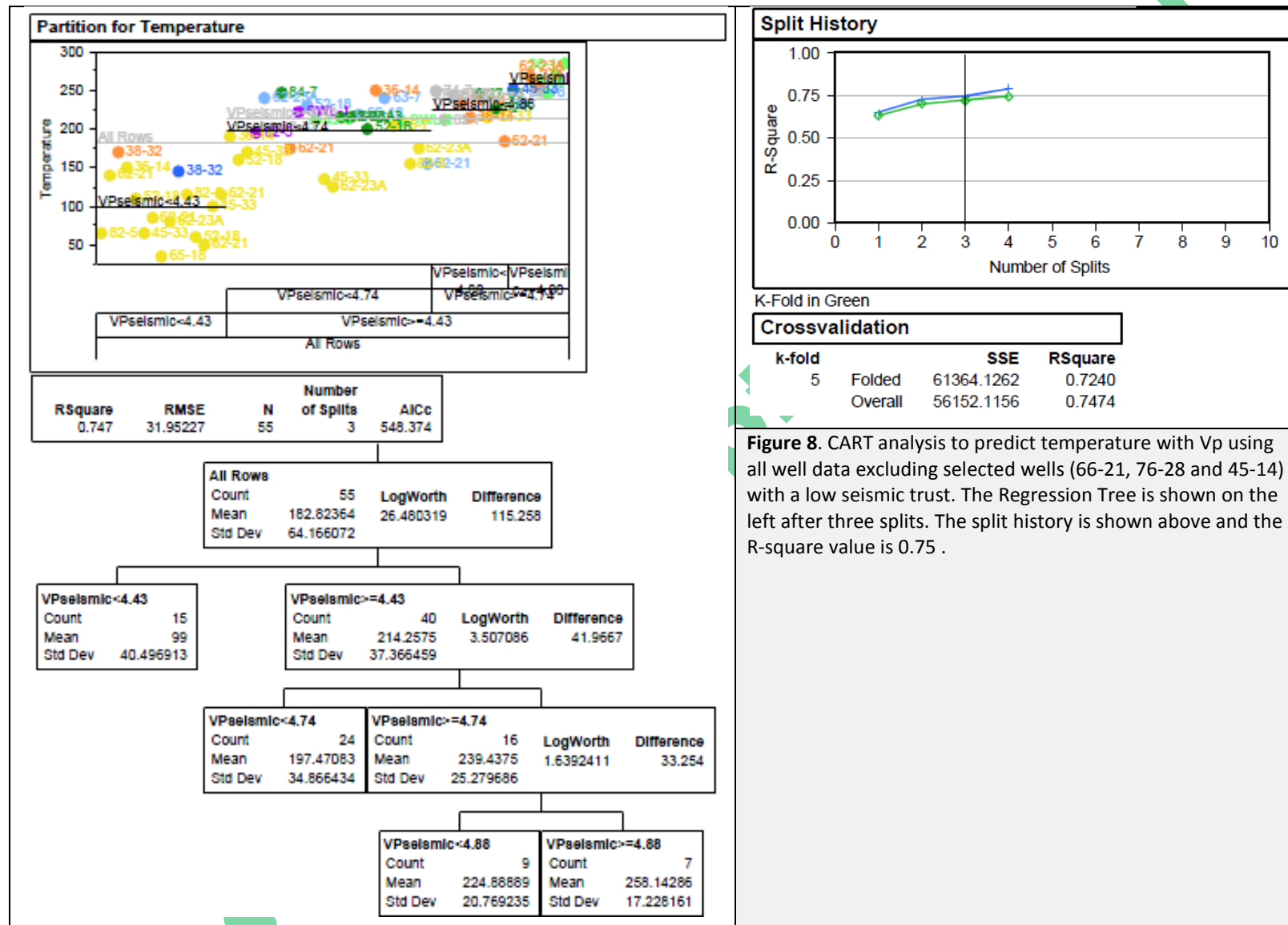


Figure 6. CART Analysis with Section Data predicting Lithology using Vp. The low  $r^2$  value (0.23) infers that Temperature cannot be predicted from Vp using the section data.



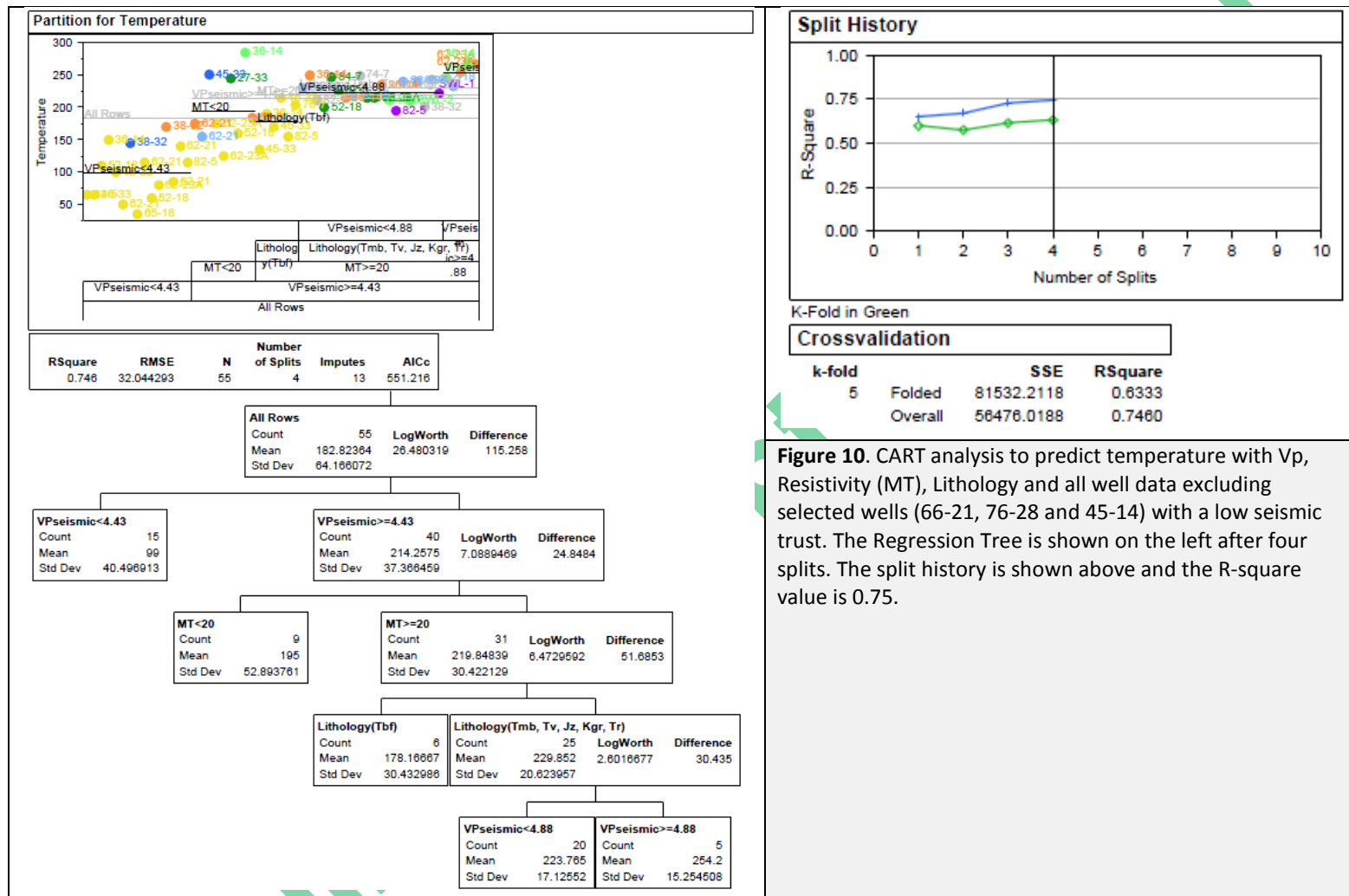
**Figure 7.** CART analysis to predict temperature with Vp using all well data. The only considered parameter is Vp. The Regression Tree is shown on the left after three splits. The split history is shown above and the R-square value for this is 0.62.



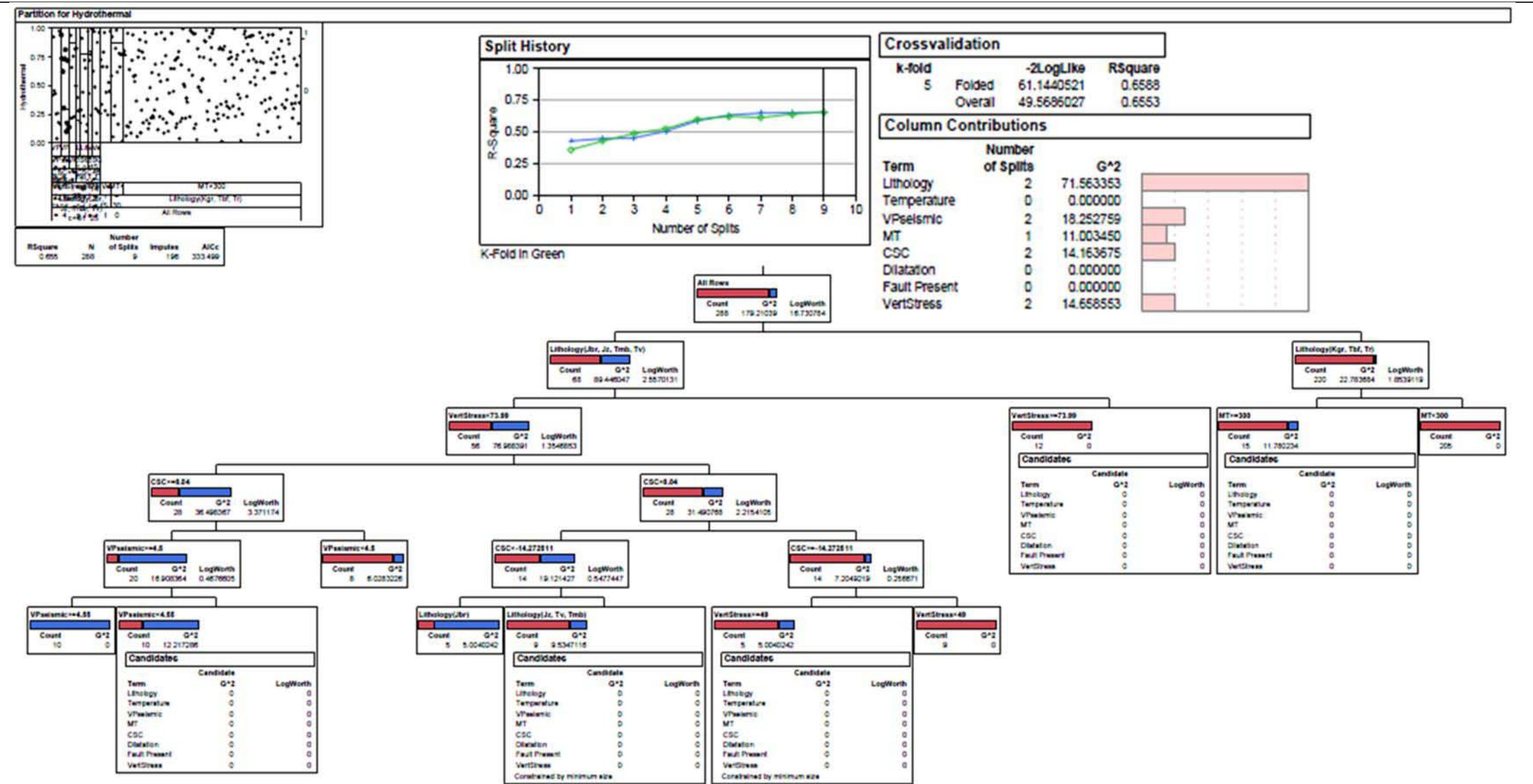
**Figure 8.** CART analysis to predict temperature with Vp using all well data excluding selected wells (66-21, 76-28 and 45-14) with a low seismic trust. The Regression Tree is shown on the left after three splits. The split history is shown above and the R-square value is 0.75 .





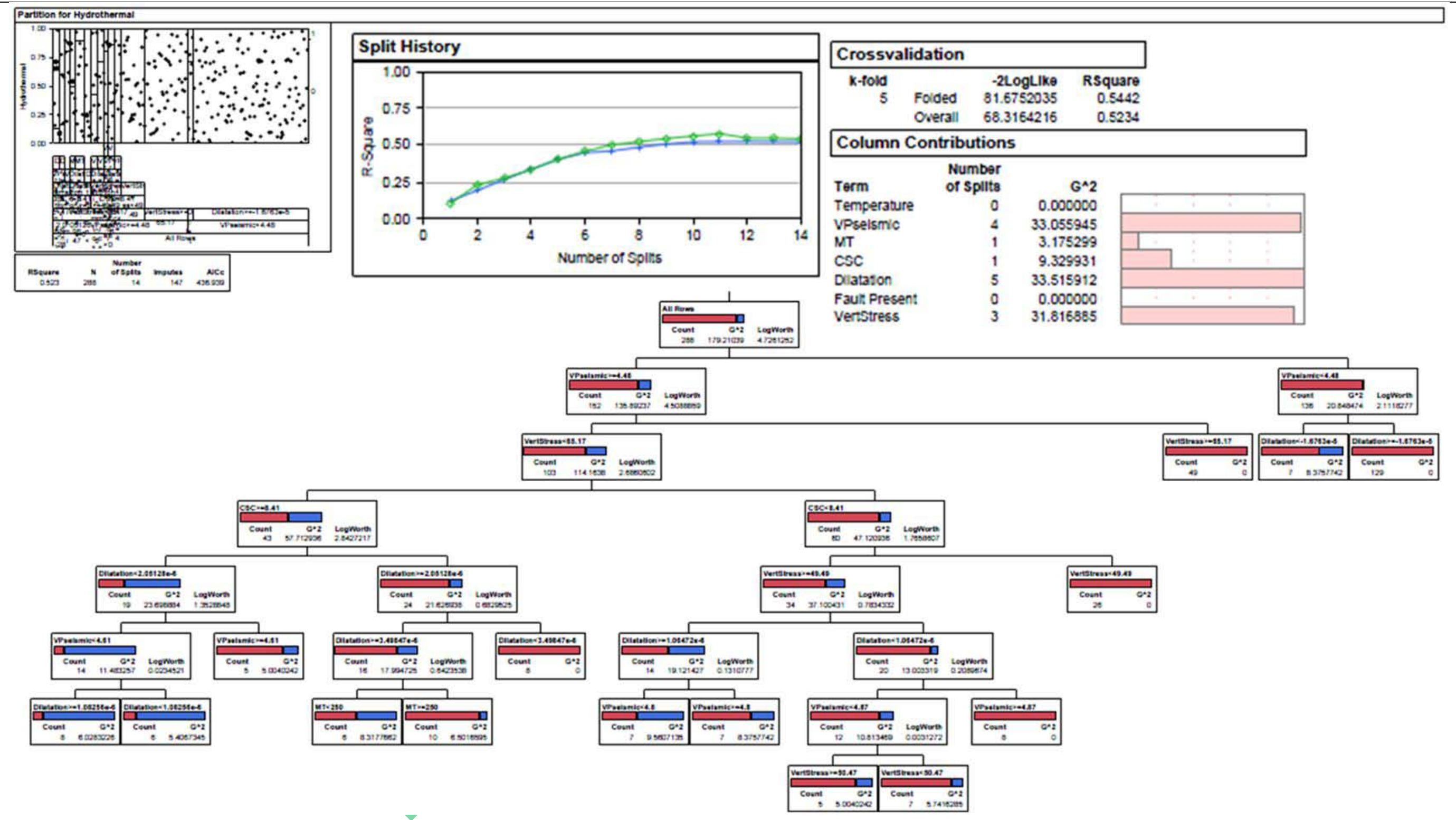


**Figure 10.** CART analysis to predict temperature with Vp, Resistivity (MT), Lithology and all well data excluding selected wells (66-21, 76-28 and 45-14) with a low seismic trust. The Regression Tree is shown on the left after four splits. The split history is shown above and the R-square value is 0.75.

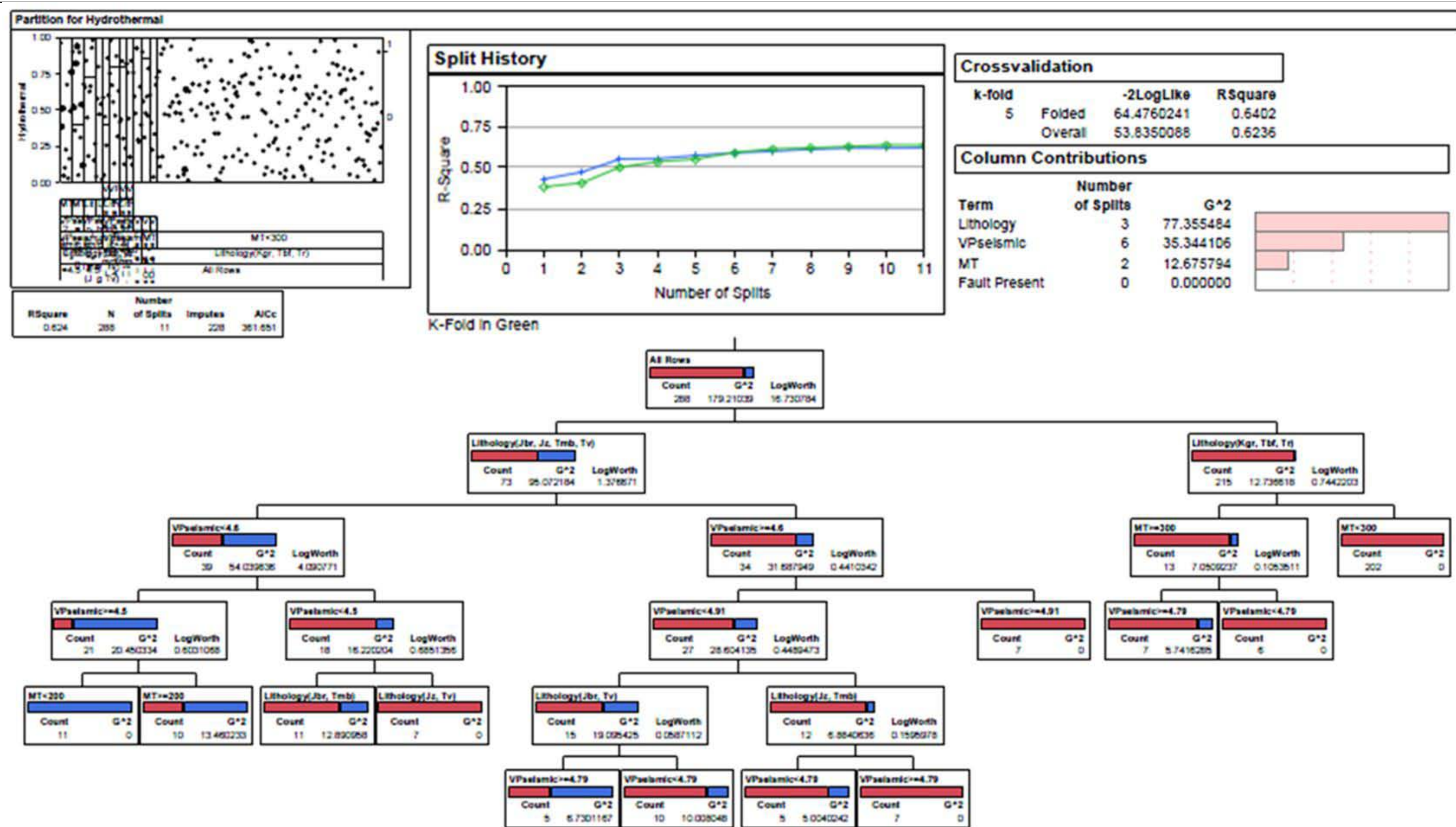


**Figure 11.** CART Analysis for the prediction of productivity (hydrothermal) using all the available well data and the following parameters: Lithology, Temperature, Vp, VertStress, Resistivity (MT), CSC, Dilatation, and Presence of a Fault. Note in the column contributions that the parameters "Temperature" and "Fault Present" were not used. The R=square value is 0.66.



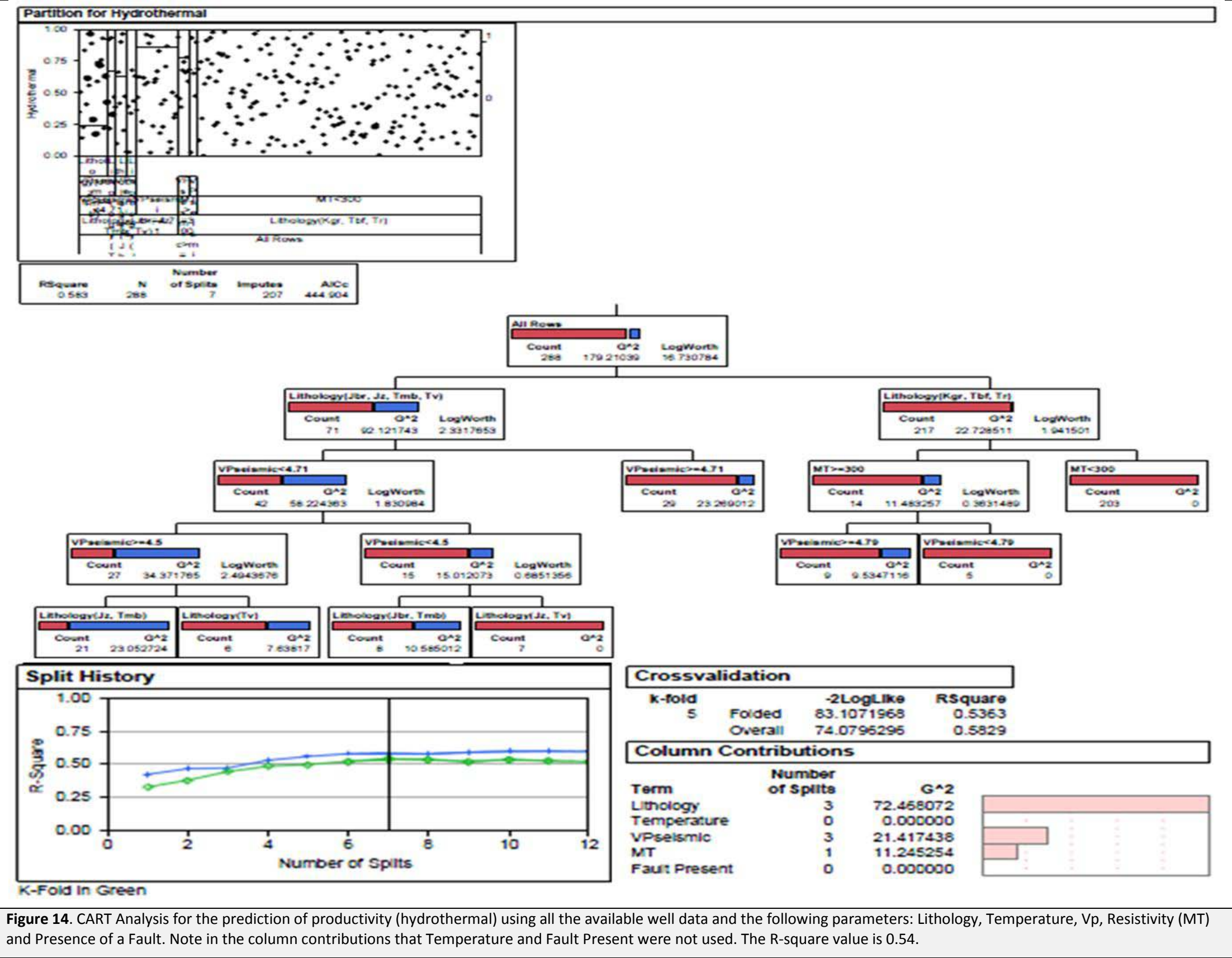


**Figure 12.** CART Analysis for the prediction of productivity (hydrothermal) using all the available well data and the following parameters: Temperature, Vp, VertStress, Resistivity (MT), CSC, Dilatation, and Presence of a Fault. The parameters are the same as the previous figure except lithology has been removed. Note in the column contributions that the parameter "Temperature" was not used. The R-square value is 0.52.



**Figure 13.** CART Analysis for the prediction of productivity (hydrothermal) using all the available well data and the following parameters: Lithology, Vp, Resistivity (MT) and Presence of a Fault. Note in the column contributions that the parameter "Fault Present" was not used. The R-square value is 0.62 which infers that productivity can be predicted based on lithology, Vp and Resistivity (MT).





**Figure 14.** CART Analysis for the prediction of productivity (hydrothermal) using all the available well data and the following parameters: Lithology, Temperature, Vp, Resistivity (MT) and Presence of a Fault. Note in the column contributions that Temperature and Fault Present were not used. The R-square value is 0.54.