TR

Memorandum To: Philip Justus, HLTR

From: James Warner, HLTR

Subject: Trip Report, GSA Southcentral Section Meeting, Lawrence, KS

Date: 3/13-3/15/88

On March 14, 1988, I attended a session at GSA Southcentral entitled "Geohydrology and Waste Isolation". In addition to listening to three talks concerning Deaf Smith County site hydrology, I presented a talk on applications of borehole geophysics to stratigraphic studies in evaporites (see attached abstract).

James Warner, HLTR

James Warner

ABSTRACT FORM FOR ALL GSA MEETINGS IN 1988

lete sections [1] through [7] below

[1] TYPE ABSTRACT within blue lines — they're absolute! Mail flat, reinforced.

№ 7738 [2]

APPLICATIONS OF BOREHOLE GEOPHYSICS TO THE SITE CHARACTERIZATION OF A HIGH-LEVEL RADIOACTIVE WASTE REPOSITORY IN BEDDED SALT OF THE PERMIAN SAN ANDRES FORMATION, PALO DURO BASIN, DEAF SMITH COUNTY, TEXAS

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Washington, D.C. 20555

The suitability of a potential high-level radioactive waste repository in bedded salt of the Permian San Andres Formation is presently being evaluated by the Department of Energy. Information from geophysical logs from wells in the vicinity of the site can be used to produce reliable stratigraphic correlations and address geotechnical concerns associated with waste isolation.

The approximately 165 foot thick salt interval that has been targeted for disposal occurs within a cyclic succession of mudstone, limestone, dolomite, anhydrite, and halite. The variation of physical properties and corresponding geophysical log responses of lithologies in this sequence allow for detailed subsurface mapping. Standard gamma, density, neutron, acoustic, resistivity, and spontaneous potential logs from cored and noncored wells were used to document diagnostic geophysical log responses, generate lithologic logs, and correlate units within the San Andres and overlying formations. In addition, the geophysical logs were used to identify or exemplify previously identified zones of natural and drilling-induced salt dissolution, repository-level salt impurities, and potentially permeable intervals within and above the San Andres Formation.

The existence of impurities in the repository-level salt reduces the certainty of predicting the thermal/mechanical response of the host rock to future repository operations. Permeable zones are potentially problematic in terms of sealing the repository shafts and as pathways for the groundwater transport of released radionuclides.

The results of this study demonstrate that geophysical logs from cored and noncored wells in the vicinity of the Deaf Smith County site can be used to accurately define the stratigraphy and identify areas that require further investigation during site characterization.

[2] CATEGORIZE ALL ABSTRACTS —Check ONE discipline below in which reviewers would be best qualified to evaluate this abstract.

- ☐ 1 archaeological geology
- ☐ 2 coal geology
- ☐ 3 economic geology
- ☐ 4 engineering geology
- ☐ 5 environmental geology
- ☐ 6 general geology
- ☐ 7 geochemistry
- ☐ 8 geology education
- ☐ 9 geomorphology
- ☒ 10 geophysics
- ☐ 11 geoscience information
- ☐ 12 glacial geology
- ☐ 13 history of geology
- ☐ 14 hydrogeology
- ☐ 15 marine geology
- ☐ 16 micropaleontology
- ☐ 17 mineralogy/crystallography
- ☐ 18 oceanography
- ☐ 19 paleontology/paleobotany
- ☐ 20 petroleum geology
- ☐ 21 petrology, experimental
- ☐ 22 petrology, igneous
- ☐ 23 petrology, metamorphic
- ☐ 24 petrology, sedimentary
- ☐ 25 planetary geology
- ☐ 26 Precambrian geology
- ☐ 27 Quaternary geology
- ☐ 28 remote sensing
- ☐ 29 sedimentology
- ☐ 30 stratigraphy
- ☐ 31 structural geology
- ☐ 32 tectonics
- ☐ 33 tectonics/geophysics
- ☐ 34 volcanology

[3] TYPES OF SESSIONS AVAILABLE

A. SPECIAL — INVITED ABSTRACT FOR A SYMPOSIUM.
☐ This abstract was **invited** for the symposium titled

_____

If you checked here, skip to item [4].

B. VOLUNTEERED ABSTRACTS
(1) SPECIAL—THEME SESSION, ANNUAL MEETING ONLY. I would like this abstract considered for oral presentation at the following Theme Session for the Annual Meeting, Denver, 1988.
- ☐ 1 Diagenesis of lacustrine rocks
- ☐ 2 Geology & Public Policy for the 21st Century
- ☐ 3 Geophysical patterns in North America
- ☐ 4 Global aspects of sedimentary geology
- ☐ 5 Organic compounds in ground water
- ☐ 6 Paleontologic constraints on accreted terranes
- ☐ 7 Physics and chemistry of mylonites
- ☐ 8 Secular variation in the sedimentary record

If not accepted for the Theme Session, do you want it considered for a regular technical session?
☐ Yes ☐ No

(2) ☐ ORAL SESSION ☒ POSTER SESSION ☐ EITHER TYPE
☐ I'll accept a change of session type (ORAL↔POSTER) if necessary;
☒ Withdraw my abstract rather than change session type.

[4] % OF THIS PAPER PREVIOUSLY PRESENTED 0%
Where and when _____

[5] CAN YOU BE A SESSION CHAIRMAN? ☐ Yes
Topic _____
Your name _____
Telephone (late June/early July) _____

[6] SPEAKER'S IDENTITY AND MAILING ADDRESS
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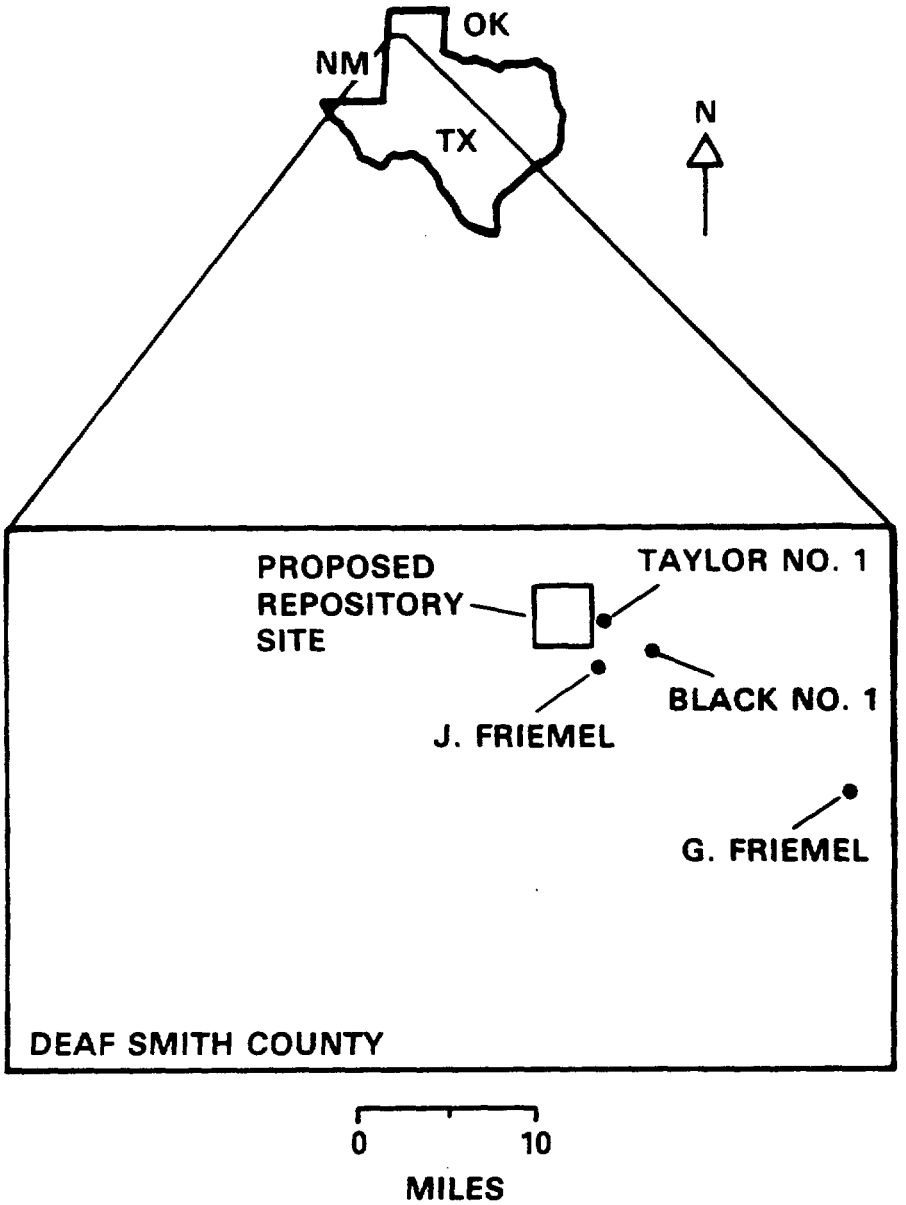
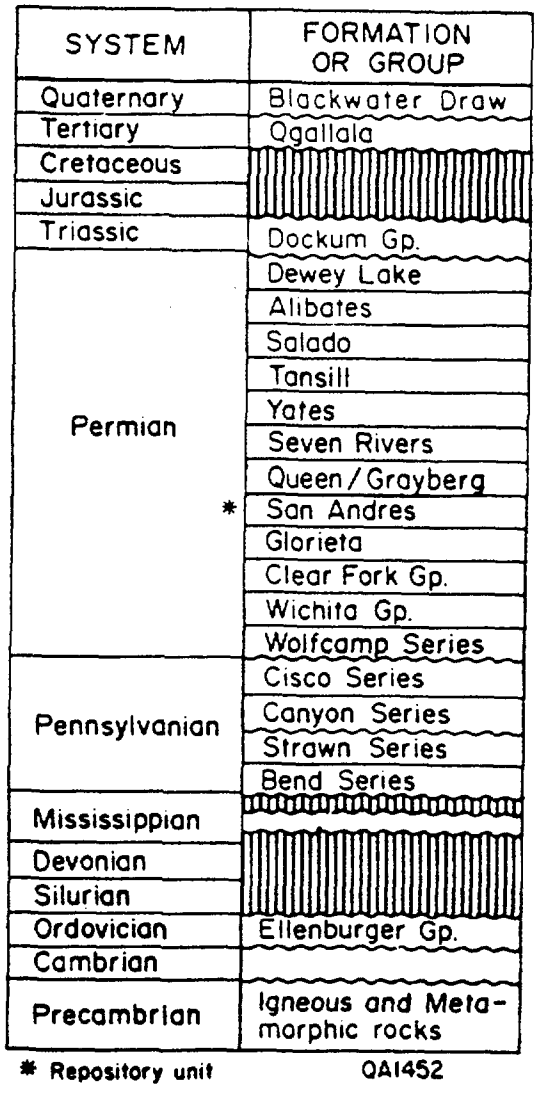
Dates we can reach you: any

[7] SEND ORIGINAL + 5 COPIES OF ABSTRACT TO APPROPRIATE ADDRESS SHOWN ON INSTRUCTION SHEET AND ON BACK OF THIS FORM. ALL ABSTRACTS MUST ARRIVE ON OR BEFORE DEADLINE SHOWN FOR EACH MEETING.

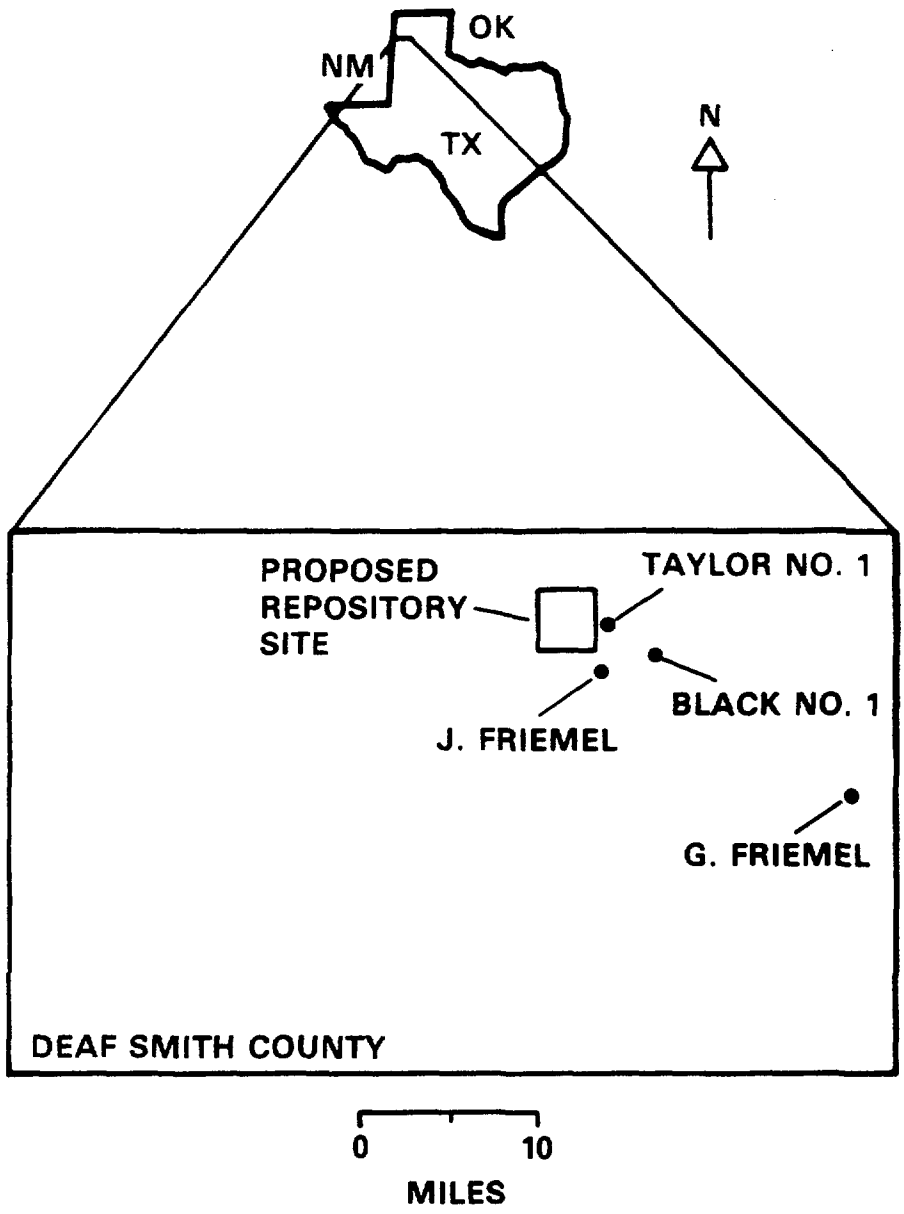
Applications of Borehole Geophysics to the Site Characterization of a High-Level Radioactive Waste Repository in Bedded Salt of the Permian San Andres Formation, Palo Duro Basin, Deaf Smith County, Texas. Jim Warner, USNRC.



Map of Deaf Smith County, Texas, showing the locations of the proposed high-level radioactive waste repository site and the wells used in this study.



Stratigraphic column for eastern Deaf Smith County, Texas (after Gustavson and Budnik, 1985).



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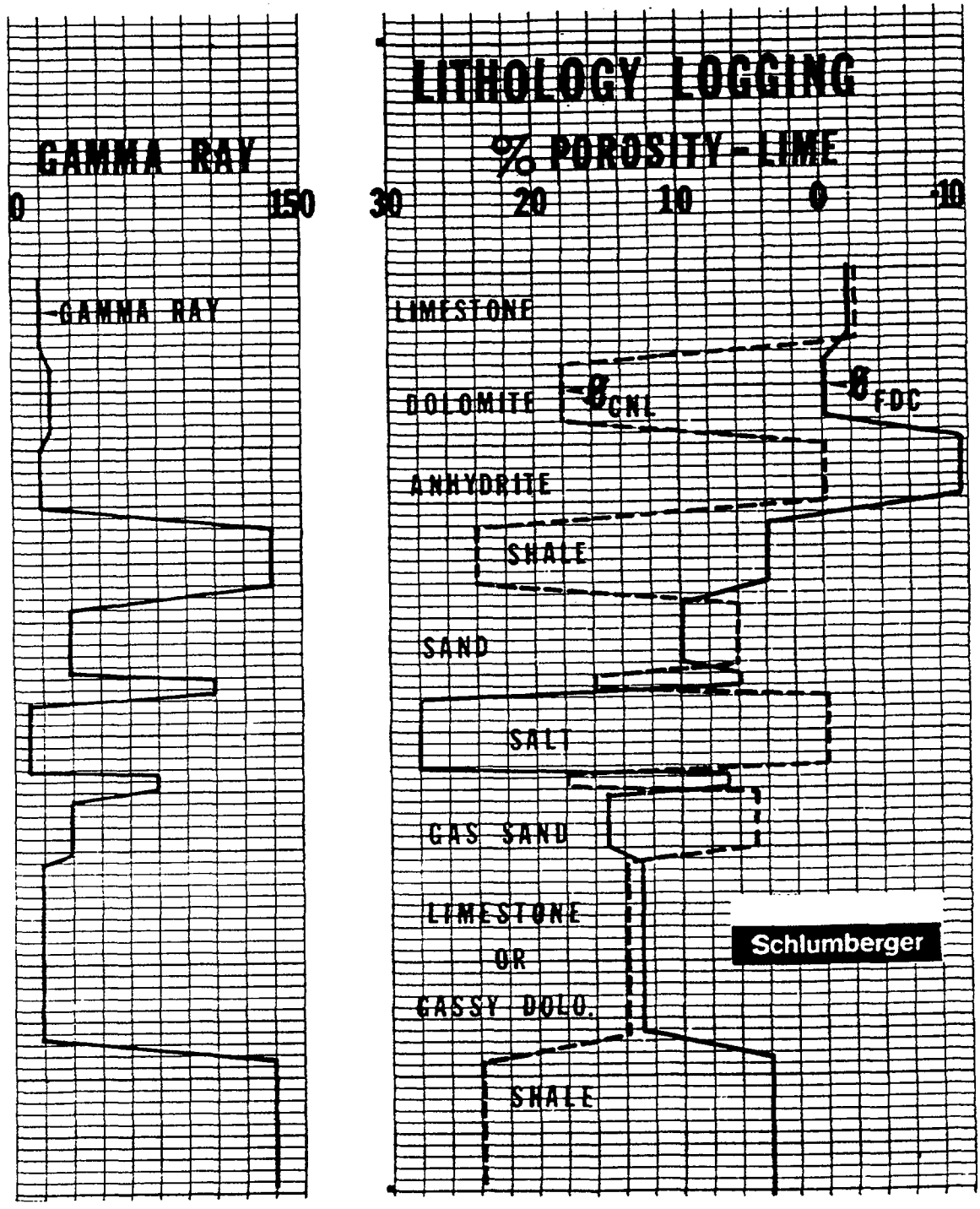
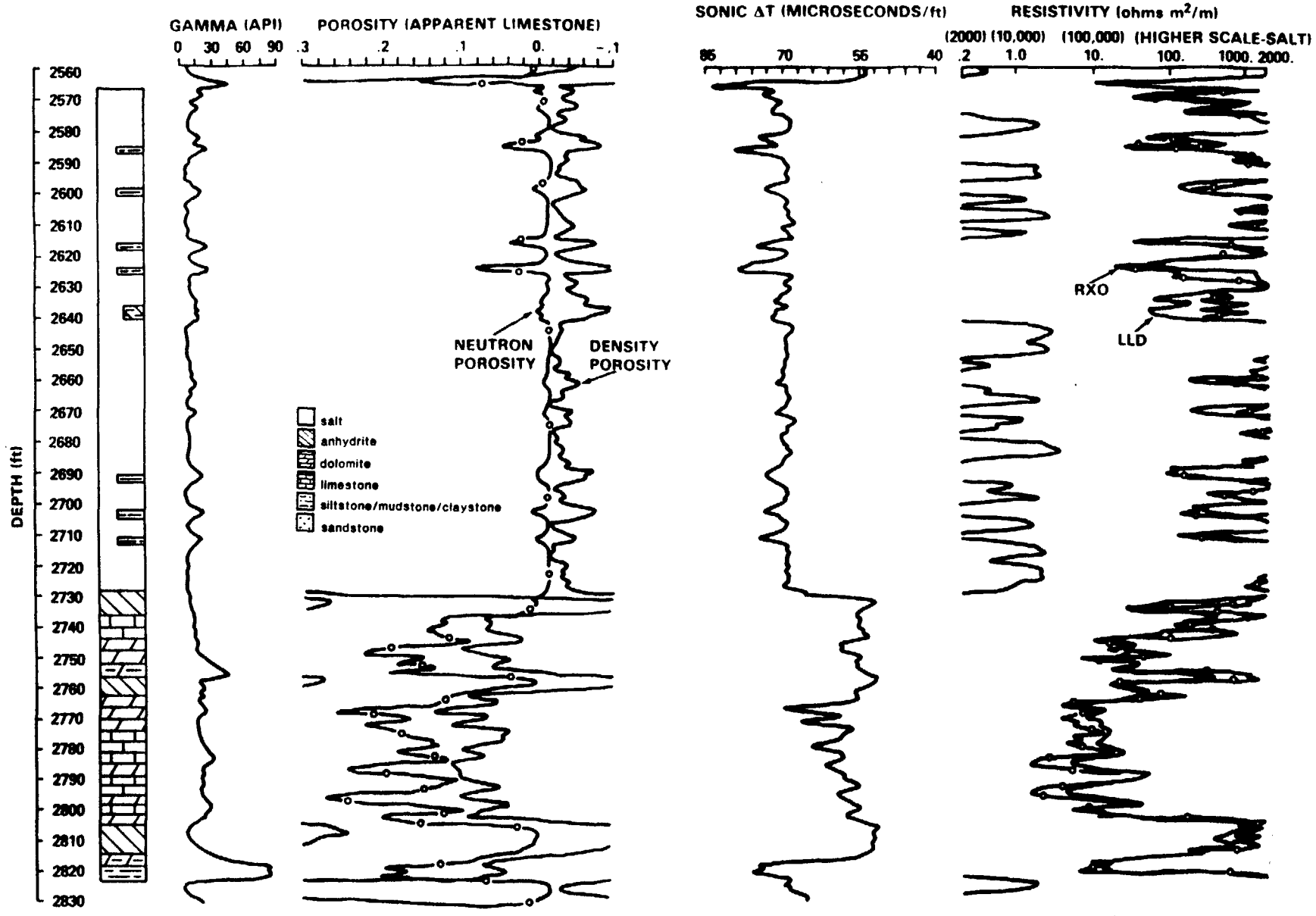
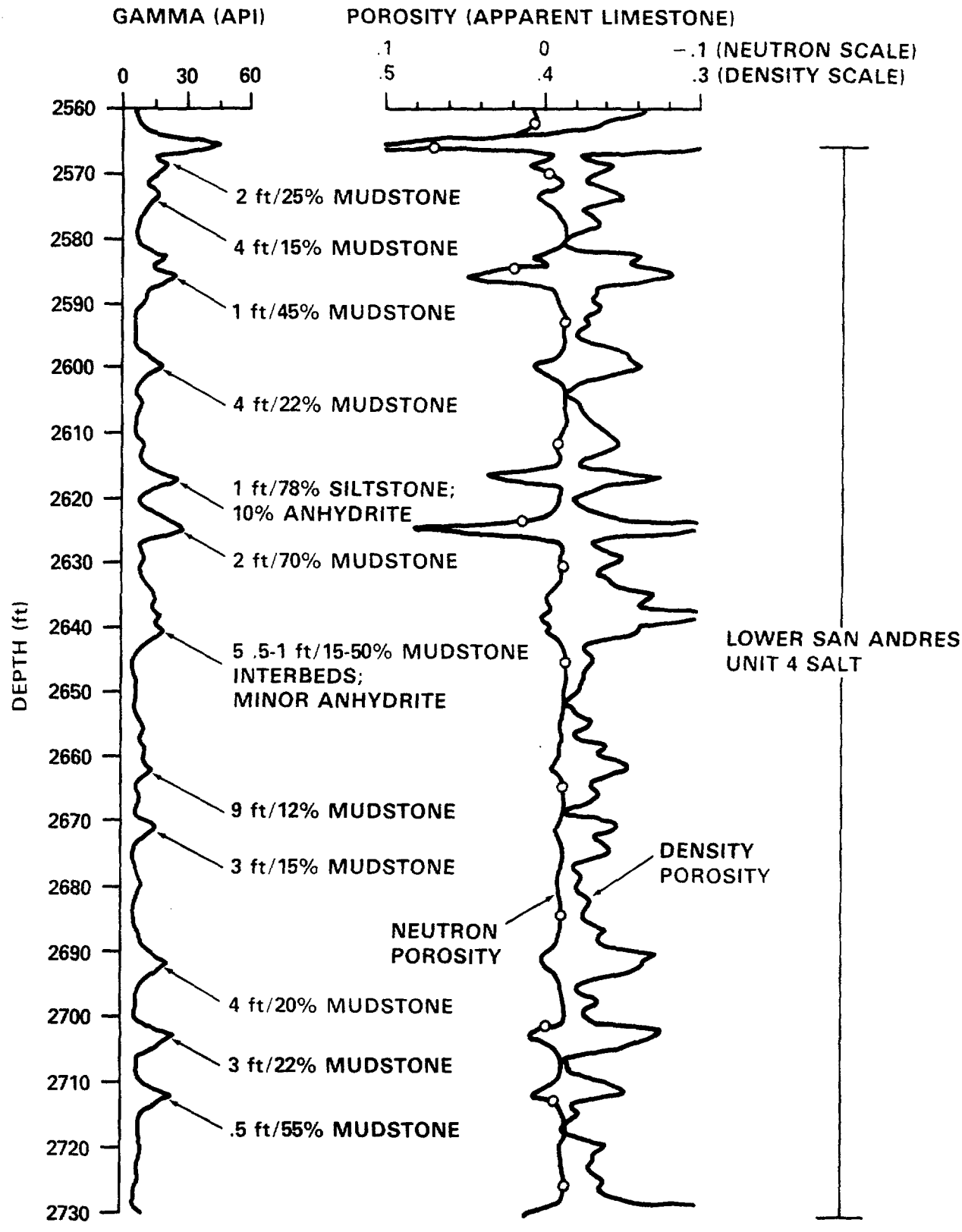


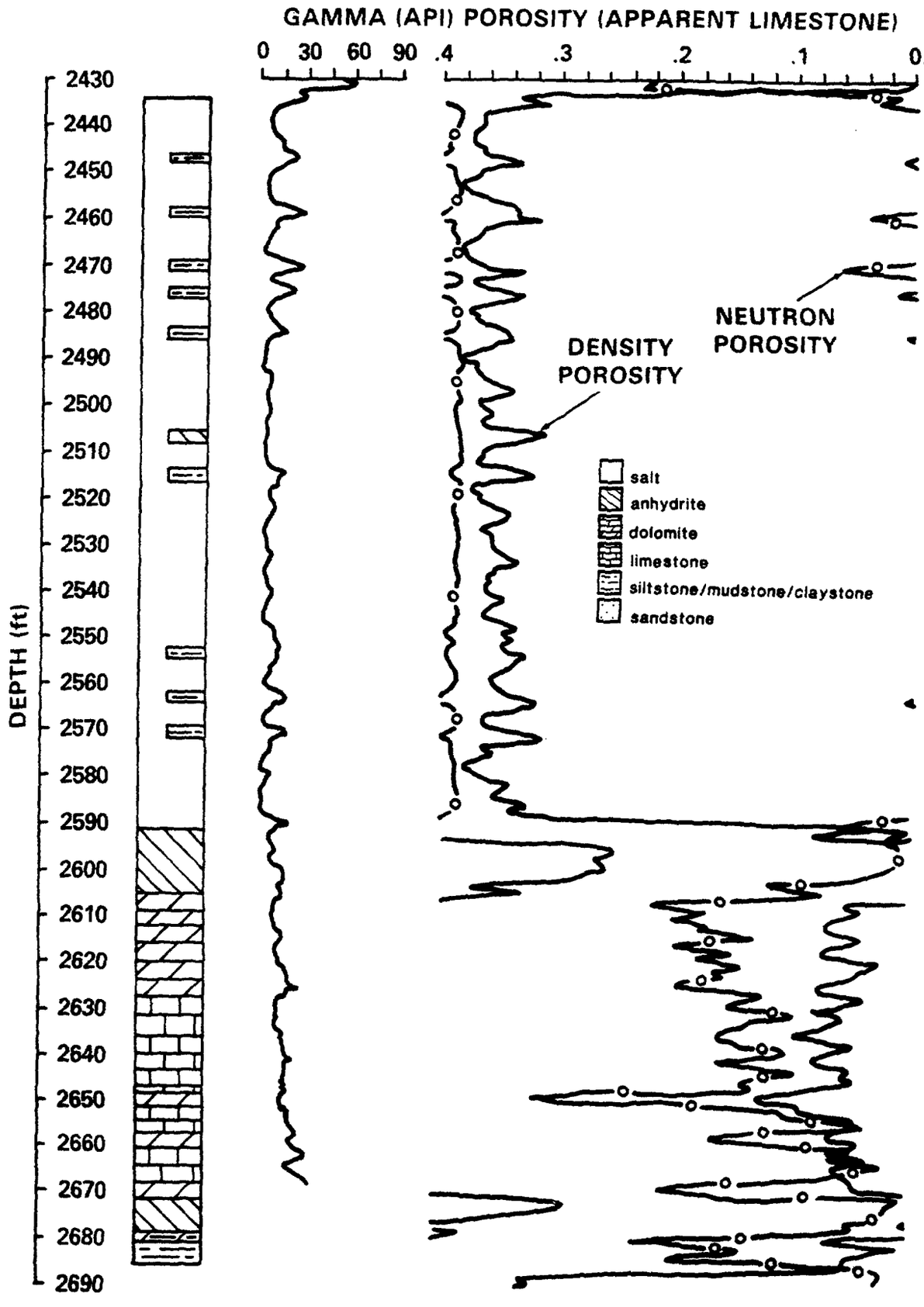
Characteristic Gamma-Density-Neutron log responses to various lithologies (from Asquith, 1982).



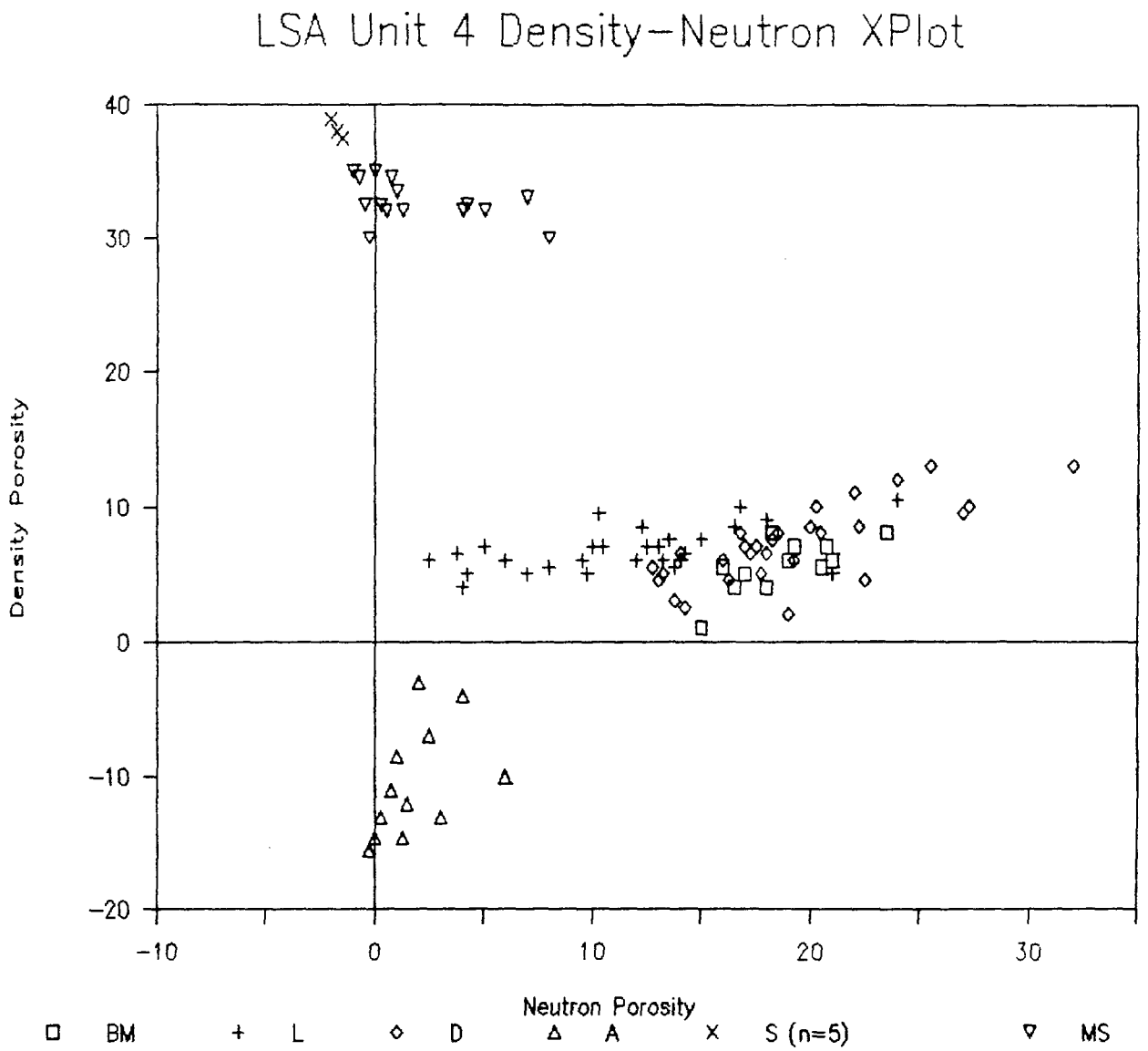
Gamma, Neutron, Density, Sonic, and Resistivity log responses to lithologies in the lower San Andres Unit 4 in the J. Friemel well.



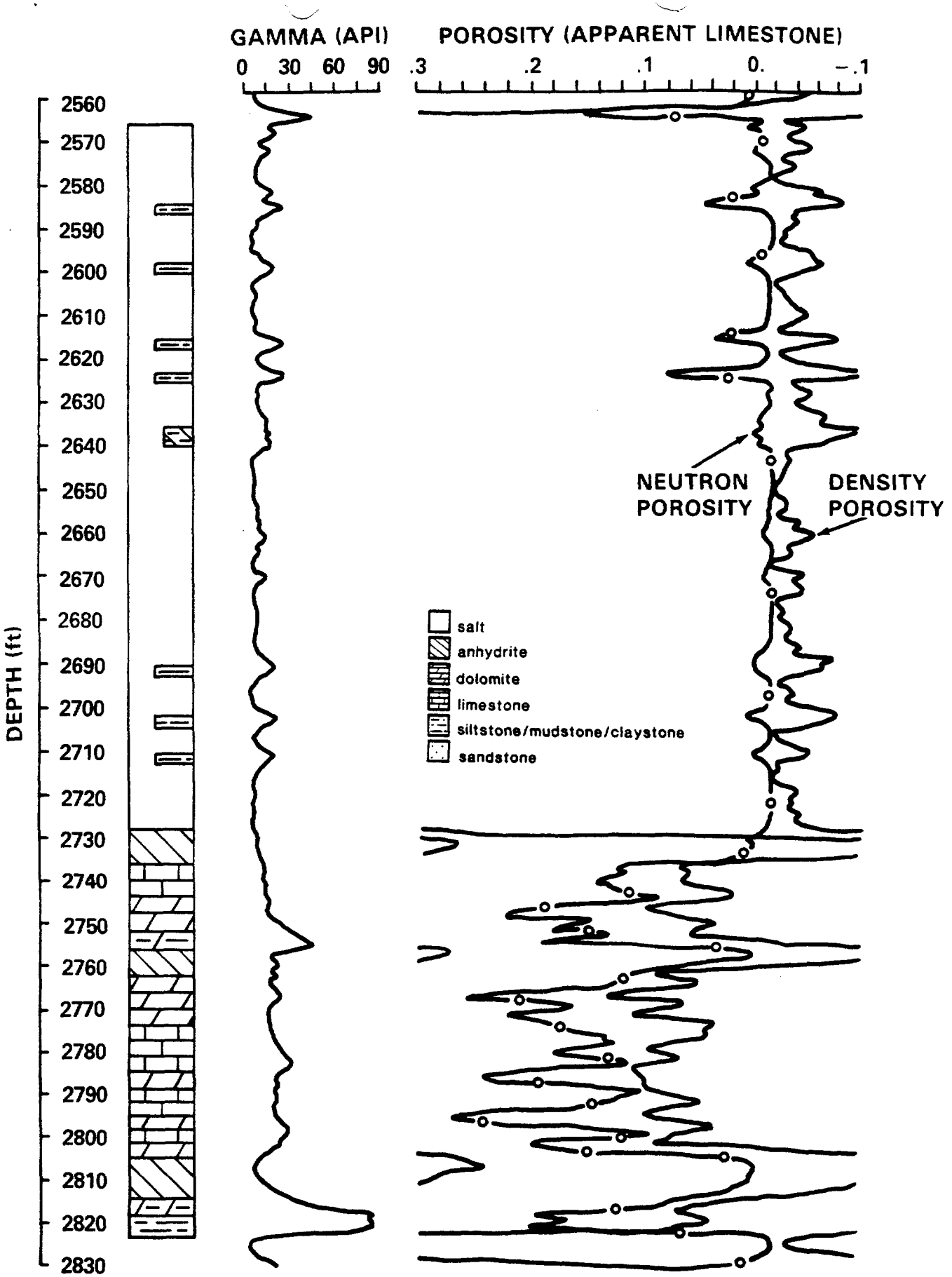
Gamma, Neutron, and Density log responses to primary mudstone, siltstone, and anhydrite interbeds within the lower San Andres Unit 4 salt in the J. Friemel well. The interbed thickness/% nonsalt lithology ratios are from the lithology log of Hovorka (1986).



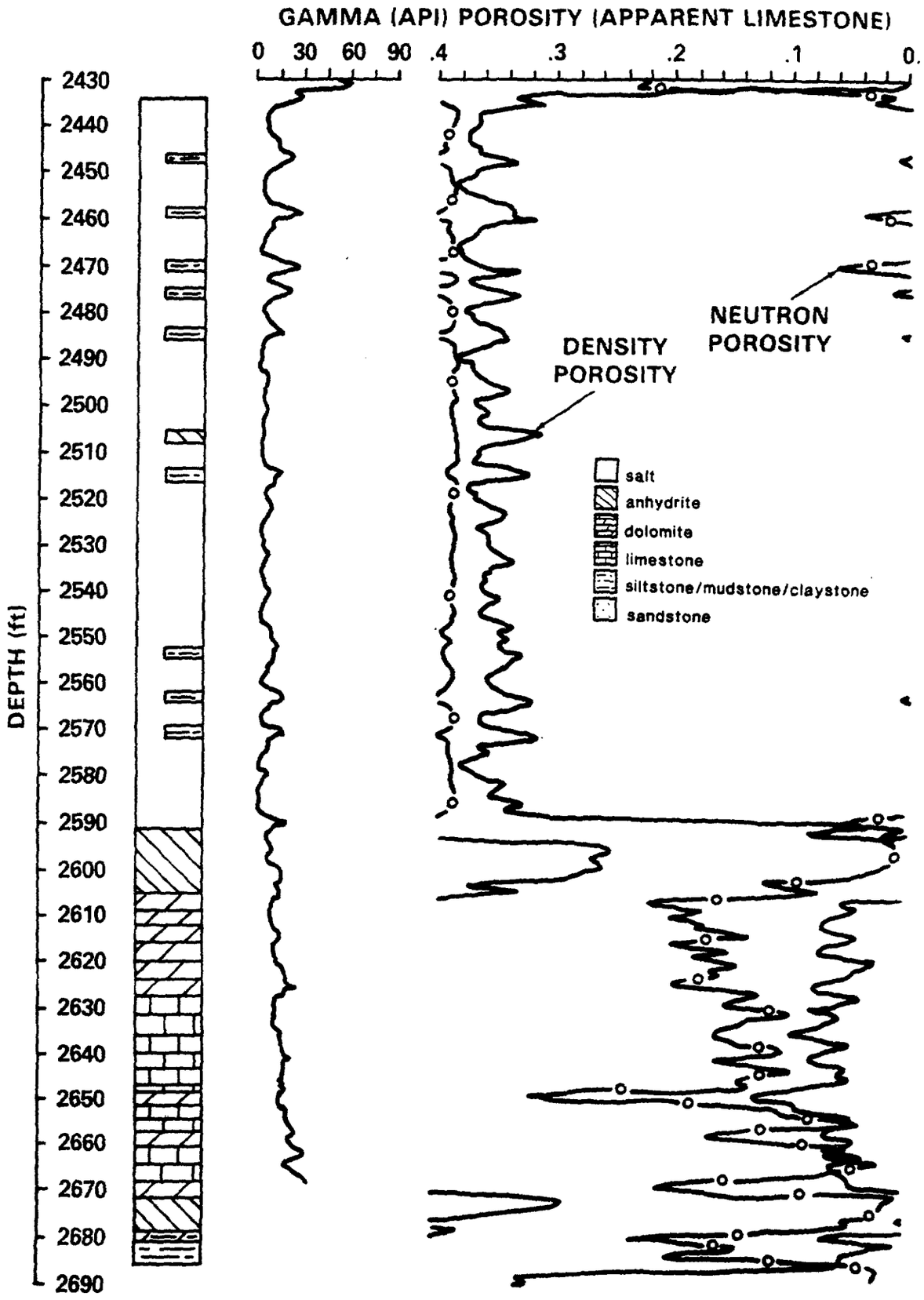
Lower San Andres Unit 4 - G. Friemel



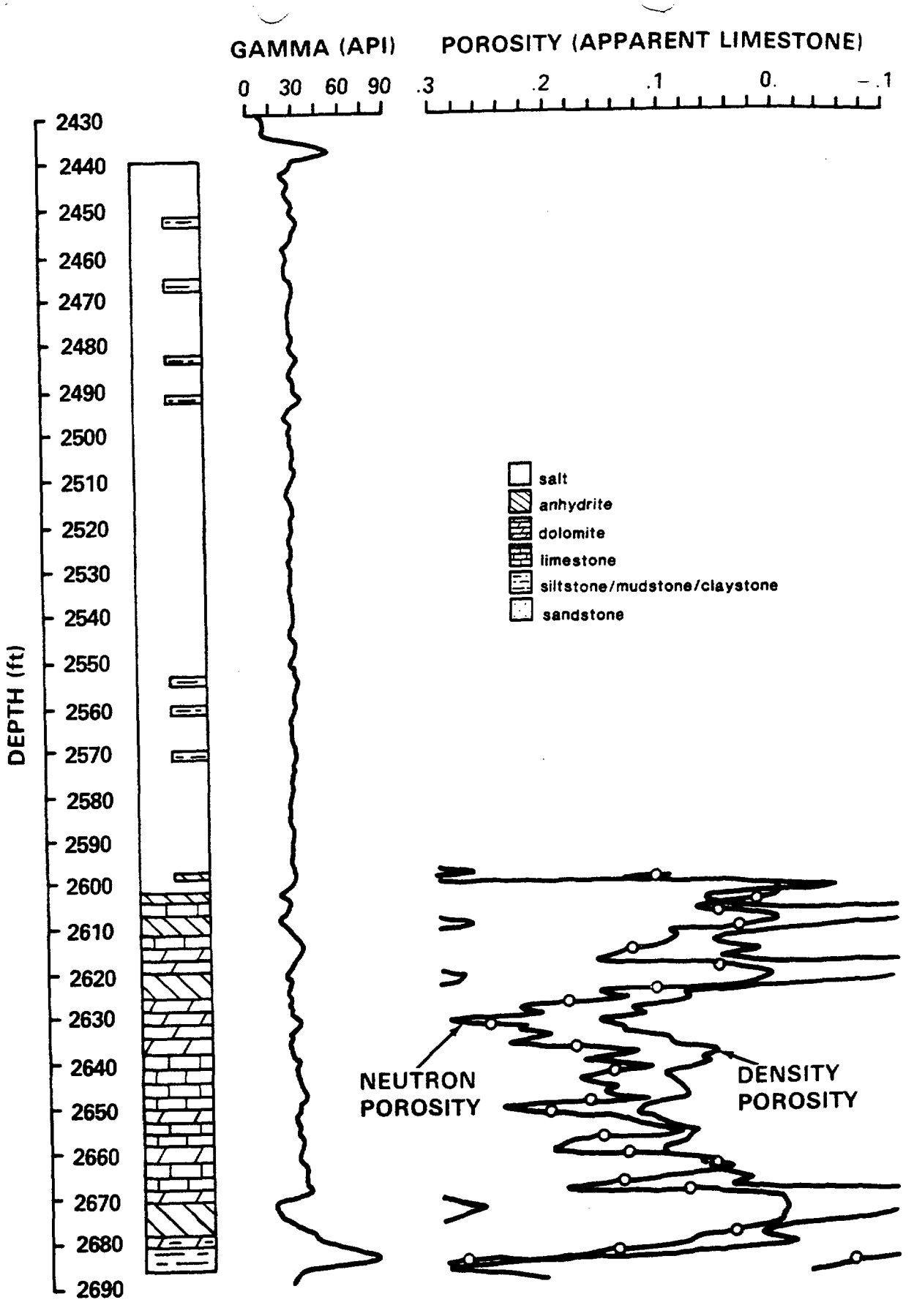
Density-Neutron crossplot of lower San Andres #4 basal mudstone (BM), limestone (L), dolomite (D), anhydrite (A), salt (S), and mudstone (MS) encountered in the J. Friemel and G. Friemel wells.



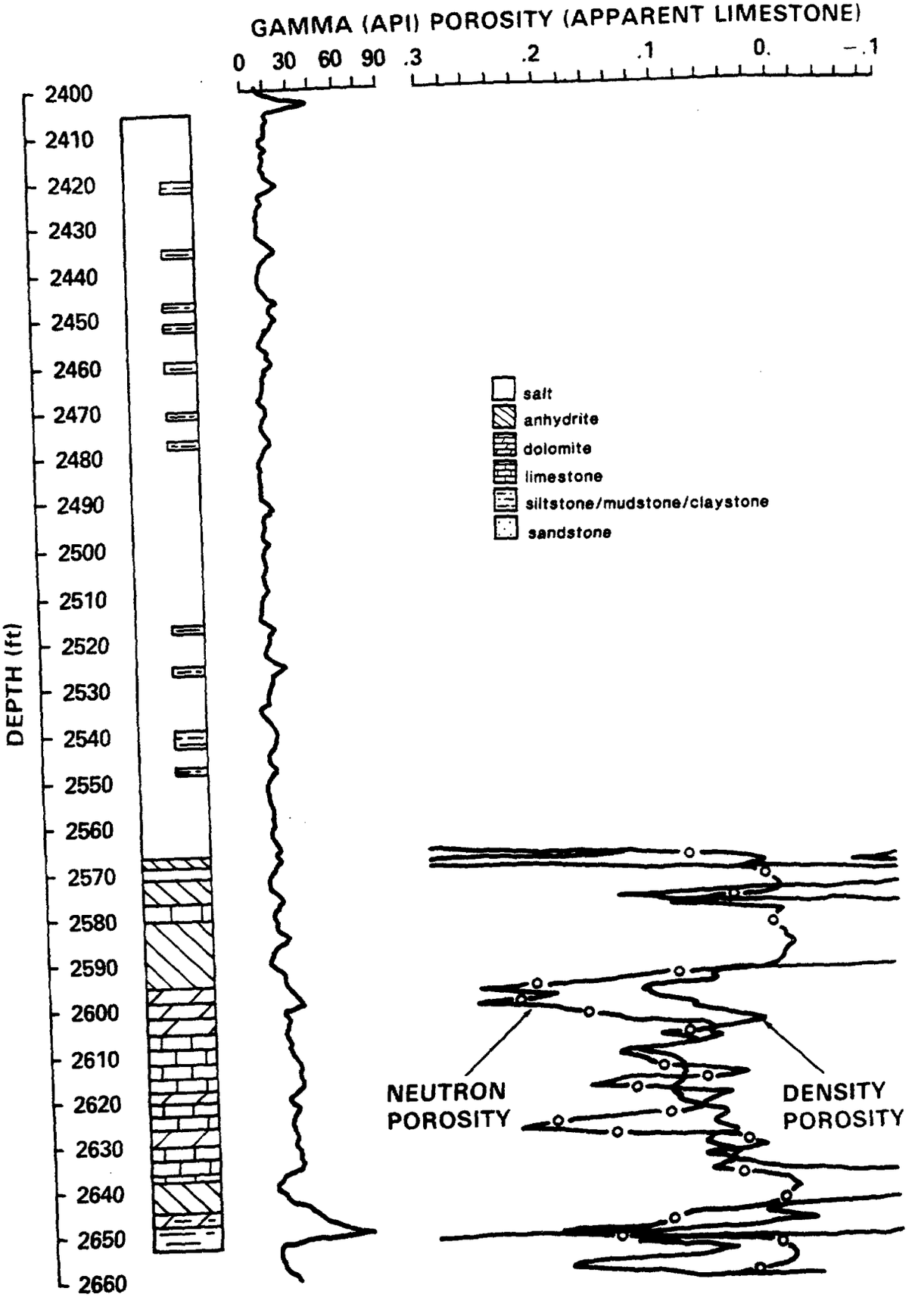
Lower San Andres Unit 4 – J. Friemel



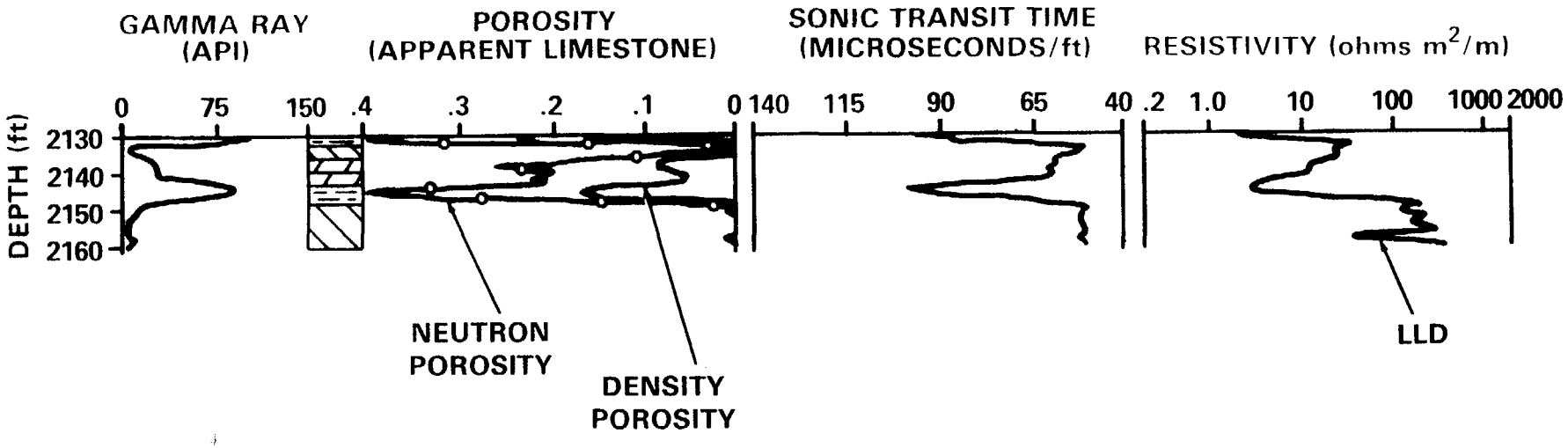
Lower San Andres Unit 4 – G. Friemel



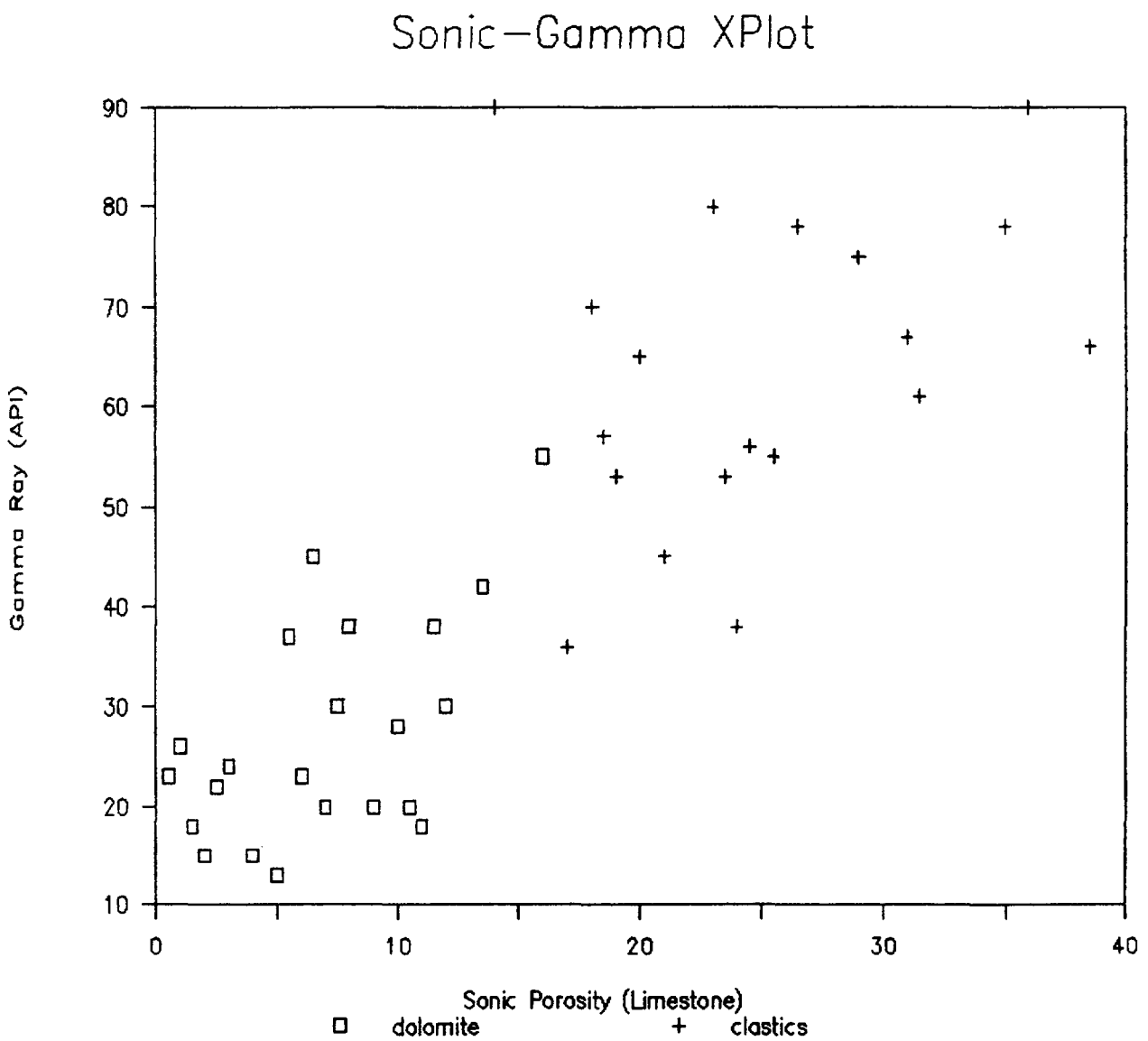
Lower San Andres Unit 4 - Black



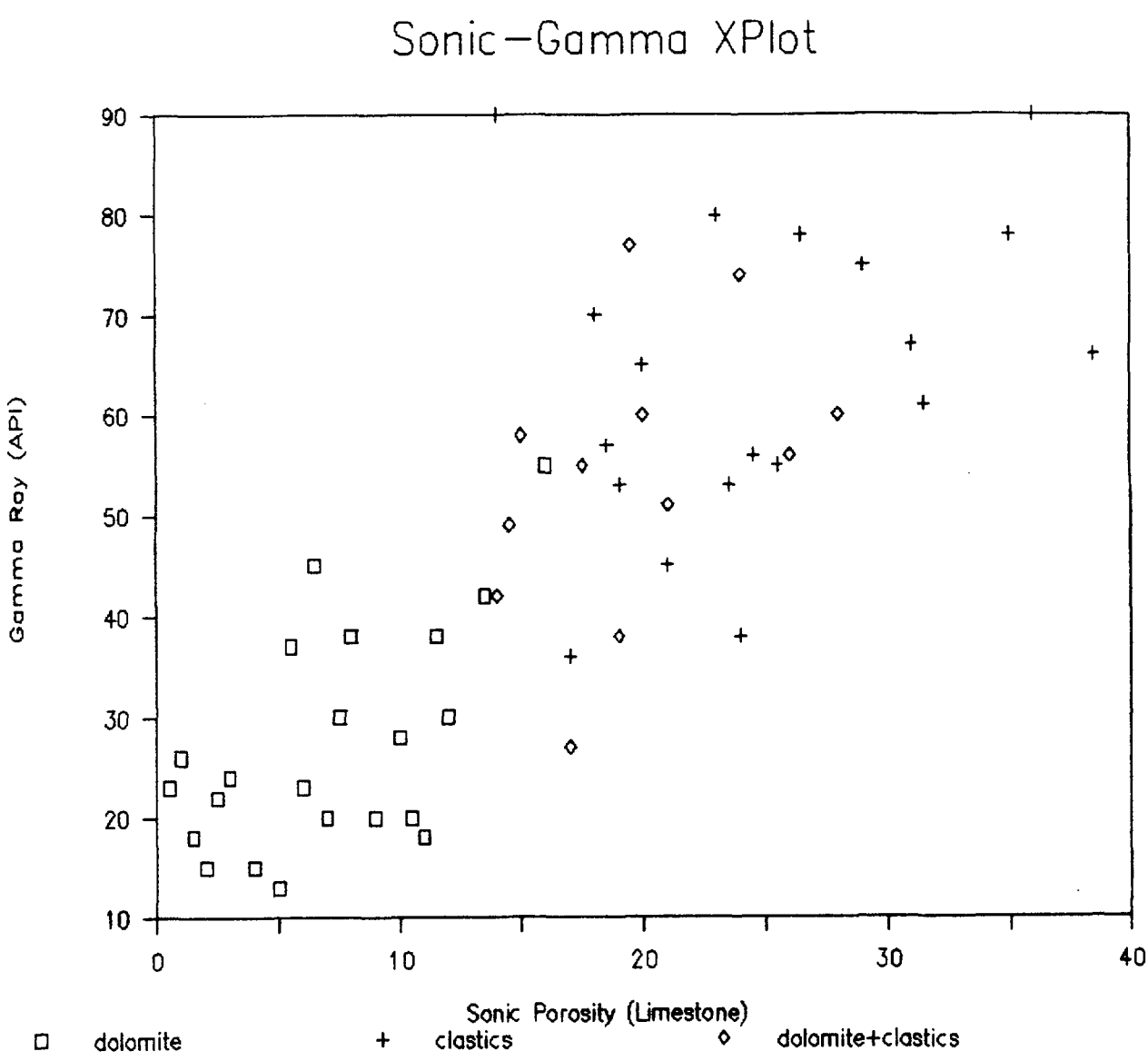
Lower San Andres Unit 4 – Taylor



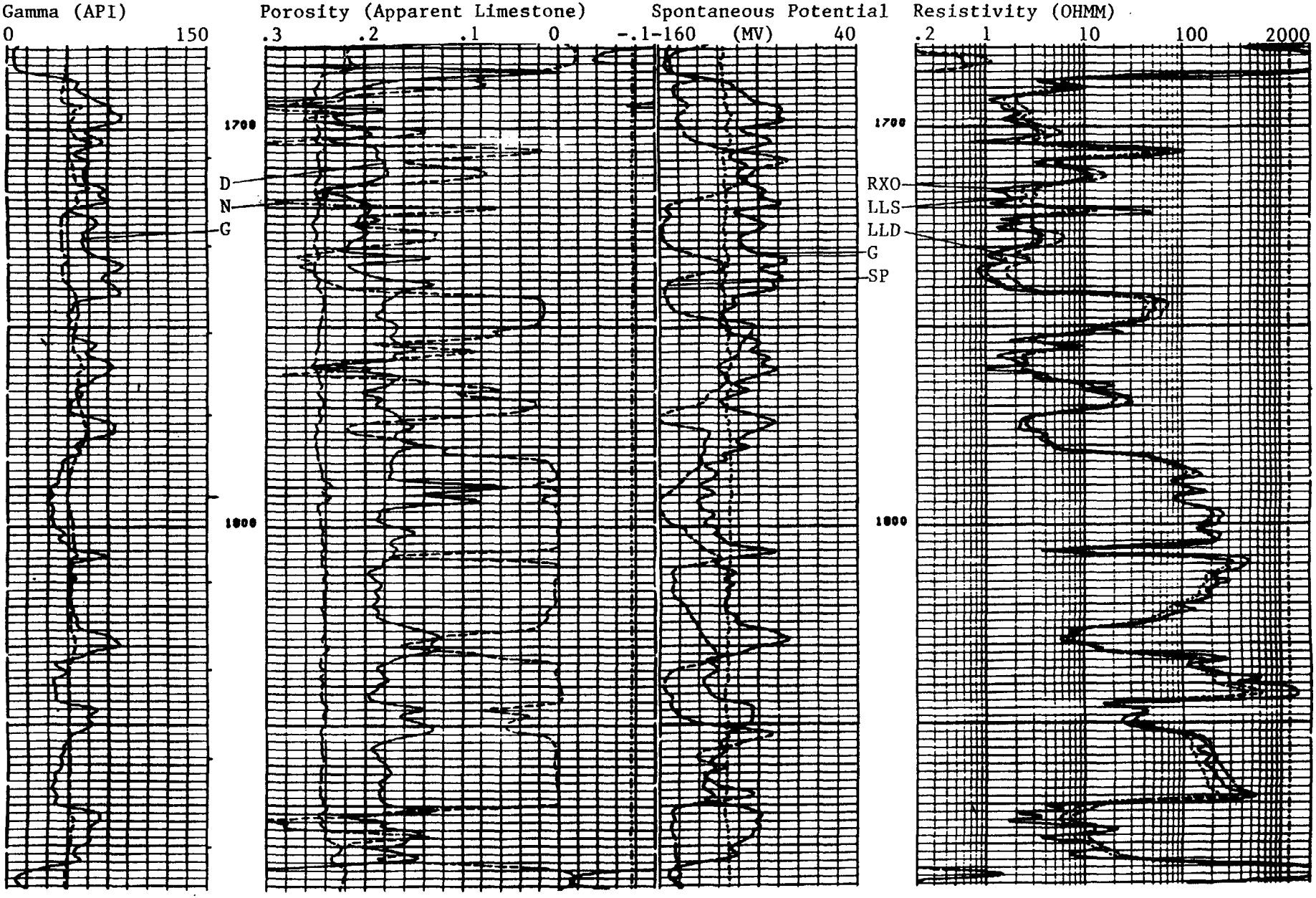
Gamma, Neutron, Density, Sonic, and Resistivity log responses to lithologies in the San Andres Formation in the G. Friemel well (lithology log modified from Hovorka, 1986).



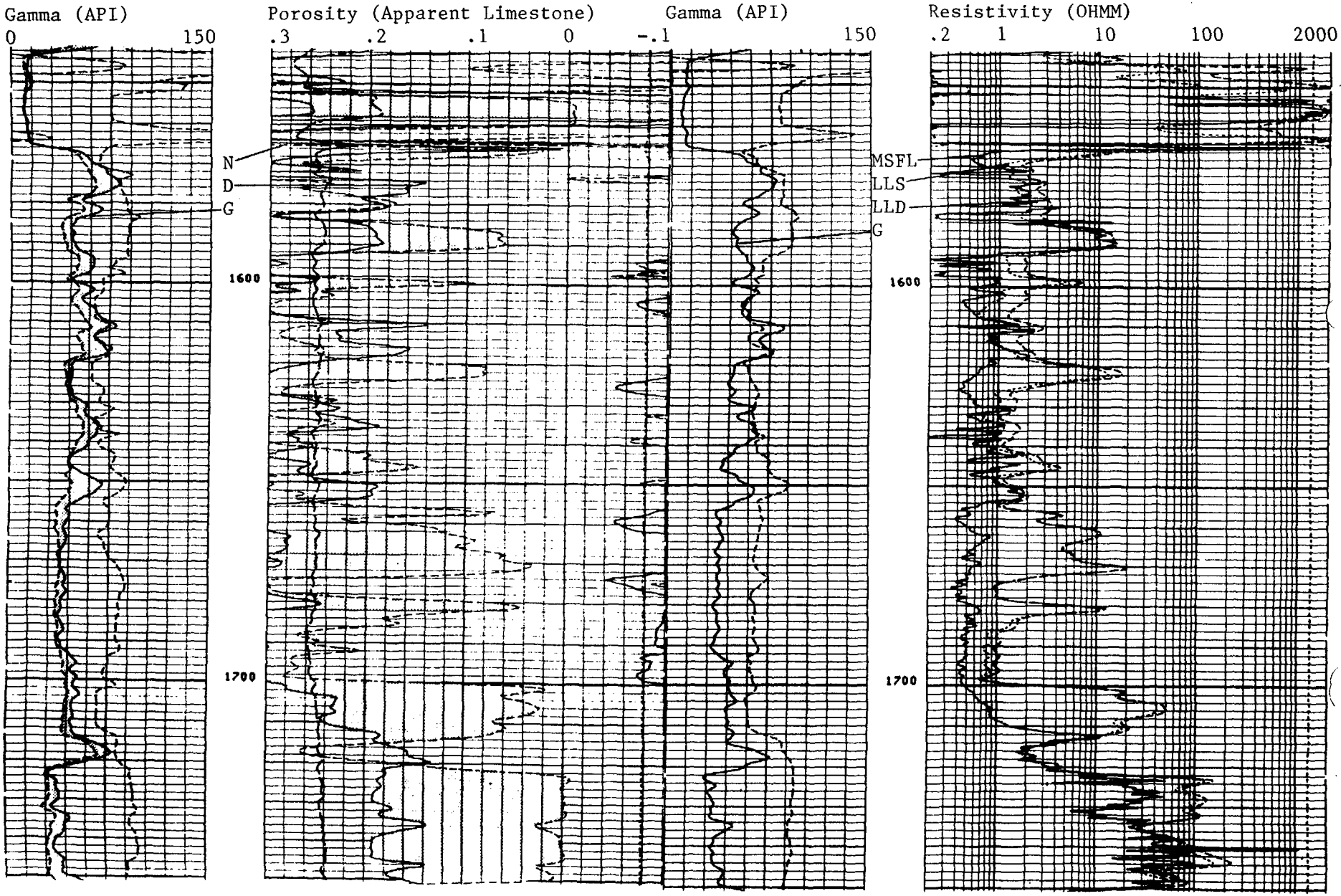
Sonic-Gamma crossplot of San Andres Formation dolomite and clastic (claystone, mudstone, siltstone) lithologies in the J. Friemel and G. Friemel wells.



Sonic-Gamma crossplot of San Andres Formation dolomite, clastic (claystone, mudstone, siltstone), and dolomite+clastic lithologies in the J. Friemel and G. Friemel wells.



Gamma (G)-Density (D)-Neutron (N)-Spontaneous Potential (SP)-Resistivity (RXO, LLS, LLD) log responses to the Queen-Grayburg Formation sandstone/siltstone/shale sequence in the J. Friemel #1 well.



Gamma (G)-Density (D)-Neutron (N)-Resistivity (MSFL, LLS, LLD) log responses to the Queen-Grayburg Formation sandstone/siltstone/shale sequence in the Black #1 well.

REFERENCES

Asquith, G., 1982. Basic Well Log Analysis For Geologists, American Association of Petroleum Geologists, 216 p..

Fracasso, M.A. and Hovorka, S.D., 1984. Cyclicity in the Middle Permian San Andres Formation, Palo Duro Basin, Texas Panhandle, Bureau of Economic Geology, The University of Texas at Austin, OF-WTWI-1984-21, 45 p..

Gustavson, T.C. and Budnik, R.T., 1985. Structural Influences on Geomorphic Processes and Physiographic Features, Texas Panhandle: Technical Issues in Siting a Nuclear-Waste Repository, Geology, Vol. 13, p. 173-176, March, 1985.

Hilchie, D.W., 1978. Applied Openhole Log Interpretation, Douglas W. Hilchie, Inc..

Hovorka, S.D., Luneau, B.A., and Thomas, S., 1985. Stratigraphy of Bedded Halite in the Permian San Andres Formation, Units 4 and 5, Palo Duro Basin, Texas, Bureau of Economic Geology, The University of Texas at Austin, OF-WTWI-1985-9, 67 p..

Hovorka, S.D., 1986. Lithologic Logs from the Palo Duro Basin: Ten National Waste Terminal Storage Project Wells, Bureau of Economic Geology, The University of Texas at Austin, OF-WTWI-1986-2.

Keys, W.S. and McCary, L.M., 1971. Application Of Borehole Geophysics To Water-Resources Investigations, USGS-TWRI-Book 2-Chapter E1, 126 p..

Schlumberger, 1972. Log Interpretation: Volume I-Principles, 113 p..

Schlumberger, 1972. Log Interpretation Charts, 92 p..

Stone & Webster Engineering Corporation, 1984a. Well Completion Report-J. Friemel No. 1 (PD-9) Well, Palo Duro Basin, Texas: Unanalyzed Data, BMI/SRP-5011.

Stone & Webster Engineering Corporation, 1984b. Well Completion Report-G. Friemel No. 1 (PD-5) Well, Palo Duro Basin, Texas, Unanalyzed Data, BMI/SRP-5003.

U.S. Department of Energy, 1986. Environmental Assessment-Deaf Smith County Site, Texas, DOE/RW-0069, Vol. 1 of 3.