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Amoco S Pointed Mountain (D-1) L-68-60-20-123-45
Northwest Territories

Report on
Sampling and Examination of Selective Rock Cuttings
In the interval 1490m and 2890m

Reference: National Energy Board File 9120-A000-6-1

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Introduction

Background

Cuttings were sampled from the Amoco S Pointed Mountain L-68-60-20-123-45 well. Amoco's Pointed Mountain lease-well number is D-1. The L-68 well was spudded 25 March 1982 and the rig was released from contract on 4 November of the same year. The well was licensed as a Pointed Mountain development well to extend the Pointed Mountain Middle Devonian gas pool south of the Pan Am Pointed Mountain G-62-60-30-123-45 producing gas well (since abandoned).

The Nahanni Formation in L-68 was reached at a depth of 4139m KB (TVD 4079m). The well reached total depth at 4200m (TVD 4140m). The well was originally licensed to a depth of 4010m but this had to be revised when the Nahanni Formation came in deeper than anticipated. The top of the Nahanni came in below the elevation of the Pointed Mountain Nahanni gas/water contact. The leading edge of the Nahanni, riding on the hanging wall of the Pointed Mountain thrust fault that contains the Pointed Mountain Nahanni gas pool, is located west of the L-68 bottom hole. The L-68 well was plugged and abandoned.

At L-68, an anomalous natural gas-charged geologic section was opened in the interval between the base of the Mississippian Mattson Formation at 1453m (surface casing shoe at 1424m) and intermediate casing that was set prematurely at 3297m because of the problems presented by natural gas flows entering the bore hole. The well was drilled through the Flett-Prophet-Besa River interval under balanced so that permeable zones flowed natural gas into the well bore and the gas was flared at the surface.

Purpose of the Study

The purpose of this study is to investigate the rock fabrics and rock textures in the sampled intervals. The nature of the porosity, micro-porosity, permeability, micro-permeability and other rock and reservoir properties will be investigated. These parameters have allowed the natural gas storage and the natural gas flows that were measured and reported in the L-68 well file [the file can be accessed in the National Energy Board Frontier Data Room]. The study results give a better understanding of the gas-charged Flett-Besa River reservoir rock.

Sampling

Sampling Procedures & Techniques

The bagged bulk unwashed well cuttings collected from the L-68 well were sampled on November 26, 2002 at the Core and Sample Repository Geological Survey of

Canada in Calgary. Sampling was done by the author, under the direct supervision of the Head, Core and Sample Repository, Mr. Allan Scott.

Unwashed samples were selected from each bag that contained representative cuttings from a 5m interval in the L-68 well. This material was placed in a sample vial. Each sample vial was carefully pre-labeled with the well name and the sample interval that corresponded to the interval written on the bag label and a serial number from 1 through 30 was also indicated. The 5m intervals sampled and the sample serial numbers are listed in Table 3.

30 samples in 30 individual vials were removed from the Core and Sample Repository November 26, 2002. An inventory of the samples removed was recorded on the *Record of Examination and Loan* form obtained prior to commencement of sampling. This same form was returned to the Head, Core and Sample Repository at the conclusion of the study.

The 30 unwashed samples were moved to Canadian Forest's office in downtown Calgary and forwarded to AGAT Laboratories. At the AGAT facility, under the direction of Philip Haig, the samples were washed in a 10% KCl solution. A 10% KCl solution was used to prevent possible damage to the clays that may be present in the rock chips. The cleaned samples were then dried and passed through wire sieves of 10 (very coarse), 20 (coarse), 40 (medium) and 100 (fine) mesh screens. The cleaned samples were then transferred to, properly labeled by interval and mesh size, serial number sample vials for visual inspection.

Since it is suspected that hydrothermal chert microporosity may be present in the unwashed cuttings all the fine material was retained for testing. It may be possible that the chert in the formation may have shattered on impact with the drill bit and much of the cuttings that were collected may be fines. It is suspected that if this is the case that most of the fine material may not be present in the washed cuttings in the GSC vial sample set.

Testing and Analyses

The samples were then examined under the binocular microscope. Individual chips were select from certain intervals for various tests and analyses. These tests and analyses included:

(i) Thin section preparation and petrographic image analyses.

A portion of the washed coarse sample numbers 2, 5, 8, 11, 14, 17, 19, 23, 25, and 30 were chosen to cut 10 thin representative thin rock sections.

(ii) Scanning Electron microscopy (SEM).

A portion of the washed coarse sample numbers 2, 5, 8, 11, 14, 17, 19, 23, 24, 25, 29, and 30 were prepared, mounted and examined in the scanning

electron microscope. 10 of the samples corresponding to the sample numbers used to prepare the thin sections.

Additional testing was not preformed because the mineralogy and rock types were readily interpretable from the petrographic and SEM analyses. Also since porosity (in the form of microporosity) was evident from the SCM analyses in all 12 samples, the results did not need to be repeated on more samples.

Professional Qualifications

Selection of the sample intervals and the sampling were done by the author who is registered as a Professional Geologist in the Province of Alberta and holds a Masters degree in Earth Science (Petrography and Structural Geology) from the University of Manitoba. He is an employee of Canadian Forest Oil Ltd. with more than 30 years experience.

Philip Haig, B.Sc., is the manager, geological services with AGAT Laboratories in Calgary and is registered as a Professional Geologist in the Province of Alberta. Mr. Haig was contracted to do the detailed analytical work.

Interpretation of Results

A report titled *A petrographic study of twelve drill cutting samples from the Mississippian at the Amoco S. Pointed Mountain (D-1) L-68-60-20-123-45 location* by Philip Haig of AGAT Laboratories is attached. It gives a very detailed interpretation of the results of testing and analyses.

Implications for future work

The results of this study will be used to predict the economic potential of the Upper Devonian-Mississippian gas reservoir at L-68. If economics are positive, the study results along with seismic interpretation will be used to design an optimum drilling and completion program for a well proposed as S. Pointed Mountain L-68A-60-20-123-45. The L-68A well would twin (or whipstock a slanted hole using part of the existing well bore) the L-68 well in the Mattson – Flett - Besa River section. An agreement to acquire the natural gas rights is pending.