GEOCHEMISTRY OF BASINS ON THE ATLANTIC CONTINENTAL MARGINS OF NORTH WEST EUROPE

AREA III

PORCUPINE BASIN (IRELAND)

GEOMARK
RESEARCH, INC.

PROSPECTUS

INTRODUCTION

GeoMark Research, Inc. has completed a review of aspects of petroleum systems existing in the Porcupine Basin. The project area is defined by the Porcupine wells that have encountered shows, since most of the test samples are included in this study. Figure 1 is an outline map of the general area of interest in the project.

The Porcupine Basin is a focus of exploration interest because of its location within the chain of failed Jurassic rift basins which, prior to the onset of Atlantic drift, extended from Norway Newfoundland (Masson and Miles, 1986). Drilling in the Porcupine Basin began in 1977 and twenty five wells were completed before exploration was suspended in 1988. Though shows were found throughout the drilled section, there were no commercial discoveries.

OBJECTIVES

GeoMark has also completed a major study of the geochemistry, thermal evolution and hydrocarbon migration history of the West of Shetlands basins (Illich et. al., 1994 and 1995). Our results confirm the widely held view that success with the Tertiary play in the Porcupine Basin will require unraveling and understanding the migration pathways between the Jurassic kitchens and the Tertiary sands. Whilst we have found no analogues of the mid-Tertiary created pathways which are so prominent in parts of the Faeroe Basin (Earl et. at., 1989), we are encouraged by the direct evidence that already exists indicating hydrocarbons have reached the Tertiary section despite the lack of obvious faulting above the base Cretaceous unconformity. Firstly, there are oil shows in the Tertiary and the underlying Cretaceous chalks. Secondly, thermogenic has been sampled from present day, deepwater, biochemical mounds (Hovland and Croker, 1994).

The indirect evidence for the probability of migration pathways is also encouraging. White et. al. (1992) and Hall and White (1994) provide evidence for a syn-depocentre phase of minor extension, whilst apatite fission track results show synchronous hot fluid movement (McCulloch, 1993). Segments of the basin margin fault set remained active into the Tertiary (Croker and Klemperer, 1989) and the regional geology would permit transform fault swarms of the type now evident from gravity mapping in the Faeroe Basin region. Finally experience from the North Sea shows that conventional migration pathways into the Tertiary reservoirs are commonly absent. Fields with this characteristic are considered to have been force charged by rupture of overpressure cells within Humber Group kitchens (Holm, 1995).

To further optimize ongoing studies of charging mechanisms, both for the Tertiary and older objectives, GeoMark Research has completed a petroleum systems study of the Porcupine Basin. The objective was to determine:

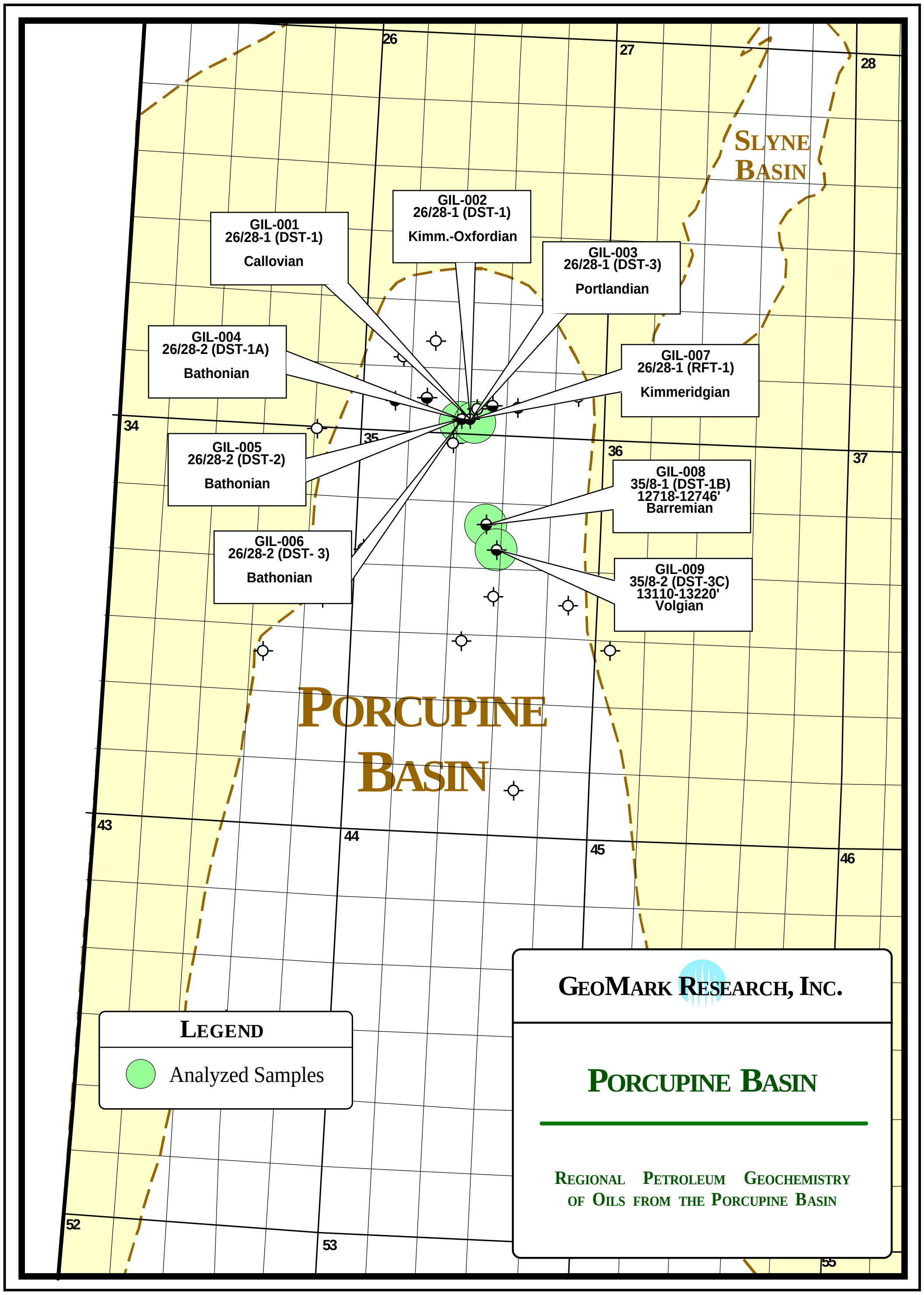

Figure 1. Location map showing samples analyzed for this study.

- The origin of the known oils and the timing of their formation and migration.
- The timing of generation of hydrocarbons from the middle and late Jurassic kitchens present below the Tertiary play area.
- Compare the oils with the Porcupine Basins to 31 oils of other Basins in the region to establish possible analogs.

Early Cretaceous source rocks have been described from the area (Croker and Shannon, 1987) and the play map, using Tate's base Cretaceous surface for control (Tate, 1993), indicates where source rocks of this age are most likely to reach their optimum development. Late Cretaceous and Paleocene aged source rocks could also be present in this area, part of which extends into the central region of the new Tertiary play. Liassic source rocks related to those described from the Slyne Trough may be locally preserved within the northern portion of the Porcupine Basin (Scotchman and Thomas, 1994). Source rocks of this age may also be preserved to the SSW and SSE immediately below the basin boundary faults. Permo-Carboniferous source rocks, present in eastern Canada, are also possible in these areas (Mossman, 1992).

ANALYTICAL PROGRAM

The following techniques were used on each of the oil samples:

- API Gravity
- % Sulfur
- Nickel/Vanadium concentration
- C15+ vs. <C15
- Deasphalting
- Liquid Chromatography (%Sat %Aro %NSO)
- Capillary GC of Whole Crude Oils
- Stable Carbon Isotopes for both Sat and Aro Hydrocarbon Fractions
- GC/MS of branched/cyclic fraction for Terpane/Sterane Distributions

PRESENTATION OF RESULTS

Results of the study are presented in both analytical and interpretive formats to insure that all findings are readily accessible to explorationists and research personnel. All of the analytical data is provided in hard copy and on magnetic media.

Analytical data is presented within **Data Volumes,** and include the following:

- physical property data
- liquid chromatographic data
- gas chromatographic results
- stable carbon isotope data
- GC/MS mass chromatograms.

A synthesis and interpretation of all information is presented in a comprehensive **Final Report**. The **Final Report** includes sections for:

- regional geology,
- inferred oil/source correlations,
- oil generation and migration,
- interpretation of oil characteristics,
- and differentiation of oil families/mixing by multivariate statistics.

PARTICIPATION

The complete study is available at a cost of US $15,500.00

TIMING

This project is complete and available for immediate delivery.

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APPENDIX A

Samples Analyzed for this Study

Sample ID	Country	Basin	Field	Well	Depth	Age
GIL001	Ireland	Porcupine	26	28-1; DST1	2328-2339.5 m	
GIL002	Ireland	Porcupine	26	28-1; DST2	2245-2268 m	
GIL003	Ireland	Porcupine	26	28-1; DST3	1960-1970'	
GIL004	Ireland	Porcupine	26	28-2; DST1A		
GIL005	Ireland	Porcupine	26	28-2; DST2		
GIL006	Ireland	Porcupine	26	28-2; DST3		
GIL007	Ireland	Porcupine	26	28-1; RFT1	2247m	
GIL008	Ireland	Porcupine	35	8-1; DST1B		
GIL009	Ireland	Porcupine	35	8-2; DST3C	13110-13220'	
NWE003	UK	East Shetland	Cormorant	211/26		
NWE004	UK	Central Graben	Argyll	30/24		
NWE005	UK	East Shetland	Hutton	211/27		
NWE011	UK	Central Graben		30/14-1; DST2	2947-2958m	Paleocene
NWE016	UK	Moray Firth	Ettrick	20/2-1; DST3A	3236-3246m	U.Jurassic
NWE017	UK	Moray Firth	Buchan	21/1-B1	2583-2978m	Devonian
NWE018	Norway	East Shetland	Snorre	34/7-6; DST2		M.Jurassic
NWE035	Norway	N. Viking Graben	Oseberg	30/6		M.Jurassic
NO010	Norway	S. Viking Graben	Lille Frigg	25/2-12	3692.2m	Eocene
NO012	Norway	S. Viking Graben	E. Frigg Satellite	25/2-13; DST2B	3695-3713m	Jurassic?
NO013	Norway	S. Viking Graben	Vale	25/4-6S; DST1	3802-3819m	Eocene?
NO014	Norway	S. Viking Graben	Froy	25/5-1; DST3B	2687-3002m	Jurassic?
NO018	Norway	S. Viking Graben	Balder	25/11-5		Paleocene
NO020	Norway	S. Viking Graben	Balder Satellite	25/11-16; RFT		Paleocene
NO003	Norway	S. Viking Graben	Sleipner Alpha	15/9-1; DST1	3655-3660m	M.Jurassic
UKCS001	UK	S. Viking Graben	Bruce	9/9B-3; DST4	3845-3860m	Jurassic
UKCS004	UK	S. Viking Graben	Forth	9/23B-7; DST1		Eocene
UKCS005	UK	S. Viking Graben		9/23B-8; DST1		Eocene
NWE024	UK	West Shetland	Clair	206/7-1; DST1	5358-5807'	Carboniferous
NWE026	UK	West Shetland	Clair	206/9-2; DST4	5655-5830'	Carboniferous
NWE034	UK	Inner Moray Firth	Beatrice			
NWE001	Ireland	Fasnet		CS 63/10-1		
NWE040	UK	Irish Sea	Douglas	110/13-1; DST1	~ 3000'	Early Triassic
GIL010	Ireland	Celtic	49	9-4	Stock Tank	
GIL011	Ireland	Celtic	49	9-4	1771m	
GIL012	Ireland	Celtic	50	6-1	1610m	
GIL013	Ireland	Celtic	50	6-1		
NWE006	Canada	Newfoundland	Hibernia	DST 3	2431-2440m	
NWE007	Netherlands	Southern North Sea	K18	1; DST2		