

PLANNING ACT 2008

Underground Gas Storage Facility at Praesall, Lancashire.
In respect of an application for a Development Consent Order by Halite Limited
Application reference: EN030001

**STATEMENT OF COMMON GROUND BETWEEN HALITE ENERGY GROUP
LIMITED AND LANCASHIRE COUNTY COUNCIL ON GEOLOGY**

Prepared On Behalf Of Halite Energy Limited by
Mott MacDonald Ltd



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1 INTRODUCTION

1.1 Overview of the Topic

1.1.1 This Statement of Common Ground (SoCG) is made between Mott McDonald (MML) on behalf of Halite Energy Group Limited (Halite) and Lancashire County Council (LCC) in relation to Halite's application for a development consent order for an underground gas storage facility at Preesall (Project). LCC has taken advice from its expert geology advisors, Atkins on geology issues and this SoCG. The aim of this Statement of Common Ground (SoCG) is to set out the basis for the geological interpretation, how areas were identified for safe cavern construction and the assessment of geological risks associated with the Project.

1.1.2 The proposed underground gas storage scheme principally comprises of the creation of caverns in halite (salt) in which gas would be stored. The caverns would be connected to the surface by well casings. Geology has a fundamental impact on the location and design of the caverns and the assessment of risk associated with the gas storage. Previous planning applications have been unsuccessful for a number of reasons but particularly because it had not been demonstrated to the satisfaction of the Planning Authority that:

1. The geology was capable of accommodating the proposed development
2. The geology in relation to former mining activities was sufficiently understood
3. The geology was not sufficiently defined to assess the risks of gas migration through the strata or former mining features.

1.1.3 The Geological Summary Report reference 277663/BA01/002/01 forms the basis of the interpretation and presentation of the geology. It is the document that was submitted for public consultation and to Lancashire County Council (LCC) and Atkins, LCC's technical advisors. The document submitted to the IPC (DCO Application Document 9.2.2) is clarified and expanded in several respects to accommodate comments made by the public, LCC and Atkins during the consultation. An additional section has been included to cover the Brinewell 45 (BW45) incident which is a summary of the full Mott MacDonald report on the BW45 Incident and which has been presented to LCC, Atkins, the HSE and the public (DCO Application Document 9.2.4). In addition a specific seismic risk assessment report has been prepared by MML (DCO Application Document 9.2.7) in response to

public concerns regarding recent seismic events associated with the exploration of shale gas involving the 'fracking' of shale, and which has been used to support the seismic risk section within the GSR Section 5.8. Potential cavern locations and their relationship to geology have been described in more detail.

1.2 Summary of the Application.

1.2.1 In summary, the Project proposes the construction of 19 underground caverns by solution mining connected to seven well heads by vertical and slant well casings and above ground infrastructure for the operation of an Underground Gas Storage Facility with a total capacity of 900 million cubic metres to provide a working capacity of about 600 million standard cubic metres of natural gas. The Project would be connected to the Gas National Transmission System at Nateby by an interconnector pipeline.

2 ACCEPTED DATA

2.1 Details and Chronology of Discussions between the Parties

2.1.1 This statement on geology is based on the Geological Summary Report (GSR) prepared by Mott MacDonald (MML); reference 277663/BA01/002/01 as finalised in DCO Application Document 9.2.2. This report includes summaries of other particular reports into specific subjects which could impact on the scheme which are referred to in the GSR. The revised geology interpretation and associated aspects have been discussed with Lancashire County Council (LCC) and their technical Advisors, Atkins since June 2010. The chronology of events is:

1. Meeting of Halite and LCC with their respective Technical Advisors, County Hall, Preston, 20 May 2010
2. Presentation of Geological Summary to Atkins at MML offices Altrincham 07 June 2010
3. Meeting with between Halite and Atkins at Atkins' office in Warrington, 08 July 2010
4. Update meeting at Halite Kirkham office, 21 October 2010
5. Meeting of Halite and LCC with their respective Technical Advisors, County Hall, Preston 16 June 2011
6. Meeting between C Harding MML and G Raybould Atkins on 15 July 2011 in MML Offices Altrincham

7. Meeting between Halite and LCC with respective technical advisors at County Hall, Preston, 22 September 2011.
8. Submission of DCO application by Halite on 30th November 2011.

The objective of this SoCG is to set out the common ground in relation to the following DCO application documents:

- 9.2.1 Legacy Brinewell Impact Assessment DCO Application Document 9.2.1
- 9.2.2 Geological Summary Report DCO Application Document 9.2.2
- 9.2.3 NTS Interconnector at Preesall Pipeline Subsidence Assessment Report DCO Application Document 9.2.3
- 9.2.4 Assessment of Brinewell 45 Incident, Subsurface Aspects DCO Application Document 9.2.4
- 9.2.5 Review of the Proposed Drilling and Completion Programme DCO Application Document 9.2.5
- 9.2.7 Seismic Desk Study DCO Application Document 9.2.7
- 9.3.1 Risk Assessment DCO Application Document 9.4.6

The assessment methodology, baseline data, assessment findings in the above application documents are accepted and agreed. There are no issues in relation to the above application documents that are outstanding.

The following matters (paragraphs 2.2 to 2.7 below) are accepted and agreed and there no outstanding issues in relation to the matters referred to:

2.2 Agreed Study Area

2.2.1 The area covered by the GSR specifically addresses the area around Preesall as shown on the GSR Figure 1. This covers the area in which caverns are proposed to be created and which could be affected by the creation of the proposed caverns.

2.3 Assessment Methodology

2.3.1 The method of assessment was to provide a single geological summary with plans and sections that summarised the basics of the geology and the context of the previous mining which has taken place. The GSR demonstrates how the Project could be safely accommodated taking due account of the presence and quality of the salt, the basic geological structure with respect to the anthropogenic hazards posed from old solution brinewells,

dry mining and the geological hazards of faulting and wet rockhead. The GSR has been prepared from a number of base documents and references as stated in the GSR Section 2 and presents the definition of the geology in text, plans and sections.

2.3.2 The data have been used to prepare a three dimensional model of the salt strata. Contour plots of the top of salt and the base of salt, salt thickness and dip of the top salt surface have been prepared. These plots together with the base data of geophysical sections and boreholes have been used to define salt structure and the location of mudstone interbeds within the salt. For presentation purposes sections have been cut through the proposed project area from north to south as well as east to west to assist in the visualisation of the geology.

2.3.3 Other risks associated with the creation of caverns have also been considered in the GSR which includes seismic risk, subsidence, gas risk assessment and the impact of the historic salt abstraction industry.

2.4 Baseline Conditions

2.4.1 The geology baseline in the GSR is defined by the work of the British Geological Survey in their reports listed below:

- BGS Report CR/08/114 Review of Canatx work relating to mining in the Preesall saltfield and comments on wet rockhead conditions
- BGS Report CR/08/149 Reviews of BGS work for Canatx in support of a revised planning application at Preesall.
- BGS Report CR/09/015 Report on Burrows Marsh borehole (Middle Deviated), Preesall, Lancashire.
- BGS Report CR/09/028 Aspects of the petrology and fracturing characteristics of the Preesall Halite and Mercia Mudstone Group relevant to the construction of gas storage caverns
- BGS Report CR/09/034 Characteristics and engineering geology of the Mercia Mudstone overburden succession in the Preesall Saltfield with comparison to other saltfields; information relevant to gas storage in halite in the Preesall Saltfield
- BGS Report CR/09/035 Comparison between the Canatx gas storage proposal at Preesall and some other operating and planned salt cavern gas storage projects.
- BGS Report CR/09/036 Quality, composition and character of the Preesall Halite with comparison to other saltfields: information relevant to gas storage in the Preesall Halite.
- BGS Report CR/09/037 Rockhead conditions, salt extraction, subsidence and stability of the Preesall Saltfield with comparison to other saltfields: information relevant to gas storage in halite in the Preesall Saltfield.

- BGS Report CR/09/038 Faulting at Preesall and other saltfield: information relevant to gas storage in the Preesall Halite
- BGS Report CR/09/040 Preliminary geophysical log interpretation and correlation of the Canabx Burrows Marsh (middle deviated) exploration borehole with previous exploration boreholes at Preesall.
- BGS Report CR/09/048 Preliminary geophysical log interpretation and correlation of the Canabx Hay Nook exploration borehole with previous exploration boreholes at Preesall.
- BGS Report CR/09/049 Report on Hay Nook borehole, Preesall, Lancashire
- BGS Sheet Memoir 66: Geology of the country around Blackpool, 1990
- BGS Report CR/10/128 Hay Nook and Burrows Marsh (Middle Deviated) borehole core

The baseline BGS data has been supplemented by further surveys which are described in Section 2.5

The baseline data was subjected to a complete review by a peer geology team in 2010. The team consisted of the BGS, Dr Everett Rutherford and MML and the review is described in the GSR, Section 2.

2.5 Details of Surveys Carried Out

2.5.1 In addition to the BGS reports further surveys and boreholes have been undertaken and used to assist in the definition of the geology and to assess the potential impact of the proposed project. The surveys have been defined within Section 2 of the GSR.

2.6 Brinewell 45 Incident

2.6.1 In June 2011 a blow out incident occurred at Brinewell 45, one of the old brinewells. Investigations were undertaken into the causes of the blow out to identify any potential impacts on the interpretation of geology and associated risk assessments. The investigation has been reported by Mott MacDonald "Report on the Assessment of the Brinewell 45 Incident – Subsurface Aspects".

2.7 Relevance to Proposed Development/Potential Effects

2.7.1 The definition of the geological sequence and structure forms the basis for the definition of areas in which caverns may be constructed. The potential effects of creating caverns and storing gas has then been considered in terms of stability, risk of gas migration and the impact of the legacy of past salt

abstraction through the presence of former deep dry mine workings (now flooded) and redundant caverns created by solution mining ..

2.7.2 The geology has been defined by a three dimensional model which has been based on geophysical surveys, boreholes and historic drilling records. Plans and sections have been developed to simplify the presentation, particularly with respect to the definition of areas where caverns are proposed. Hazard zones (within which caverns should not be constructed) were developed from the assessment of the basic geology and the historic mining conditions which are in accordance with design rules prepared by Professor Rokahr, a leading authority on cavern design. Two potential cavern development areas (the two polygons which form the basis of the DCO application) have been identified that would avoid the hazard zones relative to the known geological hazards of faults and wet rock head and the mining hazards of solution brine wells and dry mining. An outline spatial layout for proposed caverns within the proposed development areas has been identified based on the stand off and separation distances proposed by Professor Rokahr.

2.7.3 The potential effect of seismic activity, whether produced by natural earth movements or by man's activities, has been assessed by international experts and it is considered unlikely that seismic activity will have any significant impact on the proposed scheme. Reference MML report 277663/FNG/01 "Seismic Hazard Desk Study" DCO Application Document 9.2.7)

2.7.4 Parts of the access road and interconnector pipeline to the NTS would be located close the historic mining activity. The impact of potential subsidence from the historic activity is assessed in MML report "Pipeline Subsidence Assessment Report" (DCO Application Document 9.2.3) and summarised in Section 5.7 of the GSR which concludes that there will be no significant impact on the proposed infrastructure.

2.7.5 The risk of gas migration has also been considered in a source-pathway-receptor analysis and the risks have been assessed as negligible. This is set in the Risk Assessment (DCO Application Document 9.3.1).

2.7.6 The creation of caverns would cause some surface subsidence. The magnitude of subsidence has been assessed on a cautious basis which predicts that subsidence would be less than 80mm over the lifetime of the project and will have little impact on existing infrastructure and features. This is set out in the GSR (DCO Application Document 9.2.2).

2.7.7 The recent blow out in BW45 has been investigated and the causes of the blow out have been established. The blow out was caused by mechanical failure of corroded casing at some 190m depth in an airlock which was

created during solution mining operations at the top of the cavern. The failure did not affect the cavern stability and is not located within influencing distance of the proposed scheme. A risk assessment of all brine wells within influencing distance of the proposed scheme has been undertaken and is set out in the Assessment of Brine Well 45 Incident (subsurface aspects) Report (DCO Application Document 9.2.4) and the Legacy Brine Well Impact Assessment Report (DCO Application Document 9.2.1)

2.7.8 An indicative cavern layout within the two polygon areas has been identified which takes account of the geology, anthropogenic and natural hazards and associated impacts. A probabilistic analysis of volumes has been undertaken to account for the impacts of washed cavern shape, insoluble content and insoluble sweeping. The total gas storage volume was calculated to be about 900Mm³ (standard) with a corresponding working gas volume of about 600Mm³ (standard) using an upper credible probability of 30%.

3 CONCLUSION

- 3.1 The GSR(DCO Application Document 9.2.2) presents an adequate representation of the geology which is sufficiently well defined to establish areas in which caverns can be constructed by solution mining. An indicative layout of caverns within the two polygon areas has been prepared to fit within the defined areas. The geology has been sufficiently defined for an analysis of the risks from gas migration to be assessed and surface subsidence to be calculated subject to confirmation by further drilling as the development proceeds. The risk of seismic activity has been assessed as negligible. The risks from historic salt abstraction have been assessed and will not impact on the proposed Project. An indicative cavern layout has been defined within the two polygon areas which have a working gas capacity of 600Mm³ (standard).

This Statement of Common Ground on the topic of Geology has been prepared by Mott MacDonald on behalf of Halite Energy Group Limited, and agreed by Lancashire County Council and Wyre Borough Council.

Signed _____



Colin Harding

on behalf of Mott MacDonald

Signed _____



Michael Green

Cabinet Member for Economic
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on behalf of Lancashire County Council

1st June 2012