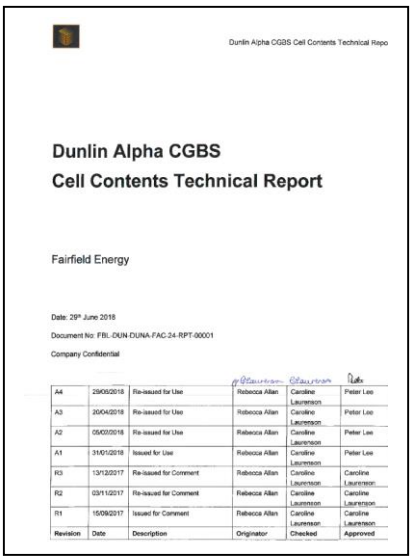
Dunlin Alpha - Cell Contents

Fairfield's proposed management option for the CGBS storage cell contents is to leave the cell contents in situ with no further recovery or remediation.

1. What are cell contents?


Dunlin Alpha CGBS Cell Contents Technical Repo

Dunlin Alpha CGBS
Cell Contents Technical Report

Fairfield Energy

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The majority of material present in the Dunlin Alpha Concrete Gravity Base (CGBS) storage cells will have originated from the reservoir, brought in as components of the produced fluids. These components can be broadly characterised as residual hydrocarbons (oil and wax), sediments (sand and clay) and scale. Other materials associated with these components include organic and inorganic compounds, metals and naturally occurring radioactive material.

The *Cell Contents Technical Report* - Sections 1 and 2 - contains further details regarding the production history and current inventory of the CGBS storage cells.

2. What is Attic Oil and what was the Attic Oil Recovery Project (AORP)?

The pipework used to export oil from the Dunlin Alpha storage cells is positioned below the top of the ceiling of the cells. As a result, there was an inaccessible volume of oil above this pipework which could not be extracted by the existing platform pumps. The term "attic oil" is used to describe the oil sitting in the upper "attic" spaces of the cell compartments.

In 2007, an Attic Oil Recovery Project (AORP) was successfully undertaken to recover the attic oil remaining in the cells. The project was able to successfully use Carbon Dioxide (CO_2) gas to push the oil down and make it accessible via the pipework. Pumping was performed by a new set of temporary pumps that were able to draw off the oil at the low flow rates required. As a result, it is estimated that over 97% of the attic oil within the Dunlin Alpha storage cells has already been recovered, and the storage cells now contain approximately 99% sea water.

The *Cell Contents Technical Report* - Sections 1 and 2 – contains further details regarding the AORP.

3. What approach has been taken to quantify and characterise the residual cell contents?

An extensive review of the residual cell contents has been undertaken in order to quantify and characterise the materials remaining in the storage cells. Significant technical challenges and risk to offshore workers has prevented direct access to the storage cells in order to gain physical samples. The information used for the cell contents assessment is therefore based on evidence gathered from operational records, analysis of historical samples, use of analogous data, and the application of proven scientific principles. The assessment process has been shared and discussed with a number of stakeholders to ensure the methodology is acceptable.

A *Cell Contents Technical Report* has been compiled, detailing the body of work that has been undertaken to inform Fairfield's understanding of the cell contents and support management options. Sections 1 and 2 of the report contain further details regarding the production history and current inventory of the CGBS storage cells.

4. How much uncertainty is there regarding the cell contents? What steps are being taken to reduce this?

The *Cell Contents Technical Report* has drawn upon data and information from a wide range of sources to quantify and characterise the cell contents, and various analytical techniques and calculation methods have been used. Uncertainties associated with the base data have been assessed to ensure that the data is fit for purpose and acceptable for informing cell contents management options. Where appropriate, conservative (worst-case) assumptions have been applied to ensure the environmental impacts are not underestimated. A full description of the uncertainty analysis undertaken as part of the cell contents assessment is discussed in Section 3 of the *Cell Contents Technical Report*.

Fairfield continue to assess potential survey and physical sampling options for obtaining additional cell contents data in order to refine assumptions and reduce uncertainty. A summary of the work completed to date is provided in the *Cell Contents Technical Report* - Section 3.

5. What options are there for further recovery of cell contents?

The only option for completely removing the residual cell contents would require the full deconstruction and recovery of the CGBS, including full removal of the Dunlin Alpha drill cuttings pile. The comparative assessment of CGBS decommissioning options concluded that full removal of the CGBS was the least preferred option when considered against safety, environmental, technical and economic criteria. Further details are provided in the *Dunlin Alpha Comparative Assessment Report*.

Over 70 alternative options for the long term management of the residual cell contents were initially identified as part of the Cell Contents comparative assessment. These included further cell contents recovery, *in situ* bioremediation, and the use of capping material as a further barrier.

Assessment of the options identified that technical challenges associated with further recovery would limit the quantity of material that could be removed due to the physical restrictions of the cell compartments, the ability to adapt and upscale technology and the physical properties of the materials to be recovered. As a result, while further recovery may reduce the quantity of contents released to the environment, the overall reduction in environmental impact would be indiscernible.

The comparative assessment of the Cell Contents management options concluded that leaving the cell contents *in situ* was the most preferred option when considered against safety, environmental, technical and economic criteria. Full details of the Cell Contents comparative assessment are provided in Chapter 4 of the *Cell Contents Technical Report*.

6. **What are the environmental impacts of leaving the cell contents in situ**?

Fairfield is committed to ensuring that the Dunlin Alpha cell contents are decommissioned in a manner that does not result in unacceptable environmental impact. Environmental impacts associated with

gradual releases (arising from long-term degradation of the CGBS) and unplanned instantaneous releases (arising from a high energy impact) have therefore been assessed to inform cell contents management decisions.

The assessments consider the key receptors that could be affected (i.e. seabed species, seabirds and habitats), the pathways for potential impact, and the magnitude of potential releases. Release modelling has been undertaken using conservative (worst-case) scenarios, and assessments have considered both short-term and long-term impacts, including whether there is potential for impact to the food chain due to bioaccumulation. For all scenarios, the environmental impacts were assessed to be not significant.

Cell Contents Technical Report - Section 5 and *Dunlin Alpha Decommissioning Environmental Appraisal Report* - Section 5 provide full details of the environmental assessments undertaken.