Sellafield Ltd

Sellafield Integrated Waste Strategy (IWS) Progress Report

September 2011

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Executive Summary

Sellafield Site Integrated Waste Strategy (IWS) has continued to mature, drive improvements and realise benefits within waste management over the past period.

Continuous improvement on the application of the waste management hierarchy has continued to drive higher waste incorporation rates achieved by high level waste plants (HLWP) and Magnox Encapsulation Plant (MEP). Packing fractions in Intermediate Level Wastes (ILW) have also seen a significant improvement over the same period.

The amount of Plutonium Contaminated Material compacted through the Waste Treatment Complex (WTC) has seen the best performance to date, achieving long term hazard reduction. Additionally, the Floc retrievals and Liquid Activity Reduction project has resulted in immediate hazard reduction that has been undertaken satisfactorily within the discharge limits of the plants.

There has been a significant reduction in the total site number of LLW containers shipped to LLWR. This achievement is down to a number of ongoing improvements; characterisation work, improved sorting and segregation of waste at source, decontamination and size reduction activities that are key enablers in re-routing previously assumed LLW. Packaging efficiencies have also contributed to the improvement.

The output and capability of metals recycling continues to grow and realise benefits. In parallel the solid waste asset disposal project continues to pursue the reuse and recycling of unwanted stock, equipment and scrap metal.

The period has seen a step change in the Sellafield Ltd Environmental Permit KP3690SX that has resulted in a number of approved new waste routes being opened up, albeit initially with nil volume, once fully commissioned these will enable significant volumes of waste to be diverted from the LLWR. This is a key enabler to the future optimisation of Sellafield applying the waste hierarchy through utilisation of the supply chain. In addition the joint LLW management plan with LLWR/NDA has introduced activities and targets to further optimise the utilisation of the waste services contract.

Other observations over the period include the annual performance of Magnox Encapsulation Plant (MEP) that was significantly lower than contract baseline; however MEP's performance is upstream driven from Magnox outturn. The HAL stocks over period have risen, driven by the continued support to repossessing, especially THORP, whilst the Waste Vitrification Plant (WVP) has experienced some throughput challenges.

Sellafield recognises the enormous future challenge of high hazard reduction and the associated waste that requires safe retrievals, treatment, storage and management. To this end, the business priority and resources are focused on high hazard reduction; studies will continue into the optimisation of ILW, capital projects and the optimisation of future/existing stores. At a national level, SL will continue to support RWMD in the upstream optioneering studies and associated strategic work.

The business focus on high hazard reduction has diverted resources and attention away from non-radiological waste which has limited progress within this area. Priority work is ongoing, jointly within Waste and Environment to develop and establish a set of suitable Key Performance Indicators that will fulfil the needs of our stakeholders.

Over the coming period, the new waste routes will be commissioned and the necessary management processes and arrangements will be established and embedded. This will enable the diversion of waste from LLWR.

The component strategies of the IWS will continue to mature and effort will be made to ensure alignment and integration of strategies such as the PCM and Decommissioning Strategy, and increased consideration of the End States strategy that will ultimately determine the success of the IWS.

The IWS needs to remain current as it plays a key enabling role for the Sellafield Site to optimise the application of the waste management hierarchy. It should monitor progress against the component strategies and the IWS as a whole, and track the realisation of benefits and the maturity of risks and opportunities. The IWS Principles Paper will be reviewed and updated to illustrate and communicate this framework.

Contents

Section A

1 Introduction

This report provides an update on the progress of the IWS and demonstration of its application, through incorporating progress on the component strategies since the last annual IWS report which was published in June 2010. This report covers a slightly longer period of 14 months; from June 2010 – August 2011 due to the varied permit that became effective from the 1 August 2011 that changed from the previous Radioactive Substances Act 1993 (RSA 93) authorisation template to an Environmental Permitting Regulations 2010 (EPR 2010) template and includes a rationalisation of the previous Schedule 9 requirements.

1.1 Scope and Purpose

This annual report provides Sellafield Ltd and the Nuclear Decommissioning Authority (NDA) with a review of the previous year's performance in implementing the IWS and driving the application of the waste management hierarchy by reporting upon both strategic developments and operational improvements. Looking forward, the report outlines the improvement plan for the forthcoming year and highlights any significant future work or developments that should be considered within the IWS.

In parallel, there is a requirement under the EPR 2010 permit KP3690SX (1) to provide an annual IWS update which this report delivers. The rationalisation of the Schedule 9 requirements has widened the scope of this report from the previous submission; it now covers two further requirements as detailed below. The report will be presented to the Integrated Waste Strategy Steering Group (for endorsement) and communicated for information to other relevant forums.

The progress report is set out in two distinctive sections; section (A) covers the progress of the IWS, its implementation and any techniques that have been used to drive optimisation of the waste management hierarchy. Section (B) reports the annual estimates of liquid and gaseous effluent discharges from major activities for past, current and the future. The Schedule 9 requirements that are fulfilled through this report are detailed in the following:

Requirement 1 *(Section A)*
The operator shall develop and maintain an Integrated Waste Strategy (IWS), supported by waste strategies covering waste management and disposals to land, water and air, to enable it to implement and manage its current and future operational, decommissioning and restoration activities so as to deliver optimised performance taking account of environmental, safety and other relevant factors.

The Environment Agency specifies that the IWS should be developed and maintained according to the specification and guidance developed by the Regulators and the NDA. Supporting strategies covering waste management and disposals to land, water and air shall be developed and maintained. The strategies shall be supported by the development of environment protection principles, appropriate standards, management arrangements and key performance indicators. The Environment Agency recognises that it will be a number of years before the IWS and supporting strategies are fully developed and that the submissions made in the interim will represent work in progress; IWS progress report and improvement plan annually.

This now incorporates Requirement 6 and 19 from the previous RSA93 authorisation BX9838/CE1369 which specified the following:

Requirement 6 (*Section A)*
The Operator shall submit a written report to the Agency that provides details of the techniques that have been introduced to minimise discharges and disposals of radioactive waste over the preceding 12 months.

Requirement 19 *(Section B)*
The operator shall develop a methodology to estimate the discharges from the major activities on the site. The Operator shall submit the methodology in a written report. The Operator shall submit to the Agency annual estimates of discharges from major activities for the previous calendar year and each calendar year thereafter.

1.2 Vision

The Vision for Sellafield Integrated Waste Strategy (IWS) is:

An Integrated Waste Strategy will aid delivery of an operating site that has minimised waste generation and where waste is generated, it is contained in a manner that achieves sustainability; where sustainability is waste in a form that requires ideally nil, but probably minimal, management to safely protect people and environment including the remediation of historical impacts.

1.3 Waste Management Principles

The IWS is underpinned by Waste Management Principles that are explained within the IWS Principles Paper (March 2010) (2). The Principles Paper will be reviewed following the submission of this report and formally re-issued in 2012, as explained in section 6.1

Figure 1: IWS Principles

IWS Principles

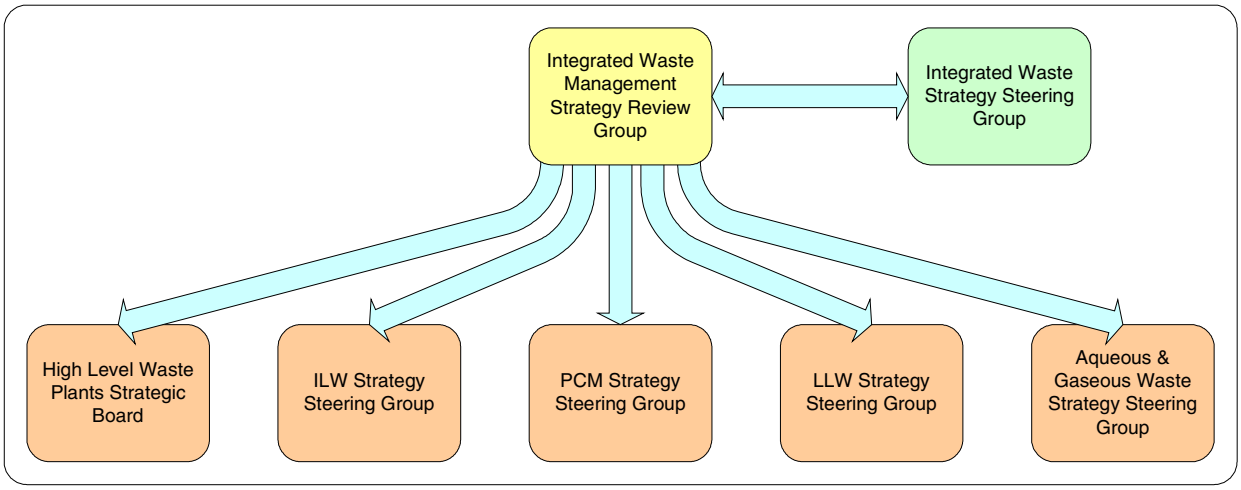
- Adhere to UK Government policy and legislation
- Prioritise Hazard and Risk reduction on the site
- Minimise Impact on health, safety and environment
- Ensure that all risks are as Low as Reasonably Practicable (ALARP)
- Ensure alignment with the NDA strategy and Integrated Waste Strategy (IWS) for the site
- Ensure application of the Sellafield Ltd. Waste Management Hierarchy (WMH)
- Ensure strategy is robust and deliverable
- Reflect International best practice and guidance
- Ensure all waste products are suitable for transport and disposal to GDF
- Optimise the utilisation of existing and planned facilities
- Minimise double handling and any future rework
- Ensure value for money for the UK tax payer

2 Components of the IWS

The IWS is made up of a number of component strategies that reflects the fundamental categories of waste and significant work programmes (Figure 2). In the long term the component strategies that make up the IWS will remain fairly constant, though it is expected that there will be further strategies developing that will require consideration and/or inclusion as a core component into the IWS. The current Decommissioning strategy as reflected by the LTP2010 contract baseline is currently undergoing review in order to develop a more optimised solution. The development of this optimised plan is being undertaken in cognisant of the IWS principles and the IWS elements from the LLW, ILW, Effluent and PCM strategies. Decommissioning is the major contributor to future waste arisings and the IWS will continually improve integration and optimise all waste related activities ranging from operations, decommissioning and potential contaminated land arisings to achieve the Site End States objectives. This position will be consolidated as part of the pending IWS Principles Paper review.

The component strategies are at varying degrees of maturity reflecting influences and developments within the nuclear industry. Each component strategy has its own Strategy Steering Group in order to encourage site wide discussions surrounding waste treatment and disposal management. The Steering Groups ensure that new developments, benefits and opportunities regarding waste management are fully explored and critically reviewed whilst maintaining strategic direction.

Figure 2: Core Component Strategies



3 Consideration of influencing and impacting developments

Given the complex and interdependent nature of Sellafield Site, the development of an IWS must consider and play some co-ordination role in a number of factors and developments that can/does have a significant influence and/or impact; providing the Integration between these factors. The significant influencers and impacts that require current management are explored in the following. Influences and impacts that are identified as requiring active management in the future are covered in section 6.

3.1 Lifetime Contract Baseline 2010 (LCB 2010) / Life Time Plan 2011 Performance Plan

2010 LCB (3) is the first baseline produced by Sellafield Ltd under the ownership of NMP. The baseline aims to deliver a programme of work for Sellafield, based on existing performance norms. It is intended to be robust, transparent and deliverable. Furthermore, it has been built to reflect the sites strategies and is funded. A complete baseline rebuild, including an assurance scrub was conducted and produced LCB2010.

During development of the build, the baseline has been shared with key stakeholders in an open manner. It reflects a fully integrated position for Sellafield Ltd to go forward in the future. NMP are committed to improving future performance against 2010 LCB.

The prioritisation process of the build considered the IWS to maintain the strategic direction of waste management strategies, but there has been some deferral of waste treatment facilities. The facilities remain in the LCB 2010 baseline but funding constraints means that they will not be built at the strategically optimum time. However, they remain candidates for scope acceleration should sufficient efficiencies or funding become available.

The Life Time Plan Performance Plan 2011 (LTP PP) (4) was issued on the 31st March 2011. The LTP PP is an update of the LCB 10 to reflect underpinned and anticipated

improvements to schedule performance, efficiencies and acceleration. The LTP PP 2011 indicates an earlier start to Retrievals, a reduction in the retrievals duration, sustained higher outputs in operating facilities and continued investment in asset care improvements.

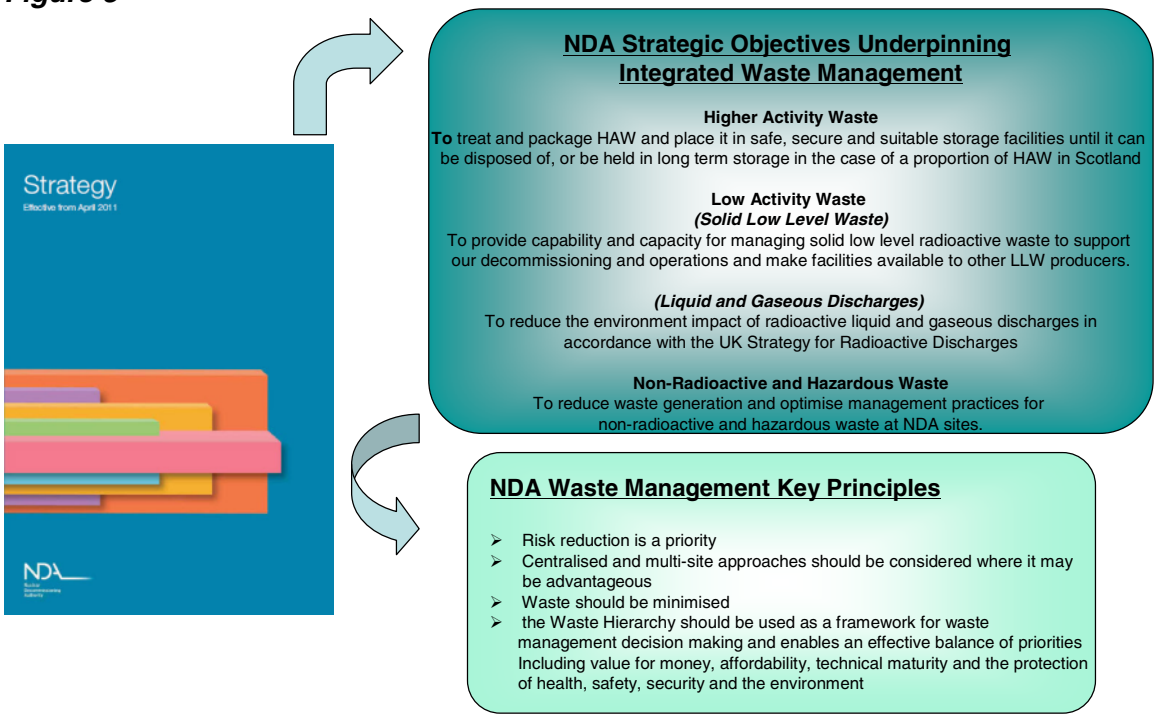
3.1.2 Sellafield MOX Plant Closure

The very recent closure of the Sellafield MOX Plant (SMP) will have implications/considerations for the Integrated Waste Strategy. The extent of this is unclear until an assessment against LTP10 has been undertaken. It is noted here for recognition that the closure will impact and therefore needs to be considered within the IWS.

3.2 Nuclear Decommissioning Authority (NDA) Strategy

The NDA published their revised strategy in April 2011 (5). The strategies and principles for waste management are illustrated below in Figure 3:-

Figure 3



The NDA also published the UK strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry in August 2010 (6).

Sellafield Ltd IWS needs to fully align to both these strategies to facilitate the optimised application of the waste hierarchy, opportunities and realisation of benefits for all key stakeholders. As Sellafield Ltd IWS Principles were developed previous to these published by the NDA, Sellafield Ltd will ensure clear communicated alignment i.e. the line of sight between the NDA and SL objectives and strategies through the planned review and re-issue of the IWS Principles Paper.

The implementation of the NDA strategy to take a multi site UK wide approach across the NDA estate is evident through the proposed co-location of radioactive waste from Harwell to Sellafield Site for long term storage. The business case has been prepared and submitted to the NDA; detailed engagement will follow.

3.3 Integrated Change Programme

The first phase of the Integrated Change Programme (ICP) had two programmes of work which support the implementation of the IWS, the Integrated Waste Management programme and the Radiological Rollback programme.

The ICP has recently (July 2011) been rationalised into seven priority focus areas and placed under the remit of Major Projects Directorate, where the existing project governance arrangements will be applied.

The IWM improvement programme has not been prioritised as a focus area at this stage as the continuous improvements of waste management is considered business as usual activities that were enabled through the organisational changes implemented as part of the IWM improvement programme. Moving forward, it is logical that the IWS and IWM improvement programme are managed as one entity, as the strategy drives the improvement plan which in turn implements the strategy and realises benefits. This positioning will be further reviewed and consolidated within the forthcoming review of the IWS Principles Paper.

3.3.1 Integrated Waste Management (IWM) Improvement Programme (ICP)

The IWM programme focused on implementing organisational improvements as a key enabler to implementing the waste management hierarchy across Sellafield. Within the Waste and Effluent Disposition Directorate (WEDD), the Waste Operating Unit has continued to develop and mature the centralisation of waste management and disposition.

The organisational structure introduced the Waste Advisor's role across the site that are enabling benefits to be realised and supporting the cultural change; for example implementation of the waste hierarchy has/is reducing the volume of waste generated and sent to WAMAC as either compactable waste or non compactable waste for disposal via LLWR. The waste oversight team has been established with the remit of understanding and taking control of the Sellafield site boundaries for solid waste transfers.

The organisational changes have also strengthened the support in the metal stream area. This has resulted in a more pro-active approach to the identification of waste volumes, and treatment options of metallic type waste being recycled and increased volumes of metallic waste being identified for offsite processing via the supply chain. The offsite disposition team are also now part of the central team and are finding alternative uses for redundant assets that can either be re-used within the NDA estate or sold to generate revenue.

3.3.2 Radiological Rollback Programme

The purpose of the radiological rollback programme is to focus on minimising the radiological footprint by downgrading of the radiological status of an area through decontamination. This has various benefits; the one of main interest to the IWS is the reduction of LLW, through the avoidance of additional PPE. There have been four pilots run over the past year with lessons learned undertaken for each. The pilots have claimed a significant reduction of LLW volumes and PPE being created; the projects are working on quantification of these benefits in terms of volumes, costs and efficiencies. There are also specific examples from within the Sludge Packing Plant (SPP1) where area's have been rolled back to reduce the build programmes in terms of cost and schedule.

Moving forward, there is a site wide implementation plan being developed that identifies further candidate areas and schedules for rollback implementation. When the benefits are consolidated a trend can be raised that will look to consolidate the benefits and efficiencies into the out years of the LTP.

3.4 Sellafield Excellence Model

Sellafield Ltd excellence is our new business model for changing and sustaining workforce behaviours to deliver excellence in everything that we do; safe, reliable and predictable. It can be considered as the high level blueprint to delivering excellence. In summary, the model provides a line of sight from an individual's contribution right up to one (or more) of the five Strategic Business Imperatives;

- Operational Excellence and Nuclear Safety
- Environmental Stewardship
- Workforce Safety and Effectiveness
- Commercial Excellence meet production and financial commitments
- Asset management.

3.5 LLWR Waste Acceptance Criteria

The Low Level Waste Repository (LLWR) Environmental Safety Case (ESC) was submitted to the Environment Agency on the 1st May 2011. It plays a very important role in determining the future of the LLWR as the UK's primary facility for the disposal of LLW. The objective of the ESC is to demonstrate to stakeholders and regulators that it is safe to continue to dispose of LLW at the LLWR in the future.

Based on the outcomes of assessments concerning the potential environmental impacts from both disposed radionuclides and non radiological contaminants, the significant changes to be introduced into the Waste Acceptance Criteria are:

- Management of the radiological capacity of the LLWR, consistent with the ESC and relevant permit conditions
- Application of additional consignment limits to control activity concentrations
- For those wastes that are of the greatest potential significance in environmental safety terms, additional emphasis is placed on ensuring that the approach to disposal represents the use of Best Available Techniques for the management of the wastes.
- The use of emplacement strategies for particular waste streams and waste consignments where specific arrangements are required to demonstrate optimisation with respect to environmental safety.
- Provision of a basis for revisions to the WAC and the waste acceptance arrangements that incorporate the assumptions and findings of the ESC.

These changes to the WAC will potentially impact upon the IWS by changing the current assumptions that underpin the LTP10 and therefore waste arising estimates that will be disposed of at LLWR.

4.0 Progress of Component Waste Strategies

The core component strategies that make-up the Sellafield IWS are at different degrees of maturity, due to a range of internal and external influences. For each component strategy, the following section provides:

- An overview of strategic developments
- Progress against the application of best practices, benefits realised and work ongoing that supports application of the waste hierarchy.

4.1 High Level Waste (HLW)

4.1.2 High Level Waste Strategy Developments

The overall strategy for HLW is to minimise stocks and arisings of Highly Active Liquor (HAL) through use of evaporation and vitrification. The total allowable stocks of HAL are to be progressively reduced until the stock of HAL is below buffer levels measured in terms of tonnes (Uranium) equivalent. As HAL is a corrosive liquid, the operation of storage tanks and evaporators is subject to an operational lifetime restriction due to corrosion of key parts of the plant. Key equipment and plants are continuously reviewed to ensure the required capacity is available. HLW is vitrified and safely stored at Sellafield; the Windscale site does not generate HLW. Some of this waste has been and will be returned to overseas reprocessing customers. Any waste that is not returned will be disposed of in the national geological disposal facility (GDF).

4.1.3 High Level Waste Progress

The HAL stocks over the last 14 months have risen by approximately 125m^3 as HALES continues to support reprocessing, especially in THORP, whilst the Waste Vitrification Plant (WVP) has experienced some throughput challenges in 2010/11. The Office for Nuclear Regulation (ONR) has confirmed the change in the form of the specification, from m^3 to tonnes (Uranium) equivalent. This gives an improved measure of hazard reduction as the stocks diminish, as all tanks will have a small heel volume (of about 20-30m^3) when they have been emptied of HAL. Complete emptying of the tanks of all liquor will result from POCO of the tanks.

Between June 2010 and mid August 2011 there has been a net hazard reduction of 1289 teU WVP throughput, with the Waste Vitrification Plant (WVP) making 132 containers in this timeframe. Waste incorporation rates into glass have been achieved at approximately 27% for blended, and up to 32% for Magnox HAL respectively. This continues improvement over historic norms of approx. 25%. These improvements have been made possible due to the investment in development work and new technology on the plant. The waste vitrified since June 2010 has been both Magnox and blended waste. The manufacture of blended (Thorp and Magnox) waste is important for the containers made being available for the vitrified residue returns (VRR) to overseas reprocessing customers.

Since the last update, noting the successful first returns to Japan and The Netherlands respectively from the Residue Export Facility, the second Japanese return shipment of highly active waste (3 Flasks) to overseas reprocessing customers has now also recently successfully taken place. Following a lengthy period of active commissioning, the ONR has now issued REF with the required Licence Instrument to enable the Facility to move from commissioning to full operational status i.e. "Consent to operate", thus supporting the longer term export programme demands.

The Evaporator D project Design & Engineering has continued to overspend from the previous financial year. Recent quality issues with the vessel suppliers have resulted in

significant delays to module fabrication; premium time working has been implemented to drive completion of the modules to the May 2012 target completion date.

4.2 Intermediate Level Waste (ILW)

4.2.1 Intermediate Level Waste Strategy Developments

The Sellafield ILW strategy document has been produced and was internally approved in March 2011 [GEN-2973B] (7). A draft version of the strategy was issued to the regulators (EA and ONR) in July 2010 for their guidance and comments. The final version of the strategy was issued to the regulators in July 2011 with an opportunity for further engagement.

The strategy document is comprehensive in its scope and includes the following:

- UK Government policy, regulation and NDA strategy
- Scope and background of how ILW is managed at Sellafield
- Principles, aims and objectives of the strategy
- ILW strategy components
- Governance arrangements on the site
- Optimisation of the strategy and recommendations going forward
- Strategy improvement plan and strategic decision calendar

The IWS principles (issued in June 2010) were further developed for the ILW strategy. These principles are as follows:

- Prioritise and deliver hazard and risk reduction on the site
- Adhere to UK Government policy and legislation
- Minimise impact on health, safety and the environment
- Ensure that all risks are As Low as Reasonably Practicable (ALARP)
- Ensure routes are available for all wastes
- Ensure alignment with the NDA strategy and the IWS for the site
- Ensure strategy is robust and deliverable
- Reflect international good practice and guidance
- Ensure all waste products are suitable for transport and disposal to the GDF
- Optimise the utilisation of existing and future planned facilities
- Avoid unnecessary generation of waste and apply the Waste Management Hierarchy (WMH)
- Minimise double handling and any future rework
- Ensure value for money for the UK taxpayer

The components of the ILW strategy were reviewed against these key principles to identify where potential improvements could be made. Five recommendations were made with associated action plans. The recommendations are as follows:

- Recommendation 1: Ensure that waste management routes (treatment facilities and stores) will not constrain any improvement plans to accelerate Hazard and Risk reduction

- Recommendation 2: Ensure the governance and deliverability of waste routes

- Recommendation 3: Ensure that waste management strategies recognise uncertainties in waste volumes and characteristics are robust

- Recommendation 4: Ensure strategic opportunities are explored with internal and external stakeholders

- Recommendation 5: Progress opportunities to establish optimal ILW strategy based on scenario analysis to obtain the optimal balance in achieving hazard and risk reduction in the most practicable and cost effective manner (this is a key area of integration between the IWS and Decommissioning strategy development).

4.2.2 Intermediate Level Waste Programme Progress and Future Plans

Opportunities
From the review against the key principles, recommendation 5 has the most significant strategic impact. Work is ongoing to progress the opportunities that include assessment of alternative options and strategies for decommissioning as well as optimising treatment facilities and opening up new waste routes. This work is also being considered in parallel through higher level studies being undertaken by NDA/RMWD that is identifying and pursuing the development of opportunities across the NDA's SLC's both individually and as a collation. Upstream Optioneering Workshops are being held with each site to identify opportunities; these will then be considered holistically to optimise the opportunities that exist across the NDA estate.

Co-location of Waste
There is a collaborative programme of work ongoing to investigate the possibility of transferring ILW material for treatment and/or long term storage to Sellafield utilising the existing facilities. This work demonstrates the NDA strategy co-location of waste storage until final disposal to the Geological Disposal Facility (GDF).

Optimising exiting facilities
SL have been working with RWMD to trial a streamlined route for the LoC (Letter of Compliance) endorsement of proposed waste packages, based on the previous endorsement of similar waste packages.

It is necessary to remove scrap items from the First Generation Magnox Storage Pond and bays in order to allow de-sludging to proceed. During early 2006, one trial drum of ILW Scrap was taken from the First Generation Magnox Storage Pond and was successfully encapsulated in WEP. The trial involved retrieval of an amount of scrap from the Magazine Transfer Bay. The scrap underwent size reduction, sorting and segregation within the First Generation Magnox Storage Pond and was then transferred to WEP where the scrap was encapsulated within a single 500 litre product drum.

A LoC was obtained in 2009 which extended the single drum trial for a further fifteen drums. The scope of this was limited to metallic scrap only; as the removal of non-metallic material from the First Generation Magnox Storage Pond would incur significant dose uptake to workers.

SL and RWMD then worked to broaden the acceptable envelope to the fullest extent by making use of existing LoCs for WEP and other plants, both at Sellafield and elsewhere. A Standard Waste Package Description (SWPD) was developed by RWMD in conjunction with SL for the packaging of metallic scrap in WEP. This can be used as the basis for endorsing the packaging of similar waste using the same waste container and waste conditioning processes, without the need for a full disposability assessment. The SWPD defines scrap as being mainly stainless and/or mild steel but also allows a limited quantity of other materials such as aluminium, magnesium, uranium, graphite, beryllium, cellulose, and 'other' organics The waste can also be contaminated with uranium fuel related sludge.

As a SWPD describes a disposable waste package, any proposed waste package compliant with all of the features defined by that SWPD would also be disposable. The LoC process can therefore be accelerated by making use of the SWPD. The SWPD for metallic scrap was then used to gain a LoC for the encapsulation of solid ILW retrieved from MFSP, thus

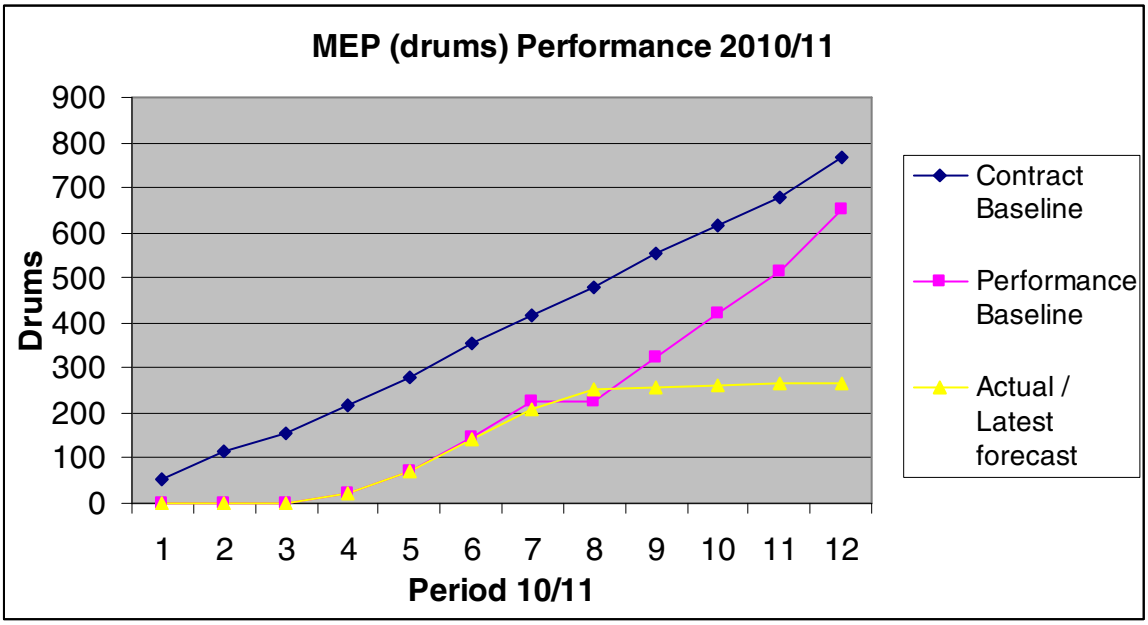
removing much of the need to segregate materials prior to sending the waste for encapsulation, and reducing the dose uptake to workers.

This approach could be extended to allow the treatment in WEP of compatible ILW scrap from any other Sellafield plant, or that arising from a future 'Sort and Segregation' facility, with endorsement from RWMD via the streamlined assessment process.

Plant Performance

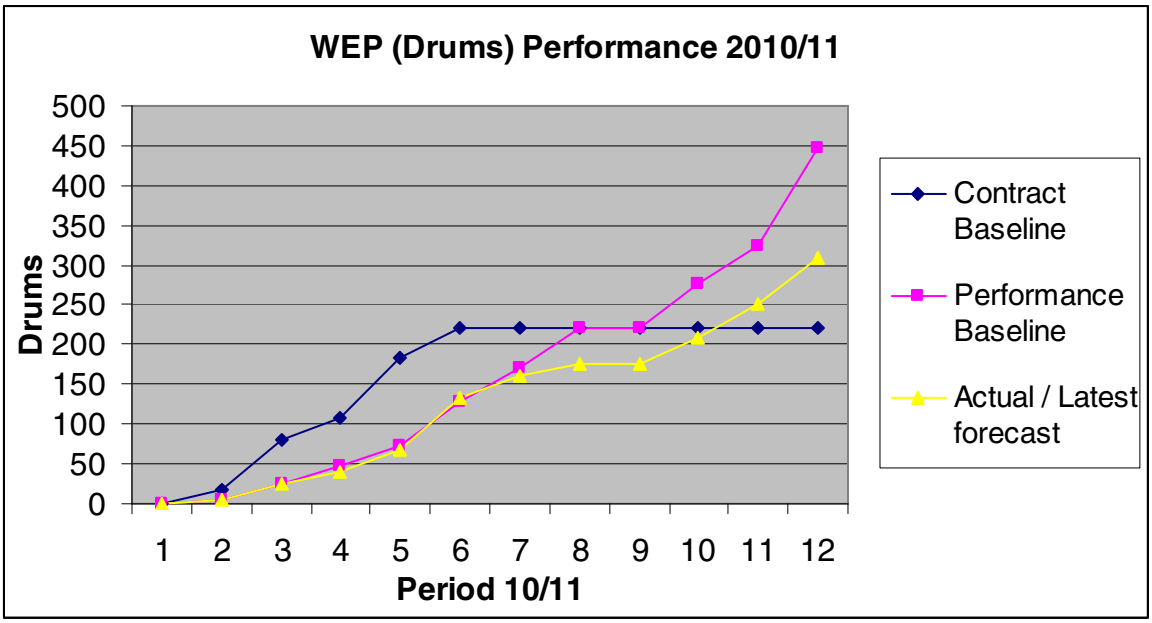
Magnox Encapsulation Plant (MEP) totalled 264 drums against a contract baseline of 766 and performance plan of 654, see Figure 4. The performance of MEP is driven by Magnox which out turned at 232te.

Figure 4: MEP (drums) Performance 2010/11



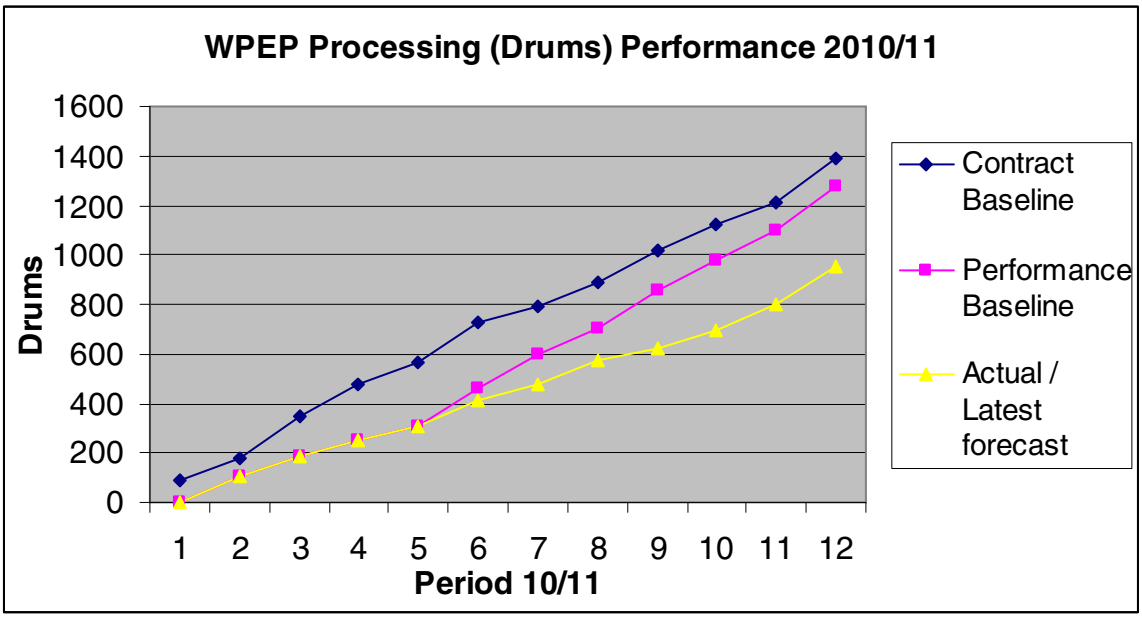
The Waste Encapsulation Plant (WEP) produced a total of 308 drums against a contract baseline of 220 and performance baseline of 446, see Figure 5. WEP supported Thorp in performance outturn that exceeding the contract baseline. This was enabled by a number of improvements introduced into WEP; increased manpower to change worker shift patterns, 3 six sigma business improvement projects carried out for key availability issues, system engineering introduced onto key plant areas and the team was restructured to increase focus onto the plant. A significant plant breakdown occurred during November/December 2010 where the bogie used to process containers from Thorp in the WEP cave failed. A team of designers and engineers worked well together to enable a full recovery.

Figure 5: WEP (Drums) Performance 2010/11



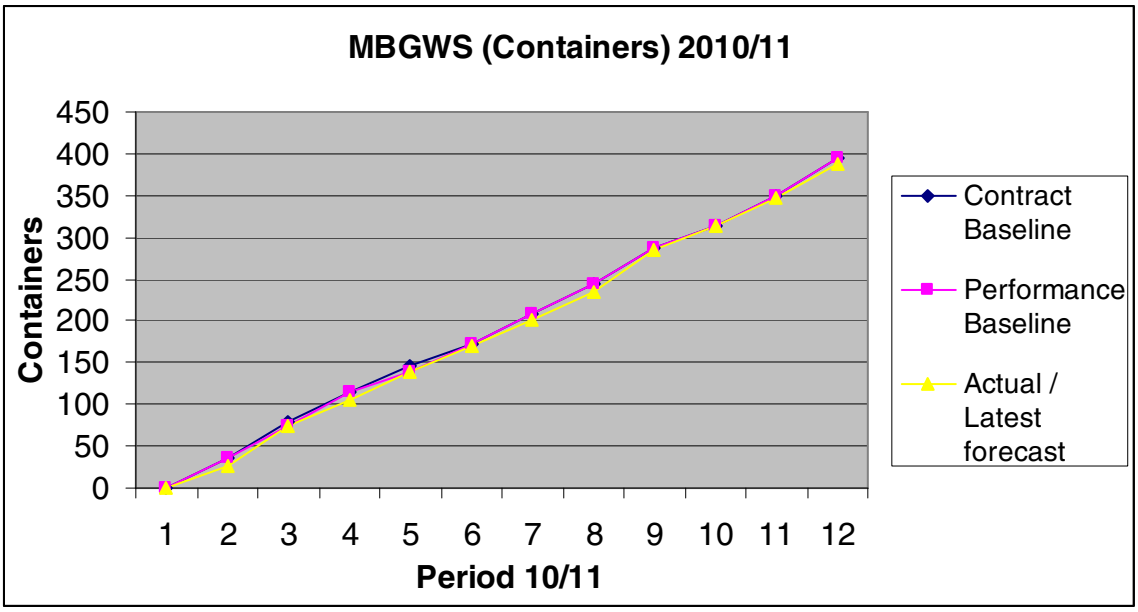
The Waste Packaging and Encapsulation Plant (WPEP) produced 952 drums during 2010/11 against a contract baseline of 1390 and performance plan of 1280, see Figure 6. This year end performance included drum efficiencies of 267 drums due to incorporation rates in the Enhanced Actinide Removal Plant (EARP). The outturn also reflects the reduced throughput of Magnox.

Figure 6: WPEP Processing (Drums) Performance 2010/11



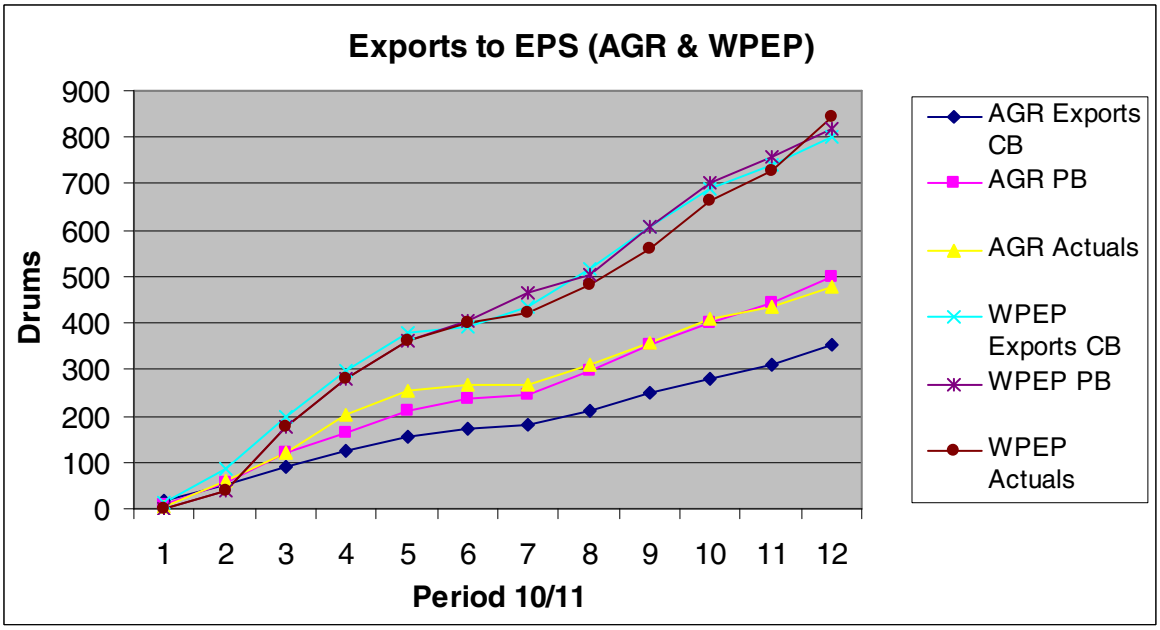
Miscellaneous Beta Gamma Waste Stores (MBGWS) produced a total of 388 containers in 2010/11 against the contract baseline and performance plan of 394, see Figure 7. MBGWS outturn is consignor driven, however consignments received were below contract baseline due to donor plants application of the waste hierarchy. Packing fraction improvements also enabled reduced box usage for waste consignments.

Figure 7: MBGWS (Containers) 2010/11



The Encapsulated Product Store (EPS) experienced a significant improvement in performance 2010/11 due to improvements to key equipment to reduce failures and enable recoveries to take place more efficiently. Figure 8 below illustrates the exports to EPS from AGR and WPEP, both of which exceeded the contract baseline. WPEP export also exceeded the Performance baseline, AGR exports were very close to achieving the performance baseline.

Figure 8: Exports to EPS (AGR & WPEP)



The Encapsulated Product Store 3 (EPS3) build continues to progress, the key achievements include the following:

- Roof steelwork, external staircase steelwork and all roofing have been completed. Cladding is complete to the staircases and the roof structure with the exception of equipment access on the south elevation and the area around the interconnecting link bridges to EPS2 on the north elevation.

- The two 10 tonne vault cranes works testing has been completed and both cranes delivered to site and installed in the vaults. The vault vent covers have been installed in the transfer tunnel and four ancillary cranes installed in November 2010.

- HVAC, services pipe-work and cable containment installation began in late August 2010 and the project is now preparing temporary energisation of vault 3 crane through undertaking energisation checks.

4.3 Plutonium Contaminated Material (PCM)

4.3.1 Plutonium Contaminated Material Strategy Developments

The PCM strategy (8) that originates back to 2007 has been revisited, triggered from the significant changes and prioritisation process of the LTP10 build and a much larger volume of future PCM waste arisings are now predicted than previously assumed.

The output from the 2010 Lifecycle Baseline has been taken into account, which deferred funding requirement to deliver the new capital builds identified in the 2007 PCM strategy against higher hazard reduction programmes on site. This has resulted in the requirement to intervene with legacy packages to reduce risk levels to ALARP until the hazard presented by the waste can be eliminated through processing into a final disposable form.

The other main driver in revising the 2007 strategy is the recognition that consigning all PCM waste arisings from decommissioning into 200Litre drums is an inefficient process; it generates a considerable quantity of secondary waste and puts the Decommissioning operators at greater risk.

In order to address these issues, the strategy proposed that the following measures are adopted:

- Legacy waste packages consisting of drums, filters and crates which cannot currently be processed into final form products require characterisation, modification to improve their containment capability and where appropriate, relocation into modern stores.
- The introduction of a larger interim raw waste package as an additional interim raw waste package of the 200litre drum.
- A new work programme to develop a process that will accept larger interim raw waste packages as an input, without further pre-conditioning, to produce an output that is compliant with requirements for GDF storage.
- Until there is sufficient confidence in the technology, it is recommended that alpha decommissioning is deferred.

As well as the reduction in the risk to Decommissioning operators and uncertainties in future waste volumes, the strategy generates additional benefits in potentially reducing the number of future processing facilities and new stores which are currently identified as being required in LTP10.

In summary, the key benefits that will be realised through deployment of the strategy are:

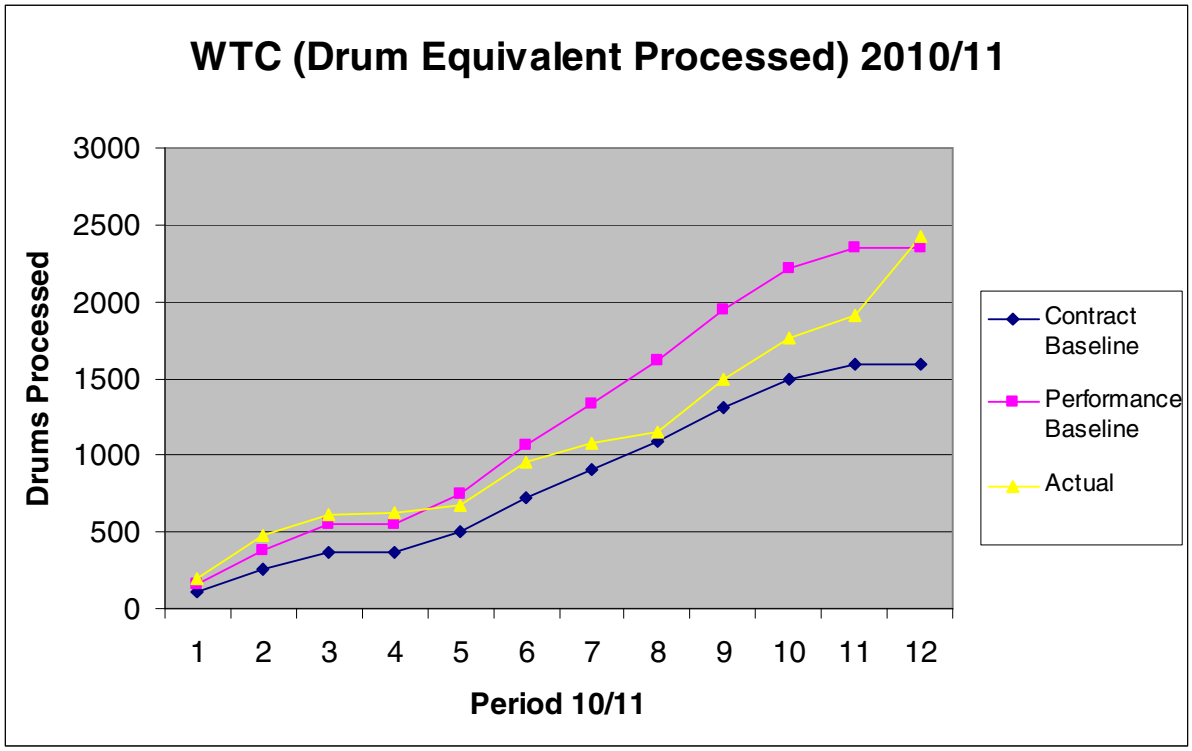
- Hazard and risk management
- Minimising waste generation
- Optimising waste storage
- Optimising waste treatment and disposal.

4.3.2 Plutonium Contaminated Material Progress and Future plans

The PCM programme has continued to make progress in implementing the existing PCM strategy and waste hierarchy. There have been a number of achievements during the

financial year 2010/11 that have focused on enabling hazard reduction through the repackaging and transferring of PCM waste into the Engineering Drum Store (EDS); the Performance of the Waste Treatment Complex (WTC) achieved the highest annual compactions to date, exceeding the contract and performance baseline, see Figure 9. Additionally, 250 drums of PCM waste has been re-classified to LLW and processed through WAMAC.

Figure 9: WTC (Drum Equivalent Processed) 2010/11



Work is currently ongoing to support the business case for the proposed transfer of material from Harwell to Sellafield which includes PCM waste. Opportunities to use existing Sellafield facilities for processing and storage, until final disposal at the GDF are being explored. The business case to support the proposal has been submitted to the NDA that will be followed up with detailed engagement and further discussions regarding the proposal.

4.4 Low Level Waste (LLW)

4.4.1 Low Level Waste Strategy Developments

Sellafield Ltd LLW strategy was issued in December 2008 (9). The NDA issued the UK strategy for LLW in August 2010. Although Sellafield Ltd strategy was issued prior to this (December 2008) the strategies remain consistently founded on waste principles and application of the waste management hierarchy.

Sellafield has continued with inter-SLC working with LLWR to implement a range of treatment and disposal options. Sellafield has commenced preparation of the joint LLW Management Plan with the first review held on the 20th July and on plan for submission by the end of September 11. This has updated Sellafield Ltd LLW strategy to maintain full alignment with the national strategy.

A full review of the forecasted LLW volumes to be generated from Sellafield sites using norms and guidance provided by LLWR has been undertaken. This resulted in a re-forecast

of volumes in November 2010 that consequently resulted in a new estimate of cost calculated and reported at the end of February 2011. Work is ongoing to consolidate the estimates and ensure alignment with the Sellafield Radioactive Waste Inventory.

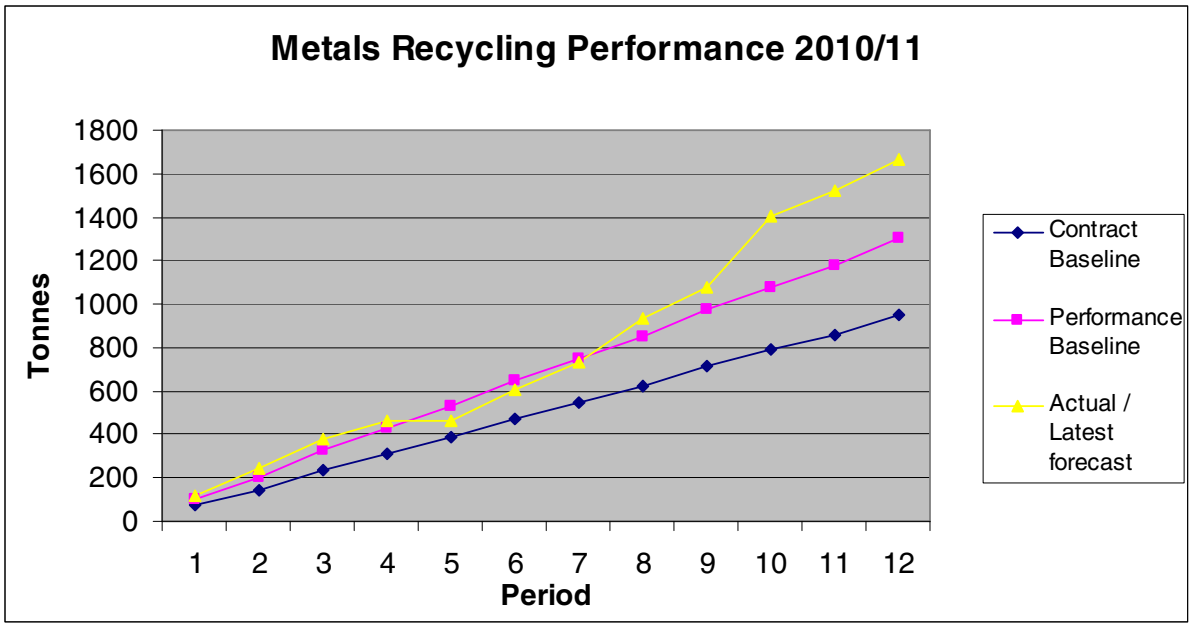
4.4.2 Low Level Waste Progress and Future plans

The key Progress and achievements demonstrated within the LLW programme of works (that also included VLLW categorised waste)

Metals

- An increase in Sellafield Ltd metal recycling output and capability. In 2010/11 1669Te metals were re-cycled that exceeded the performance plan target of 1350Te, as illustrated by Figure 10
- The Thorp Multi Element Bottles (MEB) frame shipments were completed in November 2010 that was used to prove the LLW metal recycling disposal route. This diverted previously assumed waste to be recycled.
- A MEB's size reduction and re-cycling route has been proven. The significant decontamination of MEB internals was trailed in THORP to support the MEB export campaign. This has proved to be invaluable work by Waste's Decontamination function to underpin MEB operations in THORP; 8 MEBs were re-categorised from ILW to LLW. The first two of these MEB's were shipped off site to support size reduction and segregation trials at Studsvik's Metal Recycling Facility.
- A total of 341Te of LLW metal was sent for re-cycling off site 2010/11 through the LLWR segregated waste treatment service contract.
- Calder ductwork size reduced and shipped for re-cycling

Figure 10: Metals Recycling Performance 2010/11



Asbestos

The disposal of all the removed lagging from the main bodies of the Calder Hall heat exchangers has been completed. This included 1757Te Asbestos and 208Te of Calcium Silicate lagging disposed of safely by exemption to an off site landfill.

Oil

The First 2 shipments of waste oil to a UK incineration facility have been completed via the commissioned waste route opened for LLW oil. Two trials were undertaken successfully in

March 2011 with the disposal of 3.5%, of the inventory from THORP, Sep Area and HALES, reducing hazard directly from these areas. Preparation of the supporting management system documentation is underway to enable a planned shipment by the end of October 11. This work has been undertaken in partnership with LLWR Ltd using the Segregated Services Contract.

Combustibles
Progress on combustibles includes the opening up of the combustible waste route for LLW oils, as covered above and the route for LLW Solids authorisation; discussions with EA continue with a trial of 40m^3 planned to be shipped by the end of December 11. It is anticipated that following a successful trial, an authorised volume will be incorporated into the permit by the EA.

VLLW
The LLWR segregated services contract for VLLW is estimated to be in place by April 2012. Sellafield have undertaken some preparatory work to facilitate utilising this route in 2012. Further work will continue on the consideration of VLLW and incineration options.

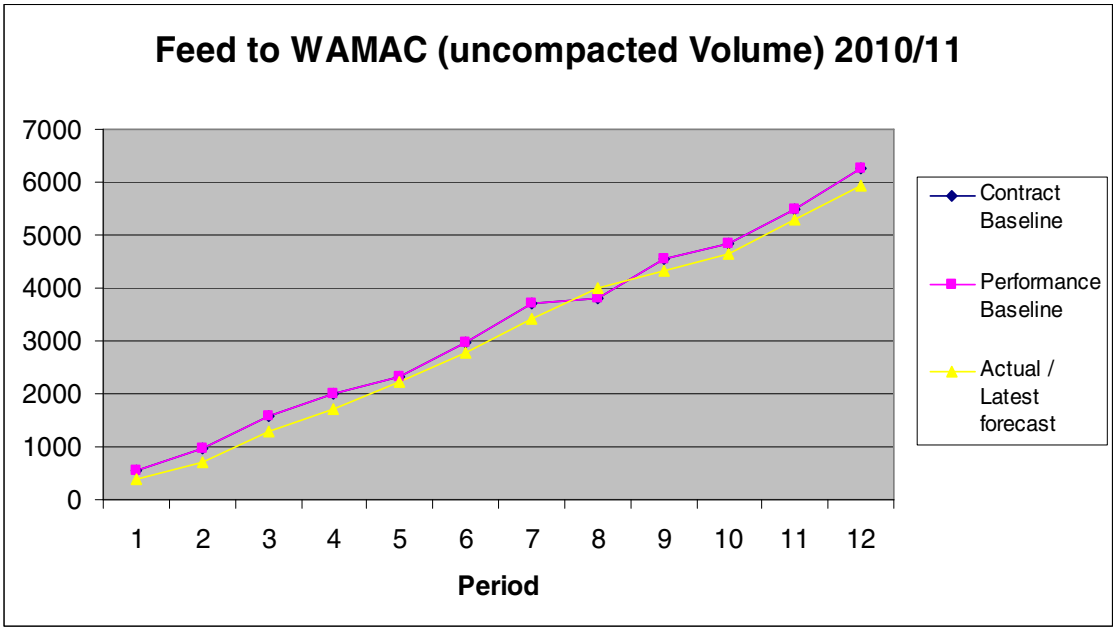
Exempt Waste
Work is progressing to re-commission the bag monitoring facility for exemption operations and a full plan has been developed. This will be undertaken 2011/12.

Operations and Management

- A significant reduction in the total site number of LLW containers shipped to LLWR; 145 in 2010/11 compared with 169 in 09/10 and 211 in 08/09, demonstrating an improved implementation of the waste management hierarchy.
- Decontamination facility has successfully been brought into the Waste OU
- A Rapid Improvement Event on consignment activities to LLWR to increase compliance confidence identified a number of process improvements including a new electronic LLW data system that has been developed and is being tested prior to commissioning. This should improve the management of consignment data for LLW shipments.
- Waste team involvement with the review of the Sellafield arrangements for non active and exempt waste disposals with the implementation of changes being facilitated through the renewal of the site FM contract. This has enabled greater control on the full range of Sellafield waste disposals by the Waste OU.
- The varied Environmental permit was granted, effective from the 1 August 2011 which has opened up a number of waste routes, albeit some initially with nil volume, that when fully commissioned, will enable SL to optimise the application of the waste management hierarchy:
  - Incineration to facilitate volume reduction of waste
  - Disposal to landfill as High Volume Very Low Level Waste (HV-VLLW)
  - Disposal to landfill as LLW
  - Permitting of Phase 2 of the Calder Floodplain Landfill Extension – Segregated Area.
- 12 pond items have been size reduced in WAMAC.
- The feed to WAMAC (un-compacted volume) for 2010/11 achieved an annual total of 5931m^3 against the contract baseline and performance plan total of 6271m$^{3.}$ Figure 11 below illustrate the annual performance.
- There were two waste events in 2010 that involved the incorrect consignment of waste that prompted a site suspension of all waste streams. Following the gradual re-establishment of areas from the suspension, and to further develop permanent, sustainable, robust and enhanced arrangements relating to waste management at an operations and site wide level, the Waste Oversight Group was formed to improve and roll out the revised waste management arrangements and to provide control of the site boundaries for solid waste transfers. This work is ongoing. Further detail on Waste & Environmental Audits undertaken by SL over this period can be

found in the Sellafield Ltd Environmental Assurance Report June 2011 (10) submitted under schedule 9 requirement 30.

Figure 11: Feed to WAMAC (un-compacted Volume) 2010/11



4.5 Effluent Waste (Liquids and Aerial)

4.5.1 Effluent Waste Strategy Developments

The Sellafield Effluent Management Strategy document (11) is currently under development together with the complementing Infrastructure development plan for endorsement at the Aqueous & Gaseous Waste Strategy Steering Group (A&GWSSG) in October 2011. Once complete, both documents together with recommendations and decisions will be owned by A&GWSSG. Draft versions of the documents have been presented to the EA & ONR in June 2011 to provide the opportunity for feedback, their observations and recommendations.

The Effluent Management Strategy document covers a wide range of topics including:

UK Government Policy for Effluent, Regulatory Framework and NDA Strategy
Effluents at Sellafield
- Background to Effluent Management at Sellafield
- Liquid Effluents
- Gaseous Effluents
- Sellafield IWS

- Principles, Vision, Aims & Objectives for the Effluent Management Strategy
- Effluent Strategy Components
- Effluent Strategy Governance Process
- Lifetime Plan 2010 CBL & 2011 PP
- Recommendations
- Effluent Strategy Implementation Plan & Decision Calendar

The Effluent Management Strategy principles were developed to align with the Sellafield IWS principles, EHS&Q's vision & the Site's overall Vision which ultimately aligns to the NDA's vision & mission. The principles outlined in the document:

- Ensure UK Government Policy & Legislation can be achieved.
- Ensure hazard and risk reduction on site can be achieved.
- Minimise effluent discharges aligning to the aims & objectives of UK Strategy for Radioactive Discharges & ensuring discharges are ALARP
- Ensure alignment to the Sellafield Integrated Waste Strategy and application of the Waste Management Hierarchy to optimise discharges
- Ensure alignment with the NDA strategy
- Ensure the effluent strategy is robust & deliverable
- Maximise the utilisation of existing and any future planned effluent facilities as far as practicable
- Ensure adequate effluent management, treatment and discharge capability is available to support the site's strategic imperatives
- Ensure value for money for the UK tax payer
- Ensure international good practice and guidance to effluent management is applied

A set of effluent strategy components have been established which consist of statements describing what is required to be done during the different phases from operations to legacy waste retrievals and decommissioning to ensure the management of effluents is consistent with the Sellafield Ltd vision.

The strategy components are then assessed against the principles of the effluent strategy and indicate where there is alignment and where there needs to be more focus to ensure the strategy remains robust.

Where there is a requirement for further work to be undertaken, recommendations are proposed which will appear on the Effluent Strategy decision calendar that is owned by the A&GWSSG. As the strategy is in the development stage, the full set of recommendations and decisions are yet to be agreed.

4.5.2 Effluent Waste Progress and Future plans

The Effluent Infrastructure Development Plan is intended to outline the physical assets required to manage current and future liquid and gaseous effluents. It is to be used to confirm the adequacy and appropriateness of the effluent management asset provision and inform assessments of the risk based asset care provision using the Geographical Information System (GIS) mapping.

The plan outlines visually how the current effluent infrastructure will support the site strategy and when the infrastructure is finished with. It visually demonstrates where new-build supporting effluents will be located with the ability to outline gaps and issues which could otherwise be overlooked.

The visual maps can be used in study briefs whereby they can assist the decision making process by showing the effluent infrastructure demand and requirements at different points in time.

Both the Effluent Management Strategy and the Effluent Infrastructure Development plan will be updated to reflect any major changes to the strategy and will be owned by the A&GWSSG.

There is a Lloyds Register Quality Assurance (LRQA) audit scheduled for the end of October 2011 that will specifically focus on liquid effluent.

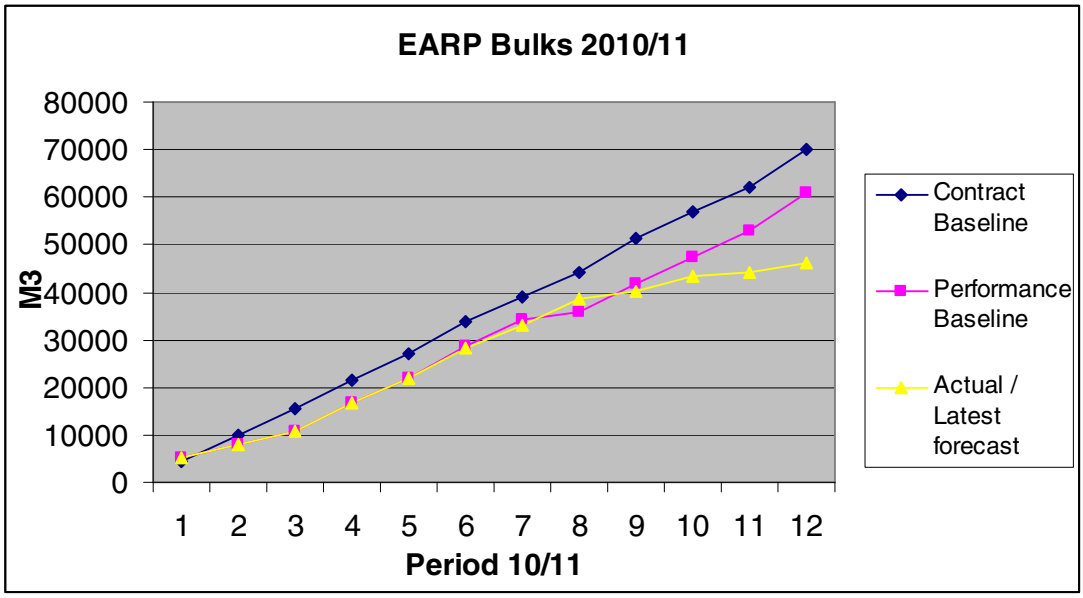
Risk Reduction
Risk reduction progress has been made within the Floc Retrievals Programme. The processing of the second tank of material (primary sludge tank PS4) through EARP and

WPEP are well advanced with preparations for re-suspension and transfer of the third tank (PS3) to the buffer tank ready for processing to commence in quarter 3 2011/12.

Plant Performance

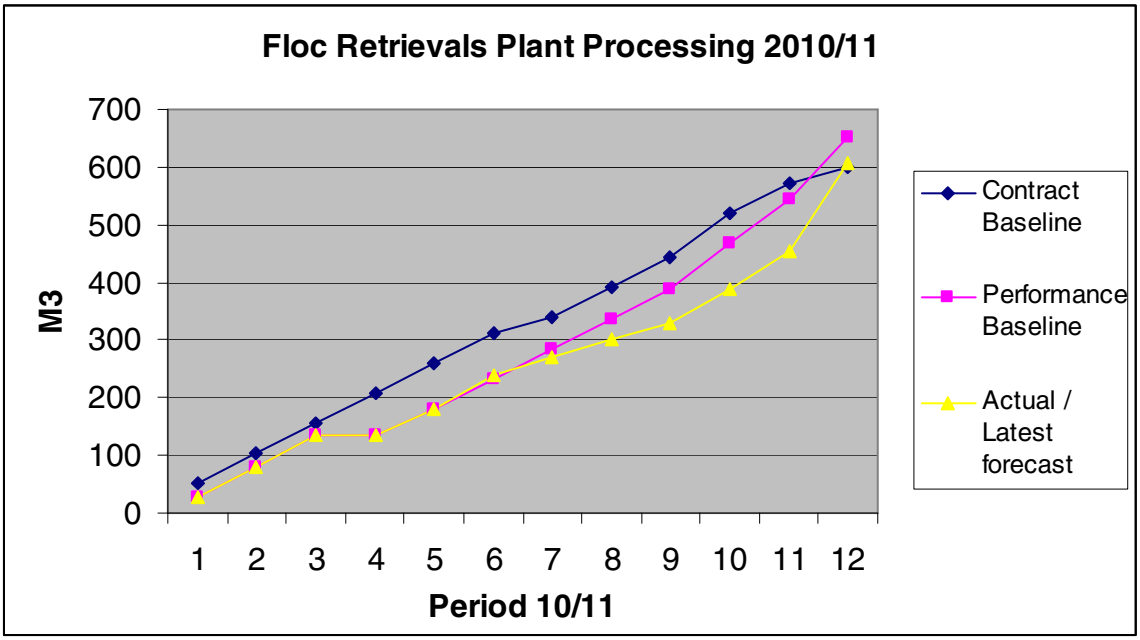
Enhanced Actinide Removal Plant (EARP) bulks performance for 2010/11 is illustrated below. Actual performance was 45999 against a contract baseline of 70121 and Performance baseline of 60928, see Figure 12. EARP bulks volumetric throughput is dedicated by the effluent feeds from upstream donors, particularly Magnox reprocessing which is largely related to the number of operating days of Magnox. EARP bulk performance therefore reflects the reduction in Magnox reprocessing performance 2010/11.

Figure 12: EARP Bulks 2010/11



During 2010/11 financial year, the Floc Retrieval Plant processed totalled at 608m^3 against the contract baseline of 598m^3 and performance plan of 651m^3, see Figure 13. The plant experienced reduced performance in the first two quarters of the year that was due to a combination of technical issues. These issues were addressed and performance increased in the second half of the year to recover the contract baseline target. This demonstrated that overall schedule can be recovered at that level of performance.

Figure 13: Floc Retrievals Plant Processing 2010/11



4.6 Decommissioning Waste

4.6.1 Decommissioning Strategy Developments

To date the Decommissioning Strategy (12) has primarily been defined by the schedule output from the Lifetime Planning Process, which in turn has been an ongoing reflection of Sellafield priorities. At the forefront of these has been the high hazard risk reduction focus in the Legacy Ponds and Silos areas, the scope of which now includes the acceleration of risk reduction activities through the incorporation of interim buffer storage for higher hazardous ILW wastes. Furthermore the requirement to address conventional hazards posed by ageing facilities, while improving building condition and infrastructure has also influenced near to medium term priorities.

Since the publication of the Sellafield Integrated Waste Strategy in 2006, much work has been completed to support strategy development by improving the underpinning of individual facility decommissioning plans. This work recognised the significant influence Decommissioning will have on Waste Treatment and Storage Strategies and produced Preliminary Decommissioning Plans through the Mandate process for the most significant facilities on the site. Each plan provides a detailed outline of expected primary and secondary waste arisings from decommissioning activities. Supplemented by additional waste packaging information gathered from recent projects, this has also been used to model the waste arisings from those facilities that have not been through the Mandate process. In turn, both the plans and the model have informed wider site strategic planning and development. Decommissioning plans continue to be produced, albeit on a reduced scale, targeting specific facilities that offer best value in terms of reducing uncertainties.

Most recently the publication of NDA Strategy (April 2011) has, for the first time, articulated a willingness to consider ‘in situ’ disposal as a sub option “for managing the products of decommissioning”; and also for ‘in situ’ management of contamination as part of Land Quality management where “intervention may do more harm than good” while still achieving the site end state. This has provided a clear opportunity to review the Decommissioning Strategy which has always focussed on facility demolition to base slab as the final decommissioning objective. Similarly it is understood that although the Site End State is defined, the definition is open to interpretation and again NDA Strategy describes the concept of interim states that may be used in pursuit of the final End State.

Building on these changes, a fresh approach to the development of an optimised Sellafield Decommissioning Strategy is now underway, which will consider alternative facility end states. Furthermore it is expected that it will also provide an unprecedented insight by considering final site end use, and so begin to test the interpretation of Interim and Site End State. Ultimately this integration of the Sellafield Decommissioning and End State strategies is expected to provide the NDA with options to inform its own strategy development.

4.6.2 Decommissioning Waste Progress and Future plans

Further progress has also been made through the preparation of the sites Decommissioning arrangements under Site Licence Condition 35. Those arrangements clearly state that POCO will be managed to the requirements of SLC 35, and so begin to address one of the cornerstones of successful decommissioning, namely successful POCO. To that end the link between experienced plant operators and decommissioning expertise will be strengthened to improve planning for both POCO and Decommissioning. Early discussions have already taken place in order to roll out the new arrangements and set the foundations for successful POCO planning as Site Reprocessing operations draw to a close.

In March 2011 the first alternative Plutonium Contaminated Material (PCM) waste package consignment to the Engineered Drum Stores heralded the realisation of an agreement in

principle between the Decommissioning and Waste Directorates to assess PCM waste consignments on a case by case basis. This improved approach addresses the continued challenge to remain ALARP and minimise the amount of manual intervention required during plutonium facility decommissioning. It is also expected over the long term to contribute to the reduction of secondary decommissioning waste volumes, currently driven by the size reduction necessary to fill the 200 litre drum PCM package.

Other in flight scope supporting the IWS delivery includes the imminent implementation of a waste route for the First Generation Magnox Storage Pond decanner bay solid ILW to the Sellafield Wastes Encapsulation Plant for immobilisation. This route will be further supplemented by the inclusion of pre-processing in the redundant Thorp Area which will provide the capability to sort and segregate wastes to improve waste categorisation and sentencing. In addition following the decommissioning of the Windscale Advanced Gas Cooled Reactor (WAGR) an opportunity to utilise the remnant waste treatment and storage capacity is now under consideration to support hazard reduction through management of Miscellaneous Beta Gamma Waste (MBGW) solids currently stored in the legacy Magnox Swarf Storage Silos, providing an early start to retrieval operations and the capability to sentence compatible waste to a second route during bulk retrieval operations.

Furthermore the development of the Legacy Pond Solids Treatment Plant has reached a significant milestone in its studies programme with a decision on the technologies which will form the basis of its detailed R&D programme. Within the PFSP an opportunity has been realised to reclassify a significant proportion of the ILW solids inventory as LLW. In addition the PFSP has launched a study into the use of existing infrastructure for the treatment of ILW sludge's and solids.

4.6.3 Characterisation work

The site characterisation team have provided data to enable projects to successfully apply the principles of the waste management hierarchy over the past period. The data produced from characterisation activities has been used to underpin demolition strategy, safe working methods and optimisation of waste routing. Examples of where characterisation has been a key enabler, has provided significant project support over the period include:

- **Characterisation of Calder Heat Exchanger Top and Bottom Duct Calcium Silicate Lagging**. - The baseline radiological waste category was LLW as the waste originated from a C2 area. Characterisation confirmed the bulk activity concentration and enabled 300m^3 of bottom duct lagging to be disposed on site as VLLW to CLESA and 450m^3 of top duct lagging to be disposed off-site to landfill as exempt waste.
- **Characterisation of Ground Works in support of the installation of Electrical Transformers** – The baseline radiological waste category was VLLW as the waste originated from a C0 area with the potential for contamination. Characterisation confirmed the bulk activity of the soil and enabled 5000m^3 to be disposed off-site to landfill as exempt.
- **Characterisation of redundant buildings to enable demolition** – The baseline radiological waste category was LLW as the waste originated from C2/C3 area. Characterisation produced a radiological and chemical fingerprint for the waste and estimated bulk activity concentration. This enabled 1155m^3 of building fabric to be disposed on-site to CLESA and 332m^3 of metal to be recycled via the on-site wheelabrator.
- **Characterisation of redundant Base Slabs** – The baseline radiological waste category was LLW as the waste originated from a C2 area. Characterisation confirmed the bulk activity of the waste and enabled 672m^3 to be disposed off-site to landfill as exempt and 300m^3 to be reused on site as in-fill material. This avoided LLW being generated and re-using a proportion of the material.

- **Characterisation of stack ventilation duct** – The baseline radiological was LLW as the waste originated from a C2 area. Characterisation confirmed the LLW category and alleviated project risk/concern that the material may be ILW.
- **Characterisation of waste compacter effluent** – The characteristics of the effluent were unknown. The effluent was characterised and a practical and cost effective waste route proposed.

5.0 Non-Radioactive Discharges

5.1 Non-Radioactive Discharge Strategy

Non-Radioactive discharges from Sellafield are a consequence of operations on the site. The site uses normal industrial waste disposal practices for non-radioactive discharges, and seeks to apply Best Practice for waste minimisation.

A Pollution Prevention and Control (PPC) Permit was issued for the Sellafield PPC Installation by the Environment Agency (EA) in October 2007. Due to changes in legislation, this became an Environmental Permit in April 2008 and has since been varied.

The Sellafield Environmental Permit (1) covers most but not all of the activities on site (including Fellside Combined Heat and Power Plant), the main exclusion being the Sellafield MOX Plant. However those areas of site which are excluded from the Sellafield Environmental Permit use the principles behind the permit as best practice guidance where applicable.

This Permit sets out conditions for the management and operation of the Installation and includes the following main requirements:

- Compliance with aerial and liquid discharge limits as set in the Permit and ensuring all monitoring and reporting of these discharges to the EA is undertaken.
- Energy and water efficiency, including regular reviews to determine if there are opportunities to make improvements.
- Raw material efficiency, including regular reviews to look for suitable alternatives and opportunities to make improvements.
- Avoidance, recovery and disposal of non-radiological wastes (i.e. the WMH).
- Use of appropriate pollution prevention measures to prevent (or minimise) spillages reaching the environment (including the ground).
- Application of Best Available Techniques (BAT) to prevent or minimise emissions and their impact on the environment.

5.2 Non-Radioactive Discharge Progress and Future plans

The original Permit contained an Improvement Programme with 16 requirements. Responses to all of these requirements were submitted to the EA by the 21st October 2009. Some of the work streams included in this improvement programme was:

- Demonstration of a raw materials database detailing the inventory of raw materials used on site.
- A review of the heavy metal limits on site which resulted in proposed changes to the current regime including the proposal to remove some limits.

The output and ongoing work from several of these responses support the permit's requirement for continual improvement including the requirement for a number of reviews which must be carried out at least every four years, these are:

- A review of energy to identify whether there are suitable opportunities to improve the energy efficiency of the activities.
- A review of water to identify if there are opportunities to improve the efficiency of water use.
- A review of raw materials to identify whether there are suitable alternative materials that could reduce environmental impact or opportunities to improve the efficiency of the raw material use.
- A review of the measures taken to ensure that waste produced by the activities is avoided or reduced, or where waste is produced it is recovered wherever practicable or otherwise disposed of in a manner which minimises its impact on the environment.
- A review of the Accident Management Plan for the Sellafield PPC Installation.

The outcome of the above reviews is recorded and appropriate measures identified by the reviews progressed.

The permit also requires the production of an annual report on the performance of the activities over the previous calendar year. This report must include a review of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data, plus energy and water usage data. The 2010 report was completed and approved in June 2011 (13).

The above requirements form the basis for the site's ongoing management of non-radioactive discharges and provide the background against which future approaches are considered.

5.2.1 Solid Waste Asset Disposal project

The central waste team has facilitated the solid waste asset disposal project. Surplus assets such as redundant plant and stocks (free release items) across the Sellafield site are being identified for re-use or recycling. Items no longer required are firstly offered to other SLC's across the NDA estate for re-use. If there is no SLC customer identified, the assets proceed into a Contract Tender Management process (EU approved) where they are tendered against and sold to the highest bidding company, the revenue is returned to the NDA. This project is deliberately diverting items previously assumed and disposed of as waste into reuse. In parallel, the project is also identifying and collating non-radioactive redundant scrap metals from across the site and selling this back into the UK metal market for recycling. This project demonstrates two examples of applying the waste hierarchy at the operational level that is realising benefits.

5.3 The Environmental Footprint Reduction Strategy

The Environmental Footprint Reduction Strategy (Internal SL document) (14) as endorsed by the Strategic Governance Committee in August 2010. This strategy has direct links and overlaps with the IWS, such as a need to develop and implement meaningful KPI's and metrics that drive application of the Waste Management Hierarchy. The intention is to produce a communications version of the strategy that will be published and made available to key stakeholders.

The pending review of the Principles Paper and future development of the IWS will give the Environmental Footprint Reduction Strategy due consideration and collaborative working between the two strategies will ensure they are aligned to each other and to the strategic business imperatives.

6.0 IWS Future Plans

6.1 Review of the Sellafield Ltd IWS Principles Paper

The IWS needs to remain current as it plays a key enabling role for the Sellafield Site to optimise the application of the waste management hierarchy. It should monitor progress against the component strategies and the IWS as a whole and track the realisation of benefits and the maturity of risks/opportunities. To achieve this, fit for purpose governance arrangements should be defined along with the arrangements for effective communications and engagement with key stakeholders. The IWS Principles Paper will be reviewed and updated to illustrate and communicate this framework.

6.2 Development of appropriate metrics / Key Performance Indicators (KPI's)

Work has continued over the past year to establish and embed the Sellafield strategic dashboard. There are a number of established measures within the strategic dashboard that will be utilised for monitoring and reporting against IWS performance. These are likely to be supplemented by other measures that are less mature and require further work. A gap analysis will be undertaken to ensure the necessary areas have or are developing performance measures, this will consider other sources of information pertinent to the development of useful KPI's, these are:

- Sellafield Strategic Dashboard
- Sellafield Ltd Excellence Strategic Business Imperatives
- Sellafield Environmental Footprint Reduction Strategy
- EA Nuclear Sector Plan, Issue 2
- Sellafield Site Environment Review Report (Not issued yet)
- Sellafield Environment Management System and any other environment performance reporting mechanisms.
- Appendix A, IWS progress Report June 2010. Proposed list of KPI's.
- Existing operational performance measures on the Executive Dashboard
- Joint Waste Management Plan (SL & LLWR).

(*This list is not exhaustive*).

The IWS KPI's and measures will be consolidated and defined in the review of the IWS Principles Paper.

6.3 Exploring Opportunities across the NDA estate within Higher Activity Waste

During the course of development work undertaken across the NDA estates over the recent years a number of opportunities have been recognised that could offer significant advantages from a waste management perspective. This information is recorded in a number of documents. NDA RWMD is collating a wide range of such opportunities through a series of workshops at Harwell (to cover NDA, RWMD), Warrington (to cover Magnox, LLWR, RSRL and DSRL), and in Cumbria to cover Sellafield.

The Technical Baseline and underpinning Research and Development (TBuRD) and Risk Opportunity Registers currently represent the main sources of opportunities that have been discussed and initially screened to eliminate any that are judged to be completely unsatisfactory. The Sellafield Ltd workshop was held 9th August 2011 and looked to expand on the existing SL opportunities list through:

- Challenging existing relevant assumptions, constraints and Exclusions within the 2011 LTP Performance Plan.

- By considering a range of high level topics (waste types, timescales, end states, est.) as they impinge on Higher Activity Waste management generally or specifically.

As the NDA programme is subject to continuous review and improvement, it is appropriate that these additional opportunities, if accepted as feasible, will be put forward for further study.

6.4 Training and Development

There is a clear driver from the site change programme, in parallel with Learning from Experience over the previous year to improve and sustain the capabilities and competence of individuals within roles identified on site which generate, classify, handle, certify or ship waste materials. The Waste Operating Unit is reviewing the current training requirements and provisions with the intent to identify areas for improvements and developing these improvements into a more robust training programme, initially the LLW familiarisation, LLW co-ordinator and Skip Controller courses are being improved. The revised training will, in part, address some of the cultural changes that are required through changing some key behaviour within the waste community and key competent roles. In turn this will be supported through the site organisational and cultural change focus area within the ICP.

At a higher level, the business is embarking on a leadership development programme that will be cascaded through the organisation to individuals from the office of the MD through to the team leader level. This leadership training is focusing on the development and improvement of three core competencies within the leaders of the organisation. These competencies have been highlighted by both WANO and ONR inspections and audits as an area of required improvement; lead by example, commitment to standards and holding self and others to account. This should support and improve the leadership of waste and environmental performance across the site.

7.0 Conclusion and Recommendations

The past year has seen some significant improvements in the implementation of the IWS within the operating units, where the benefits are being realised, such as the increase in waste metals now being diverted from disposals to a recycling route, and improvements in the characterisation of radioactive waste is permitting the re-classification of wastes and allowing positive application of the waste management hierarchy. The recent varied Environment Permit (August 2011) is a step change; the opening up of new waste routes will enable Sellafield Ltd to significantly drive best practice within the waste management hierarchy.

The IWS is live and will continue to evolve and drive for continuous improvements. The priority areas that Sellafield will focus upon to drive improvements in the forthcoming period are the following:

1.) Review and issue of the IWS Principles Paper
2.) Establish a suitable set of KPI's/measures against IWS progress
3.) Stakeholder Engagement and Communications

8. References

1. The Environmental Permitting (England & Wales) Regulations 2010. Sellafield Ltd, Permit number KP3690SX.
2. Sellafield Integrated Waste Strategy – Principles. March 2010.
3. Sellafield Ltd Lifetime Contract Baseline 2010 (LCB10)
4. Sellafield Ltd Performance Plan, 2011 (LTP-11 PP)
5. Nuclear Decommissioning Authority Strategy, effective from April 2011.
6. UK Strategy for the Management of Solid Low Level Radioactive Waste from the Nuclear Industry.
7. Sellafield Intermediate Level Waste Management Strategy, March 2011. GEN-2973B.
8. Sellafield Plutonium Contaminated Material Management Strategy, Ref: PCMSSG(11)P01.
9. Sellafield Site Low Level Waste Management Strategy, December 2008, IWSSG(08)01.
10. Sellafield Ltd Environmental Assurance Report, June 2011. Sellafield Site.
11. Sellafield Effluent Management Strategy, Draft – June 2011. GEN-3223_P5.
12. Sellafield Decommissioning Strategy.
13. A report on the performance of activities during 2010 for the Sellafield PPC Installation in response to clause 4.2.2 of the Environmental Permit EPR/BM4317IX variation EPR/XP3433TV/V003, June 2011.
14. Sellafield Environmental Footprint Reduction Strategy – Internal Document for Endorsement, August 2010.

Section B: Discharges

The charts, tables and illustrations on the following pages provide a summary of the following Sellafield Site Discharge information:

- Sellafield Effluent Discharges - Summary 2010/11
- Sellafield Liquid Effluent Discharges – Past, Current & Future predictions in relation to the UK Discharge Strategy.
- Sellafield Liquid Effluent Discharges – Summary of Current & Future Discharges
- Sellafield Gaseous Effluent Discharges – Past, Current & Future predictions.
- Sellafield Gaseous Effluent Discharges – Summary of Current & Future Discharges.
- Sellafield Effluent Discharges – Summary Description of the OES Model & the methodology.

Sellafield Effluent Discharges – Summary (2010/11)

Sellafield Ltd

Strategic Objectives

The strategic objective for Effluent Management on the Sellafield site is:

- to enable the Site's strategic imperatives to be delivered, safely, reliably and efficiently
- in line with government policy and
- by applying principles of best practice

Key Messages

- ☑ Current understanding and assumptions pose no threat to discharge limits - however latent risk of increased discharges during future decommissioning activities (including legacy waste retrievals) may challenge this
- ☑ Predicted radioactive discharges are very small when compared to background exposure (~2700 µSv)
- ☑ Predicted discharges up to 2020 are considered compliant with the UK Discharge Strategy Targets (UKDST) that are applicable to Sellafield †
- ☑ Predicted discharges appear consistent with the aims of the UK Discharge Strategy, in that they show an overall, progressive reduction trend. However, some of the proposed targets may be compromised in the latter years (2030 onwards)

Key: ☑ Meets Targets ☑ Exceeds Targets for short duration ☑Exceeds Targets for a longer duration

2020 UKDST	2030 UKDST
☑ 20 TBq/yr Beta 5	☑ 10 TBq/yr Beta 5
☑ 0.1 TBq/yr Alpha	☑ 0.05 TBq/yr Alpha†
☑ 100 TBq/yr Tritium	☑ 10 TBq/yr Tritium
☑ 1 TBq/yr Tc-99	☑ 0.1 TBq/yr Tc-99

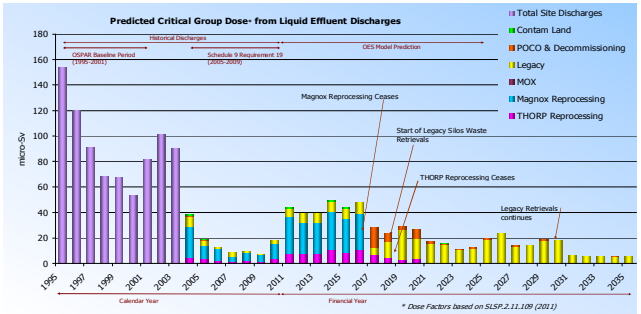
† Note: the above outlines achieving the UKDST for **Total Site Discharges** i.e. including discharges associated with reprocessing & decommissioning.

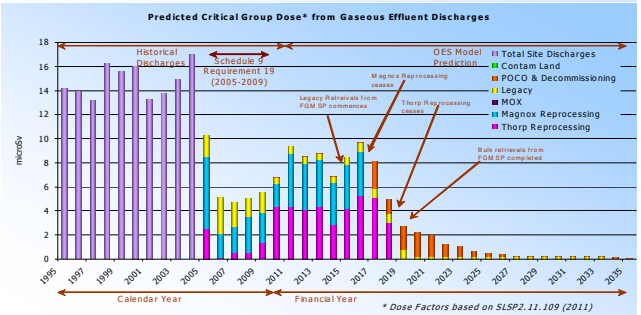
- ☑ Predicted environmental impact in 2011 from liquid effluent ~ 40 µSv (SLSP 2.11.109 dose factors)
- ☑ Predicted environmental impact in 2011 from gaseous effluent ~ 10 µSv (SLSP 2.11.109 dose factors)

Notes

- Future site and plant limits should take into account the potential variability in activity discharges during POCO & Decommissioning and margins should not be set in such a way that will result in unexpected consequences
- Flexibility in discharges during decommissioning is essential
- No significant 'spikes' currently predicted during POCO and LP&LS activities – though flexibility to allow some variation is essential during decommissioning. i.e. Discharge limits need to be set recognising the areas of uncertainty, but flexibility in managing limits will help ensure the site high hazard/ risk reduction programme is not compromised. (This will ensure BAT can be applied to minimise the environmental impact of long term discharges).
- Future predicted discharges are based on Sellafield Plan, Issue 1, August 2011 and are correct at the time of publication

Environmental Impact from Liquid & Gaseous Effluent Discharges

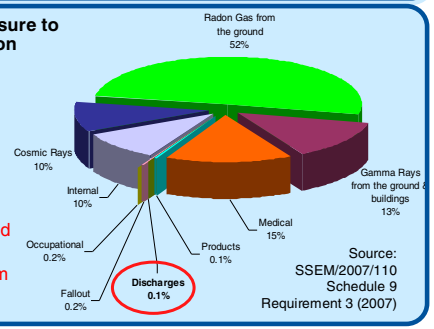




Comparison to UK Radiation Exposure

UK Population Exposure to Ionising Radiation

Figure - Sources and Magnitudes of UK Population Exposure to Ionising Radiation Averaging 2700 µSv per year (UK)



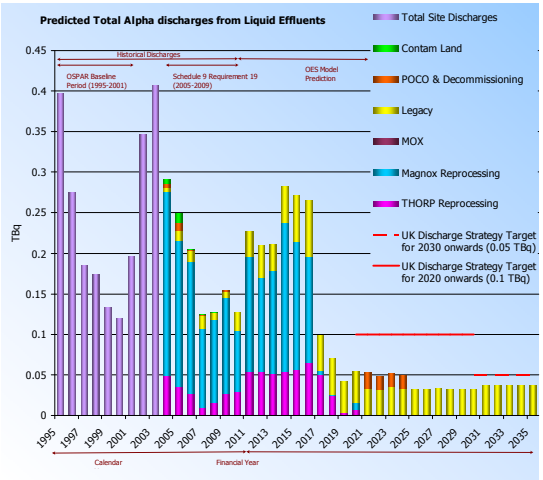
(Entire UK liquid and aerial discharges from all sources)

Source: SSEM/2007/110 Schedule 9 Requirement 3 (2007)

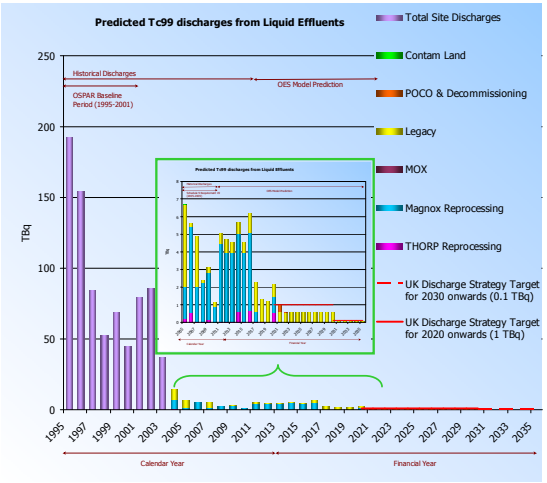
Sellafield Liquid Effluent Discharges – Past, Current & Future predictions in relation to the UK Discharge Strategy

Sellafield Ltd

Total Alpha



Tc-99



Reprocessing Schedule

Sellafield Plan, Issue 1, August 2011

Magnox

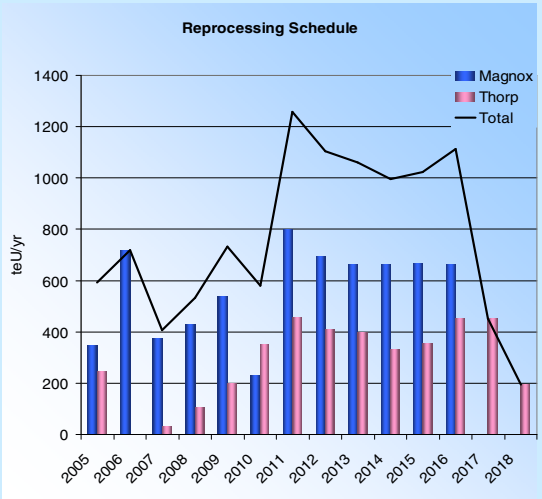
Reprocessing until March 2017 MOP.

THORP

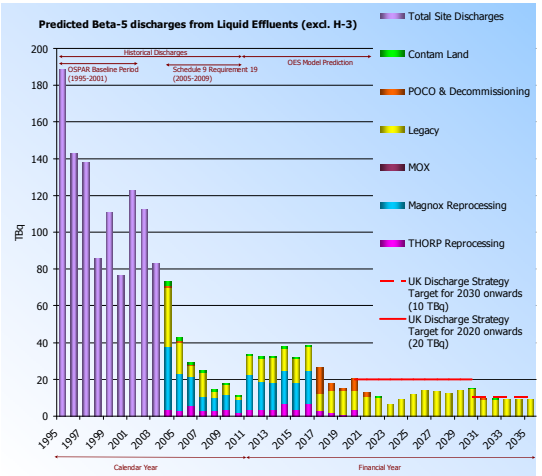
Reprocessing until November 2018.

Schedule (FY):

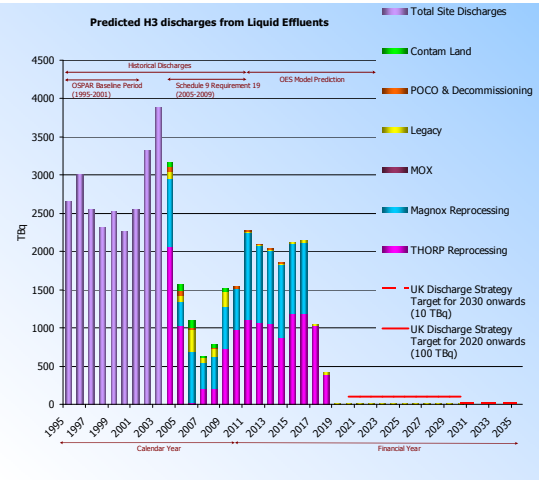
Year:	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LTP11 - Performance Plan														
Magnox	348	720	374	430	538	229	800	695	664	664	667	664		
Thorp	246	0	33	104	196	351	458	410	398	331	356	450	450	194
Total	**594**	**720**	**407**	**533**	**734**	**579**	**1258**	**1105**	**1062**	**995**	**1023**	**1114**	**450**	**194**



Beta-5



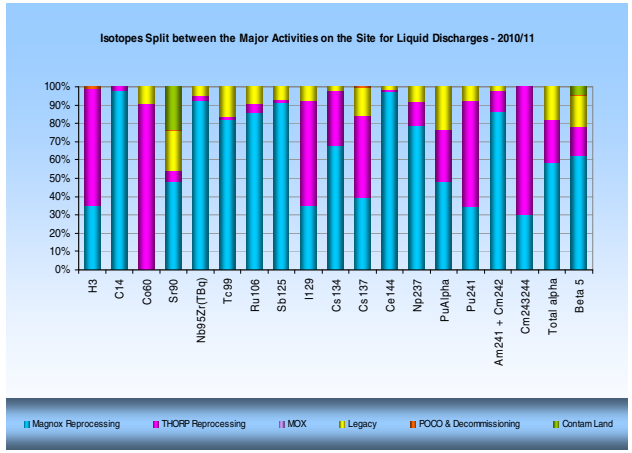
H-3



Sellafield Liquid Effluent Discharges – Summary of Current & Future Discharges

Sellafield Ltd

Estimated Discharges grouped by the major activities on site for each isotope (FY 2010/11)



MOx discharges are an insignificant proportion of the total site discharges

2010/11 Site	Magnox Reprocessing	THORP Reprocessing	Mox Fuel	Total Production	Legacy Waste Retrievals	Decommissioning & POCO	Contaminated Land Remediation	Total Non-Production
	TBq	TBq	TBq	TBq	TBq	TBq	TBq	TBq
H-3	5.40E+02	9.84E+02	0.00E+00	1.52E+03	1.08E+00	1.52E+01	1.55E-08	1.62E+01
C-14	3.20E+00	5.89E-02	0.00E+00	3.26E+00	5.73E-06	7.99E-07	0.00E+00	6.53E-06
Co-60	2.25E-05	8.46E-02	0.00E+00	8.46E-02	8.60E-03	1.98E-07	7.92E-11	8.61E-03
Sr-90	6.81E-01	9.11E-02	0.00E+00	7.72E-01	3.09E-01	3.94E-03	3.33E-01	6.46E-01
Zr-95 + Nb-95	2.07E-01	6.60E-03	0.00E+00	2.14E-01	1.13E-02	7.59E-07	6.83E-10	1.13E-02
Tc-99	9.01E-01	2.04E-02	0.00E+00	9.21E-01	1.79E-01	2.39E-07	0.00E+00	1.79E-01
Ru-106	8.66E-01	4.82E-02	0.00E+00	9.15E-01	9.45E-02	7.33E-07	2.60E-09	9.45E-02
Sb-125*	4.38E+00	7.05E-02	0.00E+00	4.45E+00	3.55E-01	3.05E-06	0.00E+00	3.55E-01
I-129	1.27E-01	2.08E-01	0.00E+00	3.36E-01	2.87E-02	3.75E-07	0.00E+00	2.87E-02
Cs-134	6.58E-02	2.96E-02	0.00E+00	9.55E-02	1.69E-03	3.59E-07	1.75E-10	1.69E-03
Cs-137	1.83E+00	2.10E+00	0.00E+00	3.93E+00	7.20E-01	2.65E-02	1.40E-05	7.47E-01
Ce-144	5.49E-01	4.67E-03	0.00E+00	5.54E-01	7.67E-03	8.91E-07	1.95E-09	7.67E-03
Np-237	3.28E-02	5.41E-03	0.00E+00	3.82E-02	3.53E-03	1.18E-06	0.00E+00	3.53E-03
Pu-alpha	5.98E-02	3.61E-02	6.69E-07	9.59E-02	2.88E-02	7.12E-05	1.36E-10	2.89E-02
Pu-241	9.88E-01	1.65E+00	2.42E-05	2.64E+00	2.29E-01	1.28E-06	5.06E-09	2.29E-01
Am-241	1.87E-02	2.50E-03	5.00E-08	2.12E-02	4.06E-04	2.18E-07	2.52E-05	4.31E-04
Cm-243244	9.98E-04	2.34E-03	0.00E+00	3.33E-03	7.29E-09	3.13E-07	0.00E+00	3.21E-07
Total Alpha	7.40E-02	3.03E-02	5.15E-07	1.04E-01	2.28E-02	4.69E-05	4.17E-05	2.29E-02
Total Beta-5	7.01E+00	1.83E+00	0.00E+00	8.84E+00	1.93E+00	3.17E-02	5.21E-01	2.48E+00

Key Activities / Achievements (FY 2010/11)

The following are key activities / achievements that have impacted liquid effluent discharges during the financial year 2010/11:

Reprocessing

- THORP – 351 teU
- Magnox – 229 teU
- 362 m^3 of Salt Evaporator Concentrate treated through the Enhanced Actinide Removal Plant

Decommissioning

- Successful transfer of flocculent content from the 4th Primary Sludge Tank the to buffer tank
- Transfer of historic medium active solvent to the Solvent Treatment Plant receipt tank – 70 m^3
- Desludging of bays 7-12 of the Magnox Storage Pond 1
- Magnox Solid Waste Storage Silo Liquor Activity Reduction – 377m^3

Tabular Summary Estimates of Future Discharges

Liquid Discharges	Average	total-α TBq		total-β TBq		H-3 TBq		Tc-99 TBq	
	Year	Reprocessing	Decommissioning	Reprocessing	Decommissioning	Reprocessing	Decommissioning	Reprocessing	Decommissioning
	2011-2015	0.20	0.040	20.58	12.91	2054	21.27	4.28	0.61
	2016-2020	0.059	0.059	8.80	14.88	710	16.69	1.44	1.16
	2021-2025	0.0001	0.047	0.13	9.88	0.00	7.09	0.01	0.62
	2026-2030	0	0.032	0	13.66	0	8.99	0	0.554
	2031-2035	0	0.037	0	9.22	0	2.34	0	0.050

Future Milestones in relation to discharge profiles, New Builds & Contingencies

Future Milestones

- Magnox Reprocessing is expected to end in 2017
- THORP Reprocessing is scheduled to end in 2018
- Retrievals from Magnox Solid Waste Storage Silo starting in 2017
- Feeds from the Segregated Effluent Treatment Plant diverted to the Enhanced Actinide Removal Plant in two phases ranging from the end of Magnox reprocessing through to the end of THORP Reprocessing
- Retrievals from First Generation Magnox Storage Pond due to start from 2015 once the Sludge Packaging Plant becomes available
- Bulk radioactive inventory removed from First Generation Magnox Storage Pond by 2020

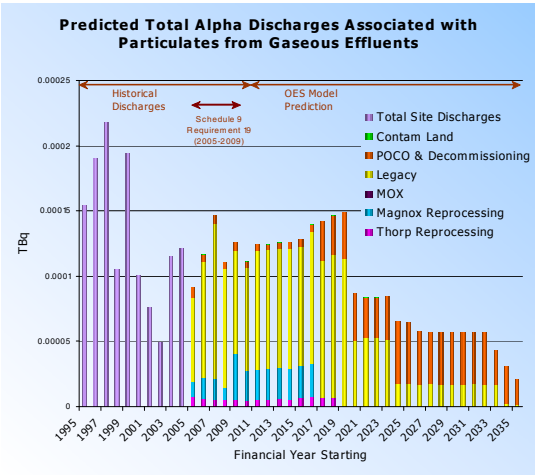
Effluent New Builds & Contingencies

- Availability of the new Highly Active Evaporator 'D' in 2014
- Fuel Storage Ponds undergoing closed circuit water treatment from 2018
- Contingency arrangements for the SIXEP to be arranged for 2020
- Retrievals of solid wastes from SIXEP commencing 2023
- Effluent collection systems East & West of the River Calder to be available from 2043 to enable de-coupling & remediation of the site effluent infrastructure

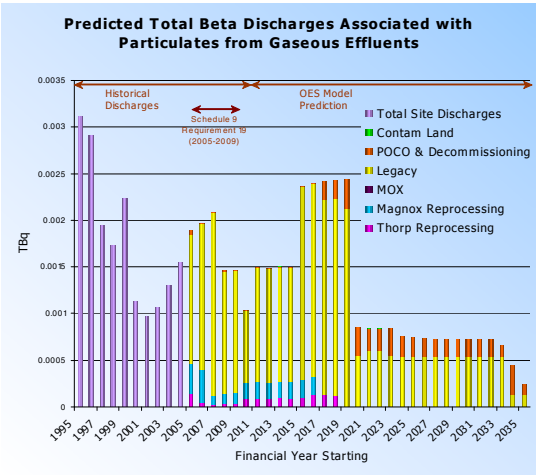
Sellafield Gaseous Effluent Discharges – Past, Current & Future predictions

Sellafield Ltd

Total Alpha Particulate



Total Beta Particulate



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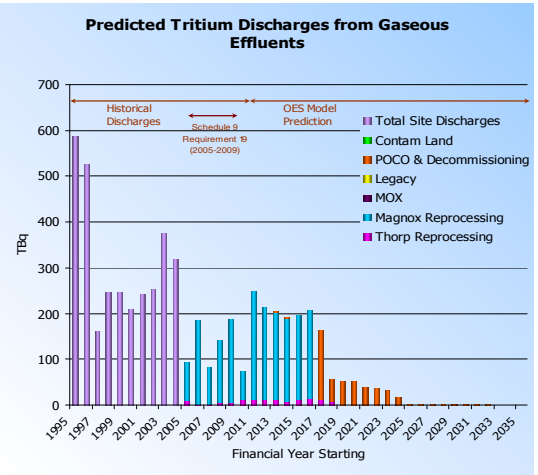


Reprocessing Schedule

Sellafield Plan, Issue 1, August 2011

Magnox

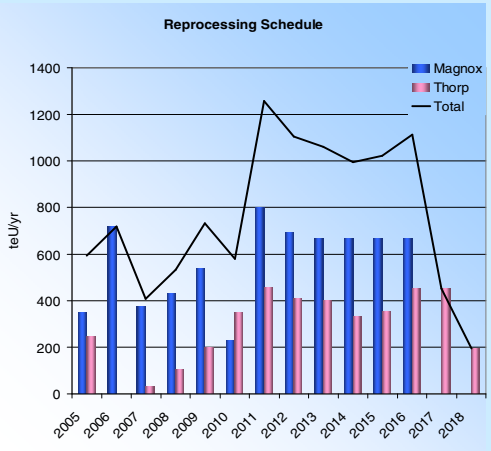
Reprocessing until March 2017 MOP.

THORP

Reprocessing until November 2018.

Schedule (FY):

Year:	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LTP11 - Performance Plan														
Magnox	348	720	374	430	538	229	800	695	664	664	667	664		
Thorp	246	0	33	104	196	351	458	410	398	331	356	450	450	194
Total	**594**	**720**	**407**	**533**	**734**	**579**	**1258**	**1105**	**1062**	**995**	**1023**	**1114**	**450**	**194**



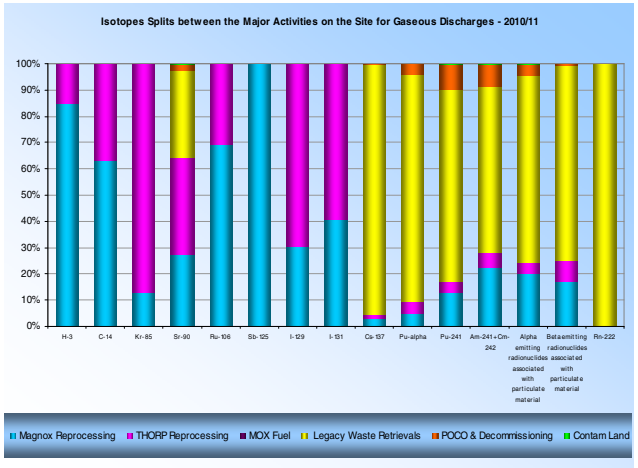
Notes

- Future predicted discharges are based on Sellafield Plan, Issue 1, August 2011 and are correct at the time of publication
- Historic discharges include Individually Limited Stacks and Miscellaneous & Other Outlets (M&OO – primarily attributed to FGMSP open pond surface)
- Reductions have been achieved in reported discharges for 2010 compared to previous years, due to:
  - Improved analytical protocols leading to lowering the impact of limits of detection
  - FGMSP Independent Pond Purge trial lowered average pond water activity
  - Reduction in gaseous discharges from FGMSP open pond in 2010/11 compared with previous years
- Post operational discharge predictions based on:
  - Particulate discharges during POCO are cautiously assumed to remain equal to final year of operations, falling to 50% during Decommissioning
  - Volatile discharges assumed to fall quickly during POCO, to zero during Decommissioning

Sellafield Gaseous Effluent Discharges – Summary of Current & Future Discharges

Sellafield Ltd

Estimated Gaseous Discharges grouped by the major activities on site for each isotope (FY2010/11)



Discharges due to MOX and Contaminated Land Remediation are an insignificant proportion of the total site discharges

2010/2011	Magnox Reprocessing TBq	THORP Reprocessing TBq	MOX Fuel TBq	Total Production TBq	Legacy Waste Retrievals TBq	POCO & Decommissioning TBq	Contaminated Land Remediation TBq	Total Non-Production TBq
H-3	6.24E+01	1.11E+01	0.00E+00	7.35E+01	0.00E+00	2.47E-02	0.00E+00	2.47E-02
C-14	1.64E-01	9.58E-02	0.00E+00	2.59E-01	0.00E+00	3.54E-04	0.00E+00	3.54E-04
Kr-85	7.24E+03	4.89E+04	0.00E+00	5.62E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	1.05E-05	1.42E-05	0.00E+00	2.47E-05	1.27E-05	7.86E-07	1.82E-07	1.37E-05
Ru-106	5.10E-04	2.24E-04	0.00E+00	7.34E-04	9.37E-08	0.00E+00	0.00E+00	9.37E-08
Sb-125	4.99E-03	8.51E-08	0.00E+00	4.99E-03	3.06E-06	3.65E-08	0.00E+00	3.10E-06
I-129	3.13E-03	7.14E-03	0.00E+00	1.03E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.52E-04	2.23E-04	0.00E+00	3.75E-04	3.14E-07	0.00E+00	0.00E+00	3.14E-07
Cs-137	2.48E-06	1.28E-06	0.00E+00	3.76E-06	8.19E-05	3.33E-07	4.62E-08	8.23E-05
Pu-alpha	8.31E-07	7.28E-07	0.00E+00	1.56E-06	1.45E-05	6.22E-07	2.89E-08	1.52E-05
Pu-241	2.23E-05	7.64E-06	0.00E+00	2.99E-05	1.27E-04	1.63E-05	7.54E-07	1.44E-04
Am-241 + Cm-242	3.72E-06	9.56E-07	0.00E+00	4.68E-06	1.06E-05	1.36E-06	6.11E-08	1.20E-05
Alpha emitting radionuclides associated with particulate material	1.70E-05	3.47E-06	4.43E-09	2.05E-05	6.02E-05	3.46E-06	1.55E-07	6.38E-05
Beta emitting radionuclides associated with particulate material	1.59E-04	7.50E-05	2.09E-08	2.34E-04	6.84E-04	5.44E-06	6.67E-07	6.90E-04
Rn-222	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-02	0.00E+00	0.00E+00	4.26E-02

Key Activities / Achievements (FY2010/11)

The following are key activities / achievements that have impacted gaseous effluent discharges during the financial year 2010/11:

Reprocessing

- THORP – 351 TeU
- Magnox – 229 TeU
- STP – 67m³ LA solvent & 6m³ MA solvent treated
- 96 containers vitrified highly active waste produced

Decommissioning

- FGMSP Independent Pond Purge trial lowered average pond water activity
- Reduction in gaseous discharges from FGMSP open pond in 2010/11 compared with previous years

Tabular Summary Estimates of Future Discharges

	Average	Alpha particulate TBq/y		Beta particulate TBq/y		H-3 TBq/y	
	Year	Reprocessing	Decommissioning	Reprocessing	Decommissioning	Reprocessing	Decommissioning
Gaseous Discharges	2011-2015	0.000030	0.000096	0.00027	0.0014	210	0.60
	2016-2020	0.000009	0.00012	0.00011	0.0020	45	60
	2021-2025	0	0.000077	0	0.00081	0	25
	2026-2030	0	0.000057	0	0.00073	0	1.4
	2031-2035	0	0.000042	0	0.00056	0	0.6

Future Milestones in relation to discharge profiles, New Builds & Contingencies

Future Milestones: Gaseous Effluents

- Magnox Reprocessing is expected to end in 2017
- THORP Reprocessing is scheduled to end in 2018
- Retrievals from First Generation Magnox Storage Pond due to start from 2015 once the Sludge Packaging Plant becomes available
- Bulk radioactive inventory removed from First Generation Magnox Storage Pond by 2020
- STP POCO ends 2024
- Vitrification Plants POCO ends 2027
- Ventilation demand for the key plants is assumed to cease at the end of interim decommissioning

Gaseous Effluent New Builds & Contingencies

- Separation Area Ventilation System and associated stack replace Magnox stacks in 2014
- Gaseous effluents arising from undefined new build waste management plants are excluded

Sellafield Effluent Discharges – Summary Description of the OES Model & the methodology

Sellafield Ltd

Methodology Summary

- The Overall Effluent Strategy Model (OESM) provides the basis for these discharge assessments
- Data used in these assessments reflect the best information currently available. The profiles represent estimated predictions at September 2011 – important to note in relation to discharge targets
- There are a number of ongoing uncertainties (see key aspects), around which the model is continuously developed & updated
- Effluent data (source, abatement facilities, final discharge) are based on operational flowsheet data, updated to reflect latest actual plant performance (as available)
- Review of annual performance in Reprocessing, High Level Waste Plants and the Enhanced Actinide Removal Plant are key aspects in assessment of historic discharges
- The EPR permit has required breakdown of annual discharges since 2005
- Historic discharges prior to 2010 are shown as calendar years in alignment with previous EPR permit requirements. Discharges from 2010 onwards are shown as financial years (April to March) in alignment with revised EPR permit requirements
- Future discharge predictions are based on the Sellafield Plan, Issue 1, August 2011
- Environmental impact assessments are based on marine and aerial critical group dose release ratios supplied in the draft SLSP 2.11.109 (2011). Note that these cannot be directly compared to impact assessments carried out under the superseded methodology
- Effluent discharges are split into two main categories, reprocessing & decommissioning:
  - Decommissioning consists of effluent discharges associated with Legacy clean-up, Post Operational Clean Out (POCO) & Decommissioning and Contaminated Land
  - Reprocessing consists of effluent discharges associated with Magnox & THORP reprocessing and the storage of the fuel in the ponds until reprocessing ceases
- Legacy refers to the activities in connection with historic operations on the Sellafield site and in particular to the removal of historic wastes from plants prior to their decommissioning (i.e., discharges are a legacy of historic site operations)
- POCO & Decommissioning refers to the period of cleaning and dismantling the plant / facility after operations and bulk retrieval of the legacy waste
- Contaminated land includes wastes from surface water, ground (and groundwater) contamination beneath a particular plant or facility are allocated to this category regardless of how the plant / facility is categorised

Uncertainties

Uncertainties

- Discharge projections are estimated based on assumptions about future activities, which include some important technical uncertainties
- Better understanding of technical uncertainties is an ongoing aspect of preparation for the retrieval and treatment of old radioactive wastes, however some can not be fully resolved until work is well underway, e.g.:
  - Risk of sudden dislodgement of activity during retrievals from Legacy Ponds & Legacy Silos (LP&LS)
  - Uncertainties on activity, volumes and duration associated with POCO, decommissioning and retrievals
  - Success of POCO in removing activity
  - Performance of new (unknown) local effluent treatment plants
  - Variations in performance of any current plants
- Liquid effluent predictions incorporate Site Ion eXchange Effluent Plant (SIXEP) Decontamination Factor correlations that are considered to be representative of current operations and management. This will be revisited as new data becomes available and as bulk retrieval of legacy wastes commences
- Future discharges associated with groundwater, land remediation & demolition discharges are also excluded
- Data used in this assessment reflects the best information available at September 2011

Key aspects of the OES model

- Windscale and the British Technology Centre are included in the assessments.
- Future LP&LS baseline timeline & data, are based on SIXEP Activity Management Project information
- Proposed new-build Intermediate Level Waste treatment plants will make provisions (if practicable), to treat liquid effluent arisings at source
- Though POCO effluents are included, effluents resulting from the very last stage of preparing plants for recycle or disposal (i.e. during the final phase of decommissioning), are excluded
- The model incorporates radioactive decay for short lived radionuclide species – to reflect changes in storage time/ fuel cooling.
- Data used in this assessment reflects the best information & understanding currently available