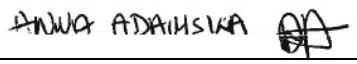
Sellafield Ltd **Technical Specification** **Title: Legacy Ponds Nuclear Diving Capability**	SP/LPSERP-015/PROG/00001/A Issue 1 Effective date 12/2024 Page 1 of 12

Specification No:

Title: **Legacy Ponds Nuclear Diving Capability**

Sub Title: **Legacy Ponds Retrievals Management Project**

	Name	**Signature**	**Date**	**Position**
Prepared by	A. Adamska		09/10/2024	Author
Content Approved by	S. Balchin		09/10/2024	Owner

Amendment history

Amendments detailed below are those made from:

From Draft	**To** Issue 1

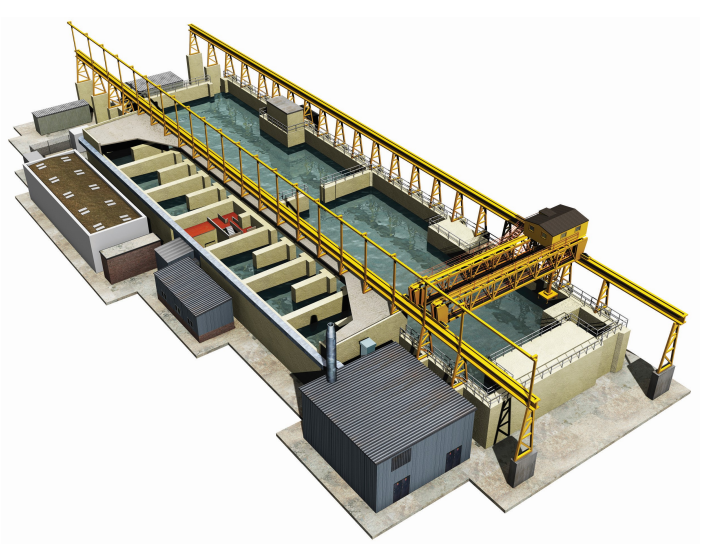
Date amendment(s) made	Section or paragraph amended	Details of amendment

Contents

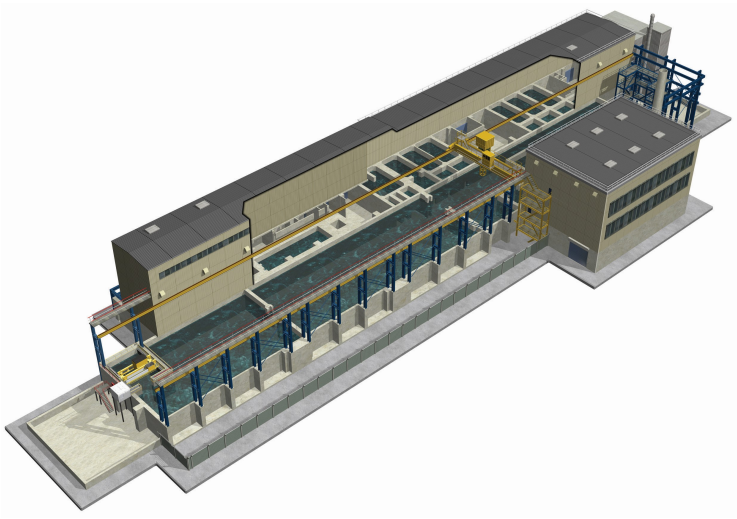
1 Introduction

Sellafield Ltd. is the company responsible for safely delivering decommissioning of the UK's nuclear and the management of low, high and intermediate level nuclear waste activities at Sellafield on behalf of the Nuclear Decommissioning Authority.

The Retrievals value stream is responsible for managing the site's major hazard and risk reduction programme: retrieving the waste from Sellafield Ltd's highest risk legacy storage facilities, such as Pile Fuel Storage Pond (PFSP), First Generation Magnox Storage Ponds (FGMSP) and Redundant Settling Tank (RST).



The Pile Fuel Storage Pond (PFSP) was the first nuclear fuel storage pond at Sellafield build between 1948 and 1952. The PFSP was used for storage and cooling of irradiated fuel and isotopes from the two Windscale Pile reactors. The PFSP continued to operate as a storage facility until operations ceased in the early 1970s. The PFSP consists of 2 main cooling ponds and 12 Decanning Bays (arranged in 6 pairs). The pond dimensions are 104 m × 23 m × 5.6 m (water depth). The pond is enclosed by thick concrete walls and stands. The Decanning building is 75 m × 12 m × 7 m. Each decanning Bay wall is 5.9 m high. Currently, the pond hosts 47 PFSP skips and 33 Chapelcross skips (80 in total) containing small amounts of fuel, Magnox swarf and debris, isotopes and reactor furniture. There is an estimated 144 m^3 of radioactive sludge remaining in the pond, bays and skips. The plan is to remove the radiological inventory from the pond; thereby reducing the hazard/risk posed by the plan in its current state. This will allow subsequent dismantling of residual structure and final pond decommissioning. To date the bulk fuel has been removed and many hundreds of tonnes of Intermediate Level Waste (ILW) have been exported from the pond. Work to remove the sludge and debris is progressing with significant areas of the pond cleared. Nuclear Diving within PFSP has been identified as a gamechanger to complete the remaining complex dismantling and clean-up work safely, effectively and efficiently within the PFSP Pond and Bays to assist with achieving the Interim State requirements. The Diving Pilot, active plant-based dives started in December 2022. Active Nuclear diving then commenced in January 2023 where further nuclear dives took place. In total there were 15 Nuclear Dives completed, which demonstrated the Proof of Concept. The PFSP Remediation Programme requires further deployment of nuclear divers into the PFSP pond and Bays. The divers will access the Bays from a Divers Access Platforms already installed within the PFSP during the Pitot Project in support of Bay 11 and 12 Clearance.



The First Generation Magnox Storage Pond (FGMSP) was constructed in the 1950s to receive and store irradiated fuel from Magnox reactors and remove the fuel cladding prior to fuel being reprocessed. The facility consists of a main pond structure, redundant wet and dry fuel decanning facilities and an import/export facility. During the FGMSP's 30-year operating lifetime it processed approximately 27,000 tonnes of fuel - almost 2.5 million fuel rods. Used nuclear fuel from the UK's nine Magnox stations, along with Magnox fuel from both Italy and Japan was held in the FGMSP. Currently the pond contains significant quantities of irradiated solid nuclear fuel, radioactive sludge, miscellaneous nuclear wastes and skips. The plan is to progressively retrieve and treat the radiological inventory residing in the facility, reducing the on-going risk posed by its storage and then reducing the inherent hazard posed by the materials.

The Redundant Settling Tank (RST) was originally used to receive and settle sludge in purge flows from the FGMSP. It was built in the 1950's and first used in the 1960's. It stopped receiving materials in 1986 at which time it was replaced by a more modern plant which discharged the FGMSP effluents to sea via Site Ion Exchange Effluent Plant (SIXEP). The residual inventory in the RST is held in seven water retaining chambers and has been estimated to include 70 m^3 of sludge and a small quantity of miscellaneous solids. The plan is to accelerate the remediation of the RST by adaptably the nuclear diver's capability.

2 Purpose

The purpose of this Technical Specification is to set out a summary of diving activities in an environment where radiological and contamination issues will require specific management to accelerate the retrievals to enable the facilitation of Legacy Ponds Interim State.

3 Scope

The Scope of this Technical Specification is to invite proposals from candidates in response to the Future Nuclear Diving Capability Contract in Sellafield Ltd. Legacy Ponds. Main nuclear diving activities will be carried out within PSFP with the potential for activities within FGMSP and RST.

The PFSP Remediation Programme is significantly advanced; bulk fuel has been removed and many hundreds of tonnes of ILW have been exported from the pond. There are several projects

in flight which will support the completion of retrievals operations and prepare the facility for Interim State and Final Demolition. The project consists of several work streams including:

A. Asset Management Support,
B. Interim State Learning Project,
C. Retrievals Management Project,
D. Large Item Removal and Opportunistic De-Planting Project,
E. Interim State Enabling Project.

Asset Management refers to:
- Asset care and maintenance,
- Modifications and repairs to existing assets and capabilities.

Interim State Learning refers to:
- Clearance of Bays 11 and 12,
- Completion of the Nuclear Diving Pilot Project,
- Hydraulic Isolation of Bays 11 and 12,
- Interim State Learning objectives.

Retrievals Management refers to:
- Provision of capabilities to support retrievals operations,
- Provision of access arrangements to support retrieval operations,
- Future Diving Enabling Projects.

Interim State Enabling refers to:
- Preparing the facility for Interim State post-retrievals operations,
- Post Operational Clean Out (POCO) Enabling Projects for supporting plants and infrastructure.

The scope of work identified for Legacy Ponds nuclear divers includes:

1. **Development of Safe Systems of Work**
   - Production of a Risk Assessments,
   - Production of a Method Statements.

2. **Development of Implementation and Transition to BAU Strategies**
   - Tasks assessment and site investigation,
   - Knowledge management and skills transfer,
   - Problem solving and creativity,
   - Demonstration and trials at offsite facility,
     Provide novel solutions to the waste retrievals challenge.

3. **Solid and sludge retrieval or removal activities within Legacy Ponds** (see Table below for detailed work scope).

Detailed retrieval or removal scope activities identified for nuclear divers

Fuel Pieces and Debris	Sludge (< 3 mm)	Pond Furniture and Large Items
- Deployment of long reaching hand tools to retrieve fuel pieces and debris (> 25 mm) from the main pond and bays floors or from other large items. - Deployment of an equipment to transfer fuel/debris from Bays floor / troughs to Main Pond / pond-side of plinth.	- Deployment of sludge retrieval equipment to remove the sludge from the main pond and bays floors for further Conditioning and Export.	- Deployment and operation of cutting or size reduction equipment within the main pond and bays. - Cleaning and preparation for Export of the main pond and bays furniture (e.g. flasks, skips and trolleys). - Removal of encast steel work (e.g. pipes and brackets) from the wall or floor within the main pond and bays. - Service isolation to enable their removal. - Rigging of lifting equipment for large items removal

4. **Interim State enabling activities within the PFSP**

- Cleaning of hydraulic isolation guide rails
- Support to installation of bays water level management equipment
- Concrete remediation preparation
- Modification of Local Effluent Treatment Plant (LETP)

Cleaning the hydraulic isolation guide rails within PFSP may correspond to the removal of residual solids (fuel and debris) and residual sludge.

Support to water level management equipment may correspond to installation of pumps or water level indicators during the Bays Interim State activities.

Concrete remediation preparation may correspond to installation of underwater shielding or coating of concrete walls ready for de-watering and other activities e.g. scrabbing or shaving of pond walls.

LETP is design to lower the levels of radioactivity in the water of the storage pond by recirculating the water though an Ion Exchange filtration plant. The system controls the pond level by discharging treated liquor as required. Nuclear divers will be expected to support the LETP modification to allow for operability at lower pond levels during the pond de-watering activities.

5. **Support to Legacy Ponds Asset Care and Maintenance**

- Deployment/installation of survey and monitoring equipment,
- Deployment of various tooling required for asset maintenance,
- Mechanical equipment repair, modification or replacement (e.g. hydraulic hoses, filter changes etc.),
- Concrete structure repairs, concrete casting.

The civil asset corresponds to the building structure and its external envelope (e.g., brick or block walling), which houses the process plant and equipment and provides a number of key safety related function for example: structural robustness, containment, shielding, safe working environment etc. Asset Care and Maintenance plays a vital part in plant operational safety, operating and life cost and plant life extension. It is important to follow the Asset Management Plan (AMP), carry out frequent asset inspections and asset condition surveys, repair/refurbish or replace when necessary. Asset Care and Maintenance not only corresponds to PFSP or FGMSP structure itself but also to any mechanical equipment present within the ponds. Nuclear divers are expected to support the underwater Asset Care and Maintenance.

6. **Technology and equipment deployment within the Legacy Ponds**

- Support to Legacy Ponds capability deployment and implementation,
- Tooling design and manufacture in support of Legacy Ponds retrievals,
- Support to Legacy Ponds Learning Plans.

The main goal of Legacy Ponds Programme is to remove the fuel and waste from the ponds to reduce the hazard and liability at Sellafield. In order to achieve that aim new capabilities and technologies need to be implemented within the ponds. Nuclear divers are expected to contribute to new technology development and deployment/installation to support legacy wastes retrieval operations.

4 Specification of Requirements

Table below groups requirements into two broad categories:

1. Essential properties of candidate (must be present)
2. Desirable properties of candidate (should be present)

3-5. Additional requirements: Appointment of supervisor, Diver Qualification and Medical

Requirement No:	Requirement
1.1	Must have experience of contaminated or other high hazard environments.
1.2	Must be able to provide the continuity of diving resources.
1.3	Must be able to provide innovative solutions.
1.4	Must be able to provide and maintain the diving and ancillary equipment.
1.5	Must have a diver SQEP process.
1.6	Must have an experience of supporting and working within the bounds of safety case documentation
1.7	Must have an accredited Quality Management Process
1.8	Must have dive supervisors who are registered as Association of Diving Contractors Supervisors
1.9	Must be a member of the Association of Diving Contractors (ADC)

1.10	Must be able to support clients in developing the scope of work they will be delivering
1.11	Must have an Environmental Management System
1.12	Must have experience of liaising with Industry Regulators
2.1	Should have divers with nuclear experience
2.2	Should be able to provide solutions in order to accelerate the decommissioning mission
2.3	Should have experience of working to radiological regulations
2.4	Should have the ability to support the development of a future diving BAU capability
2.5	Should have experience of working with CDM Regulations
2.6	Should have diving training plans to upskill local workforce
2.7	Should employ divers as staff
2.8	Should have experience of working in operational plants
2.9	Should have the ability to provide/utilise a local office
2.10	Should have the ability to design and manufacture tooling
2.11	Should have experience of NEC Forms of Contract
Additional Requirements	
	Appointment of Supervisor
3.1	There must be multiple dive supervisors appointed. All supervisors must be appointed in writing by the diving contractor, Chief Operations Officer.
3.2	Dive supervisors are selected for jobs based on their level of experience.
3.3	Must have nuclear diving operation experience.
3.4	Must be required to pass the UK ADC diving supervisor examination.
3.5	Supervisor CV maintained in the SQEP file.
3.6	All members of the dive team must be trained in respect to the tasks applicable to the project before being selected to complete such tasks.
3.7	All supervisors and dive team members must have required certifications for the project specific tasks.
3.8	Dive supervisors not diving on the project are not required to have a current dive medical.
3.9	Should the dive supervisor become unable to perform his/her duties the next dive supervisor in command must be competent and knowledgeable and appointed the responsibilities. Change over must be recorded on the dive log sheets.
3.10	All issues must be referred to the dive supervisor. If the dive must be aborted, the dive supervisor shall alert the dive team and safely recover the diver before addressing the issue.
3.11	The dive supervisor must ensure that the diving operation is carried out safely. He/she must consider the following:
3.11.1	Ensure, as far as reasonably practicable, that the operation that they are being asked to supervise complies with the requirements of DAW 1997.
3.11.2	Satisfy themselves, as far as reasonably practicable, that the proposed dive site and the water and weather conditions are suitable.

3.11.3	Ensure that the risk assessment is still current for the prevailing circumstances on the day of and during the dive.
3.11.4	Ensure that they understand their own areas and levels of responsibility and who is responsible for any other relevant areas.
3.11.5	Satisfy themselves that the personnel that they are to supervise are competent to carry out the work required of them and, where appropriate, hold a suitable and valid certificate. They should also check, as far as reasonable, that these personnel are fit, and in possession of all necessary certificates.
3.11.6	Ensure that the diving project plan and arrangements for dealing with foreseeable emergencies are clearly understood by all those engaged in the diving operation.
3.11.7	Check that the plant that they propose to use is adequate, safe, correctly certified and maintained.
3.11.8	Ensure that the possible hazards from complex or potentially hazardous plant have been evaluated and are fully understood by all relevant parties and that, if required, training or familiarization is given.
3.11.9	Establish so far as they are reasonably able that all relevant people are aware that a diving operation is to start or continue.
3.11.10	Have adequate means of communication with any personnel under their supervision.
3.11.11	Maintain the required records of the diving operation.
3.11.12	Maintain the diving operation record throughout the diving operation for which they are appointed.
3.12	The diving supervisor has control of the work site during diving operations. Only authorized personnel are to gain access to the work site.
	Diver Qualifications
4.1	Each diver must be trained and carry certification recognized by the HSE.
4.2	Divers must be competent in diving operations and first aid.
4.3	Divers and dive team members must cooperate with the dive supervisor and follow all reasonable instructions.
4.4	Divers logs must comply with ADC UK standards.
	Diving Medical
5.1	All divers must have current medicals performed by an HSE appointed physician verifying fitness to dive.
5.2	Divers whose medical fitness may be in doubt for any reason, e.g. fatigue, minor injury, etc. are required to inform the supervisor immediately. Part of the pre-dive checks is to verify and document that the diver is fit to dive.
5.3	In the event that a diver was treated for a DCI (decompression illness) their fitness to dive must be thoroughly evaluated prior to the first return dive.

5 Constraints and Exclusions

Table below lists the identified constrains for nuclear divers.

Constraint/ Exclusion Number	Constraint/Exclusion
1.1	Radiation Passbook.
1.2	Working hours constrained by dose uptake.
1.3	Reduced pond water visibility due to sludge or algae blooms.

6 References

6.1 Sellafield Ltd Drawings

Document Reference	Document Title
0 BE 3032458	PFSP Diver Operations Dive Platform Plan View – an example
0 BE 3032459	PFSP Diver Operations Equipment GA – an example
0 BE 3032460 Sht 1	PFSP Diver Operations Dive Platform Elevation View -an example
0 BE 3051487 Sht 2	PFSP Diver Operations Dive Platform Elevation View -an example

6.2 Sellafield Ltd Supporting Practice

Document Reference	Document Title
SLSP 1.06.55.06	Arrangements for Managing Electrical Safety during Construction, Commissioning, Decommissioning and Demolition Activities

6.3 Sellafield Ltd. Legacy Ponds Standards

Document Reference	Document Title
B29/HR/001, Issue 25	Pile Fuel Storage Pond PFSP House Rules
B30 House Rules, Issue 36	First Generation Magnox Storage Facility FGMSP Complex House Rules

6.4 British/International Standards

Document Reference	Document Title
1997 No. 2776	Diving at Work Regulations 1997
IMCA D 045	Code of Practice for The Safe Use of Electricity Under Water
IMCA D 041	Use of Battery-Operated Equipment in Hyperbaric Conditions

6.5 Any other documents

Document Reference	Document Title
	Sellafield Ltd Practice (SLPs)
SLP 2.01.45	How do I request Inner Area Access Authorisation (For security Category I facilities)?
SLP 2.03.08	Consultation with Radiation Protection Advisers
SLP 2.04.10	Workforce Consultation on Health, Safety and Welfare
SLP 3.02.07	How do I manage contractors?
Document Reference	**Document Title**

	Sellafield Ltd Manuals (SLMs)
SLM 4.06.02	Contract Quality Manual
SLM 4.09.300	Information Security Management Manual
SLM 4.09.303	Personal Data Handling Manual
	Nuclear Diving Documentation
	List of Approved Diving Qualifications dated 31 January 2024

7 Definitions/abbreviations

ADC	Association of Diving Contractors
AMP	Asset Management Plan
BAU	Business as Usual
BS	British Standard
DAW	Diving At Work
DCI	Decompression illness
FGMSP	First Generation Magnox Storage Pond
GA	General arrangement
HSE	Health and Safety Executive
LETP	Local Effluent Treatment Plant
LP	Legacy Ponds
NEC	New Engineering Contract
PFSP	Pile Fuel Storage Pond
POCO	Post Operational Clean Out
RST	Redundant Settling Tank
SIXEP	Site Ion Exchange Effluent Plant
SLM	Sellafield Ltd Manual
SQEP	Suitably Qualified and Experienced Person

8 Annexes

8.1 Legacy Ponds Diving Capability Timeline