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DECOMMISSIONING / DISPOSAL STRATEGY

SUBMARINE DISMANTLING - FACILITY GAP ANALYSIS

Safety Categorisation	N/A

Approval:

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NOTE: ***Document approval is via electronic signature – the complete approval record is held electronically within CDMS.***

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- **personal information; and**
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REVISION HISTORY

Issue	Date	Status	Comment
1.0	October 2010	Issued for Project Approval	

AMENDMENTS

To assist in identifying the amendments in each revised issue of this document, a vertical line is displayed in the right hand margin opposite new or revised text. Vertical lines marking previous amendments are deleted at each revised issue of the document.

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1.0 ABBREVIATIONS

Abbreviation	Definition
ACRC	Alternative Core Reactor Cooling
AWAF	Active Waste Accumulation Facility
BMD	Babcock Marine Division
COTS	Commercial Off The Shelf
CPWTP	Core Pond Water Treatment Plant
DNSR	Defence Nuclear Safety Regulator
DRD	Devonport Royal Dockyard
DRDL	Devonport Royal Dockyard Limited
EMP	Equipment Monitoring Point
EPH	Electrical Plant Houses
ETC	Effluent Transport Container
ETP	Effluent Treatment Plant
FHISO	Full Height International Standards Organisation
HHISO	Half Height International Standards Organisation
ILW	Intermediate Level Waste
LLRF	Low Level Refuel Facility
LLW	Low Level Waste
LLWR	Low Level Waste Repository
LTAS	Long Term Active Store
MoD	Ministry of Defence
MoD (N)	Ministry of Defence (Navy)
NBC	Naval Base Commander

Abbreviation	Definition
NDA	Nuclear Decommissioning Authority
NEMSFAC	New Equipment Maintenance and Storage Facility
NII	Nuclear Installations Inspectorate
NSF	Nuclear Support Facility
NTR	Nuclear Transfer Route
NUB	Nuclear Utilities Building
OHC	Occupational Health Centre
OOS	Out Of Service
PET	Portable Effluent Tank
PETP	Portable Effluent Treatment Plant
PRS	Periodic Review of Safety
PRT	Power Range Testing
PST	Primary Shield Tank
PWR	Pressurised Water Reactor
RAH	Reactor Access House
RC	Reactor Compartment
RCL	Radiochemistry Laboratory
REW	Refuelling Equipment Workshop
RPV	Reactor Pressure Vessel
RRD	Rosyth Royal Dockyard
RRPB	Refuel and Reactor Production Building
RSV	Resin Storage Vessel
S&D	Strip and Decontamination
SDP	Submarine Dismantling Project

Abbreviation	Definition
SEPA	Scottish Environment Protection Agency
SSN	Ships Submersible Nuclear
SQEP	Suitably Qualified and Experienced Personnel
SRC	Submarine Refit Complex
SWHF	Solid waste Handling Facility
TD	Technical Demonstrator
STETs	Super Transportable Effluent Tank
THISO	Third Height International Standards Organisation
TSSBN	Trident Ships Submersible Ballistic Nuclear

2.0 EXECUTIVE SUMMARY

This Gap Analysis provides an early indication of the additional infrastructure requirements that may be required by Rosyth Royal Dockyard (RRD) or Devonport Royal Dockyard (DRD) to support submarine dismantling.

It has been identified that both sites lack facilities available to size reduce, segregate and package large volumes of metallic Intermediate Level Waste (ILW) into $3m^3$ Nuclear Decommissioning Authority (NDA) Approved Packages. Both sites will also require dock bottom infrastructure and a capability to remove active components from the Reactor Compartment (RC).

RRD has a greater capability for additional Low Level Waste (LLW) processing than DRD. This is due to the availability of the Active Waste Accumulation Facility (AWAF) which is currently underutilised. The AWAF may still require upgrade and investment, particularly in ensuring suitable craneage and effluent treatment capability.

It should be noted that the gap analysis assessment is purely based on technical requirements and available capacity. This report, in isolation, does not determine the levels of required investment at either site.

This report will require significant review and revision as the design phases of the Submarine Dismantling Project (SDP) are undertaken with Operational Functional Requirements and Safety Functional Requirements being defined.

3.0 PURPOSE

The infrastructure required to support submarine dismantling has previously been identified [Reference 1]. This report compares existing facilities at Devonport Royal Dockyard (DRD) and Rosyth Royal Dockyard (RRD) against the identified requirements in Reference 1 and highlight potential 'gaps' at each of the sites.

The purpose of this 'gap analysis' is to ensure that the additional infrastructure requirements at each site are identified and understood. The output of the analysis will feed in to subsequent investment appraisals and will assist the Ministry of Defence (MoD) in differentiating between DRD and RRD as suitable sites for submarine dismantling.

It is noted that this report provides an early indication of the additional infrastructure requirements at each site. This work will require significant review and revision as the design phases of the Submarine Dismantling Project (SDP) are undertaken with Operational Functional Requirements and Safety Functional Requirements being defined.

4.0 SCOPE

This document considers infrastructure and facility requirements for RRD and DRD. The scope of this review is limited to those facilities within the boundaries of the Licensed Site.

5.0 ASSUMPTIONS

A number of assumptions have been applied to the analysis. The assumptions are detailed in the subsequent sections.

5.1 Generic

- All identified facilities; infrastructure and consumables assessed within this report for suitability may require further development in line with industry best practice. This will be assessed every ten years, through Periodic Review of Safety (PRS) in accordance with the requirements of the Companies Corporate arrangements.
- Additional Environmental Permits and/or other regulatory permissions required to support submarine dismantling are not addressed.
- Waste disposal costs will be comparable for both sites and are not discussed further in the analysis.
- Significant upgrades/ alterations to the dock structures will not be required.

- The Reactor Pressure Vessel (RPV) and Primary Shield Tank (PST) will be removed as a single unit from the submarine. Subsequently, the RPV and PST will transported to a processing facility.
- No consideration has been given to the production of substantiation reports or safety reports. Furthermore, no consideration has been given to the interaction of the required facility with other facilities and their associated substantiation/ safety reports.
- The project requirement will be to dismantle/ de-plant and cut up the radiologically contaminated and irradiated material on the licensed dockyard site. Following demonstration that the remaining hulk of the submarine is free from all radiologically implicated material, it will be prepared for transportation and final dismantling at a conventional ship recycling facility.
- Suitably Qualified and Experienced Persons (SQEP) are available to carry out the task at both sites.
- Docking requirements will be as for a laid up submarine i.e. assuming no special requirements for missile tube removal.
- Site Radiochemistry Laboratory (RCL) and Health Physics Monitoring services will be available.
- No consideration has been given to the implications of logistical efficiency when considering the compatibility of existing capabilities.
- The Authorities security declassification strategy will require minimal additional infrastructure / equipment above and beyond existing capability at the licensed dockyard sites.

5.2 Devonport Specific

[redacted]

- Consideration of existing facilities compatibility is based on current capacity.

5.3 Rosyth Specific

- RRD will not be involved in defuelling and laying-up submarines in the future.

[redacted]

- The Active Waste Accumulation Facility (AWAF) will be available for storage, cut-up, handling, packaging and dispatch of the radioactive waste.

6.0 METHODOLOGY

A high level list of infrastructure required to support submarine dismantling is detailed in Table 1. These requirements were previously identified in Reference 1.

The requirements include:

- Infrastructure.
- Facilities.
- Consumables.

Consumables are defined as 'Mobile plant and equipment that will be purchased and utilised, but not re-used. This includes hired plant and equipment.'

For the purpose of this assessment consumables are not thought to be a key differentiator between the sites and consequently are not considered further. Consumables have been identified and highlighted in 'grey' in Table 1.

Following identification of consumables, the next step in the analysis was to consider whether the infrastructure and facilities identified in Reference 1 currently exist at DRD and RRD. The Gap Analysis was conducted as a two stage process, illustrated in figure 1. The results of the analysis are recorded in Table 2 (Devonport) and Table 3 (Rosyth).

Stage 1: Existing Facility Assessment

Facilities at Devonport and Rosyth that have the potential to meet the SDP infrastructure requirements [Reference 1] were identified.

Where identified infrastructure is not present on site, the shortfall is identified as a 'Gap'. All identified Gaps are highlighted in RED.

Stage 2: Compatibility Assessment

Where infrastructure is present on site to support the SDP requirements, it is necessary to consider the compatibility of the infrastructure.

Compatibility has been considered in terms of capacity, availability and functional requirements. For example, it is necessary to consider the

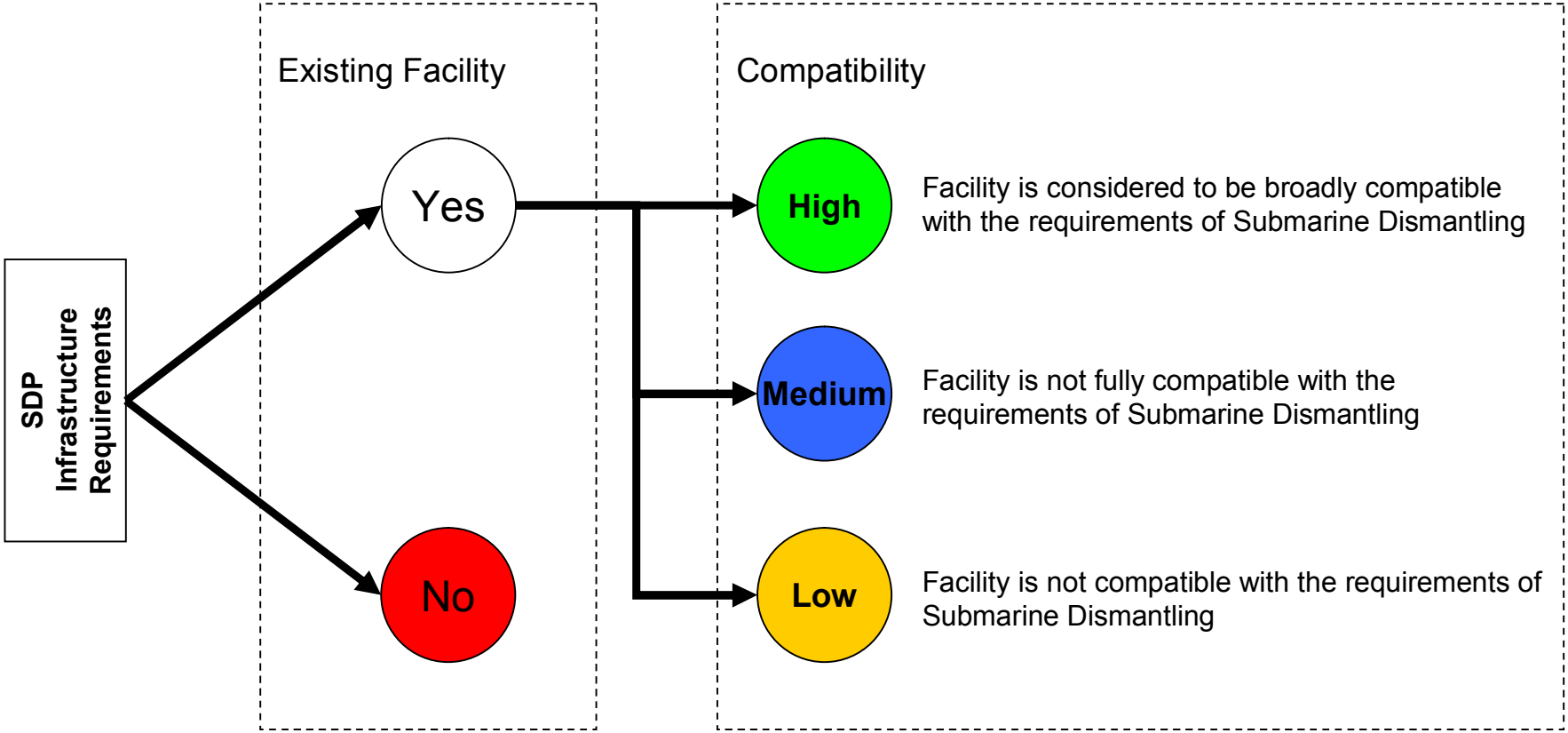
accessibility and engineered ventilation systems when considering the compatibility of a radioactive workshop.

Compatibility has been categorised as High, Medium, and Low. Definitions of these categories are provided in Figure 1.

As previously provided in the Alignment Report [Reference 1], there are detailed descriptions of infrastructure and facility requirements, for example the Effluent Treatment Capability (F5.1.2) is a Level 2 requirement that is required as part of the Level 1 Waste Management Facility (F5.1).

This report assesses Level 1 requirements. The justification of the allocated compatibility of the Level 1 requirements is derived from the underlying Level 2 justifications.

Figure 1: Facility Gap Analysis Methodology



7.0 SITE DESCRIPTION – DEVONPORT ROYAL DOCKYARD

This site description is limited to facilities and infrastructure within the boundary of the Licensed Site.

Babcock Marine Division (BMD) is contracted by the Ministry of Defence – Navy (MoD(N)) to refit and repair nuclear powered submarines. BMD holds a Site Licence under the Nuclear Installations Act 1965 (as amended) for part of the Dockyard Site.

All nuclear related processes conducted on the Nuclear Licensed Site are subject to the conditions of the Site Licence. In addition, DRDL is Authorised by the Secretary of State for to undertake Authorised Activities, such activities are regulated by the Defence Nuclear Safety Regulator (DNSR).

The requirements under the Site Licence and Authorisation are broadly complementary.

The dockyard site is licensed by the Nuclear Installations Inspectorate (NII) for the purpose of installing and operating installations designed or adapted for storage of:

- New fuel.
- Irradiated nuclear fuel.
- Bulk quantities of any other radioactive material that has been produced or irradiated in the course of the use of nuclear fuel.

Furthermore, BMD is authorised by the MoD to carry out the following authorised activities on the licensed site and in 5 Basin:

- Receipt, dispatch, berthing, docking and trim diving of nuclear powered warships.
- Support of the nuclear steam raising plant by shore equipment.
- Decontamination of the nuclear steam raising plant.
- Disassembly and reassembly of the nuclear steam raising plant.
- Decommissioning of nuclear powered warships.
- Conduct of tests, trials, and commissioning of nuclear steam raising plant.
- Storage, handling, consignment, and use of nuclear material, including new and used fuel.
- Accumulation, storage, handling, and disposal of radioactive waste.

7.1 Devonport Licensed Site Constituent Parts

Submarine related work is undertaken at two main locations on the Nuclear Licensed Site, the Submarine Refit Complex (SRC) and the southern end of 5 Basin at 9 Dock. The SRC, located in the northwest corner of 5 Basin, is comprised of 14 and 15 Docks, the Nuclear Support Facility (NSF) building, and the Nuclear Utilities Building (NUB).

[redacted]

[redacted]

[redacted]

Submarines in 5 Basin berth alongside the Nuclear Licensed Site at approved berths. The 'X' Berths' structures form part of the Nuclear Licensed Site but work on the submarines afloat in the Basin is Authorised in a similar manner to other work Authorised by the MoD on the DRDL Site. A range of services are available at all approved berths [redacted]

Figure 2 identifies facilities located in North Yard which are discussed in more detail below.

Figure 2: Facility Layout North Yard

7.1.1 11 and 12 Dock (North Lock)

The original North Lock complex consisted of Docks, offices and submarine crew accommodation. Following the completion of the SRC in the early 1980s this complex was justified to conduct refuel but was subsequently withdrawn from service in 1994.

7.1.2 10 Dock

The 10 Dock facility is located on the South side of 5 Basin between 4 and 5 Basin. The facility was previously used for non-refit maintenance dockings of Trafalgar and Swiftsure Class nuclear powered submarines. Currently 10 dock is utilised to maintain capital ships.

7.1.3 8 Dock

The 8 dock facility is currently used to support refitting and maintenance of surface ships. 8 dock has been previously used to dock defulled submarines.

7.1.4 5 Basin

5 Basin is an enclosed area of water accessed from the Hamoaze via an entrance on the west side of the basin. A caisson is present and is designed to isolate 5 Basin from the effects of tidal movements. 5 Basin provides access to 8, 9, 10, 12, 14 and 15 Docks for ships and submarines. 5 Basin is also used for berthing submarines and other ships.

There are seven 'X' Berths in 5 Basin, including inner and outer berths, cleared for berthing nuclear submarines.

7.1.5 Submarine Refit Complex

The SRC was designed and constructed specifically for the task of refitting, de-fuelling/ refuelling and maintaining nuclear powered submarines, Ship Submersible Nuclear (SSNs).

7.1.5.1. Existing Docking and Berthing Facilities

14 and 15 Docks and 5 Basin Arm are currently used for the refitting and refuelling of SSNs. The docks have sufficient capacity to satisfy the current SSN refitting programme.

7.1.5.2. Nuclear Support Facility

[redacted]

[redacted]

7.1.5.3. NUB Waste Treatment Facilities

[redacted]

[redacted]

7.1.5.4. Solid Waste Handling Facility

7.1.5.5.

[redacted]

7.1.5.6. Decontamination (MODIX) Facility

[redacted]

7.1.6 9 Dock

[redacted]

7.1.6.1. Refuel and Reactor Production Building

[redacted]

7.1.7 Other Site Facilities

A number of other facilities exist on site:

[redacted]

[redacted]

[redacted]

8.0 SITE DESCRIPTION – ROSYTH ROYAL DOCKYARD

Rosyth Business Park (formerly RRD) is situated on the North Bank of the River Forth in the county of Fife, approximately 12 miles north of Edinburgh. The site is owned by Babcock. Surrounded by a perimeter fence it is occupied by Babcock and a significant number of private companies leasing properties in the “open area”.

8.1 Rosyth Site Constituent Parts

Ship refitting, laid up submarine storage and commercial waterborne activities are enclosed within a secure area encompassing:

- Three in number large graving docks.
- A non-tidal basin (accessed from the river by either a direct entrance or Entrance Lock.
- 12 medium to large ship berths.
- A ship-lift / synchrolift facility.
- A river Jetty approximately 300m long.
- Offices and accommodation.

All docks and berths are fully serviced (power, water, High Pressure Air, Low Pressure Air, communications and craneage).

Nuclear Submarine refitting & refuelling at Rosyth ended in 2003. A significant site decommissioning work package was completed in 2009 when part of the licensed site was cleared to the required NII and Scottish Environment Protection Agency (SEPA) clearance standards. The Licensed site area was reduced following the successful clearance.

8.1.1 Active Waste Accumulation Facility

Rosyth still operates a Licensed site (Figure 3). The revised licensed site encompasses 2 and 3 Dock areas, each capable of docking up to four submarines at the same time; and the AWAF. RRD retains the Site Licence for these areas under the Nuclear Installations Act 1965 (as amended).

The AWAF building consists of a single storey reinforced concrete walled structure, with walls and columns of varying heights due to the geometry of the roof. It is essentially rectangular in plan, approximately 52 metres wide by 56 metres long. The inner walls provide partitioning and segregation of the internal building area and fire resistance and radiological shielding as required. The outer walls also provide radiological shielding and protect against external fires.

Internally the building is divided into the following main areas:

- Health Physics foyer, office accommodation, general plant and equipment and central areas of the building.
- Resin Catch Tank Store and Receipt and Despatch Bay to the north of the central areas
- Storage and processing of radioactive waste to the south of the central areas

The AWAF is equipped with active ventilation systems, and active drainage systems.

Figure 3: Rosyth Licensed Site

9.0 RESULTS

Tables 2 and 3 contain the detailed Gap Analyses which have been summarised in the Table 4 below. The variance has been identified at a high level in the Table 4 and is discussed in Section10.0

Table 4: Summary of Gap Analysis

ID Number	Description	Devonport	Rosyth	Reason for Variance
F1.1	Dockside			
F1.2	Dock			
F2.1	Dock Bottom			
F2.2	Dockside (Top)			
F2.3	Plant Removal (Inboard)			
F2.4	RPV Removal			
F3.1	Security Declassification Equipment			
F4.1	Radiological Clearance Equipment			
F5.1	Waste Management Facility (General)			
F5.2	ILW Processing Plant			
F5.3	ILW Conditioning and Packaging Plant			
F5.4	ILW Storage and Consignment Plant			
F5.5	LLW Processing Plant			
F5.6	LLW Conditioning & Packaging Plant			The AWAF at Rosyth is not operating at capacity and could be configured for conditioning and packaging of LLW with minimal effort. The current facilities at Devonport do not have adequate waste sorting capacity.
F5.7	LLW Consignment Plant			The AWAF at Rosyth has shielded buffer storage available. Unutilised shielded buffer storage at Devonport is limited.
F5.8	Non Active Waste Management			
F6.1	Pressure Hull Repair Equipment			
F7.1	ILW Transport Equipment			

Key

	Facility is considered to be broadly compatible with the requirements of Submarine Dismantling
	Facility is not fully compatible with the requirements of Submarine Dismantling
	Facility is not compatible with the requirements of Submarine Dismantling
	Facility Gap

10.0 DISCUSSION

This report provides an early indication of the additional infrastructure requirements that may be required by RRD or DRD to support submarine dismantling. This report will require significant review and revision as the design phases of the SDP are undertaken with Operational Functional Requirements and Safety Functional Requirements being defined.

It should be noted that the gap analysis assessment is purely based on technical requirements and available capacity. This report, in isolation, does not determine the levels of required investment at either site.

The Gap Analysis was conducted in two stages.

Stage 1

During stage 1 of the Gap Analysis, a number of Facilities were identified as absent from the RRD and DRD licensed sites.

Predominantly, these shortfalls can be attributed to the lack of facilities available to size reduce, segregate and package large volumes of metallic ILW into $3m^3$ NDA Approved Packages. It is not considered possible to make a judgement on the suitability of either sites existing infrastructure to accommodate an ILW processing facility until the radionuclide inventory of the ILW is understood and the spatial and technical requirements of this facility are defined.

Other shortfalls are less significant. Both sites will require dock bottom infrastructure and a capability to remove active components from the Reactor Compartment.

Stage 2

During stage 2 of the Gap Analysis, an assessment of the compatibility of existing infrastructure was undertaken.

DRD and RRD have very similar capabilities for activities undertaken in Dock and at the Dockside. RRD met the capability assessment in more areas of LLW processing than DRD. This is due to the availability of the AWAF which is currently underutilised. The AWAF may still require upgrade and investment, particularly in ensuring suitable craneage and effluent treatment capability.

11.0 CONTRIBUTORS

The following BMD personnel have contributed to this report:

Name	Title	Site
[redacted]	Project Manager (Submarine Disposal)	Devonport
[redacted]	Defuel, Dismantling & Disposals Manager	Devonport
[redacted]	Nuclear Operations Manager	Rosyth
[redacted]	Project Co-ordinator	Rosyth
[redacted]	Deputy Project Manager (Submarine Disposal)	Devonport
[redacted]	Safety Case Engineer	Devonport
[redacted]	Principal Development Engineer	Devonport
[redacted]	Senior Quantity Surveyor	Devonport
[redacted]	DRD Radioactive Waste Manager	Devonport

12.0 REFERENCES

1. 00022257, Issue 1, July 2010, Submarine Dismantling - MoD/Babcock Alignment Report.

13.0 TABLE 1: FACILITY REQUIREMENTS FOR SUBMARINE DISMANTLING

Infrastructure Requirement ID Number	Description
F1.1	**Dockside**
F1.1.1	Road access
F1.1.2	Rail link
F1.1.3	Cranes
F1.1.4	Services i.e. water, electrics
F1.1.5	Welfare Facilities/ Offices
F1.1.6	Forklift
F1.1.7	Security Controls
F1.1.8	First Aid Facility
F1.2	**Dock**
F1.2.1	Compatible dock
F1.2.2	Cradle
F1.2.3	Caisson
F1.2.4	Sealed dock (e.g. oil interceptors)
F1.2.5	Docking Infrastructure (docking trolley)
F2.1	**Dock Bottom**
F2.1.1	Dock Bottom Village (DBV)
F2.1.1.1	Containment Unit

Infrastructure Requirement ID Number	Description
F2.1.1.2	Ventilation
F2.1.2	Environmental controls
F2.1.2.1	Dust & Water Management (x2 - active & non active)
F2.1.3	HP controls
F2.1.4	Scaffolding / staging
F2.1.5	Shot blasting capability
F2.1.6	Fire system
F2.1.6.1	Detection
F2.1.6.2	Suppressant
F2.1.7	Personal Decontamination Facility
F2.2	**Dockside (Top)**
F2.2.1	Containment Structure over RC with ventilation
F2.2.2	Crane [redacted]
F2.2.3	HP Facilities and Controls
F2.2.4	Set Down Area (bunded and contained)
F2.2.5	Storage area
F2.2.6	Storage / transport containers
F2.2.7	Slinging equipment/ turning and lifting frames
F2.2.8	Transport Vehicles/ Trucks
F2.2.9	Jet Vac / Vacuum Cleaners/ Bowsers (Active)
F2.3	**Plant Removal (Inboard)**
F2.3.1	New tools for strip out and hull cuts
F2.3.2	Facilities for handling hazardous/ non hazardous materials e.g. asbestos
F2.3.3	Containment tents for cutting primary pipework / gloveboxes / bungs

Infrastructure Requirement ID Number	Description
F2.3.5	Capability to drain / remove / store/ dispose PST contents ([redacted]
F2.3.6	Temporary shielding
F2.3.7	Ventilation
F2.3.8	Thermocouple Probe Management
F2.3.9	Neutron Test Source Removal
F2.4	**RPV Removal**
F2.4.1	RPV packaging
F2.4.2	Craneage for RPV/PST Lift
F2.4.3	Transport for RPV/PST
F2.4.4	Fire system
F2.4.4.1	Detection
F2.4.4.2	Suppressant
F3.1	**Security Declassification Equipment**
	No specific items of plant/ equipment identified at this stage
F4.1	**Radiological Clearance Equipment**
F4.1.1	Storage / transport containers
F4.1.2	HP Monitoring Equipment (i.e. for clearance)
F4.1.3	Asbestos removal capability
F4.1.4	Waste removal (e.g. oil management) for WiW
F4.1.5	Non Active Bowsers/ Jet Vacs
F4.1.6	Handling, cutting and welding equipment
F4.1.7	Ventilation

Infrastructure Requirement ID Number	Description
F5.1	**Waste Management Facility (General)**
F5.1.1	Craneage
F5.1.2	Effluent Treatment Plant
F5.1.2.1	Active Drainage system
F5.1.2.2	Holding tanks (Receipt and Discharge capability)
F5.1.2.3	IXC
F5.1.3	Radiochemical Laboratory & Equipment:
F5.1.4	Engineered ventilation
F5.1.4.1	Air conditioning
F5.1.4.2	Active Ventilation
F5.1.5	HP Facilities
F5.1.5.1	HP monitoring equipment
F5.1.5.2	Dosimetry
F5.1.5.3	Change areas
F5.1.5.4	Access Control
F5.1.5.5	Active change & wash room
F5.1.5.6	Active laundry
F5.1.5.7	Whole Body Monitoring capability
F5.1.6	Waste Disposal Costs (conventional and radiological)
F5.1.7	Amenities
F5.1.8	Receipt Bay (incoming waste)
F5.1.9	Fire system
F5.1.9.1	Detection
F5.1.9.2	Suppressant
F5.1.10	Active workshops
F5.1.10.1	Tool issue store (TIS)

Infrastructure Requirement ID Number	Description
F5.1.10.2	Decontaminable walls / floors
F5.1.11	Services
F5.1.11.1	M&L
F5.1.11.2	Water
F5.1.12	Shielded equipment stores
F5.1.13	Portable Plant
F5.1.13.1	Jet Vacs
F5.1.13.2	Active Vacuum cleaners
F5.1.14	SCADA Control room
F5.1.15	Clean Receipt Area (new goods)
F5.1.15.1	Craneage / OHT
F5.1.16	ISO container (storage & maintenance)
F5.1.17	Drums (storage & maintenance)
F5.1.18	First Aid Centre
F5.1.19	Security/ Access Controls
F5.1.20	Waste Management System (IT/IS)
F5.2	**ILW Processing Plant**
F5.2.1	Preparation area
F5.2.1.1	RPV / Core Barrel / Fix Stand
F5.2.1.2	Shielded cell (C4) Remote Viewing Systems (machining cell)
F5.2.1.3	Decontaminable walls / floor
F5.2.1.4	Wash down facility
F5.2.1.5	Liquor receipt / storage & disposal (K Chromate residue)
F5.2.1.6	Specialist removal tools / lifting jigs
F5.2.1.7	Craneage i.e. OHT

Infrastructure Requirement ID Number	Description
F5.2.2	Size Reduction area (RPV & PST) (side access capability)
F5.2.3	Shielded cell (C4) Remote Viewing Systems (cutting cell)
F5.2.4	Remote Handling
F5.2.4.1	Master Slave Manipulators (remote)
F5.2.4.2	Heavy Lift Equipment
F5.2.4.3	Size Reduction Equipment
F5.2.4.3.1	Abrasive wire
F5.2.4.3.2	Circular saw
F5.2.4.3.3	Reciprocating Saw/band cutter
F5.2.4.3.4	Machining Equipment
F5.2.4.3.5	Shearing Equipment
F5.2.5	$3m^3$ box furniture & waste bins (i.e. secondary waste arising)
F5.2.7	Filtration Treatment Plant
F5.2.8	Crane (Hot cell specific)
F5.2.9	HP Monitoring Equipment
F5.2.10	Breakdown Recovery system
F5.2.11	Training Areas / Rigs / Mock Up
F5.2.12	Recovery Systems
F5.2.13	Fire system
F5.2.13.1	Detection
F5.2.13.2	Suppressant
F5.3	**ILW Conditioning and Packaging Plant**
F5.3.1	Shielded cell (C4) Remote Viewing Systems
F5.3.2	Remote Handling
F5.3.2.1	Master Slave Manipulators

Infrastructure Requirement ID Number	Description
F5.3.2.2	Heavy Lift Equipment
F5.3.3	Transfer System
F5.3.4	Grouting Facility
F5.3.4.1	Waste water / slurry effluent treatment plant
F5.3.4.2	Cement and Water Delivery
F5.3.4.3	Grout Mixing
F5.3.4.4	Grout Storage (mobile) and discharge
F5.4	**ILW Storage and Consignment Plant**
F5.4.1	Shielded buffer storage (8 packaged boxes)
F5.4.2	Remote monitoring capability (contamination, dose rate and inventory)
F5.4.3	$3m^3$ box decontamination capability
F5.4.4	Crane ($3m^3$ box specific)
F5.4.5	On site over pack
F5.4.6	$3m^3$ box and over pack lifting equipment (ISO fittings)
F5.4.7	Buffer storage / Inspection Area: $3m^3$ boxes in over pack
F5.4.8	$3m^3$ box (storage and maintenance)
F5.4.9	$3m^3$ over pack (storage and maintenance)
F5.4.10	Transport Bay
F5.4.11	Over-pack Transfer Capability
F5.5	**LLW Processing Plant**
F5.5.1	LLW Lay Down area
F5.5.1.1	Fork lift / palletisers
F5.5.2	Preparation area
F5.5.2.1	Liquor receipt / storage & disposal

Infrastructure Requirement ID Number	Description
F5.5.2.2	Residual resin removal
F5.5.2.3	LLW stands (e.g. SG, Pressuriser etc)
F5.5.2.4	Waste sorting (e.g. Lead working / poly removal)
F5.5.4	Surface decontamination (e.g. shot blasting capability)
F5.5.5	Size Reduction area
F5.5.5.1	Shielded Size Reduction Cells (C4)
F5.5.5.2	Size Reduction Equipment
F5.5.5.2.1	Abrasive wire
F5.5.5.2.2	Circular saw
F5.5.5.2.3	Reciprocating Saw/band cutter
F5.5.5.2.4	Machining Equipment
F5.5.5.2.5	Shearing Equipment
F5.5.5.2.6	Plasma
F5.5.5.3	Handling equipment/ frames/ craneage
F5.5.5.4	Temporary shielding i.e. gammablok
F5.6	**LLW Conditioning & Packaging Plant**
F5.6.1	Waste sorting area
F5.6.1.1	Clearance Monitor
F5.6.1.2	Conventional hazardous material (contaminated)
F5.6.2	ISO bays
F5.6.2.1	ISO Containers
F5.6.3	Drums
F5.6.3.1	Drum Monitor
F5.6.3.2	In Drum compactor
F5.6.3.3	Drum trolleys

Infrastructure Requirement ID Number	Description
F5.6.4	Craneage
F5.7	**LLW Consignment Plant**
F5.7.1	ISO lifting equipment (ISO fittings)
F5.7.2	Buffer storage (Shielded)
F5.8	**Non Active Waste Management**
F5.8.1	Size reduction/ shredding equipment for non active item declassification
F5.8.2	Packaging
F5.8.3	HP monitoring equipment (i.e. clearance)
F6.1	**Pressure Hull Repair Equipment**
F6.1.1	Ballast
F6.1.2	Hull Closure Plates
F6.1.3	Welding/ Repair Kit
F7.1	**ILW Transport Equipment**
F7.1.1	Suitable transport (over pack and $3m^3$ box)

14.0 TABLE 2: INFRASTRUCTURE AND FACILITIES AT DEVONPORT

ID Number	Devonport Description	Existing Facilities	Compatibility	Key Facility is considered to be broadly compatible with the requirements of Submarine Dismantling Facility is not fully compatible with the requirements of Submarine Dismantling Facility is not compatible with the requirements of Submarine Dismantling Facility Gap Comment
F1.1	**Dockside**	**Y**	**H**	
F1.1.1	Road access	Y	H	The existing roads should be adequate to support the transport requirements i.e. the RPV/ PST providing suitable transport is provided. It will be necessary to review as part of a structural assessment.
F1.1.2	Rail link	Y	H	Connections to British Rail exist. The rail links are within 200m of a dock. Rail links are beneficial if large volumes of scrap metal require dispatch from the dockyard site. Currently Low Level Waste (LLW) is transported around site and off site to the Low Level Waste Repository (LLWR) by road. It is envisaged that Intermediate Level Waste (ILW) could be transported either by rail/ road.
F1.1.3	Cranes	Y	H	This crane will be used during dock preparations. Current crane at 8 dock has [redacted] capacity.
F1.1.4	Services i.e. water, electrics	Y	H	[redacted].
F1.1.5	Welfare Facilities/ Offices	Y	H	Adequate space dockside for temporary facilities.
F1.1.6	Forklift			Mobile equipment already used widely on site, additional units maybe required.
F1.1.7	Security Controls	Y	H	[redacted].
F1.1.8	First Aid Facility	Y	H	Site has an Occupational Health Centre (OHC). Temporary facilities readily located and hired if required.
F1.2	**Dock**	**Y**	**M**	**Dock requires environmental controls and bespoke cradle to facilitate RPV removal**
F1.2.1	Compatible dock	Y	H	[redacted]
F1.2.2	Cradle	N	N/A	A set of cradles could be developed to support the dismantling of all 27 submarines. A bespoke moveable section may be required under the RPV/PST area of the hull to allow for lateral movement. It is not envisaged that existing cradles could be utilised.
F1.2.3	Caisson	Y	H	[redacted]
F1.2.4	Sealed dock (e.g. oil interceptors)	N	N/A	Requirements need to be determined. This will be specified during the design and safety process. Currently there are no docks at Devonport that are 'sealed'. [redacted]
F1.2.5	Docking Infrastructure (docking trolley)	N	N/A	
F2.1	**Dock Bottom**	**N**	**N/A**	**No suitable DBV is available**
F2.1.1	Dock Bottom Village (DBV)	N	N/A	Requirement well understood. DBV utilised during existing submarine refits. DBV will include Access towers, gantries and platforms
F2.1.1.1	Containment Unit	N	N/A	Design requirements set during design and safety process.
F2.1.1.2	Ventilation	N	N/A	
F2.1.2	Environmental controls			
F2.1.2.1	Dust & Water Management (x2 - active & non active)			
F2.1.3	HP controls	N	N/A	
F2.1.4	Scaffolding / staging			Capability exists on site, additional provisions will be required.
F2.1.5	Shot blasting capability			Existing capability provided.

ID Number	Devonport Description	Existing Facilities	Compatibility	Key / Comment
				Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling
				Key: Facility is not fully compatible with the requirements of Submarine Dismantling
				Key: Facility is not compatible with the requirements of Submarine Dismantling
				Key: Facility Gap
F2.1.6	Fire system	N	N/A	Required for the DBV. A purpose built system may be required.
F2.1.6.1	Detection	N	N/A	Required for the DBV. A purpose built system may be required.
F2.1.6.2	Suppressant	N	N/A	Required for the DBV. A purpose built system may be required.
F2.1.7	Personal Decontamination Facility	N	N/A	Temporary facilities readily available.
F2.2	**Dockside (Top)**	**Y**	**M**	**Shortfalls in local HP controls, bunding & containment.**
F2.2.1	Containment Structure over RC with ventilation	N	N/A	It is believed only umbilical style containment will be required for SG removal and minor sealing works around access cuts.
F2.2.2	Crane (~43te)	Y	H	[redacted]
F2.2.3	HP Facilities and Controls	N	N/A	A purpose built facility may be required. [redacted]
F2.2.4	Set Down Area (bunded and contained)	Y	M	Adequate space available dockside. Appropriate containment required.
F2.2.5	Storage area	Y	H	Large dockside area. A containment facility may be required.
F2.2.6	Storage / transport containers			A range of existing containers are readily available. Additional equipment will be required. LLW is likely to be loaded in to a range of HHISO, THISO and FHISO, Berglov boxes and drums. VLLW will be bagged and loaded in to dedicated skips prior to disposal to landfill or LLWR. Clean scrap and non hazardous material will be loaded directly in skips.
F2.2.7	Slinging equipment/ turning and lifting frames			Existing equipment suitable. However, additional 'bespoke' turning and lifting frames will be required.
F2.2.8	Transport Vehicles/ Trucks			Existing transportation available may need to be supplemented i.e. normal lorries and flat beds.
F2.2.9	Jet Vac / Vacuum Cleaners/ Bowsers (Active)	Y	M	Vacuum cleaners and bowsers currently available. Additional equipment may be required. Capability of existing Jet Vacs may need to be extended to retrieve solid waste. This equipment may be purchased and reused. It is not normally a 'hired in' item.
F2.3	**Plant Removal (Inboard)**	**N**	**N/A**	**Shortfalls in equipment, PST drain, NTS & TCP removal**
F2.3.1	New tools for strip out and hull cuts			Off the shelf equipment. Existing equipment available may need to be supplemented.
F2.3.2	Facilities for handling hazardous/ non hazardous materials e.g. asbestos			Limited capability exists, additional specialist contractor support/ extension of current capability may be required.
F2.3.3	Containment tents for cutting primary pipework / gloveboxes / bungs			Capability exits to provide as required.
F2.3.5	Capability to drain / remove / store/ dispose PST contents ($30m^3$) – potassium chromate (K_2Cr0_4).	N	N/A	An extant disposal route exists, activity limits apply, but there is no limit on the volume being transferred. Additional capability may be required.
F2.3.6	Temporary shielding			Existing shielding i.e. gammablok already available on site. Additional stocks may be required.
F2.3.7	Ventilation			Capability currently exists, additional equipment may be required.
F2.3.8	Thermocouple Probe Management	N	N/A	Thermocouples probes processed on site previously. Transport containers are required. Previously used containers are OOS
F2.3.9	Neutron Test Source Removal	N	N/A	Neutron test source processed on site previously. Tools available. Transport containers will need to be made available.
F2.4	**RPV Removal**	**Y**	**M**	**Work required to justify movement of RPV in the PST**
F2.4.1	RPV packaging	Y	M	[redacted]
F2.4.2	Craneage for RPV/PST Lift			Heavy lift capability required >100te. A structural assessment will be required.
F2.4.3	Transport for RPV/PST			Specialist transport required.

ID Number	Devonport Description	Existing Facilities	Compatibility	Key / Comment
				Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling
				Key: Facility is not fully compatible with the requirements of Submarine Dismantling
				Key: Facility is not compatible with the requirements of Submarine Dismantling
				Key: Facility Gap
F2.4.4	Fire system			Fire systems provided on board as part of a refit
F2.4.4.1	Detection			
F2.4.4.2	Suppressant			
F3.1	**Security Declassification Equipment**			
	No specific items of plant/ equipment identified at this stage			
F4.1	**Radiological Clearance Equipment**	**Y**	**H**	**Consumable based activity, supporting infrastructure covered elsewhere**
F4.1.1	Storage / transport containers			A range of existing containers i.e. drums, skips, ISO containers readily available. Additional equipment will be required.
F4.1.2	HP Monitoring Equipment (i.e. for clearance)			Equipment currently available in site. Capability may need to be extended. The equipment will be purchased not hired.
F4.1.3	Asbestos removal capability			Limited capability exists, additional specialist contractor support/ extension of current capability may be required.
F4.1.4	Waste removal (e.g. oil management) for WiW			Disposal routes available. Volumes generated likely to be small.
F4.1.5	Non Active Bowsers/ Jet Vacs			Current capability requires extension.
F4.1.6	Handling, cutting and welding equipment			Equipment currently in use, additional equipment may be required. The equipment will be purchased not hired.
F4.1.7	Ventilation			Ventilation requirements as existing facility. The equipment will be purchased not hired.
F5.1	**Waste Management Facility (General)**	**Y**	**M**	**Generally sufficient facility/ infrastructure exists however it is not all located within one facility. Areas such as the SWHF, NUB, REW, and S&D could all be utilised. The NEMSFAC is suitable for receiving all RC components; however this facility is fully committed for the foreseeable future. Optimising the use of existing facilities may require a degree of rationalisation / upgrades to produce a holistic waste management facility for all on site work streams.**
F5.1.1	Craneage	Y	M	Additional craneage may be required. This craneage is required to support the receipt area of the waste management facility.
F5.1.2	Effluent Treatment Plant	Y	M	ETP located in the SRC may be available to support submarine dismantling. Current ETP may require modification & upgrade to receive liquor from ILW size reduction and conditioning processes
F5.1.2.1	Active Drainage system	Y	M	
F5.1.2.2	Holding tanks (Receipt and Discharge capability)	Y	M	
F5.1.2.3	IXC	Y	M	
F5.1.3	Radiochemical Laboratory & Equipment:	Y	H	New facility located in the SRC. Additional analysis equipment may be required.
F5.1.4	Engineered ventilation	Y	H	Assumes current ventilation system re-validation/ life extension as part of Periodic Review of Safety (PRS).
F5.1.4.1	Air conditioning	Y	H	
F5.1.4.2	Active Ventilation	Y	H	
F5.1.5	HP Facilities	Y	H	Site wide HP instrumentation provision, additional equipment may be required.
F5.1.5.1	HP monitoring equipment	Y	H	
F5.1.5.2	Dosimetry	Y	H	Site wide dosimetry system available at multiple locations
F5.1.5.3	Change areas	Y	H	
F5.1.5.4	Access Control	Y	H	
F5.1.5.5	Active change & wash room	Y	H	Active change facilities at 9 dock and SRC.
F5.1.5.6	Active laundry	Y	H	Use current facility located in the NUB.

ID Number	Devonport Description	Existing Facilities	Compatibility	Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling / Facility is not fully compatible with the requirements of Submarine Dismantling / Facility is not compatible with the requirements of Submarine Dismantling / Facility Gap — Comment
F5.1.5.7	Whole Body Monitoring capability	Y	H	In house capability exists.
F5.1.6	Waste Disposal Costs (conventional and radiological)			Waste disposal costs will be comparable at each site.
F5.1.7	Amenities	Y	H	
F5.1.8	Receipt Bay (incoming waste)	Y	M	Provision must be made for a central area to receive all radiological waste as soon as it is removed from the submarine.
F5.1.9	Fire system	Y	H	
F5.1.9.1	Detection	Y	H	
F5.1.9.2	Suppressant	Y	H	
F5.1.10	Active workshops	Y	M	S&D, REW could be used. Crane in S&D 20te and REW 10te. Entrance to S&D and REW may need to be upgraded to improve access for heavy items. Medium levels of investment required to undertake modification.
F5.1.10.1	Tool issue store (TIS)	Y	H	TIS located in the NSF.
F5.1.10.2	Decontaminable walls / floors	Y	H	
F5.1.11	Services	Y	H	Generally available throughout the dockyard site.
F5.1.11.1	M&L	Y	H	
F5.1.11.2	Water	Y	H	
F5.1.12	Shielded equipment stores	Y	H	Shielded equipment stores available in the S&D, including LTAS and shielded stores in RRPB.
F5.1.13	Portable Plant	Y	M	
F5.1.13.1	Jet Vacs	Y	M	
F5.1.13.2	Active Vacuum cleaners			
F5.1.14	SCADA Control room	Y	L	Some facilities may require updates
F5.1.15	Clean Receipt Area (new goods)	Y	H	New goods could be received at existing stores i.e. main vanguard store.
F5.1.15.1	Craneage / OHT	Y	H	
F5.1.16	ISO container (storage & maintenance)	Y	H	No specific designated areas. Locations on site for storage and maintenance of empty containers.
F5.1.17	Drums (storage & maintenance)	Y	H	Storage and maintenance capability.
F5.1.18	First Aid Centre	Y	H	Occupational Health Centre available.
F5.1.19	Security/ Access Controls	Y	H	Security infrastructure already exists.
F5.1.20	Waste Management System (IT/IS)	Y	H	Existing site IT system available.
F5.2	**ILW Processing Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited.**
F5.2.1	Preparation area	N	N/A	
F5.2.1.1	RPV / Core Barrel / Fix Stand	N	N/A	
F5.2.1.2	Shielded cell (C4) Remote Viewing Systems (machining cell)	N	N/A	
F5.2.1.3	Decontaminable walls / floor	N	N/A	
F5.2.1.4	Wash down facility	N	N/A	
F5.2.1.5	Liquor receipt / storage & disposal (K Chromate residue)	N	N/A	
F5.2.1.6	Specialist removal tools / lifting jigs	N	N/A	
F5.2.1.7	Craneage i.e. OHT	N	N/A	
F5.2.2	Size Reduction area (RPV & PST) (side access capability)	N	N/A	

ID Number	**Devonport** Description	Existing Facilities	Compatibility	Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling / Facility is not fully compatible with the requirements of Submarine Dismantling / Facility is not compatible with the requirements of Submarine Dismantling / Facility Gap — Comment
F5.2.3	Shielded cell (C4) Remote Viewing Systems (cutting cell)	N	N/A	
F5.2.4	Remote Handling	N	N/A	
F5.2.4.1	Master Slave Manipulators (remote)	N	N/A	
F5.2.4.2	Heavy Lift Equipment	N	N/A	
F5.2.4.3	Size Reduction Equipment			
F5.2.4.3.1	Abrasive wire			
F5.2.4.3.2	Circular saw			
F5.2.4.3.3	Reciprocating Saw/band cutter			
F5.2.4.3.4	Machining Equipment			
F5.2.4.3.5	Shearing Equipment			
F5.2.5	$3m^3$ box furniture & waste bins (i.e. secondary waste arising)			
F5.2.7	Filtration Treatment Plant	N	N/A	
F5.2.8	Crane (Hot cell specific)	N	N/A	
F5.2.9	HP Monitoring Equipment	N	N/A	
F5.2.10	Breakdown Recovery system	N	N/A	
F5.2.11	Training Areas / Rigs / Mock Up	N	N/A	
F5.2.12	Recovery Systems	N	N/A	
F5.2.13	Fire system	N	N/A	
F5.2.13.1	Detection	N	N/A	
F5.2.13.2	Suppressant	N	N/A	
F5.3	**ILW Conditioning and Packaging Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited.**
F5.3.1	Shielded cell (C4) Remote Viewing Systems	N	N/A	
F5.3.2	Remote Handling	N	N/A	
F5.3.2.1	Master Slave Manipulators	N	N/A	
F5.3.2.2	Heavy Lift Equipment	N	N/A	
F5.3.3	Transfer System	N	N/A	
F5.3.4	Grouting Facility	N	N/A	
F5.3.4.1	Waste water / slurry effluent treatment plant	N	N/A	
F5.3.4.2	Cement and Water Delivery	N	N/A	
F5.3.4.3	Grout Mixing	N	N/A	
F5.3.4.4	Grout Storage (mobile) and discharge	N	N/A	
F5.4	**ILW Storage and Consignment Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited.**
F5.4.1	Shielded buffer storage (8 packaged	N	N/A	

ID Number	Devonport Description	Existing Facilities	Compatibility	Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling / Facility is not fully compatible with the requirements of Submarine Dismantling / Facility is not compatible with the requirements of Submarine Dismantling / Facility Gap — Comment
	boxes)			
F5.4.2	Remote monitoring capability (contamination, dose rate and inventory)	N	N/A	
F5.4.3	3m^3 box decontamination capability	N	N/A	
F5.4.4	Crane (3m^3 box specific)	N	N/A	
F5.4.5	On site over pack			
F5.4.6	3m^3 box and over pack lifting equipment (ISO fittings)			
F5.4.7	Buffer storage / Inspection Area: 3m^3 boxes in over pack	N	N/A	
F5.4.8	3m^3 box (storage and maintenance)	N	N/A	
F5.4.9	3m^3 over pack (storage and maintenance)	N	N/A	
F5.4.10	Transport Bay	N	N/A	
F5.4.11	Over-pack Transfer Capability	N	N/A	
F5.5	**LLW Processing Plant**	**Y**	**M**	**Generally sufficient facility/ infrastructure exists however it is not all located within one facility. Areas such as the SWHF, NUB, REW, and S&D could all be utilised. The NEMSFAC is suitable for receiving all RC components; however this facility is fully committed for the foreseeable future. Optimising the use of existing facilities may require a degree of rationalisation / upgrades to produce a holistic waste management facility for all on site work streams.**
F5.5.1	LLW Lay Down area	Y	M	Lay down area limited capacity, a larger area may be required to support submarine dismantling.
F5.5.1.1	Fork lift / palletisers			
F5.5.2	Preparation area	Y	H	
F5.5.2.1	Liquor receipt / storage & disposal	Y	H	Current LLW facility interfaces with on site ETP.
F5.5.2.2	Residual resin removal	Y	H	Capability exists on site to remove residual resin from ion exchange columns and containers
F5.5.2.3	LLW stands (e.g. SG, Pressuriser etc)	N	N/A	
F5.5.2.4	Waste sorting (e.g. Lead working / poly removal)	Y	H	This activity is conducted as part of existing operations
F5.5.4	Surface decontamination (e.g. shot blasting capability)	N	N/A	
F5.5.5	Size Reduction area	Y	L	Existing capability to be considered (F5.5.5.1)
F5.5.5.1	Shielded Size Reduction Cells (C4)	Y	L	[redacted]
F5.5.5.2	Size Reduction Equipment			Existing capability may need to be extended.
F5.5.5.2.1	Abrasive wire			
F5.5.5.2.2	Circular saw			
F5.5.5.2.3	Reciprocating Saw/band cutter			
F5.5.5.2.4	Machining Equipment			
F5.5.5.2.5	Shearing Equipment			
F5.5.5.2.6	Plasma			
F5.5.5.3	Handling equipment/ frames/ craneage	Y	M	Existing capability may need to be extended.

ID Number	Devonport Description	Existing Facilities	Compatibility	Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling / Facility is not fully compatible with the requirements of Submarine Dismantling / Facility is not compatible with the requirements of Submarine Dismantling / Facility Gap — Comment
F5.5.5.4	Temporary shielding i.e. gammablok			
F5.6	**LLW Conditioning & Packaging Plant**	**Y**	**M**	**Considered that existing arrangements will require optimisation**
F5.6.1	Waste sorting area	Y	M	Current area not considered to be suitable capacity
F5.6.1.1	Clearance Monitor	Y	H	
F5.6.1.2	Conventional hazardous material (contaminated)	Y	M	Facilities may be limited in terms of handling contaminated asbestos
F5.6.2	ISO bays	N	N/A	[redacted] other potential areas on site available for ISO lay down/ storage.
F5.6.2.1	ISO Containers			
F5.6.3	Drums			
F5.6.3.1	Drum Monitor	Y	H	[redacted]
F5.6.3.2	In Drum compactor	Y	H	[redacted]
F5.6.3.3	Drum trolleys			
F5.6.4	Craneage	Y	H	Various OHT in areas either currently used or potentially used for LLW packaging
F5.7	**LLW Consignment Plant**	**Y**	**L**	**Current shielded buffer storage is limited**
F5.7.1	ISO lifting equipment (ISO fittings)			
F5.7.2	Buffer storage (Shielded)	Y	L	
F5.8	**Non Active Waste Management**	**Y**	**H**	**COTS equipment available**
F5.8.1	Size reduction/ shredding equipment for non active item declassification	Y	H	Assumed current scrap pound can be utilised, may require some additional space and more equipment. This is dependant on the security declassification strategy provided by the Authority.
F5.8.2	Packaging			
F5.8.3	HP monitoring equipment (i.e. clearance)	Y	H	Various monitoring equipment available, scrap pound has portal style drive through lorry monitors
F6.1	**Pressure Hull Repair Equipment**	**Y**	**H**	**Standard ship repair/ building techniques & materials, consumable based activity**
F6.1.1	Ballast			Additional required assuming tow required
F6.1.2	Hull Closure Plates			As required, additional plates can be procured.
F6.1.3	Welding/ Repair Kit			
F7.1	**ILW Transport Equipment**	**N**	**N/A**	
F7.1.1	Suitable transport (over pack and $3m^3$ box)	N	N/A	Design available. $3m^3$ box to be manufactured. Overpack requires licensing and manufacture.

15.0 TABLE 3: INFRASTRUCTURE AND FACILITIES AT ROSYTH

ID Number	Rosyth Description	Existing Facilities	Compatibility	Key: Facility is considered to be broadly compatible with the requirements of Submarine Dismantling / Facility is not fully compatible with the requirements of Submarine Dismantling / Facility is not compatible with the requirements of Submarine Dismantling / Facility Gap — Comment
F1.1	**Dockside**	**Y**	**H**	
F1.1.1	Road access	Y	H	The existing roads should be adequate to support the transport requirements i.e. the RPV/ PST providing suitable transport is provided. It will be necessary to review as part of a structural assessment.
F1.1.2	Rail link	Y	H	Very minor works to connect dock to rail link
F1.1.3	Cranes	Y	H	
F1.1.4	Services i.e. water, electrics	Y	H	
F1.1.5	Welfare Facilities/ Offices	Y	H	
F1.1.6	Forklift			
F1.1.7	Security Controls	Y	H	
F1.1.8	First Aid Facility	Y	H	Current arrangements suffice
F1.2	**Dock**	**Y**	**M**	**Dock requires environmental controls and bespoke cradle to facilitate RPV removal**
F1.2.1	Compatible dock	Y	H	
F1.2.2	Cradle	N	N/A	Dismantling cradle required
F1.2.3	Caisson	Y	H	
F1.2.4	Sealed dock (e.g. oil interceptors)	N	N/A	Requirements need to be determined. This will be specified during the design and safety process.
F1.2.5	Docking Infrastructure (docking trolley)	N	N/A	
F2.1	**Dock Bottom**	**N**	**N/A**	**No suitable DBV is available**
F2.1.1	Dock Bottom Village (DBV)	N	N/A	DBV will include Access towers, gantries and platforms
F2.1.1.1	Containment Unit	N	N/A	
F2.1.1.2	Ventilation	N	N/A	
F2.1.2	Environmental controls			Weather protection to openings
F2.1.2.1	Dust & Water Management (x2 - active & non active)			
F2.1.3	HP controls	N	N/A	
F2.1.4	Scaffolding / staging			
F2.1.5	Shot blasting capability			
F2.1.6	Fire system	N	N/A	
F2.1.6.1	Detection	N	N/A	
F2.1.6.2	Suppressant	N	N/A	
F2.1.7	Personal Decontamination Facility	N	N/A	
F2.2	**Dockside (Top)**	**Y**	**M**	**Shortfalls in local HP controls, containment & portable equipment.**
F2.2.1	Containment Structure over RC with	N	N/A	It is believed only umbilical style containment will be required for SG removal and minor sealing works around access cuts.

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	ventilation			
F2.2.2	Crane (~43te)	Y	H	Existing cranes circa [redacted]
F2.2.3	HP Facilities and Controls	N	N/A	Locally sited portable facility
F2.2.4	Set Down Area (bunded and contained)	Y	M	Adequate space available dockside. All radioactive material transferred immediately to AWAF shipped in ISO container
F2.2.5	Storage area	Y	H	
F2.2.6	Storage / transport containers			
F2.2.7	Slinging equipment/ turning and lifting frames			Manufacture bespoke equipment
F2.2.8	Transport Vehicles/ Trucks			Hire bespoke equipment
F2.2.9	Jet Vac / Vacuum Cleaners/ Bowsers (Active)	N	N/A	
F2.3	**Plant Removal (Inboard)**	**N**	**N/A**	**Shortfalls in equipment, PST drain, NTS & TCP removal**
F2.3.1	New tools for strip out and hull cuts			For removal of SG, Pressuriser, MCP's etc
F2.3.2	Facilities for handling hazardous/ non hazardous materials e.g. asbestos			Project cost
F2.3.3	Containment tents for cutting primary pipework / gloveboxes / bungs			
F2.3.5	Capability to drain / remove / store/ dispose PST contents ($30m^3$) – potassium chromate (K_2Cr0_4).	N	N/A	
F2.3.6	Temporary shielding			
F2.3.7	Ventilation			
F2.3.8	Thermocouple Probe Management	N	N/A	
F2.3.9	Neutron Test Source Removal	N	N/A	
F2.4	**RPV Removal**	**Y**	**M**	**Work required to justify movement of RPV in the PST**
F2.4.1	RPV packaging	Y	M	The RPV will be removed and transported within the PST. It is considered that utilising the PST to transport the RPV is more cost effective than the design and manufacture of a new bespoke container. Work is required to justify the movement of the RPV in the PST.
F2.4.2	Craneage for RPV/PST Lift			Project cost
F2.4.3	Transport for RPV/PST			CVF transporter expected to be available
F2.4.4	Fire system			
F2.4.4.1	Detection			
F2.4.4.2	Suppressant			
F3.1	**Security Declassification Equipment**			
	No specific items of plant/ equipment identified at this stage			
F4.1	**Radiological Clearance Equipment**	**Y**	**H**	Consumable based activity

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F4.1.1	Storage / transport containers			Project cost
F4.1.2	HP Monitoring Equipment (i.e. for clearance)			Existing equipment will need to be replaced due to age
F4.1.3	Asbestos removal capability			Project cost
F4.1.4	Waste removal (e.g. oil management) for WiW			
F4.1.5	Non Active Bowsers/ Jet Vacs			
F4.1.6	Handling, cutting and welding equipment			
F4.1.7	Ventilation			
F5.1	**Waste Management Facility (General)**	**Y**	**M**	**AWAF building may require modification to OHT and effluent treatment plant**
F5.1.1	Craneage	Y	L	AWAF Building modifications for handling SG cut up
F5.1.2	Effluent Treatment Plant	Y	L	The PETP suitable only for low quantities of contaminated water
F5.1.2.1	Active Drainage system	Y	H	
F5.1.2.2	Holding tanks (Receipt and Discharge capability)	Y	L	Larger bowser capacity required
F5.1.2.3	IXC			As F5.1.2 above
F5.1.3	Radiochemical Laboratory & Equipment:	Y	H	
F5.1.4	Engineered ventilation			
F5.1.4.1	Air conditioning	Y	H	
F5.1.4.2	Active Ventilation	Y	H	
F5.1.5	HP Facilities			
F5.1.5.1	HP monitoring equipment	Y	H	
F5.1.5.2	Dosimetry	Y	H	
F5.1.5.3	Change areas	Y	H	
F5.1.5.4	Access Control	Y	H	
F5.1.5.5	Active change & wash room	Y	H	
F5.1.5.6	Active laundry	Y	H	
F5.1.5.7	Whole Body Monitoring capability	Y	H	
F5.1.6	Waste Disposal Costs (conventional and radiological)			Waste disposal costs will be comparable at each site.
F5.1.7	Amenities	Y	H	
F5.1.8	Receipt Bay (incoming waste)	Y	H	
F5.1.9	Fire system			
F5.1.9.1	Detection	Y	H	Modify to allow hot work
F5.1.9.2	Suppressant	Y	H	Modify to allow hot work
F5.1.10	Active workshops	Y	M	See above
F5.1.10.1	Tool issue store (TIS)	Y	H	
F5.1.10.2	Decontaminateable walls / floors	Y	H	
	Decontamination Facility	N	N/A	
F5.1.11	Services			
F5.1.11.1	M&L	Y	H	

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F5.1.11.2	Water	Y	H	
F5.1.11.3	Comms and Alarms	Y	H	
F5.1.12	Shielded equipment stores	Y	H	
F5.1.13	Portable Plant	N	N/A	
F5.1.13.1	Jet Vacs	N	N/A	
F5.1.13.2	Active Vacuum cleaners			
F5.1.14	SCADA Control room	Y	H	
F5.1.15	Clean Receipt Area (new goods)	N	N/A	
F5.1.15.1	Craneage / OHT	Y	H	
F5.1.16	ISO container (storage & maintenance)	Y	H	
F5.1.17	Drums (storage & maintenance)	Y	H	
F5.1.18	First Aid Centre	Y	H	Site Facility
F5.1.19	Security/ Access Controls	Y	H	
F5.1.20	Waste Management System (IT/IS)	Y	H	
F5.2	**ILW Processing Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited to modification of the AWAF.**
F5.2.1	Preparation area	N		
F5.2.1.1	RPV / Core Barrel / Fix Stand	N		
F5.2.1.2	Shielded cell (C4) Remote Viewing Systems (machining cell)	N		
F5.2.1.3	Decontaminateable walls / floor	N		
F5.2.1.4	Wash down facility	N		
F5.2.1.5	Liquor receipt / storage & disposal (K Chromate residue)	N		
F5.2.1.6	Specialist removal tools / lifting jigs	N		
F5.2.1.7	Craneage i.e. OHT	N		
F5.2.2	Size Reduction area (RPV & PST) (side access capability)	N		
F5.2.3	Shielded cell (C4) Remote Viewing Systems (cutting cell)	N		
F5.2.4	Remote Handling	N		
F5.2.4.1	Master Slave Manipulators (remote)	N		
F5.2.4.2	Heavy Lift Equipment	N		
F5.2.4.3	Size Reduction Equipment			
F5.2.4.3.1	Abrasive wire			
F5.2.4.3.2	Circular saw			
F5.2.4.3.3	Reciprocating Saw/band cutter			
F5.2.4.3.4	Machining Equipment			
F5.2.4.3.5	Shearing Equipment			
F5.2.5	$3m^3$ box furniture & waste bins (i.e.			

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	secondary waste arising)			
F5.2.7	Filtration Treatment Plant	N		
F5.2.8	Crane (Hot cell specific)	N		
F5.2.9	HP Monitoring Equipment	N		
F5.2.10	Breakdown Recovery system	N		
F5.2.11	Training Areas / Rigs / Mock Up	N		
F5.2.12	Recovery Systems	N		
F5.2.13	Fire system	N		
F5.2.13.1	Detection	N		
F5.2.13.2	Suppressant	N		
F5.3	**ILW Conditioning and Packaging Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited to modification of the AWAF.**
F5.3.1	Shielded cell (C4) Remote Viewing Systems	N		
F5.3.2	Remote Handling	N		
F5.3.2.1	Master Slave Manipulators	N		
F5.3.2.2	Heavy Lift Equipment	N		
F5.3.3	Transfer System	N		
F5.3.4	Grouting Facility	N		
F5.3.4.1	Waste water / slurry effluent treatment plant	N		
F5.3.4.2	Cement and Water Delivery	N		
F5.3.4.3	Grout Mixing	N		
F5.3.4.4	Grout Storage (mobile) and discharge	N		
F5.4	**ILW Storage and Consignment Plant**	**N**	**N/A**	**Existing ILW facilities are designed for the handling, processing and storage of resins. No suitable facility exists for size reduction/ segregation of massive metallic ILW structures; options for utilising existing buildings are limited to modification of the AWAF.**
F5.4.1	Shielded buffer storage (8 packaged boxes)	N		
F5.4.2	Remote monitoring capability (contamination, dose rate and inventory)	N		
F5.4.3	$3m^3$ box decontamination capability	N		
F5.4.4	Crane ($3m^3$ box specific)	N		
F5.4.5	On site over pack			
F5.4.6	$3m^3$ box and over pack lifting equipment (ISO fittings)			
F5.4.7	Buffer storage / Inspection Area: $3m^3$ boxes in over pack	N		

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F5.4.8	3m^3 box (storage and maintenance)	N		
F5.4.9	3m^3 over pack (storage and maintenance)	N		
F5.4.10	Transport Bay	N		
F5.4.11	Over-pack Transfer Capability	N		
F5.5	**LLW Processing Plant**	**Y**	**M**	**Limited effluent treatment capability, limited size reduction capability**
F5.5.1	LLW Lay Down area	Y	H	
F5.5.1.1	Fork lift / palletisers			
F5.5.2	Preparation area			
F5.5.2.1	Liquor receipt / storage & disposal	Y	M	Limited to PETP capacity
F5.5.2.2	Residual resin removal	Y	H	
F5.5.2.3	LLW stands (e.g. SG, Pressuriser etc)	N	N/A	
F5.5.2.4	Waste sorting (e.g. Lead working / poly removal)	Y	H	
F5.5.4	Surface decontamination (e.g. shot blasting capability)	N	N/A	
F5.5.5	Size Reduction area	N	N/A	
F5.5.5.1	Shielded Size Reduction Cells (C4)	N	N/A	
F5.5.5.2	Size Reduction Equipment			
F5.5.5.2.1	Abrasive wire			
F5.5.5.2.2	Circular saw			
F5.5.5.2.3	Reciprocating Saw/band cutter			
F5.5.5.2.4	Machining Equipment			
F5.5.5.2.5	Shearing Equipment			
F5.5.5.2.6	Plasma			
F5.5.5.3	Handling equipment/ frames/ craneage	N	N/A	
F5.5.5.4	Temporary shielding i.e. gammablok			
F5.6	**LLW Conditioning & Packaging Plant**	**Y**	**H**	
F5.6.1	Waste sorting area	Y	H	
F5.6.1.1	Clearance Monitor	Y	H	
F5.6.1.2	Conventional hazardous material (contaminated)	Y	H	
F5.6.2	ISO bays	Y	H	
F5.6.2.1	ISO Containers			
F5.6.3	Drums			
F5.6.3.1	Drum Monitor	Y	H	
F5.6.3.2	In Drum compactor	Y	H	
F5.6.3.3	Drum trolleys			

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F5.6.4	Craneage	Y	H	
F5.7	**LLW Consignment Plant**	**Y**	**H**	
F5.7.1	ISO lifting equipment (ISO fittings)			
F5.7.2	Buffer storage (Shielded)	Y	H	
F5.8	**Non Active Waste Management**	**Y**	**H**	**COTS Equipment available**
F5.8.1	Size reduction/ shredding equipment for non active item declassification	Y	H	Assumed current scrap pound can be utilised, may require some additional space and more equipment. This is dependant on the security declassification strategy provided by the Authority.
F5.8.2	Packaging			
F5.8.3	HP monitoring equipment (i.e. clearance)	Y	H	Hand held and Portal Monitor
F6.1	**Pressure Hull Repair Equipment**	**Y**	**H**	**Standard ship repair/ building techniques & materials, consumable based activity**
F6.1.1	Ballast			
F6.1.2	Hull Closure Plates			
F6.1.3	Welding/ Repair Kit			
F6.1.4	Hull Preservation (internal/external)			
F7.1	**ILW Transport Equipment**	**N**	**N/A**	
F7.1.1	Suitable transport (over pack and $3m^3$ box)	N	N/A	Design available. $3m^3$ box to be manufactured. Overpack requires licensing and manufacture.