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Title:	**USER REQUIREMENT SPECIFICATIONS FOR THE LA EFFLUENT OFF-LOAD AREA AT P-2400**

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Revisions

This document has been revised according to the following schedule:

Revision	Date Approved	Nature of Revision	Prepared by
00	24/06/2024	First Issue	JH LUBBINGE
01	See title page	Section 10 updated with correct figure.	JH LUBBINGE

Contents:

LIST OF TABLES:

1.0 PURPOSE

The purpose of this document is to define the user requirement specification (URS) for the LA off-load area to be designed, installed, constructed and commissioned at P-2400.
The URS is compiled to provide design engineers with an understanding of the needs of the project, to design accordingly.

2.0 SCOPE

This document defines the requirements for the establishment of the LA off-loading Area at P-2400.

3.0 REFERENCES

[1] Drawing No: 274J005-00-00	P&ID drawing
[2] Drawing No: 274Y001-00-00	P-2400 Site & Utilities
[3] Drawing No: 274Y006-00-00	Piping Layout drawing
[4] LE-PRG-0001	RP Surveillance and control programme for P-2400
[5] LE-WAC-0001	LEMS waste acceptance criteria for liquid effluent
[6] NLM-STU-24/001	Options Study for the Handling of LA Effluent Generated at VRF
[7] SHEQ-INS-0825	NECSA requirements for construction
[8] SHEQ-INS-5300	Written Safe Work Procedures, Instruction and Task Training
[9] SHEQ-INS-8150	Access and Egress Control for Radiological Areas

4.0 DEFINITIONS

No definitions.

5.0 ABBREVIATIONS

ℓ	Liter
LA	Low Active (Effluent)
LAETF	Low Active Effluent Treatment Facility situated at P-2400 operated by LEMS
LEMS	Liquid Effluent Management Services (Section of WM group)
NIL	Nuclear Installation License
OHS	Occupational Health and Safety
P&ID	Piping and Instrument Diagram

P-2400	Building P-2400 on Pelindaba west (operated by LEMS)
PDO	Pre-Disposal Operations
RP	Radiation Protection
SAR	Safety Assessment Report
SHEQ	Safety, Health, Environment, and Quality
SS304	Stainless Steel 304
URS	User Requirements Specification
VRF	Volume Reduction Facility in Pelstore
WM	Waste Management

6.0 RESPONSIBILITY

It is the responsibility of the project manager to ensure that SHEQ and regulatory requirements are met.
Construction work at LEMS P-2400 shall be under the control of the Facility Manager or his delegate and in full compliance with all requirements of the relevant process of Necsa's SHEQ system.

7.0 GENERAL REQUIREMENTS

The LA off-loading area shall enable the off-loading of LA via road tanker at the LAETF. The LA off-loading area shall also contain any potential spillages and thus prevent contamination of the environment.

8.0 PROJECT DESCRIPTION

An options study for the handling of LA effluent generated at the VRF was conducted [6] and concluded that a road tanker shall be used to transfer LA effluent from the VRF to LEMS. The existing LAETF is designed and constructed to treat LA received via dedicated pipelines from facilities on Necsa site. These facilities are located close to the LAETF. The VRF which is currently in the commissioning phase will generate LA effluent once operational. The VRF is located on Pelindaba East and is thus far from the LAETF and therefore the most viable option is to transfer the LA via road tanker to the LAETF [6], as there are no existing pipelines between the two facilities. Other planned facilities on the Necsa site may also generate LA and need the removal of it via road tanker.

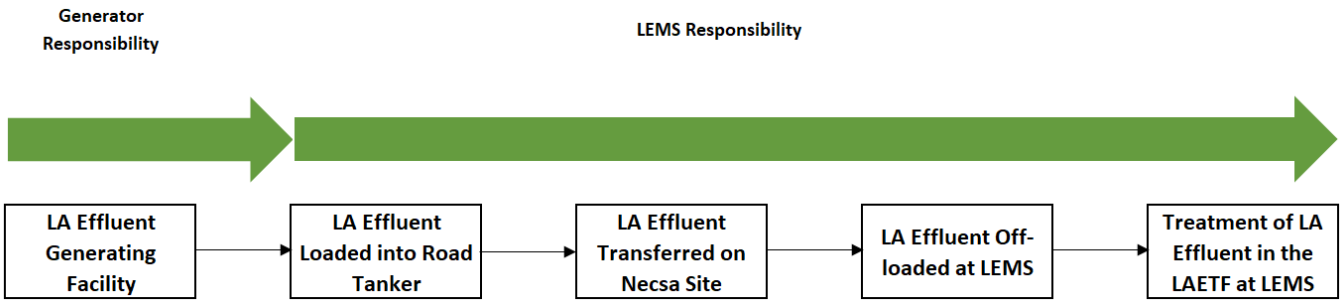
The planned off-loading area will be constructed in an existing radiological area and the off-loading of LA effluent in that area will not change the existing radiological area classification as White contamination and Blue radiation [4].

9.0 PROJECT ASSUMPTIONS

- Existing Necsa P-2400 facility and associated utilities will be used.
- All current and existing systems and processes at P-2400 are licensed (NIL-41).
- Any process deviations from what is approved in the LEMS SAR and / or impacting NIL41 will have to be licensed.
- In the absence of applicable standards and/ or drawings, assumptions should be verified with the project manager.
- The LA road tanker has a capacity of 3000 ℓ.
- The LA road tanker is enabled for emptying by gravity.

10.0 PROCESS FLOW

Below is the process flow diagram



11.0 DESIGN REQUIREMENTS

- The design of the bund area shall be in accordance with sound engineering and scientific practices, and appropriate technical standards to ensure intended performance.
- Safety, human factors, maintenance, and other interfaces must be considered when designing the bund area.
- Adhere to Occupational Health and Safety Act 85.

12.0 USER REQUIREMENT SPECIFICATIONS

12.1 SUMMARY OF MODIFICATIONS TO THE LAETF AT P-2400

Construction of a bund Area and pipeline at P-2400 is to be designed to accommodate the road tanker:

- The bund to safely contain a volume of 3000 ℓ of LA plus a 10% spare capacity.
- The bund shall be coated with acid resistant epoxy.
- New pipeline and valves to direct LA effluent from the road tanker to either tank T46/1, T46/2 or T46/3 (P-2400 LA effluent receiving tanks). A flexible coupling shall be provided to couple the new pipeline to the road tanker.

- New pipeline and valves to direct rainwater, spillage of LA effluent or wash water from the bund area to either of the drain tanks Prosmet 1 and Prosmet 2.

12.2 INSTRUMENT AND CONTROL ENGINEERING REQUIREMENTS

No instrumentation nor controls needed for the off-loading area and pipelines. Operational procedures will be implemented to ensure correct operation.

12.3 MECHANICAL ENGINEERING REQUIREMENTS

Design of new pipelines from the off-loading area:

- New pipeline and valves to connect to the road tanker to direct LA effluent from the road tanker to either tank T46/1, T46/2 or T46/3 (P-2400 LA effluent receiving tanks). A flexible coupling shall be provided to couple the new pipeline to the road tanker.
- New pipeline and valves to direct rainwater, spillage of LA effluent or wash water from the bund area to either of the drain tanks Prosmet 1 and Prosmet 2.
- Pipelines and valves shall be made of SS304.

12.4 CIVIL ENGINEERING REQUIREMENTS

- Design of the new bund area for 3000 ℓ volume plus at least 10%.
- Bund to be coated with acid resistant epoxy.
- Access into the bund for the 3000 ℓ road tanker. The access area of the bund shall be sloped to enable the access and egress of the road tanker while preventing spilled effluent from flow out of the bund into the environment.
- The bund should have a drain line to direct rainwater, spillage of LA effluent or wash water from the bund area to either of the drain tanks Prosmet 1 and Prosmet 2.
- A water supply point shall be installed at the bund to enable the washing of the bund and road tanker wheels in the case of a spillage.

12.5 SHEQ REQUIREMENTS

The below SHEQ-INS documents must be complied with:

- SHEQ-INS-5300 Written Safe Work Procedures, Instruction and Task Training [8].
- SHEQ-INS-8150 Access and Egress Control for Radiological Areas [9].
- SHEQ-INS-0825 NECSA requirements for construction [7].

12.6 RADIOLOGICAL REQUIREMENTS

The facility shall ensure that LA effluent is contained and safely handled to ensure personnel and environmental protection.

12.7 MATERIALS OF CONSTRUCTION

The materials of construction shall be durable and allow for easy cleaning.

12.8 SAFETY REQUIREMENTS AND HUMAN FACTORS ENGINEERING

- The facility shall comply with the OHS Act and all applicable regulations.
- Enough space shall be provided for maintenance activities.
- Ergonomics must be considered during the design of the facility and equipment. The height of workstations etc. must be designed to limit operator fatigue or endangerment.

- All applicable safety and radiological signs and markings shall be installed.

12.9 TESTING REQUIREMENTS

All testing done should be accompanied with the relevant standard certificates and proof of accreditation.

12.10 FACILITY LAYOUT

- The layout of the facility shall provide enough space for working and handling equipment.
- As per reference drawings below:
  - P-2400 Site & Utilities drawing No: 274Y001-00-00 [2]
  - P&ID drawing 274J005-00-00 [1]
  - Piping Layout drawing 274Y006-00-00 [3].

13.0 EFFLUENT CLASSIFICATION AND ACCEPTANCE CRITERIA

The below tables indicate the radiological and chemical limits of the liquid to be handled [5]. The materials selected for this project should be able to handle these.

Table 1 RADIOLOGICAL CLASSIFICATION

Classification	Description	Radioactivity criteria	
		α-activity (Bq/l)	β-activity (Bq/l)
LA	Effluent from radioactive processes with a low radioactivity content	< 100	< 4000 and Tritium < 3E05 Bq/l

Table 2 EFFLUENT CHEMICAL LIMITS

CHEMICAL DETERMINATE	ACCEPTANCE LEVELS
Ammonia – Ionized and un-ionized (as N)	≤ 6.0 mg/l
Boron (as B)	≤ 1.0 mg/l
Chemical Oxygen Demand (COD)	≤ 75 mg/l
Chlorine-Residual (as free Cl)	≤0.25 mg/l
Dissolved Arsenic (as As)	≤ 0.02 mg/l
Dissolved Cadmium (as Cd)	≤ 0.005 mg/l
Dissolved Chromium-Hexavalent (as Cr)	≤ 0.05 mg/l
Dissolved Copper (as Cu)	≤ 0.01 mg/l
Dissolved Cyanides (as Cn)	≤ 0.02 mg/l
Dissolved Iron (as Fe)	≤ 0.3 mg/l
Dissolved Lead (Pb)	≤ 0.01 mg/l
Dissolved Manganese (as Mn)	≤ 0.1 mg/l
Dissolved Selenium (as Se)	≤ 0.02 mg/l
Dissolved Zinc (as Zn)	≤ 0.1 mg/l

Electrical Conductivity	≤ 100 mS/m
Faecal Coliforms	≤ 1000 counts/100 ml
Fluoride (as F)	≤ 5.0 mg/l
Mercury and its compounds (as Hg)	≤ 0.005 mg/l
Nitrate/Nitrite (as N)	≤ 15 mg/l
Ortho-phosphate (as P)	≤ 1.0 mg/l
pH	≥5.5 ≤ 9.5
Soap/oil/grease	≤ 2.5 mg/l
Sulphate (as SO4)	≤ 200 mg/l
Suspended solids	≤ 25 mg/l
Temperature	Within 3°C of the ambient water temperature
Colour, odour or taste	Shall not contain any substance in concentrations capable of producing any colour, odour or taste
Sodium Absorption Rate	-
Sulphides (as S)	≤1.0 mg/l
Sodium (as Na)	≤ 130 mg/l
Dissolved Oxygen	≤ 75% saturation
Oxygen Absorbed	≤ 10 mg/l (Potassium Permanganate method)
Trichloroethylene (TCE)	≤ 50µg/l
No other constituents in concentrations which are detrimental to health and safety of humans, animals, fish other than trout, or other forms of aquatic life, or which are deleterious to agricultural.	

14.0 RECORDS

No records applicable.