5. CLEARANCE OF LIQUID MATERIAL
Application of the concept

**Unconditional Clearance**
- Dose criteria 10uSv/a.
- Generic levels: (usually in activity concentration)
  - Not site specific
  - Material specific?
- No total quantity constraints (Bq/a)

(If total quantity constraints apply, then it should be considered conditional clearance. Building rubble in Germany: Quantity constraints, but still called unconditional clearance 1000 tonnes/a).

No optimization (ALARA).
Authorization may be needed (depending on country)
May be released into the environment even in large quantities.
Conditional clearance
Identical to unconditional clearance, except possible constraints (list not complete):
- Total quantity
- Destination (Dispersal. Reuse/Recycle)
- Time period

Discharge (always into the environment for dispersal)
- 0.1-0.3mSv/a
- Site specific levels, no generic levels
- Authorization is always needed.
- Usually total quantity limited to certain time period (e.g. Bq/a), but has additional constraints on concentration (e.g. Bq/m3).
- Optimization (ALARA) needs to be demonstrated.
• The CLs provided in Table I.2 of GSR Part 3 may serve as the basis for clearance of liquids, provided that concentration or filtration processes may not occur with the cleared liquids.

**Processes that may increase the activity concentration are much more likely with liquids.**

It is probably necessary to specify the particular types of liquids where these processes are very unlikely. The concept of clearance may be applied for these liquids. Annex with some examples is recommended.

The regulatory body may decide on a case-by-case basis that a specific liquid can also be cleared.

**H3 in water may be considered separately as it is unlikely to get further concentrated.**

When incinerating liquids, a concentration process takes place, but is of little concern as it is already accounted for in the scenarios for the solids (applies to solids too).

**CLs provided in Table I.2 are appropriate for liquids which are to be incinerated (Generic clearance levels used for conditional clearance in this case).**
A good practice would be to filter liquids prior to clearance. However filtration is not needed if scenarios show that the presence of particles have no impact on the dose estimation, e.g. incineration in case of conditional clearance.

Type of liquid: Likely to crystallize? If yes: radiological model must account for the formation of solid inclusions that may settle and thus accumulate radionuclides.

• Not applicable for clearance of large quantities of liquids that are to be released into the environment, as these pathways were not part of the radiological model used for derivation of those CLs

Recommendation:

Shouldn’t use the clearance levels for bulk amounts of solids for the unconditional clearance of liquids without further validation for each type of liquid.

Countries may decide to develop clearance levels that apply specifically to liquids.
• Practical application of the concept of clearance to liquids for release into the environment is addressed in TECDOC 1000. Values are provided in Bq/a (on the basis of 10 µSv/a), which can be converted into limits for volume-related concentrations (Bq/m³ or Bq/l) if the annual amount of effluents is known.

DS500 should refer to TECDOC 1000, but given the definitions above, this falls under conditional clearance, because quantity and final purpose are constrained.

• Need for differentiation between aqueous and non-aqueous liquids

See ‘type of liquids’. If the terms ‘aqueous’ and ‘non-aqueous’ liquids are used, they must be defined (as e.g. in the UK) or at least referenced in order to avoid confusion.

• An example of the practical application of clearance of liquids for disposal in a waste incineration plant is provided in Annex III

Very instructive. :D

• Characterization of liquids, possibility of deposition of sediments

In addition to its radiological characterization, it necessary to have an understanding of the nature of the liquid (chemical and physical
properties) in order to determine if it can be conditionally or unconditionally cleared.

• Liquid effluents from nuclear facilities or from the use of radionuclides in medicine, industry and research are usually treated as discharges (dose criterion applied 0.1-0.3 mSv/a, regulatory authorization needed)

• CL for aqueous liquids that are to be discharged can also be calculated on the basis of individual effective doses on the order of 10 µSv/a. Liquids that meet such clearance levels (cleared) can be released without a regulatory authorization for discharge.

See distinction between conditional and unconditional clearance.

Liquid that has been unconditionally cleared: can be discharged under any circumstances

Liquid that has been conditionally cleared: depends on the conditions under which it has been cleared, e.g. it must be incinerated.

• There are situations where liquids contaminated with radionuclides cannot be discharged (oils, lubricants, chemicals) and have to be released from radiological regulatory control in a different way
TRUE. Also true for aqueous liquids that require treatment to remove other hazardous substances in order to be discharged.

• Discharged liquids, once released to the environment, remain dispersed (activity cannot be concentrated again by any process)

Natural processes may concentrate the activity again. Care should be taken when liquid is released to the sewer because treatment of the waste water may again concentrate the activity.

• Cleared liquids may remain together, activity concentration after clearance may be significantly increased by filtration or by concentration processes (evaporation) -this needs to be taken into account appropriately in the derivation of CL (conditional clearance)

TRUE

Total dose calculation should include natural RN in the water, like K-40 and U-238/Th-232

• when to take into account natural part?

Concept of clearance and exemption should only address the additional radiation exposure not arising from natural background radiation.
Liquids are easy to dilute, so consider illicit dilution, are there criteria for this?

Dilution is not allowed unless the regulator approves. RS-G-1.7:
Dilution of materials is not permitted. Applies to solids and liquids.