Organotin Compounds

Exeter Fixed Soil Treatment Facility

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1. TYPES AND LIMITS FOR ORGANOTIN COMPOUNDS

- Organotin compounds, including tributyltin (TBT), dibutyltin (DBT), and triphenyltin (TPhT), are persistent organometallic pollutants commonly originating from antifouling paints, PVC stabilizers, and biocides. These compounds strongly adsorb to soil organic matter and fine particles, posing long-term risks to terrestrial and aquatic ecosystems due to their toxicity and bioaccumulation potential.

- Organotin compound use has left persistent contamination in soils, sediments, and dredged materials.

- Annex XVII of REACH lists restrictions on "Organostannic compounds" (a synonym for organotins) and places market/usage restrictions on them; demonstrating that organotin compounds are regulated because of their hazard and persistence, thus legitimising the necessity for their remediation.

- As regulators revisit legacy brownfield and coastal sites, organotin compounds are being included into routine analytical suites, according to Sediment Quality Guidelines (2025) and Part 2A contaminated land assessments.

- Soil washing has emerged as a viable remediation option for organotin-contaminated soils and solids containing organotins such as antifouling paint fragments. The technique can effectively separate and remove organotin compounds by targeting the fine, contaminant-rich soil fractions through physical separation and/or chemical extraction. The use of surfactants, chelating agents, or organic solvents enhances the desorption and solubilisation of organotins from soil matrices.

- Given their persistence, toxicity, and potential for removal via soil washing, organotin compounds warrant inclusion in the list of treatable contaminants at Exeter Soil Treatment Facility.

- To ensure that future proofing is incorporated into the current permit variation application, we wish to permit the treatment of a broad spectrum organotin compounds, including, but not limited to those included within EU REACH:

    1. The restriction covers "tri-substituted organostannic compounds such as Tributyltin (TBT) (and similarly "tri-substituted" tin compounds) in articles above 0.1 % by weight of tin.

    2. It also covers other organotin classes – for example, in some cases di- and mono-organotins (e.g., dibutyltin (DBT), dioctyltin (DOT)) are mentioned in guidance as being restricted in articles above 0.1 % by weight of tin.

    3. This proposal is not limited to articles with 0.1% organotins, but also to lower concentration of soil particle bound chemicals.

- While REACH Annex XVII explicitly restricts tri-substituted organotins (e.g., tributyltin, triphenyltin), dibutyltin, and dioctyltin compounds, other organotins such as mono- and tetra-substituted derivatives are not directly covered. However, these compounds share similar environmental behaviours and may co-occur at contaminated sites, therefore, their inclusion within the current permit variation provides regulatory robustness and anticipates potential future amendments to REACH or related hazardous waste classifications.

- As a result of the above arguments, the list for treatment would include organotin compounds included in Table 1, and other related organotin/organostannic compounds.

Table 1: Organotin compounds

Compound / Group	Abbreviation	Organotin Class	Typical Uses
Monobutyltin	MBT	Mono-organotin	Intermediate; degradation product of TBT/DBT
Dibutyltin	DBT	Di-organotin	PVC stabilizers, silicone curing, catalysts
Tributyltin	TBT	Tri-organotin	Antifouling paints, wood preservative, marine biocide
Tetrabutyltin	TeBT or TBTn	Tetra-organotin	Industrial precursor for TBT and DBT synthesis
Dioctyltin	DOT	Di-organotin	PVC heat stabilizer
Tri-n-octyltin	TOT	Tri-organotin	Biocide, PVC stabilizer

Triphenyltin	TPT	Tri-organotin	Agricultural fungicide (e.g., rice, potatoes)
Tetraphenyltin	—	Tetra-organotin	Catalyst, laboratory reagent
Monophenyltin	MPT	Mono-organotin	Research reagent
Dimethyltin	DMT	Di-organotin	PVC stabilizer, catalyst
Trimethyltin	TMT	Tri-organotin	Industrial intermediate
Tripropyltin	—	Tri-organotin	Research compound
Trineophyltin	—	Tri-organotin	Catalyst, laboratory use
Tetramethyltin	TeMT	Tetra-organotin	Intermediate for methyltin compounds