Explanatory Guide

Code of Practice for the release of stored water from privately owned farm storages to receiving waters in the Queensland Murray-Darling Basin

December 2016

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The Department of Environment and Heritage Protection acknowledges the work of the following industry associations in the preparation of the Code of practice:

- Cotton Australia
- Smartrivers
- Border Rivers Food and Fibre
- Queensland Farmers Federation

Other stakeholders consulted are also acknowledged:

- Darling Downs Environment Council Inc.
- Australian Floodplain Association
- Lower Balonne Working Group
- Lower Balonne Water Network
- Northern Basin Aboriginal Nations
- Queensland Murray-Darling Committee
- Department of Natural Resources and Mines (DNRM)
- Department of Science, Information Technology and Innovation (DSITI)
- Department of Agriculture and Fisheries (DAF)
- Department of the Environment and Energy (DEE) Office of the Commonwealth Environmental Water Holder (DEWH).

Acknowledgement of the Traditional Owners of the Murray-Darling Basin

The Department of Environment and Heritage Protection (the department) would like to acknowledge and pay respect to the past and present Traditional Owners of the region and their Nations. The department acknowledges that the Traditional Owners of the Murray-Darling Basin have a deep cultural, spiritual and ceremonial connection to their lands and waters and understands the need for recognition of Traditional Owner knowledge and cultural values in water quality planning.

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The following is an explanatory guide accompanying the *Code of Practice for the release of stored water from privately owned farm storages to receiving waters in the Queensland Murray-Darling Basin* – which was gazetted under Section 318E of the *Environmental Protection Act 1994* in December 2016.

1. The activity

The activity is the release of stored water from privately owned farm storages to receiving waters.

Initial impetus for the activity was based on consideration by the Commonwealth Environmental Water Holder (CEWH) of the use of private irrigation infrastructure to divert, store, supply and/or re-direct environmental water as part of active water management in the Northern Unregulated Rivers of the Queensland Murray-Darling Basin.

Since the concept was originally raised, release of stored water for purposes other than those of the CEWH have been identified. These could include:

- request by a State agency to satisfy a State purpose
- to allow a landholder to move water from one location to a nearby location, or
- to lower the water level in a storage which was in urgent need of repair.

It has also been suggested that the Code could apply throughout the State rather than just to the watercourses within the Queensland Murray-Darling Basin. This would require a risk assessment to be conducted with respect to the potential for impact on environmental values within each catchment. Given the variation in values and possible sources of impact across the State (Reef catchments, Wet Tropics watercourses, Gulf catchments etc) it has not been possible to undertake such assessment in this document. This document is restricted to the Queensland Murray-Darling Basin.

Other approvals may be needed to support these purposes and they are not part of this Code of Practice. The Code is concerned with the potential impacts of releasing water on the values of the receiving environment (Section 2), and those impacts and values are essentially the same irrespective of the purpose of release.

1.1. Relationship to the needs of the Commonwealth Environmental Water Holder

With respect to the potential use by the CEWH, the following selected text is taken from "Portfolio Management Plan: Northern Unregulated Rivers 2016–17" (Commonwealth of Australia, 2016).

"Under the Water Act 2007, Commonwealth environmental water must be managed to protect or restore environmental assets, so as to give effect to relevant international agreements. The Water Act 2007 also requires that the CEWH perform its functions and exercise its powers consistently with, and in a manner that gives effect to, the (Murray-Darling) Basin Plan and that Commonwealth environmental water is managed in accordance with the Basin Plan's environmental watering plan.

The long-term environmental objectives and expected outcomes for the Murray-Darling Basin are described in the Basin Plan's environmental watering plan and the Basin-wide environmental watering strategy.

Comprehensive assessments of environmental water requirements were undertaken by the Murray-Darling Basin Authority (MDBA) in 2012 for key environmental assets in the northern unregulated rivers as part of the determining the sustainable diversion limits under the Basin Plan. The resulting requirements are a suite of indicators covering key flow components (low flows, freshes, bankfull,

overbank) expressed as flow rates and durations at specific sites with target frequencies to be achieved over the long term.

In the long term, the Commonwealth Environmental Water Office seeks whole-of-system environmental outcomes in unregulated systems through having a targeted portfolio of entitlements that restores ecologically important flows that were formerly diverted for irrigation and other uses.

In the northern unregulated catchments with in-stream use of entitlements, there is limited ability to manipulate use to achieve targeted flow and environmental outcomes. Water cannot be ordered from storage at a particular time – environmental water can only be sourced as a share of an unregulated flow event, determined by entitlement conditions. Carryover and management of account balance cannot generally be used to influence the timing and volumes of environmental water in river systems. There is limited public infrastructure such as dams, weirs and other structures in the region to regulate environmental flows to target particular assets.

Most Commonwealth unregulated entitlements are left in-stream to provide environmental benefits by restoring flows that were formerly extracted and improving flow variability. This is referred to as passive management. 'Active management' encompasses mechanisms to achieve more targeted environmental outcomes from unregulated flow events, such as use of in-stream and on-farm infrastructure, water trading, modified pumping access and flow protection rules. Active management could be used to enhance overall flows, alter the timing or rate of flow or to direct flow to a different watercourse or an off-stream asset. Use of private irrigation infrastructure to divert, store, supply and/or re-direct environmental water, may play a key role in implementing active management due to the lack of public infrastructure in the region for this purpose".

As such, any release requested by the CEWH would be for the purpose of achieving a targeted beneficial environmental outcome.

Under the activity (the release of stored water from privately owned farm storages to receiving waters), contractual arrangements for such use would be agreed between landholders who own the storages and the CEWH, who (generally) owns the water entitlement, however agreement for use could also relate to a water entitlement still owned by the landholders.

The infrastructure (e.g. channels, storages, pumps and pipes) originally constructed by landholders to access those entitlements now owned by the CEWH is often still in place and potentially operational but otherwise essentially redundant.

The CEWH aims to commence such active management in the Lower Balonne and lower Border Rivers systems. Support from local landholders has been fundamental to the development of the proposed activity.

2. Environmental values

The activity of releasing stored water to receiving waters could potentially cause harm to the environmental values of the receiving waters.

2.1. Northern Unregulated Rivers of the Murray-Darling Basin

While the catchments in the Northern Unregulated Rivers of the Queensland Murray-Darling Basin drain from the western side of the Great Dividing Range and include the full range of river zones (montane, upland, slopes and lowland as defined by the Sustainable Rivers Audit, Davies *et al* 2008), the areas identified by CEWH for active management purposes are in the lowland or downstream

catchments. These areas include the alluvial fan of the Lower Balonne and floodplain of the Border Rivers catchment.

The Sustainable Rivers Audit (Davies *et al* 2008) considered the Condamine and Border Rivers catchments as having the highest rank for ecosystem health of all 23 catchments in the Murray-Darling Basin, other than for the Paroo River. Round 2 of the audit (Davies *et al* 2012, reported at the end of the Millennium drought) ranked the Condamine 4th and the Border Rivers 6th. In this audit the lowland zone of the Condamine again ranked second only behind the Paroo.

The recognised aquatic environmental values of the region relate to (Commonwealth of Australia 2016):

- Extensive wetlands and floodplains
- Riparian and floodplain vegetation
- Semi-permanent and permanent waterholes
- Native fish community

A key ecological asset of the Lower Balonne is the Narran Lakes wetland area which supports significant waterbird breeding.

These values are largely reiterated by the ecological outcomes specified within the Water Resource Plans (Queensland) for each of the catchments.

While these catchments have not had environmental values and water quality objectives listed under Schedule 1 of the Environmental Protection (Water) Policy 2009 (EPP Water), it is likely all uses would be represented across the Queensland Murray-Darling Basin, with some local variation. The most common environmental values in the Lower Balonne and Border Rivers include:

- Aquatic ecosystems
- Cultural, spiritual and ceremonial values
- Irrigated cropping
- Farm use
- Stock watering
- Primary and secondary recreation
- Visual appreciation
- Raw drinking water

Aquaculture and industrial uses are less likely to be present in lowland or downstream catchments. Recreational fishing is popular in these catchments, particularly for Yellowbelly, Murray Cod and yabbies.

3. Matters the Minister must have regard to when approving a Code of Practice under Section 318E of the *Environmental Protection Act 1994*

Section 318E of the *Environmental Protection Act 1994* (EP Act) states that the Minister may, by gazette notice, make codes of practice stating ways of achieving compliance with the general environmental duty for an activity that causes, or is likely to cause, environmental harm. In making a code of practice, the Minister must have regard to the following matters addressed below.

3.1 The nature of the harm or potential harm

3.1.1 Identification of potential risks

Section 440ZG of the EP Act states that a person must not unlawfully deposit a prescribed water contaminant in waters. Prescribed water contaminants are listed in Schedule 9 of the *Environmental Protection Regulation 2008* (Appendix 1 herein) and of most relevance to this activity are:

- biocides (including herbicides, fungicides and pesticides)
- a chemical toxicant for which guidelines are prescribed in ANZECC 2000)
- suspended solids
- a substance that has a pH outside the range of 6.5 to 8.5
- a liquid that has a temperature difference by more than 2°C from ambient water temperature
- plant matter, including, for example, bark and leaves.

The other prescribed contaminants relate to various solid and liquid wastes which are very unlikely to be present in the stored water but a control measure has been included in the Code to ensure this is the case.

The water in storage originates from river flows and / or overland flow, extracted under licence and primarily during elevated flow events. As such, whatever the quality of this water, the initial level of risk associated with extracted water is consistent with that offered by the passive management option of the CEWH (allowing the water to pass down the river without being extracted).

The prescribed water contaminants that are biocides or toxicants may be present in the water when initially extracted but may also enter the water while in storage through direct deposition from surrounding land uses (e.g. spray drift during application of farm chemicals) or indirectly if the storage collects farm runoff (tailwater or stormwater which drains from actively cropped areas).

The remaining prescribed water contaminants occur naturally but may alter and become a “contaminant” as a result of the period of time that the water is in storage and the particular characteristics of the storage and its release mechanisms. For example a deep storage which has held water for an extended period of time may stratify such that the deeper water is substantially colder than surface water and may be anoxic.

The act of releasing the water may also cause erosion of the discharge channel which in turn will raise the level of suspended solids. Erosion of the discharge location or bed and banks of the watercourse receiving the discharge may also occur if the discharge point is not adequately engineered.

With regard to potential fisheries impacts, the issues relate to changes to the flow regime, protection of the well-being of fish, and to the possible release of pest fish species from the storages into the watercourse. These issues are considered very low probability of occurrence and of minimal likely consequence. For example the release, if at the direction of the CEWH, may specifically be targeted at achieving a positive outcome for native fish species or if not directly related to fisheries, is at least targeting a positive environmental outcome which has indirect benefits for fisheries. With respect to pest fish species, Carp, Goldfish and Mosquito fish are known from all catchments in the Queensland Murray-Darling Basin.

3.1.1.1 Risks to Aboriginal Values and Uses

Aboriginal people have a strong spiritual, physical and cultural connection to land and water. Rivers and waterholes have significant value to the Aboriginal community for cultural, spiritual and ceremonial purposes. These aquatic ecosystems are important for people of the Aboriginal Nations in the Queensland Murray-Darling Basin for many activities, including, but not limited to, recreation, storytelling, fishing, singing and ceremonies, as well as water for economic development.

Consultation with representatives from the Northern Basin Aboriginal Nations identified that the release of stored water from privately owned farm storages to receiving waters presents potential risks to downstream Aboriginal values and uses. The activity should be managed in a way that ensures the quality of water is suitable to support cultural, spiritual and ceremonial values and uses; as demonstrated by maintaining the current water quality of the receiving waters.

An Aboriginal Waterways Assessment[1] in the Lower Balonne will be independently undertaken to assess the Cultural Health Index of the waterways and subsequently inform environmental watering planning under the Basin Plan. The Cultural Health Index will document and map cultural status and use, animals and plants of cultural significance, and an assessment of stream health including, for example, catchment land use, riparian vegetation, riverbed condition and sedimentation, channel modification, flow and habitat variety (pools, runs and rapids), water clarity and water quality.

The assessment for the Lower Balonne, and a corresponding assessment for the Upper Condamine, will support the development of the Condamine-Balonne Healthy Waters Management Plan. Mapping from both assessments can be included as part of environmental values mapping for the waters of the Condamine-Balonne being developed under the EPP Water. This will be conducted based on the advice of Traditional Owners.

3.1.2 *Risk pathways and likelihood of occurrence*

Contaminants may:

- be present in the water when initially extracted
- be added to the stored water via farming activities
- develop as a result of changes to the quality of the stored water, and
- result from erosion of the discharge pathway.

As noted, if the extracted water was immediately released from storage back to the river from whence it came, the risk to environmental values would be essentially the same as if it had not been extracted in the first place. As part of the planning process for the Code, DEHP engaged the Murray-Darling Basin Committee to sample a range of river and private storage environments for over 120 chemicals, including farm chemicals commonly used in the region. Data to date shows that although contaminants do occur in the river water, the majority were within guideline levels for protection of

[1] Refer to the Murray-Darling Basin Authority website for more information.

95% of species (based on median result). The median result for only one contaminant (Metolachlor) exceeded the freshwater low reliability trigger value under ANZECC 2000 at baseflow conditions. Note that this trigger value is an indicative interim working level and therefore is likely to be conservative.

The potential to add contaminants via farming activities relates to either:

- direct contamination from spills during transport or mixing of chemicals, incorrect use, or poor control of application leading to drift
- indirect contamination via the farm water management system.

Chemical use on farms is a significant component of cost so it is common sense that landholders aim to maximise the intended benefit and minimise wastage. Any chemical which finds its way into storages has essentially been wasted. Many of the industry best practice guidelines are aimed at addressing these issues and coincidentally minimise environmental risk.

Sampling to date shows metolachlor as the only pesticide to exceed a trigger value in storages, noting that it also did so in the river. This suggests that on-farm practices are not currently adding significantly to the contaminant load within stored water.

Higher levels of various chemicals and metals were obtained from storages which were sampled at very low water levels. This has influenced the current estimate of the median result. Control measures have been included within the Code to directly address such circumstances – though it is unlikely that releases would be requested when the storages hold little water as such small volumes would be unlikely to provide the desired environmental benefits.

The water management systems on irrigation farms include means to recover tailwater (excess irrigation water which drains from the fields after delivery) and to capture stormwater runoff. Both tailwater and stormwater (from the active fields) are acknowledged as potentially containing higher levels of farm chemicals or other contaminants (e.g. suspended solids). The design of the systems aims to prevent discharge of such water or at least the first flush of stormwater, to natural watercourses and to allow recycling to the fields. Similarly farm management systems aim to minimise the production of tailwater as this also represents wasted irrigation water.

Some water management systems are designed to entirely separate tailwater and stormwater from the initial water storage system, while others may use the storages to capture the runoff water. The Code recognises this and places emphasis on proving the suitability for discharge from storages which capture tailwater and / or stormwater.

Without any specific controls but assuming a modern approach to farm management, the risk of additional contamination from on-farm activities could be considered low to moderate so the Code formalises control measures which aim to reduce that risk to very low levels.

The quality of stored water may change as a result of the time the water is held in storage and aging effects related to stratification (affecting temperature and other attributes), large surface areas open to sunlight or interaction with storage sediments (primarily anaerobic oxidation). The likelihood of stratification occurring will vary greatly with storage design parameters. Deeper, more stable storages (not easily influenced by wind driven circulation or some other form or disturbance) are more likely to stratify. Stratification is most likely to occur in the warmer months from October to May and if the water has sat in storage over winter. In Queensland, waterbodies are considered to be stratified if the difference in temperature between upper and lower layers is greater than 5°C

(DNRW, 2007). As most storages release from the bottom, the released water from a stratified storage is likely to be relatively cold, low in dissolved oxygen and potentially high in nutrients and sulphides.

Stratification can be avoided or reduced by not leaving the water in storage for long periods before releasing or by actions which circulate the water or increase the interaction between the water and the atmosphere. Stratification, if present, would be broken down in on-farm storages through re-filling from a spring or summer flow event or aggregation of water across storages (moving the water between storage cells to minimise the surface area and hence evaporation). The code includes monitoring to test for stratification and controls to minimise the effects of water released from stratified storages.

Storages and channels are often constructed from compacted local soil, and in the irrigation areas of the Lower Balonne or lower Border rivers this usually comprises various forms of cracking clays which generally provide suitable construction material. However, they can erode as a result of heavy rainfall or of the forces associated with the flow of water in the channels, particularly at bends or other areas where the force is directed toward a fixed location. Erosion provides sediment which can be entrained within the discharge water. The risk of compromising an environmental value is considered low because background turbidity in many of the watercourses in the region is commonly relatively high, particularly during flow events. There is a high probability that water would be released in association with a natural flow event, and water which has been in storage for some time is likely to show reduced turbidity as a result of settling. The code includes control measures to minimise the likelihood of erosion and to ensure adequate repairs are undertaken should erosion occur.

3.1.3 *Likely timing of releases*

The active flow management options currently nominated by the CEWH all relate to enhancing (or supplementing) a naturally occurring flow event, i.e. “each action is appropriate to a specific flow situation, and will only be viable if there is suitable trigger unregulated flow event” (Commonwealth of Australia, 2016). As such, when releases from storages are activated they are likely to represent a relatively low proportion of total flow in the river. The requirement to top up drought refuge waterholes may not be triggered by a flow event but at such times it is very unlikely that any water would be available within private storages. While the annual flow management priorities of the CEWH will change over time and with climatic conditions, as long as the environmental watering requirements remain as specified in current planning documents, the likely link of releases to naturally occurring flow events will remain strong.

The timing of releases for purposes other than those of the CEWH cannot be specified.

3.1.4 *Potential consequences*

The possible contaminants associated with release of stored water are already present at some level in the receiving environment. Assessments of the condition of the aquatic ecosystems has repeatedly shown them to be relatively healthy. As such, consequences related to current management practices have not resulted in significant ecological consequences. With the implementation of the control measures included within the Code, any consequence as a result of releasing stored water would likely be less than the existing risks to the environment and therefore the activity is likely to be localised, minor or inconsequential to the system.

3.2 Sensitivity of the receiving environment

The hydrology of the lower floodplain region of the Northern unregulated rivers of the Queensland Murray-Darling basin is seasonal and naturally highly variable. This results in aquatic ecosystem components that are both tolerant and flexible with respect to their relationship to hydrology and the physico-chemical characteristics that vary with it, such as temperature, dissolved oxygen, pH, turbidity and conductivity. Tolerance varies between species – for example, Bony bream are generally less tolerant of physico-chemical change than Yellowbelly.

Sensitivity to contaminants is expected to be similar to other catchments and the ANZECC guidelines on toxicity apply to species or organism types (algae, crustaceans, fish etc) rather than to locations (other than separating freshwater from marine environments).

3.3 Current state of technical knowledge

With respect to the specific action of releasing water from an on-farm storage via a discharge channel to a receiving water, this will essentially simply reverse the procedure of initial water capture. All engineering components of the process are commonplace and well understood.

With respect to our understanding of regional and local environmental values of water, the Queensland Murray-Darling Basin area is relatively well studied as a result of Commonwealth, State and private initiatives.

Although the turnaround time for laboratory based analysis of water for biocide contaminants is usually 10 working days, some laboratories may offer faster turnaround times on a case-by-case basis. The timing and availability of water quality data prior to a decision being made to release stored water needs to be considered. “Quick-test” strips have been developed for some chemicals (such as Atrazine and Diuron), through the Faculty of Agriculture & Environment, The University of Sydney and provide an instantaneous, in-field result which is of suitable accuracy. Such tests could be viewed as sentinels or indicators of other possible contamination.

3.4 Likelihood of successful application of control measures

The control measures included within the code were drawn largely from the *my***BMP** program of Cotton Australia. The program began nearly 20 years ago, has undergone several reviews and is widely accepted as industry best practice for broadacre irrigation. The control measures are equally applicable to any crop. The primary modules from which control measures were drawn are mirrored in the Grains BMP (Agforce, Fitzroy Basin Association, Department of Agriculture, Fisheries and Forestry and Queensland Government). The Grains BMP includes property design and layout, pesticide application and integrated pest management, however does not address irrigation infrastructure.

There is no requirement for participating landholders to be accredited for *my***BMP** because while many of the control measures were drawn from it, the Code is a stand-alone document.

The measures are practical, directly targeted at avoiding or minimising contamination of storages or erosion and are relatively easily implemented. Landholders who will be required to implement the control measures largely already do so due to the long existence and acceptance of *my***BMP**. Approximately 79% of cotton farms formally participate in the *my***BMP** program with many others known to implement the measures without formally participating.

Between 2003 and 2015, a 92% reduction in pesticide use has been achieved (Cotton Research and Development Corporation and Cotton Australia 2014), as well as a 42% improvement in irrigation water use efficiency over the past decade.

The code includes control measures in addition to those contained within current BMPs. These measures address issues specifically related to the release of stored water.

Government sponsored monitoring programs investigating levels of chemical contamination within regional rivers and private storages are ongoing and will allow future revision of the code if necessary.

It is also noted that while *my***BMP** is occasionally updated to reflect current best practice, the Code will not necessarily be amended to reflect these changes. An operator can implement these updated control measures (which are not the same as those in the Code) and still comply with their environmental duty because the updated measures represent an alternative course of action that achieves the same or a better environmental objective.

3.5 Financial implications relating to the activity

The control measures included in the Code are relatively commonplace on major irrigation farms, so compliance with the Code represents little additional burden for most operators. The Code has mirrored the structure of *my***BMP** to make it easier for landholders to relate to their current practices, but compliance with *my***BMP** per se is not required in order to comply with the Code – which is a stand-alone document. However, for those who wish to participate in the *my***BMP**, refer to the website for further details: https://www.mybmp.com.au/.

The physical infrastructure is currently in place, though it is possible that operators may wish to construct new infrastructure or modify existing infrastructure in order to be able to undertake the activity. This will generate costs related to approvals and construction. The viability of undertaking such works will depend on the contractual agreement between the CEWH (or other party) and the landholder.

4. References

Commonwealth of Australia, 2016. *Commonwealth Environmental Water Portfolio Management Plan: Northern Unregulated Rivers 2016–17.*

Cotton Research and Development Corporation and Cotton Australia (2014). Australian Grown Cotton Sustainability Report.

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DNRW, 2007. *Water Monitoring Data Collection Standards, Version 2.1*. Queensland Department of Natural Resources and Water, Brisbane.

EHP, 2013. *Monitoring and Sampling Manual 2009, Environmental Protection (Water) Policy 2009, Version 2, July 2013*. Department of Environment and Heritage Protection, Brisbane.

Appendix 1 Prescribed water contaminants as listed in Schedule 9 of the *Environmental Protection Regulation 2008*

1 a chemical, or chemical waste containing a chemical

Examples—

• biocide, including herbicide, fungicide and pesticide

• chemical that causes biochemical or chemical oxygen demand

• chemical toxicant for which guidelines are prescribed in the document 'Australian and New Zealand guidelines for fresh and marine water quality'

• degreasing agent

2 a gas other than oxygen

3 a liquid containing suspended or dissolved solids

4 a liquid that has a temperature different by more than 2ºC from ambient water temperature

5 animal matter, including dead animals, animal remains and animal excreta, and water used to clean animals, animal enclosures or vehicles used for transporting animals

6 ashes, clay, gravel, sediment, stones and similar organic or inorganic matter

7 a substance that has a pH outside the range 6.5 to 8.5

8 building and construction materials, including bitumen, brick, cement, concrete and plaster

9 building, construction and demolition waste, including bitumen, brick, concrete cuttings, plaster and waste water generated by building, construction or demolition

10 clinical waste

11 glass, metal parts, paper, piping, plastic and scrap metal

12 industrial waste

13 oil, including, for example, petroleum or vegetable based oil

14 paint, paint scrapings or residues, paint sludge, water used for diluting paint or washing painting utensils, and waste from paint stripping

15 plant matter, including, for example, bark, lawn clippings, leaves, mulch, pruning waste, sawdust, shavings, woodchip and other waste from forest products

16 putrescible waste, including, for example, food scraps

17 sewage and sewage residues, whether treated or untreated, and any other matter containing faecal coliforms or faecal streptococci, including, for example, waste water pumped out from a septic tank

18 vehicles and components of vehicles, including, for example, batteries and tyres

19 waste and waste water, generated from indoor cleaning, including, for example, waste from carpet or upholstery cleaning and steam cleaning

20 waste and waste water, generated from outdoor cleaning, including, for example, waste generated from high pressure water blasting of commercial or industrial premises, fuel dispensing areas, plant or equipment, roofs, streets, vehicles and wharves

21 waste generated from repairing or servicing motor vehicles, including, for example, engine coolant, grease, lubricants and oil

22 waste water, including backwash from swimming pools, condensate from compressors, water from air-conditioning or cooling systems and waste water from grease traps