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2.0 WATER QUALITY OBJECTIVES

2.1 BACKGROUND

Under Council's *City Plan*, the identification of relevant Water Quality Objectives (WQOs) is a critical aspect of the design and approval process for 'high risk developments' (as defined in the Glossary – Chapter 16 of Part C of this document). For 'low risk developments' (as defined in the Glossary) the identification of WQOs is not needed under Council's *City Plan* as Stormwater Quality Best Management Practices are simply identified and implemented. This approach is risk based (refer Figure C2.1), and ensures that relatively complex processes are not used to manage simple water quality issues.

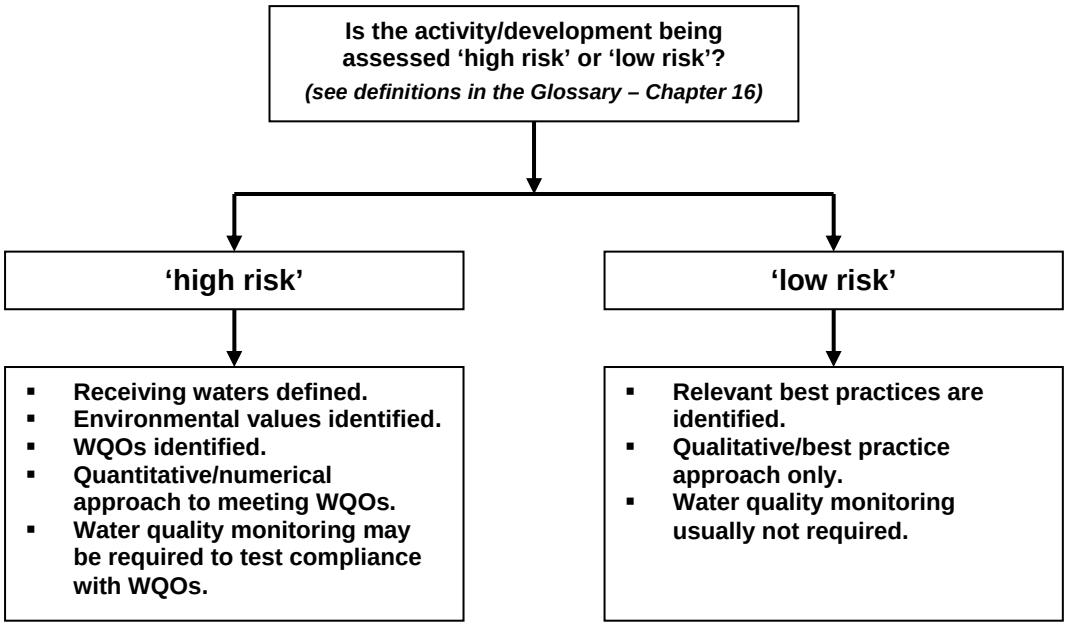

FIGURE C2.1
THE USE OF WQOS IN A DEVELOPMENT CONTEXT

WQOs are measurable 'standards' that describe the quality of water that is needed on a sustained basis in the receiving water such as a creek or river[1]. WQOs are set so that Environmental Values of receiving waters downstream or within a development are maintained or enhanced during a development's design, construction and operational phases. Environmental Values (EVs) are beneficial uses of the receiving waters, such as the ability to safely swim in a river, or the ability of the waterway to sustain healthy aquatic ecosystems.

In short, meeting WQOs is the primary objective of water quality managers involved with the design of 'high risk developments'.

[1] Note that the terminology for this Chapter (ie WQOs, Environmental Values) is derived from, and explained in, the *Environmental Protection (Water) Policy 1997* and the Glossary in Chapter 16 of Part C of this document.

The need to identify and meet relevant WQOs in part arises from *the Environmental Protection (Water) Policy 1997*, which is subordinate legislation under the Queensland *Environmental Protection Act 1994*. The Policy provides a State-wide process for determining Environmental Values of receiving waters and converting these to measurable WQOs. This process is consistent with the *National Water Quality Management Strategy* (ANZECC/AWRC, 1992).

Given the complexity involved with following the process in *the Environmental Protection (Water) Policy 1997* on a site-by-site basis, Council has done the work necessary to identify sets of WQOs for all of Brisbane City's 210 waterway planning units (sub-catchments). Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) describes how such WQOs can be identified and applied for a given site anywhere in Brisbane. This guideline will be updated as new information becomes available for the region (eg information on EVs and WQOs).

Note that WQOs are long term goals for receiving waters and in some cases (particularly during the development's construction phase), these objectives may not be able to be achieved even with best practice techniques. In such circumstances Council's development assessment staff will evaluate the overall merit of the development (including the risk to the environment) and determine whether to:

- apply water quality management performance criteria based upon 'Best Practice Discharge Guidelines' (as defined in Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* [BCC, 2000]); or
- refuse the development application on water quality grounds.

Council believes using WQOs as ultimate goals for stormwater (or wastewater) quality management can be a practical and optimal approach (as opposed to simply defining best practice) for 'high risk' developments because:

- The WQOs are defined as upper limits or ranges within which median values of water quality should lie (rather than never exceed). This approach can be used in a predictive capacity (via modelling) and allows for some exceedances (eg suspended solids during a 1 in 5 rainfall event) as long as short term environmental harm does not occur.
- The use of Council's 'Best Practice Discharge Guidelines' during the construction phase (where appropriate) increases the practicality of Council's water quality-related standards.
- The option is always available for a proponent to develop a new set of Environmental Values (EVs) and WQOs for an affected waterway if a scientifically rigorous case can be supplied to Council to support the case that the proposed EVs and WQOs are superior than those contained in the current version of *Guideline on Identifying and Applying Quality Objectives in Brisbane City* (BCC, 2000).
- Simply requiring best practice in a prescriptive manner for stormwater quality management cannot guarantee ecologically sustainable development and greatly inhibits innovation by design teams. Such an approach would be particularly inappropriate for large sites that have few constraints and many options for cost-effective stormwater quality management.

Finally, as discussed in Section 1.5.3 of Part C of this document, the concept of 'no worsening' for water quality is not consistent with the use of WQOs or the intent of the *Environmental Protection (Water) Policy 1997* and should not be used in Brisbane.

2.2 KEY ISSUES

Applicants seeking to identify relevant WQOs for the proposed 'high risk development' must use the 10 step procedure defined in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000). The process for identifying WQOs is briefly summarised below:

Step A Identify the Nature of Affected Receiving Waters
Determine the location of the:

- activity under evaluation; and
- nearest affected receiving waterways (can be within the boundary and/or outside of the activity).

If the receiving waters that are likely to be affected (ie contaminated) include groundwaters and use of this groundwater potentially occurs, consult with the State Government Agency that regulates groundwater usage (ie currently the Queensland Department of Natural Resources) to identify relevant EVs and WQOs. Note that the use of groundwater in an area may result in the need to protect a set of EVs that do not normally apply to surface waters across the catchment (eg protection of groundwaters for irrigation).

Step B Identify the Affected Creek Catchment and Planning Unit
Determine the location of the creek catchment and planning unit that includes the receiving waterways closest to the site. Maps are provided in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) and Council's Bimap system can also be used (available at customer service centres).

Step C Check Schedule 1 of the Water EPP
The State Government has the ability to set WQOs and/or EVs for waterways across the State and list them in Schedule 1 of the Queensland *Environmental Protection (Water) Policy 1997*. Where this is done, these WQOs and/or EVs take precedent over all other sources of information, including the WQOs provided in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000).

Step D Check for (or Initiate) Site-Specific Studies
A developer may wish to undertake site-specific studies to generate a new set of EVs and WQOs for the site that are superior to those generated by Council for the City. If this option is chosen, the onus is on the developer to demonstrate the new set of WQOs and EVs are based upon:

- sound consultation with key stakeholders;
- high quality data/information on ecological risks, health risks, etc;
- information from the South East Queensland Regional Water Quality Management Strategy (or other site specific studies); and
- the approach promoted by the National Water Quality Management Strategy.

This approach is unlikely to be undertaken in Brisbane given the considerable body of scientific work that has already led to the identification of WQOs for the City's waterways, as well as the considerable expense of gathering enough information to support an alternative set of WQOs on a site-specific basis. To Council's knowledge, this approach has not been undertaken in Brisbane to date.

Step E Identify Where WQOs Apply

As explained previously, WQOs can be applied to a development in two ways:

1. As receiving water quality objectives. In this case the WQOs would apply and monitoring would occur (if needed) in the nearest affected waterway corridor (as defined by the Waterway Code and associated map in the *City Plan*).
2. As stormwater/wastewater discharge criteria. In this case they apply and monitoring would occur (if needed) as soon as stormwater or wastewater leaves the site or enters a waterway corridor (which ever happens first).

Note that:

- The closest affected waterway corridor (as defined by the Waterway Code and associated map in the *City Plan*), may be located either within or immediately outside of the activity.
- Some WQOs may also apply within constructed waterway features (eg lakes, ponds, wetlands) if they have some recreational function. : For more information, see Chapter 6 of Part C of this document.
- For guidance on when water quality monitoring is appropriate, see Chapter 13 of Part C of this document.

Step F Determine the Waterway Type, Category and Set of Environmental Values

Relevant tables are provided in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000). From this information, determine the:

- type of waterway the planning unit affects – either fresh, tidal or marine; and
- the set of environmental values (EVs) for the affected waterway section - either Set A; or Set A and B; or Set A, B and C; or another combination given in the table.

Step G Match the Waterway Type and WQOs

Using the information gained from Step F, and tables in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000), identify the relevant sets of WQOs for the type of waterway (ie fresh, tidal, marine) where the WQOs apply.

Step H Match the Type of Activity and WQOs

Determine which water quality indicators (eg pH, the concentration of total suspended solids [sediment], the concentration of Copper) are relevant to the type of activity being assessed from the WQO tables in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000). Different sets of WQOs apply depending upon whether the development is a 'land disturbing activity', 'vehicle-related activity' and/or 'acid sulfate soil-related activity'.

For example, a development proposal in a low-lying area with acid sulfate soils will need to ensure that the pH of waters draining from the site meets relevant WQOs, unlike say a subdivision development at Brookfield which would not need to consider pH.

A table is provided in *the Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) that prescribes the minimum set of indicators for which WQOs need to be met for different classes of activity.

Note that:

- Some developments may include more than one of the three categories of activity given above.
- Specific indicators may be added during the development assessment process if they are likely to be present in the stormwater/wastewater discharge from the site (eg Cu, Cr and As may be key indicators for a proposed treated timber storage yard).

Step I Understanding the WQOs Once They Have Been Identified

Before using the identified WQOs, it is important to understand some key points about how they were derived, how they will change in future due to new information and changing community values and how they are expressed (eg the use of concentration ranges within which median values should lie). These issues are explained in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000).

Step J Adopt the Relevant WQOs

Adopt WQOs from the relevant table in the *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000). These WQOs will be a 'set', containing a WQO for each of the relevant water quality indicators (eg WQOs for suspended solids, nitrogen, phosphorus, litter, and faecal coliforms). Collectively this set will describe the water quality that needs to be maintained in the long term to protect Environmental Values in receiving waters.

2.3 APPLICATION OF WQOS

Once a set of relevant WQOs has been identified for a 'high risk development' proposal, it may be *applied* in one of two ways:

1. WQOs can be used as ***discharge limits*** for the quality of stormwater (or wastewater) leaving the site[2]. This is the most common approach for land-disturbing development in Brisbane. It is accepted that for WQOs derived using the process outlined in Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000), this approach is conservative, but it is a very simple method of application. It also allows for the scenario that if all land in the catchment was developed and allowed to discharge the same quality of water, then the EVs in the receiving waters would still be protected.
2. WQOs can be used as ***receiving water quality objectives*** in the closest affected waterway that is located in a 'waterway corridor' (as defined in Council's *City Plan*)[3]. In this case, the developer must be able to demonstrate to Council that it is appropriate to define an initial 'mixing zone' (see Glossary in Chapter 16 of Part C of this document) in the receiving water where:
   - WQOs do not apply;
   - water quality within the mixing zone is not so contaminated that biota are likely to suffer acute toxicity; and

[2] This approach can also be used for Best Practice Discharge Guidelines.
[3] This approach cannot be used for Best Practice Discharge Guidelines.

- WQOs will be satisfied outside the mixing zone (even if additional discharges to the receiving water occur in the future).

In practice the second approach is rarely attempted as:

- the modelling that is necessary to demonstrate compliance at the proposal stage is relatively complex and expensive (as receiving water and pollutant export models would typically be needed);
- the possibility of additional discharges to the receiving water in future can complicate the scenario; and
- the Environmental *Protection (Water) Policy 1997* specifically allows for the concept of a 'mixing zone' for wastewater discharges to surface waters (see S. 18) but not for stormwater discharges to surface waters (see S. 19).

As a result, the option of using WQOs purely as receiving water quality objectives is only feasible for major developments (eg for large industrial discharges or sewage treatment plants).

Note that in Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000), WQOs for the City's waterways are expressed as concentration ranges (or upper limits) for which the median value of a substantial data set must fall within (or below). This approach allows for rare exceedances associated with major storm events, as the median concentration would not be significantly affected. Thus, the WQOs may at first appear to be conservative and difficult to meet, but it has been shown that they can still be met even with occasional exceedances[4].

Meeting WQOs over the long term to ensure ecological sustainability does not obviate the need for compliance with the "General Environmental Duty" at all times (see S. 36 of the *Environmental Protection Act 1994)*. For example, say a development had an isolated exceedance of a WQO that led to environmental harm. In this example a fish kill was associated with the release of acidic surface water from a development in acid sulfate soils and the person(s) responsible did not take "reasonable and practicable measures" to prevent the harm. Clearly, they would still be liable to prosecution under the *Environmental Protection Act 1994* for causing environmental harm even if over say 12 months of monitoring the water quality draining from the site met WQOs in terms of the ***median*** pH value.

[4] Note that while Council accepts that it is not always possible or practical to treat all stormwater from a major storm event, an isolated exceedance of a WQO may still result in enforcement of relevant environmental legislation if the exceedance event is associated with a breach of the 'General Environmental Duty' (ie all reasonable and practicable measures have not been taken to prevent the exceedance event). For example, an isolated exceedance of a pH-related WQO that occurred as a result of a site worker deliberately pumping acidic leachate from a holding dam on a low-lying development into a creek would not be acceptable, even though the *median* value of the pH data set that describes the creek's water quality may still be within the acceptable range defined by the WQO (eg 6.5<pH<8.5).

Once relevant WQOs for a proposed 'high risk development' have been identified, the following procedure should be used by the developer and development assessment staff to ensure they are applied correctly:

Step 1 (Pre-lodgement stage)
The developer and/or their consultant(s) should ensure the relevant Council development assessment team *agrees* on the set of WQOs to be met in the long term (ie during the operational phase of the development). The recent development of Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) should make this step straightforward. Interaction with Council typically only needs to be undertaken where a departure from the WQOs contained in the guideline is being proposed.

Step 2 (Pre-lodgement stage)
Where the developer demonstrates to Council that the agreed long term WQOs cannot be met during the construction phase of the development even when best practices are implemented, the developer should meet with the relevant Council development assessment team to determine whether Council is prepared to agree to a set of short term WQOs for the construction phase of the project (ie based on 'Best Practice Discharge Guidelines'). Guidelines on suitable figures are provided in Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000). This decision would be reflected in the site's Site Based Stormwater Management Plan and Erosion and Sediment Control Program (or Erosion and Sediment Control Management Plan).

Step 3 (Preferably pre-lodgement stage, or alternatively, the development application stage)
Where the developer demonstrates to Council that the agreed long term WQOs cannot be met at any stage even when best practices are implemented, the developer should interact with Council to determine whether the development will be refused on water quality grounds or whether the development will be allowed to meet a set of WQOs based upon 'Best Practice Discharge Guidelines'. Note that 'Best Practice Discharge Guidelines' will change with time and will not be used unless the inability to meet desirable WQOs from Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) has been proven.

Step 4 (Development assessment stage)
Council's development assessment team should derive appropriate development conditions to ensure that the agreed set(s) of WQOs become legally binding and that a monitoring program is in place (where appropriate) to measure and report on compliance[5]. Given the WQOs in Council's *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City* (BCC, 2000) are defined as ranges (or upper limits) that median concentrations of pollutants must fall within (or below), a substantial data set will be required to confidently determine whether a development is meeting its conditions or not.

[5] Note that for 'high risk developments', water quality monitoring programs will typically be required by Council to test compliance with the agreed set of WQOs and/or predicted water quality (from modelling exercises). Monitoring will normally be required where there is significant risk to the environment, there is significant uncertainty associated with the modelling/predictions, and/or stormwater quality management assets are to be maintained by Council. Monitoring will not normally be required where there is little or no opportunity to improve the management of water quality on the site after construction has ceased.

A typical water quality monitoring program that aim to gather such a set of data would involve:

- time based sampling (eg weekly, fortnightly or monthly) of affected receiving waters, capturing data from "wet" and "dry" periods; and
- sampling of stormwater or wastewater leaving the site in wet weather (if WQOs are used as discharge limits) both during the construction and operational phases [6].

For more information on the nature of these programs, refer to Water Monitoring Chapter.

2.4 REFERENCES

Main References

1. ANZECC, 1999. *Draft Australian Water Quality Guidelines for Fresh and Marine Waters* (1999). Australian and New Zealand Environment and Conservation Council, Canberra.
2. ANZECC/AWRC, 1992. *National Water Quality Management Strategy*. Australian and New Zealand Environment and Conservation Council, Canberra.
3. Brisbane City Council, 2000. *Guideline on Identifying and Applying Water Quality Objectives in Brisbane City*. Brisbane City Council, Brisbane.
4. Queensland Government, 1994. *Environmental Protection Act (Qld)*. Queensland Government, Brisbane.
5. Queensland Government, 1997. *Environmental Protection (Water) Policy*. Queensland Government, Brisbane.
6. Queensland Government, 1997. *Integrated Planning Act (Qld).* Queensland Government, Brisbane.

Additional References

1. Brisbane City Council, 1999. *Water Quality Objectives for Approvals and Licenses, Main Report - Volume 1.* City Design, Brisbane City Council, Brisbane.

[6] If WQOs were used purely as receiving water quality objectives, the monitoring (if required) would occur predominantly within the affected receiving waters.