

## **The non-coincidence of Freshwater Management Unit boundaries and monitoring sites**

### **A report back from the Technical Leaders Group**

**25<sup>th</sup> February 2015**

At CSG#9 the CSG discussed Freshwater Management Units (FMUs). One particular matter discussed was the downstream boundary for an 'Upper Waikato' FMU and its relationship to a monitoring site. As previously put forward, the downstream boundary for this FMU was proposed as Karapiro Dam whilst the nearest existing monitoring site is at the Narrows (23km downstream). The CSG asked that the TLG provide a paper on this matter and how it could be resolved. This is that paper. In preparing it we have also called on the expertise of Bill Vant at Waikato Regional Council.

1. The issue raised is not peculiar to Karapiro/Narrows - non-coincidence of an FMU downstream boundary with an existing monitoring site is common to all of the FMUs in the CSG's preferred option, specifically:
  - a. Waipa @ confluence FMU versus Waipa @ Whatawhata monitoring site
  - b. Waikato @ Karapiro FMU versus Waikato @ Narrows monitoring site
  - c. Waikato @ confluence FMU versus Waikato @ Horotiu Bridge monitoring site
  - d. Waikato @ Te Puuaha FMU versus Waikato @ Tuakau monitoring site
2. There are logical reasons for the choice of FMU downstream boundaries, as previously presented to the CSG and as discussed by the CSG at its meetings, including CSG#9 where it arrived at its preferred FMUs. These boundaries should remain. With specific reference to the Upper Waikato FMU, Karapiro Dam represents a logical boundary as it the river undergoes hydrological/hydraulic change from an impounded water system to one of flowing water and a significant change in geomorphology from incised volcanic terrain to the broad alluvial plains of the Waikato that is the most dominant geomorphic feature for the remaining length of the Waikato River.
3. There are also logical reasons why the monitoring sites exist where they do and for why monitoring sites are sometimes impractical at the exact point of the FMU downstream boundary. These include, for example, safety, suitable cross-section and bank-stability for a flow measuring site (see importance in #4), avoidance of back-up effects at the Waikato-Waipā confluence during storm flows, and tidal influences below Tuakau.
4. There is also significant value in having long-term data for water quality upon which future state and trends can be compared. The sites proposed in #1 all have long-term water quality records (>20 years) and, of added importance in accounting, have water-level recorders in place supplying long-term river flow records (the mass loads of a water quality attribute, e.g., kg per year, carried by the rivers being a product of concentration and flow). From a technical point-of-view, these arguments are persuasive. With respect to the Karapiro downstream boundary, it would be feasible to start a new record at the Karapiro tailrace, but as the discussion below illustrates the TLG regard this as being a "nice to have, but not essential".
5. Water quality (both as concentration and mass load) at the downstream FMU boundaries can be estimated from the data for the nearest monitoring station. For the situation where the FMU downstream boundary is upstream from the monitoring site (Karapiro/Narrows) this estimate can be made by subtraction of inputs in between, for the others this will be by addition.

6. All the proposed FMU's are large in area and, as a consequence, have large flows and associated mass loads of the four contaminants at their downstream boundary. The adjustments required due to non-coincidence of FMU downstream boundary and monitoring site may therefore be expected to be small, and attributable to tributary inflows and inputs from any major point sources in-between.
7. Major point source dischargers measure and provide water quality and flow data as part of their consents, so calculations of their contribution is a relatively straightforward matter. Point sources of relevance include the Cambridge wastewater discharge (Karapiro/Narrows) and the Horotiu meat-works discharge (Horotiu/Confluence) and their contributions are small as shown by the analysis below for N and P:
  - a. Monitoring data show the annual mass loads at the Narrows are 3695 tonnes/year for N and 280 tonnes/year for P, with the Cambridge wastewater contributing 54 tonnes/year of N and 8.5 tonnes/year of P, a 1.5% and 3% contribution respectively.
  - b. Monitoring data show the annual mass loads at Horotiu Bridge to be 4220 tonnes/year for N and 385 tonnes/year for P, with the Horotiu meat-works adding a further 90 tonnes/year of N (2%) and 13.8 tonnes/year (3.5%) of P prior to the proposed FMU downstream boundary at the confluence of the Waikato with the Waipa.
8. Non-point source contributions arriving in the river stretch between the FMU downstream boundary and the monitoring site (or the reverse) can be estimated directly where data exists for incoming tributaries or indirectly from export coefficients or catchment models where it does not. These diffuse inputs can therefore be allowed for in calculating FMU statistics. In any case these contributions will be small relative to the mass loads being carried in the main stem of the rivers because the areas they drain are small relative to the total catchment areas at the FMU downstream boundary (less than 2%). Where export coefficient analysis or catchment modelling of unmeasured incoming tributaries suggest contaminant losses disproportionately high relative to their areal extent, there may be a case for monitoring to be instigated. This seems unlikely given that the regional council already sample the significantly sized tributaries, such as the Karapiro and Mangawhero Streams in the Karapiro-Narrows stretch.
9. The National Policy Statement for Freshwater Management (2014) requires regional councils to establish and operate a freshwater quality accounting system for those freshwater management units where they are setting or reviewing freshwater objectives and limits. The approach being proposed in the Waikato where FMU boundaries do not overlap tightly with monitoring/accounting sites appears to be in accordance with draft guidance on freshwater accounting provided by MfE.
10. **The conclusion** to be drawn is that there is no particular technical issue with the non-coincidence of FMU boundaries and monitoring sites. If required, corrections can be made and these corrections will most likely be small (of the order of 5%).