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26 February 2008

Ms Wendy Salkeld
Orica Community Relations
16-20 Beauchamp Road
Matraville, NSW 2036

Dear Ms Salkeld

**Re: BOTANY GROUNDWATER CLEAN-UP PROJECT
INDEPENDENT MONITORING COMMITTEE (IMC)
Progress report on TASK 21 (as agreed at the combined
meeting of the IMC and CLC on 26 October 2007)**

Further to Ms Lucy Archer's e-mail of 5 November 2007 and Mr Paul Shepherd's subsequent formal request in his e-mail of 3 December 2007 to carry out Task 21, I herewith provide a progress report for the attention of the Community Liaison Committee (CLC). This progress report is necessary because there are important issues which require resolution by the CLC before I can pursue further undertaking and completion of the task. Please also be advised, I am submitting the progress report at this time since I will be away (overseas) from my office from tomorrow 27 February until 27 April 2008.

Task 21 as issued states:

Orica to share the requirements of its Environment Protection Licence, Trade Waste Service Agreement and Ammonia Pollution Reduction Program (PRP) for the GTP, along with recent results for each, with Dr John McCracken in order to better describe the inputs and outputs from the GTP treatment process.

Ms Archer provided the following documents as attachments to her e-mail of 5 November 2007:

- Orica's Environment Protection Licence;
- the Trade Waste Service Agreement for Botany Industrial Park discharges to sewer (note this agreement applies to Orica, Qenos and Huntsman); and
- Orica's Ammonia PRP for the GTP which was submitted to the DECC in August 2007.

Ms Archer also advised:

- Dr John Lear, Project Technical Manager, Botany Groundwater Project, wished to discuss these documents with me before detailing the data collected for each and that he would arrange a suitable time for that discussion; and
- Orica had just received correspondence from DECC advising they proposed to amend Orica's licence to require Orica to determine the range of dilution likely at the discharge point of the excess treated water and to require Orica to provide a progress report on the PRP by 1 March 2008.

The proposed meeting of Dr Lear and myself took place at Orica's offices on 5 December 2007. He described in some detail the various streams and inputs and outputs of the GTP, and the complications and limitations with obtaining reliable data in many cases. He indicated that the results from monitoring of the discharges had been found to be compliant with the licence conditions. I suggested that some pollutants, particularly the non-volatile components, might not be caught by those licence conditions. He explained that the air stripping of the groundwater was surprisingly effective even for those low volatile components and apparent biological action on the filters was accounting for considerable further destruction of those pollutants. I indicated that analytical evidence was still required to demonstrate a high overall efficiency of pollutant treatment and where such outcome was not the case to identify pollutants not caught by licence conditions that might be of concern for human health and environmental protection.

Some discussion centred around my concept of conducting a limited 'material balance' on the inputs, outputs and accumulations treating the GTP as a black box. The 'material balance' I had alluded to in those discussions, and in subsequent communications with Dr Lear, can be described as follows:

Pollutant Removed = Pollutant Inputs - Pollutant Outputs - Pollutant Accumulations

Efficiency of treatment can then be gauged by comparing the quantity of pollutant removed to the quantity of pollutant arriving at the GTP in the groundwater. Expressed as a fraction:

$$\text{Efficiency} = \text{Pollutant Removed} \div \text{Pollutant Inputs}$$

Dr Lear described a comprehensive analytical campaign that had been conducted by Orica over the period 19-27 September 2006 and showed me the set of results in spreadsheets on his computer which he agreed to download to me. It was clear then however that those results were inadequate for my proposed overall material balance since they did not extend to all discharges. He advised that Orica was planning to undertake another comprehensive analytical campaign in the near future and that that campaign could possibly be used for the purposes I was proposing. It was agreed that I would review the previous campaign results provided in the spreadsheets and then suggest a program of testing, with subsequent input from Dr Lear, that upon implementation by Orica, should provide sufficient data for my undertaking the completion of Task 21. Subsequent communications between us involved discussion of the program of testing I proposed and the practical difficulties/limitations, irrelevance and cost of the exercise as seen by Dr Lear.

Dr Lear argued at our meeting, as he has in subsequent communications, that the annual checking for the last two years by the EPA and by the independent Auditor of compliance of the discharges to the limits imposed on Orica as laid out in the relevant licence conditions, demonstrates sufficient evidence of environmental and human health protection and that further analysis would be unlikely to provide additional confidence on the plant's compliance with the treatment of pollutants. I would not take issue with the essence of that argument if it was also true that the relevant licence conditions properly accounted for all pollutants. My concern, reiterating from the above, is driven by the potential for significant levels of less volatile pollutants to escape in the discharges from the GTP, and not being caught within the parameters imposed by the licence conditions, may pose unacceptable risk for human health and environmental protection.

It is only to be expected that the more volatile pollutants would be successfully removed by the GTP - that was the specific design intent of the principal unit processes of air stripping and thermal oxidation.

A review of Orica's Environment Protection Licence (EPL) confirms that some key indicator volatile halocarbons are specified for monitoring and assessment of discharges from the GTP to air and to water. However, the fate of the less volatile species of chlorinated hydrocarbons, phenols and chlorinated phenols do not appear to be subjected to such scrutiny in the EPL. I find it difficult to believe that the DECC would not have an issue with such pollutants discharged inadvertently or inevitably from the GTP being returned to a water environment (i.e. either to the sewer or to Botany Bay via the Perry Street Canal) if these proved not to be at acceptably low levels in relation to human health and environmental protection. Why then are such pollutants not caught within the EPL conditions? Is it simply an oversight or did the DECC envisage a high likelihood of the levels of such pollutants to always be at acceptably low levels in the groundwater and if so where has this been appropriately demonstrated?

It is clear that the annual checking undertaken by the DECC and by the independent auditor has demonstrated compliance with the EPL requirements for those specified volatile halocarbons and other volatile pollutants in the groundwater, and that is undeniably commendable. But as to the fate of the less volatile pollutants, there appears to be no requirement for scrutiny. Apparently, there is no available analytical evidence that demonstrates acceptably low concentrations of these less volatile pollutants (at least suitable key indicator species) in the aqueous discharge streams (i.e. either to the sewer or to Botany Bay via the Perry Street Canal).

The results of the comprehensive analytical campaign that had been conducted by Orica over the period 19-27 September 2006 (which I received from Dr Lear by email on 21 December 2007) indicate that the composition of the stream passing from the activated carbon filters (GACs) to the reverse osmosis RO units did not contain phenols or chlorinated phenols at detectable levels. That is a good result but if a leakage of such compounds does occur to the treated water stream due to plant malfunction, then the EPL monitoring arrangements would not pick it up.

The Sydney Water Corporation's (SWC) Trade Waste Service Agreement for discharges to the sewer from Botany Industrial Park (applying to Orica, Qenos and Huntsman) does require the monitoring of a range of the less volatile pollutants including "chlorinated phenolics", "total herbicides" and "phenolic compounds" in addition to the volatile "volatile halocarbons". (Note that if "total halocarbons", "total herbicides" and "phenolic compounds" had been specified in this Agreement, this would likely have comprised the majority of pollutants of concern including the less volatile pollutants.) Even so, the SWC has an acceptance standard whereby if the rate or concentration of a pollutant exceeds an "acceptance standard" then the customer incurs an increased charge. This does not appear to constitute an appropriate means of checking compliance of discharge to limits set in relation to human health and environmental protection.

Dr Lear provided me by email on 25 February 2008 the results of the monitoring of discharges to the sewer over the period 4 January 2006 to 26 January 2008 (sampling every 8th day) which shows no detection of chlorinated phenolic compounds and some limited detection of phenolic compounds. As pointed out by Dr Lear the GTP is not the only potential source of phenolic compounds on site. It is difficult to make a judgement on the levels of discharge of these and other pollutants that might have derived from the groundwater. In any event, the assessment of such results is very likely to be problematical due to the multiple sources and diluting volumes of discharges to the sewer, including from other Orica activities and from Qenos and Huntsman also occupying Botany Industrial Park, at the nominated point where the sampling for composition monitoring is carried out.

Therefore, contrary to the argument put by Dr Lear, I would contend that the loop to indicate that pollutants are not being inadvertently released will only be closed when:

- (a) it has been appropriately demonstrated that levels of the less volatile pollutants in the groundwater fed to the GTP are always likely to be acceptably low in relation to human health and environmental protection (otherwise some partial removal of those pollutants must occur to avoid their potential for discharge at unacceptable levels from the GTP);

and, if the outcome of (a) is not in the affirmative:

- (b) a more comprehensive analytical monitoring is conducted that demonstrates the less volatile pollutants are at acceptably low levels in the GTP's discharge streams (particularly to the sewer and to Botany Bay via the Perry Street Canal).

I would respectfully counsel the CLC to firstly consider acting on the matter raised in (a) above by requesting the DECC to report on same. That task, if not already undertaken in the past, is not particularly difficult and should not take long to complete – information on the pollutants and corresponding range of levels in the groundwater is readily available. If the outcome of that reporting is not in the affirmative then the CLC should seriously consider requesting the DECC to update the EPL monitoring requirements to include key indicator species of the less volatile pollutants in the aqueous discharge streams from the GTP to the sewer and to Botany Bay via the Perry Street Canal.

The DECC would have to be relied on here as the arbiter on 'acceptable levels' but that should not prevent the CLC seeking independent advice on any related matter if it saw fit.

The less volatile pollutants referred to here comprise all of those pollutants in the groundwater or their derivatives not caught by the EPL's specification of pollutants to be monitored at each point. In addition to phenols and chlorinated phenols, there are several species of chlorinated hydrocarbons, volatile and less volatile, known to be pollutants in significant concentration in the groundwater that are not specified for monitoring in the EPL licence.

In an e-mail to me dated 19 February 2008, Dr Lear suggested the following:

"If the full comprehensive sampling campaign was to be pursued, then Orica could provide a quotation for the extra cost above that of the limited sampling we would be planning for some time in the future. This cost would be borne by the IMC."

In relation to the matters of scope and cost, which could arise if the monitoring and assessment as I have suggested in (b) above is requested by the CLC, I would simply direct the CLC's attention to Clause III in the Scope of the IMC under the Terms of Reference for the IMC which states:

"The IMC can request that additional data be collected (or collect its own data) with the scope agreed between Orica and the CLC, and with the expense of this additional data collection being met by Orica."

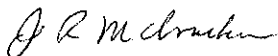
I do not believe it appropriate at this time to provide comment within the scope of Task 21 on discharges of chloramine and ammonia whilst progress on the Ammonia Concentration Reduction Pollution Reduction Program (PRP) submitted by Orica to the DECC only on 30 August 2007 is still in its early stages. The CLC should also be cognisant of the circumstances that the DECC had advised they proposed to amend Orica's licence to require Orica to determine the range of dilution likely at the discharge point and to require Orica to provide a progress report on the PRP by 1 March 2008.

Recommendations

1. The CLC should request the DECC (who may coopt Orica or its consultants as required) to report on whether the levels of the less volatile pollutants in the groundwater fed to the GTP are always likely to be acceptably low in relation to human health and environmental protection.
2. If the outcome of that reporting is not in the affirmative then the CLC should request the DECC to update the EPL monitoring requirements to include appropriate key indicator species of the less volatile pollutants in the aqueous discharge streams from the GTP to the sewer and to Botany Bay via the Perry Street Canal.

I hope this progress report on Task 21 will prove to be sufficiently self explanatory and a useful contribution to the successful outcomes of the Botany Groundwater Clean-Up Project.

Yours faithfully,



Dr John McCracken
IMC Core Member - Process Engineering Expert
Managing Director
McCracken Consulting Services