

Mr Sam Haddad  
Director General  
Department of Planning  
GPO Box 39  
Sydney NSW 2001  
NSW

Attention: Ingrid Ilias

Dear Ms Ilias

**Re: Modification to Minister's approval for the Western Sydney Recycled Water Initiative - Replacement Flows Project – Condition of Approval 2.4**

As indicated at Sydney Water's 9 July 2008 meeting with Department of Planning Officer's Neville Osborne and Ingrid Ilias, Sydney Water has developed an alternate approach to the challenge testing specified in Condition of Approval (CoA) 2.4 for the Replacement Flows Project. The alternate approach involves the biological monitoring of the pilot plant in lieu of challenge testing on the Advanced Water Treatment Plant (AWTP).

While Sydney Water has obtained the endorsement of NSW Health for this alternate approach, it has identified that pilot plant testing would be inconsistent with the requirement of Condition of Approval (CoA) 2.4 for challenge testing to be carried out on the AWTP during its commissioning period.

The purpose of this letter is to request a modification to CoA 2.4 of the Minister's approval for the Replacement Flows Project as outlined in Attachment A.

Sydney Water would appreciate the Department's early consideration of this request for a modification of CoA 2.4 to allow for the biological validation of the pilot plant (which is currently operational for a period of four months) in lieu of challenge testing on the AWTP.

The current wording of Condition 2.4 is as follows:

*The Proponent shall undertake challenge testing during the commissioning period to prove that the AWTP effectively removes biological contaminants from the feedwater. The Proponent shall consult with NSW Health to determine the pathogens to be tested as part of the challenge testing activities. Once challenge testing activities has been completed, the Proponent is to submit the results to NSW Health.*

Sydney Water suggests the following modification (**in bold**) to Condition 2.4:

*The Proponent shall undertake **biological monitoring of the pilot plant** to prove that the AWTP **will** effectively remove biological contaminants from the feedwater. The Proponent shall consult with NSW Health to determine the **micro-organisms** to be tested as part of the **biological monitoring program**. Once **biological monitoring of the pilot plant** has been completed, the Proponent is to submit the results to NSW Health.*

If you require additional information or would like to discuss this matter further, please contact Dr Sue Bowen on 9350 4507.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Judi Hansen', with a stylized flourish at the end.

12/08/08

Judi Hansen  
General Manager Sustainability

**Attachments**

- Attachment A – Requested Modification CoA 2.4 - Background and Proposed Alternate Program
- SWC letter to NSW Health outlining proposed approach to meeting CoA 2.4, dated 7 July 2008
- NSW Health's endorsement of SWC's approach to meeting CoA 2.4, received 17 July 2008

## **Attachment A – Modification Request CoA 2.4 – Background and Proposed Alternate Program**

### **Background**

Sydney Water's experience is that challenge testing with pathogens is only suited to small sized plants. Furthermore, biological challenge testing, whether at full-scale or pilot plant scale, would be very expensive and technically challenging for such a complex and advanced treatment train, as well as being excessive for the purpose that the water is being produced. In the case of reverse osmosis (RO), there could be no ongoing operational verification of the levels of microbial removal demonstrated by challenge testing.

Challenge testing on a full-scale plant magnifies these difficulties due to having to provide sufficient volume of challenge organisms at the larger scale.

Another issue with the full scale testing of the AWTP is that this test could only be carried out on the completed AWTP, by which time it would be very costly to change the design.

A more preferable and reliable solution would be to assess the ability of the membranes to remove biological contaminants as early as possible in the design process, instead of waiting until the AWTP commissioning period (currently scheduled for late 2009/ early 2010). The membrane processes should be directly scaleable from the pilot plant AWTP to the full-scale AWTP.

Sydney Water is therefore proposing to perform the validation monitoring at the pilot plant stage. This pilot plant testing will allow the effectiveness of the membranes to be used in the AWTP to be validated as early as possible in the design stage.

Sydney Water would still undertake verification monitoring during the full-scale AWTP commissioning and operation to validate the pilot plant testing results.

### **Proposed Alternate Biological Monitoring Program**

Sydney Water has consulted with NSW Health during the last five months whilst planning the challenge testing activities. During this consultation it was agreed that validation monitoring would:

1. Confirm the pathogen and surrogate levels in the feedwater supplied to the pilot plant and hence to the full-scale AWTP, and
2. Confirm that the removal of these microbes by the treatment processes as they will be operated in the AWTP are at least as efficient as expected in the risk assessment undertaken by the Centre for Water and Waste Technology, University of New South Wales (Appendix D of the Environmental Assessment)

The guidelines allow identified surrogates to be used in place of specific index pathogens, including:

- *E. coli* for bacterial pathogens such as *Campylobacter* spp.
- *Clostridium perfringens* for parasitic protozoa such as *Cryptosporidium*
- F-RNA bacteriophages for enteric viruses such as rotavirus.

Although the pilot plant will only receive feedwater from St Mary's Sewage Treatment Plant (STP) the full-scale AWTP will receive feedwater from St Mary's, Quaker's Hill

and Penrith STPs. It is proposed, therefore, to take separate effluent samples from the three STPs during this validation period for biological testing.

The proposed biological monitoring program for the pilot plant is outlined below. It aims to confirm the assumptions made in the risk assessment and the 2006 Australian Guidelines for Water Recycling 1 - Managing Human Health and Environmental Risks. The program is proposed to run for six to eight weeks.

#### **Proposed Pilot Plant monitoring program**

Parameter	Frequency	N <sup>o</sup> of samples
<b>STP influents (from each of 3 feeder plants)</b>	Effluent from St Mary's will be used to feed the AWTP during the proving period.	
<i>E. coli</i>	Daily*	42 x 3 = 126
<i>C. perfringens</i> spores	Fortnightly*	3 x 3 = 9
F-specific bacteriophage	Fortnightly*	3 x 3 = 9
<i>Cryptosporidium</i> & <i>Giardia</i>	Fortnightly*	3 x 3 = 9
<b>STP effluents</b>		
<i>E. coli</i>	Daily*	42 x 3 = 126
<i>C. perfringens</i> spores	Fortnightly*	3 x 3 = 9
F-specific bacteriophage	Fortnightly*	3 x 3 = 9
<i>Cryptosporidium</i> & <i>Giardia</i>	Fortnightly*	3 x 3 = 9
<b>Pilot Plant UF Filtrate</b>		
<i>E. coli</i> and total coliforms	Daily	42
<i>C. perfringens</i> spores	Twice weekly**	12**
F-specific bacteriophage	Twice weekly**	12**
<i>Cryptosporidium</i> & <i>Giardia</i>	Weekly**	6**
<b>Pilot Plant effluent</b>		
<i>E. coli</i> and total coliforms	Daily	42
Cultured enteric viruses (50 L sample)	Weekly	6
<i>C. perfringens</i> spores	Weekly	6
F-specific bacteriophage	Weekly	6
<i>Cryptosporidium</i> & <i>Giardia</i> (50 L sample)	Weekly	6

\* Note: These analytes will be tested to add to the Sydney Water database on these STPs.

\*\* The frequency of sampling and number of samples taken for these three (3) parameters has been increased, as required by NSW Health.

#### **NSW Health Endorsement of Proposed Alternate Biological Monitoring Program**

As NSW Health was responsible for inserting CoA 2.4 into the Minister's approval for the Replacement Flows project, Sydney Water wrote to NSW Health explaining the alternate approach (see attached letter) and seeking their endorsement for the approach.

NSW Health has reviewed and endorsed this alternate approach, subject to an increase in the sampling frequency of three of the parameters (see attached letter). Sydney Water has amended the proposed pilot plant monitoring program (outlined above) to include NSW Health's requirements.

#### **Requested modification**

The AWTP pilot plant has been built at St Mary's Sewage Treatment Plant (STP) and will operate for a period of four (4) months. Sydney Water would like to commence the proposed pilot plant biological monitoring as soon as possible.



Dr Kaye Power  
Senior Policy Advisor  
Water Unit  
Environmental Health Branch  
NSW Department of Health  
PO Box 798  
Gladesville NSW 2111

Dear Kaye

**Re: Replacement Flows Project - Endorsement of Proposed Approach to Condition of Approval 2.4 – Challenge Testing**

The purpose of this letter is to seek NSW Health's endorsement of Sydney Water's proposed alternate approach to meeting the requirements of biological challenge testing for the Advanced Water Treatment Plant (AWTP) for the Western Sydney Replacement Flows Project.

Condition of Approval (CoA) 2.4 requires that Sydney Water '*undertake challenge testing during the commissioning period to prove that the AWTP effectively removes biological contaminants from the feedwater.*' As you would be aware, Sydney Water has been consulting with NSW Health over the last five months to plan the practicality and details of the challenge testing activities. During these discussions, an opportunity to undertake an alternative program of biological testing during the pilot-testing program in lieu of full-scale challenge testing on the AWTP has been identified. This letter summarises Sydney Water's consultation with NSW Health to date and outlines Sydney Water's proposed alternate methodology for meeting CoA 2.4.

Context and Difficulties of Biological Challenge Testing on Full Scale Plant

During discussions with NSW Health, Sydney Water has identified several difficulties associated with challenge testing of the full-scale AWTP during the commissioning period as currently required by CoA 2.4.

Sydney Water's experience is that challenge testing with pathogens is only suited to a small sized plants and is labour intensive, costly and can lack sensitivity and reasonable statistical rigour. Due to the size of the AWTP, the quantity of pathogens required for a full scale test of the AWTP is extremely large (i.e. several litres of  $10^8$  to  $10^{12}$  of each pathogen and/or indicator, depending on the exact details of the challenge testing). Such a quantity of pathogens may not be possible to be obtained and if it were possible to obtain such quantities, there would be a long lead-time. Such a test would require very careful planning and there is a high risk of a repeat tests being required, which would cause with further delays and cost due to the need for additional high quantities being required.

Due to the requirements of the full scale AWTP challenge test, it would require careful advance planning by a team of experts experienced in this area, of which there are only a small number in Australia, to minimise the chances of having to repeat the exercise.

This is because there is no process monitoring in real time that can be reliably used to accurately verify microbial removal greater than approximately 2 logs, although the guidelines suggest a default log removal credit of 6 logs for all microorganisms.

In summary, biological challenging testing of the AWTP, whether at full-scale or pilot plant scale, would be very expensive and technically challenging for such a complex and advanced treatment train, as well as being excessive for the purpose that the water is being produced. In the case of RO, there could be no ongoing operational verification of the levels of microbial removal demonstrated by challenge testing. Challenge testing at the full-scale plant magnifies the difficulties due to having to provide sufficient volume of challenge organisms at the larger scale.

The additional issue with the full scale testing of the AWTP is that this test would be carried out on the completed AWTP, by which time there will be a high cost impact of changing the design. An early test on the pilot plant will validate the design at early stage.

A more preferable and reliable solution would be to obtain an indication of the ability of the membranes used in the AWTP to remove biological contaminants as early as possible in the design process, instead of waiting until the AWTP commissioning period (currently scheduled for early 2010). In addition, membrane processes should be directly scaleable from the pilot plant AWTP to the full-scale AWTP. For these reasons, Sydney Water are proposing to perform the validation monitoring at the pilot plant stage with subsequent verification monitoring after the commissioning of the full-scale plant.

#### Proposed AWTP Pilot Plant Biological Monitoring Program

Following these negotiations it has been agreed between NSW Health and Sydney Water that validation monitoring will consist of

1. Confirmation of the pathogen and surrogate levels in the feed water to the pilot plant and hence to the full-scale AWTP, and
2. Confirmation that the removals of these microbes by the treatment processes as they will be operated in the AWTP are at least as efficient as expected in the risk assessment (Roser et al 2006).

The guidelines allow identified surrogates to be used in place of specific index pathogens. These include:

- *E. coli* for bacterial pathogens such as *Campylobacter* spp.
- *Clostridium perfringens* for parasitic protozoa such as *Cryptosporidium*
- F-RNA bacteriophages for enteric viruses such as rotavirus.

Sydney Water has developed the following monitoring program to confirm the assumptions made in the risk assessment (Roser et al 2006) and guidelines.

During the operation of the pilot plant the feedwater will be supplied to the pilot plant from St Mary's sewage treatment plant (STP) only. The full-scale AWTP will be supplied from St Mary's, Quaker's Hill and Penrith STPs.

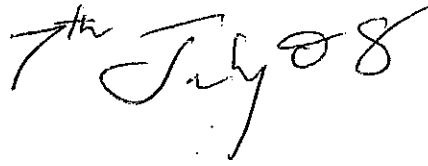
Therefore, it is proposed to take separate effluent samples for biological testing from the three STPs during this validation period as indicated in the table below.

The monitoring program for the pilot plant UF filtrate and pilot plant effluent is also indicated in the table below.

Yours sincerely

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Peter Cox  
R & D Program Manager  
Sustainability

A handwritten date in black ink, '7th July 08', written in a cursive style.

Dr Peter Cox  
R & D Program Manager Sustainability  
Sydney Water Corporation  
PO Box 53  
SYDNEY NSW 1235

Dear Dr Cox

I am writing in response to your letter of 7 July 2008 seeking NSW Health's endorsement of Sydney Water's proposed approach to meeting requirements of biological challenge testing for the Advanced Water Treatment Plant for the Western Sydney Replacement Flows Project (Condition of Approval 2.4).

NSW Health is aware of the difficulties in biological challenge testing on full scale treatment plants including the logistical and financial constraints associated with undertaking spiking trials with pathogens and/or indicator organisms. NSW Health is confident that the Condition of Approval 2.4 can be met through testing for the presence of some pathogens and surrogate microorganisms before and after the UF and RO treatment trains.

The report *California Department of Health Services Certification Testing for Zenon ZeeWeed® 1000 membrane* (2004) prepared by MWH and the subsequent letter of approval from the State of California – Health and Human Services Agency Department of Health Services (May 2005) provides evidence of the performance of the UF treatment under challenge testing. NSW Health accepts this evidence.

NSW Health has reviewed the proposed pilot plant monitoring program prepared by Sydney Water to address Condition of Approval 2.4. NSW Health endorses the pilot plant monitoring program subject to an increase in the frequency of sampling. The amended program is presented in the attached table.

If you have any enquires please contact Dr Kaye Power at NSW Health's Water Unit on 9816 0541

Yours sincerely



Dr Wayne Smith  
**Director Environmental Health**