Submission

No 7

INQUIRY INTO MANAGEMENT OF DOMESTIC WASTEWATER

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Submission to Inquiry into the Management of Domestic Wastewater

I have examined the Terms of Reference in relation to the Inquiry into the Management of Domestic Wastewater in NSW and offer the following submission. Prior to doing that, I wish to establish my credentials for the Committee.

Over the last 25 years I have worked in the field of domestic wastewater management in several states in Australia. I have been at The University of Newcastle for 22 years and have been involved in teaching and research in this area for all of that time. I have published a significant number of papers on my research into wastewater disposal practices and the fate of contaminants from on-site wastewater systems, particularly in coastal locations where there is food production in estuaries. As well as being involved in the running of over 100 private sector training courses into domestic wastewater management for the Centre for Environmental Training throughout Australia and New Zealand, I was one of the authors of the current Australian/New Zealand Standard AS/NZS1547 On-site Domestic Wastewater Management (2000). With regard to the NSW Environment and Health Protection Guidelines On-site Sewage Management for Single Households (Silver Book), I made a submission in the late 1990s when it was being compiled, and was one of team of consultants engaged to undertake a review of it in 2003. I have also previously made submissions on this topic to previous inquiries such as those undertaken by NSW Healthy Rivers (Catchment Assessment Commission) on Oysters (the relationship between healthy rivers and healthy oysters), appeared in the NSW Land and Environment Court as an Expert Witness on several occasions, contributed to SEPP62 Sustainable Aquaculture as a consultant to the NSW Department of Primary Industry, and worked in collaboration with the NSW Food Authority and local Councils on a variety of projects relevant to the subject of this inquiry. A brief biography is provided as an attachment.

Based on my experience and knowledge of domestic wastewater management in other states in Australia and New Zealand, I am of the view the NSW regulations and Guideline (Silver Book) are the most backward, and are not reflective of best practice management by current industry standards. While there was some impetus associated with the development of the current NSW Guideline in the late 1990s, and certainly following the Wallis Lake incident this happened for a short time with the Government's Septic Safe Program, the regulation and subsequent management of

domestic wastewater since then has stagnated. The fact that the current NSW Environment and Health Protection Guideline was deemed inadequate by most in the industry following its release is a direct reflection of how out of touch regulators in this state are. Even though it was subsequently revised and updated (at some cost to the NSW Government), it has been left in draft form since 2003. It is now 2011 and even this document, were it to come out today, would again require revision because of on-going developments in the industry. It is clear that the issue of domestic wastewater management is not important to the state government. For a time the regulation of Companion Animals was deemed more important by the Department of Local Government, now everything else seems to be!

In addition to the lack of direction provided by government, there are also still a number of local government areas which have not prepared On-site Management Sewage Strategies, yet they have accepted state government funding to do so. A Department of Local Government Inquiry in 2005 recognized that one third of councils had failed to do this, yet little has been done since to rectify this. Given the current situation, the issue of domestic wastewater management appears to be only of concern and interest in NSW when there is a public health issue and when the media is involved, usually following reported contamination incidents of aquaculture in estuaries. Other states in Australia have Codes of Practice which are regularly revised and updated. In NSW there is only a "guideline" which as I have stated was deemed unsatisfactory when released over 10 years ago now. The document is not helpful with respect to the design and sizing of on-site wastewater systems and there is no clear relationship with AS/NZS 1547, which is a significantly better document. It would seem that the health of people in NSW is not important unless there is an issue with regard to the failure of on-site wastewater systems and where there is highly publicized contamination in our estuaries. Wastewater systems are of course easy to blame when this occurs, but the problem is clearly related to the variable performance of local councils in this area due to the direct lack of commitment, and regulation coming from the NSW government.

With regard to the specific terms of reference that the Committee is inquiring into, I offer only brief comments below:

a) The adequacy of safeguards to ensure food safety, and to protect against the risk of localised contamination, in food production areas;

The approval of on-site wastewater management systems is in the hands of local government, while the approval of the type of systems is handled by the Health Department. Some councils do this well, while others are not very diligent and have little idea of the types of systems and the need to consider land capability criteria with respect to sizing and design of systems. The Health Department is understaffed and there is a real lack of commitment and guidance from these regulators. The point is that the current guideline is interpreted in various ways by different local councils and apart from the fact that there are things in error in there, it doesn't actually cover how to do a design. It is afterall only a guideline!

In relation to this term of reference, the safeguards are inadequate, there is localised contamination and our food safety is compromised. This has been the case for many years. It seems that at any one time in NSW (over the last 20 years at least) one estuary is contaminated and food production (oyster growing) threatened, for example, George's River, Wallis Lake, Tilligerry Creek Port Stephens and Kalang River, Urunga. The current situation on the Kalang has resulted in the estuary being closed to commercial oyster harvesting for over 3 years. While some of the contamination is due to agricultural runoff, there is every likelihood that human

sourced contamination from on-site wastewater systems is contributing to the situation. Assays of oyster tissue undertaken by Foodsafe NSW have shown the presence of human sourced viruses such as norovirus and adenovirus, and of course hepatitis was identified in the Wallis Lake incident which has been well document. A recent paper in which I review these examples is attached (reference is shown below). It is clear that on-site wastewater systems which are poorly designed and which fail have the potential to contribute to localised contamination in food production areas. Of course there are also situations where sewage treatment plant discharges also enter estuaries, however, point sources such as these are easier to monitor and manage.

Geary, P.M. and Whitehead, J.H. (2011) Water Quality Impacts on Estuarine Aquaculture: A Review, Water, 38 (8), 74-76.

b) The appropriateness of current regulatory arrangements in relation to the management of domestic wastewater;

I have already referred to the inadequacy of the NSW Environment and Health Protection Guidelines for On-site Sewage Management for Single Households (Silver Book). The current regulatory arrangements in relation to the management of domestic wastewater are inadequate for a number of the reasons discussed above. They stem from a real lack of government commitment to deal with this issue with respect to making sure that approved systems are likely to work. I have not touched on the regulation of greywater and effluent reuse in NSW as it is extremely confusing. There are a variety of documents which have been produced by various agencies (eg DEUS, Health, EPA etc). To anyone in NSW the picture is very complex and the situation is not clear. Is greywater reuse legal or not? Under what conditions and who has responsibility for its regulation? Why does it have to be this way? What a mess!

c) The adequacy of inspection procedures and requirements to report incidents;

As the Committee would be aware, the responsibility for on the ground management of on-site wastewater systems rests with local government. As previously mentioned, there is variable performance by councils with respect to management of systems in their area. The on-going maintenance of wastewater systems is very important as they age and failures are typically not going to be reported by homeowners. Local councils need to have a routine inspection system in place to assess the performance of systems. The approval process is one thing but there must be regular follow up to ensure that systems perform satisfactorily. Some councils have these procedures in place for on-going inspection plus a service fee as part of the homeowners' rates. This needs to be the case everywhere. Councils should not rely on neighbours to report failures and need to be proactive in this whole area of ongoing monitoring and in identifying where maintenance may be required. The guidance provided by the NSW Government needs to be improved and local government needs to be more vigilant with regard to regulation enforcement to make sure that the contamination incidents which frequently occur in our estuaries are reduced. If this is not an outcome from recommendations made by this inquiry, then our surviving aquaculture industry will be doomed and public health compromised.

Yours faithfully,

Phillip Geary

WATER QUALITY IMPACTS ON ESTUARINE AQUACULTURE: A REVIEW

Standard designs for on-site wastewater systems have been developed and, where implemented, impacts have been reduced

PM Geary, JH Whitehead

Abstract

In recent years, oyster harvesting in a number of rivers, estuaries and coastal lakes on the mid-north coast of NSW has been adversely impacted by reduced water quality. Since 1997 Wallis Lake, Tilligerry Creek (part of the Port Stephens estuary) and, more recently, the Kalang River, have been closed to oyster harvesting. In particular, following periods of heavy rain, water quality in the estuaries has diminished and a number of incidents of pathogen contamination of estuarine waters have occurred. Such incidents have significant adverse impacts on the oyster industry and may result in long periods of closure to harvesting with consequent implications for oyster supply and the livelihoods of those employed in the oyster industry. On-site wastewater management systems (OWMS) on properties close to the estuary have often been considered possible sources of contamination of estuarine waters.

State Government agencies have broad responsibilities for public and environmental health and in the oversight of shellfish quality, while local Councils are responsible for the approval and ongoing operation of OWMS. Studies by the authors and State Government agencies, such as the NSW Food Authority which manages the Shellfish Quality Assurance Program along with local Councils, have attempted to use a range of methods to demonstrate connectivity of failing OWMS to the estuaries.

Systematic audits of these systems in some catchments have quantified the extent to which they do not meet current regulatory requirements and have been used to develop a risk-based approach to assessment of the wider extent of the problem. Pathogen die-off modelling has been used to assess risk and determine the need for upgrading or replacement of existing OWMS. Standard designs have been developed and implemented in some catchments to ensure a higher level of performance and there is clear evidence that, where these designs have been implemented, impacts have been reduced.

Introduction

Wastewater management in small communities may involve a reticulated system with centralised treatment and water-based discharge or, in some cases, land application involving reuse of the treated effluent. Where the cost of a reticulated system is prohibitive to small communities, wastewater may be treated and disposed of on-site at individual properties (OWMS systems). Typically in these situations, a septic tank and land application system involving subsurface trenches or beds is commonly used, although other designs are available.

There are over one million OWMS in Australia (Gardner *et al*., 2006) and surveys and audits of their performance often demonstrate that a proportion (15–40%) may periodically perform poorly or even fail due to poor construction, undersizing with respect to hydraulic loads, or soil and land capability constraints for on-site effluent disposal. Where these failures occur there is concern with respect to public health and the environment; however, there are very few studies that are able to demonstrate direct linkages between OWMS failures and any adverse impacts to human health and receiving waters. The inability to discern such linkages and widespread contamination which may be anticipated due to these failures is partly due to effluent dilution, difficulties which exist in differentiating effluent pathways in the field, and the attenuation of faecal contaminants.

Case Studies

In NSW there have been a number of highly publicised cases of contamination of estuarine waters used for oyster growing along the coastline north of Newcastle. In each case possible sources of human faecal and elevated nutrient concentrations have been found to come from agricultural areas, waterway users, runoff from urbanised areas and unsewered small communities.

It has proven difficult to separate the overall impact that these small communities have to estuarine water quality in comparison with agriculture;

Oyster beds in Tilligerry Creek Estuary, Port Stephens, NSW.

An aerial photo of Wallis Lake Estuary.

however where human viruses are found in estuarine filter feeders such as oysters, a human source of contamination such as failing OWMS or sewerage treatment plant discharge has to be responsible.

In January 1997 in Wallis Lake, a *Hepatitis A* virus affected approximately 274 people in NSW (one fatally) and, in all, 422 people throughout Australia. In a subsequent investigation by NSW Health, it was concluded that the oyster contamination was waterborne and potentially from contamination by human faecal waste (Kardamanidis *et al*., 2009).

While the estuarine waters were contaminated by human faecal and nutrient pollution from unsewered small communities and other sources, the specific source of the waste was not able to be determined. Failing OWMS were, however, considered highly likely to have been primarily responsible due to their reported high rates of failure and the large number of unidentified unsewered premises in the catchment.

In July 2005 part of the State's second largest producer of oysters with an annual value of A$5 million (behind Wallis Lake with an annual value of A$14 million) was closed to commercial oyster harvesting due to a similar contamination incident. Samples of oyster tissue tested positive using PCR analysis for human *Adenovirus* and *Norovirus* in the Tilligerry Creek estuary in Port Stephens.

In this case (as in Wallis Lake), faecal contamination from failing OWMS was considered responsible, although agricultural sources of contamination were also significant in terms of the overall faecal load to the estuary. The estuary remained closed to commercial harvesting for over two years, resulting in a substantial loss of income from which the industry in that region has yet to recover.

More recently, in 2008 outbreaks of gastroenteritis have been linked to a common batch of oysters harvested from the Kalang River estuary in northern NSW. The presented symptoms were consistent with *Norovirus* infection and the estuary subsequently closed to the commercial harvesting of oysters by the NSW Food Authority. Investigations are still underway as to the source or sources of the human faecal contamination and the estuary still remains closed to harvesting. Possible human sources of the contamination are considered to be a number of OWMS adjacent to the estuarine waters and a downstream sewerage treatment plant discharge from a nearby community wastewater system.

Responses

In response to the outbreak in the Wallis Lake estuary, a number of Local and State Government agencies collaborated in estuary and catchment remediation works. Over the 13 years since the incident, these works have resulted in significantly improved estuarine water quality and commercial oyster growing is again thriving. In 2004 the Great Lakes Council was awarded a major prize for best practice in river and catchment management and environmental repair in Australia (Kardamanidis *et al*., 2009), although the actual source of the contamination incident has never been identified.

In response to the closure of the Tilligerry Creek estuary to oyster harvesting, a sanitary survey of the estuary and river shorelines was conducted by the NSW Food Authority and Port Stephens Council undertook OWMS inspections. An audit of approximately 300 OWMS in the community adjacent to the estuary found that a small number of systems were faulty and that human effluent had the potential to contaminate ground and surface estuarine waters where the oysters were grown and harvested. In this study a number of individual OWMS were dosed, using bromide and lithium salts and fluorescein dye to determine whether direct linkages existed between the OWMS and surface and groundwaters.

Aerial photo of an upstream part of Tilligerry Creek Estuary, Port Stephens, showing mixed land uses.

In several of these cases hydraulic pathways to the estuary were confirmed, indicating that contaminated groundwater from OWMS was entering surface drains and quickly entering the estuary following heavy rainfall events (Geary, 2005).

More detailed investigations followed to identify the sources of faecal contamination that an unsewered development was making to both surface runoff and groundwater entering the estuary. In addition to the microbial faecal indicators regularly used in such studies, water samples were collected and analysed for faecal sterol compounds in order to determine whether faecal contamination was human-derived. Interpretation of the various sterol compounds indicated that while there had been occasions where human-derived faecal contamination had entered the estuary, the majority of the faecal contamination at that time was sourced from herbivores in the catchment upstream (Geary *et al.*, 2007).

While the estuary was closed, estuary and catchment remediation works were initiated by the local Council. A catchment management plan was commissioned which recommended a number of improved management practices be adopted and an estuary response model developed. When a sewerage options study indicated that the cost of a reticulated system for the small community adjacent to the estuary was prohibitively expensive, a number of standard designs for improved OWMS were developed and failing systems were required to be upgraded.

One of the OWMS designs adopted by Council which has proved very successful in overcoming the problems associated with the high groundwater table is the sand (Wisconsin) mound. These systems are considered secondary treatment systems, as primary-treated effluent is pumped into an above-ground distribution system constructed in imported permeable soil. Effluent then percolates through this material where treatment occurs prior to it entering the groundwater.

As a mitigation measure, 58 mounds which receive primary treated effluent, and nine which receive secondary-treated effluent from aerated treatment systems, have been constructed. Monitoring has shown that the overall efficacy of the treatment system can be directly linked to the increased vertical separation distance to the groundwater provided by the mound and the periodic dose loading of effluent from the septic tank (Whitehead and Geary, 2009).

A Wisconsin Mound OWMS.

Similar audits conducted in the Kalang River estuary have found that a number of OWMS which have been approved by the local Council are failing. Studies have been undertaken using tracers such as fluorescein, rhodamine and bromide, along with microbiological faecal indicators, to determine the source of the human contamination in the estuary waters. While there are unsewered and sewered urban settlements adjacent to the river, and a variety of other agricultural land use activities upstream which may be contributing to the faecal contamination detected in these oyster-growing areas, the source of the human contamination has yet to be found and the estuary remains closed to oyster harvesting.

This situation, as in the former example, has had a profound effect on the commercial viability of the oyster growing industry in each of these estuaries and a consequent loss in consumer confidence in the product. There are also other estuaries where there is concern with respect to the increasing faecal bacterial counts in oyster-growing waters and the potential which exists for contamination to be human-derived from adjacent or nearby small unsewered communities.

Conclusion

Demonstrating direct linkages between the wastewater management practices of small communities and estuarine water quality is difficult at the catchment scale and may not be possible using standard monitoring techniques and typical microbiological indicators. While Gardner *et al.* (2006) has suggested that there is little evidence of the impact that unsewered communities have on water quality, the fact that human viruses can periodically be found in oysters suggests current monitoring programs at high-risk estuary locations need to be improved.

In developing new monitoring programs, consideration should be given to either more regular assays for human viruses in oysters, or in measuring chemicals associated with human metabolism and activity, which can also be present in human faecal material such as caffeine, faecal sterols and various pharmaceutical compounds. Fluorescent whitening compounds (FWCs), which are present in the majority of wastewaters containing laundry products, are also now being assessed as studies elsewhere (Gilpin *et al*., 2002) have shown that they too can be used to assist with identifying human faecal sources in environmental water samples.

Contamination incidents such as those discussed in this paper demonstrate the close relationship and the sometimes inherent conflict between managing wastewater in small communities, increasing urban and rural development, and the need to maintain estuarine water quality so that aquaculture such as oyster growing can be undertaken without compromising human health.

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