Lagoon/Pond Treatment Systems – results from pre-workshop survey

		Organisation								
PART I	**Total**	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
1a) What parameters do you monitor?										
microbial indicators	7	1	1	1	1	1	0	1	1	0
Algal/cyanobacterial counts/chlorophyll	4	0	0	0	1	1	0	1	1	0
turbidity	3	0	0	1	0	1	0	1	0	0
chemical (BOD, SS, Nutrients)	7	1	1	1	1	1	0	1	1	0
physical (DO, pH)	7	1	1	1	1	1	0	1	1	0
Weather	4	1	0	1	0	1	0	1	0	0
Inflow	6	1	0	1	1	1	0	1	1	0
Outflow	6	1	0	1	1	1	0	1	1	0
1b) What treatment does the water receive before it enters the pond?										
septic tank	2	0	1	1	0	0	0	0	0	0
activated sludge	4	0	0	1	1	1	0	0	1	0
trickling filter	3	1	0	1	0	0	0	0	1	0
membrane bioreactor	0	0	0	0	0	0	0	0	0	0
anaerobic pond	3	1	0	1	0	0	0	0	1	0
other	2	0	0	0	1	0	0	0	1	0
1c) What is the water used for after the pond?										
discharge to receiving surface water	5	0	1	1	0	1	0	1	1	0
agricultural irrigation	4	1	0	1	1	0	0	1	0	0
public safety / amenity irrigation	4	1	0	1	0	0	0	1	1	0
marine environment	3	0	1	0	0	1	0	1	0	0
other	3	0	1	0	0	1	0	1	0	0

1d) Do you currently use any modelling programs for pond operation?

Yes	1	0	0	0	0	0	0	1	0	0
No	8	1	1	1	1	1	1	0	1	1

PART II

1 What are your three priority research questions that would assist in improving pond/lagoon operation and management?

Lagoon loading and mixing (including inlet/outlet configuration, shape, depth, aeration style)

How do we implement practical applications of research

Innovative sludge removal

How can we detect deterioration in pond treatment at its early stages and what remedial measures may be put in place to resolve the problem(s)

What are the most significant treatment processes taking place in pond systems in tropical and arid climates and how can we optimize them?

What are the potential affects of using effluent in solar generation cooling systems?

Improving biological nutrient removal.

Developing guidelines for design and operational troubleshooting.

Incorporating renewable energy components

How to predict and improve disinfection performance

How to avoid high pH and suspended solids due to excessive algal growth

How to prevent and control green algae and blue green algae blooms

Detention time required for pathogen die off (eg Cryptosporidium, virus)

Optimum dimensions/configurations to maximise volume but retain aerobic/faculative conditions

Pathogen-die off in lagoons, including the role or contribution of UV disinfection with sunlight and predation.

Research into effective natural/low cost measures for in-pond algal control. Lots of work at bench/pilot scale shows good potential, but seems to be a lack of adoption by full scale operators.

To baffle or not to baffle? The debate continues to this day as to the best baffle type and configuration.

Can shallow ponds (<50 cm) perform as effectively as the conventional deeper ponds (>1 m)? Latest research suggests they can, so do we need to dig them so deep? Need 'whole of life' work to look at which design is likely to perform best over longer periods (to take into account factors like accelerated de-sludging intervals in shallow ponds and whether this likely to negate any earlier savings made through lower excavation costs).

2 What do you see as the highest risk factors (environmental and public health) in pond/lagoon operation and management?

Odour generation (loading, mixing)
Short circuiting of lagoon flows leading to ineffective treatment
Overloading lagoon systems
Discharge to local waterways close to townships/small communities
Risk of groundwater contamination through discharge of effluent to land or infiltration from pond systems
Lack of appropriate maintenance of ponds due to changes in staff and / or reluctance of staff to take on ownership for the pond systems (namely in remote communities)
Animal vectors
Inability to fine-tune the performance to assure consistent effluent quality
Low nutrient removal
Seepage and groundwater contamination are hard to detect and rectify
odour
groundwater contamination
algal blooms leading to high pH, SS and possibly odour
unexplained high E.coli counts
odour potential if overloaded
midges / mosquitos
Algae / Daphnia for downstream recycled water systems
Evaporation – salt increase
Short circuiting resulting in minimal retention in the pond
Recontamination of the pond resulting in high microorganism counts which may not be indicative of the pathogen loading or how effective the treatment process is.
Algal bloom impacting on UV transmissivity and therefore UV disinfection or that contribution to die off
Future overloading of existing ponds and inadequate disinfection
Optimising sludge/biosolids treatment and disposal/reuse
Failing to achieve adequate in-pond algal removal and relying on resource/energy-intensive post-pond processing for effluent polishing

3 How do these risk factors compare with other wastewater treatment options?

odour fairly high, rest low

From a remote community perspective WSPs seem to be the most appropriate option, other treatment options that require a technical operator would be hard to sustain due to the training required, the difficult task of finding a technical person to live and work in a small and often isolated community and the high turn over of staff.

Hard to compare with electro-mechanical treatment plants as the types of risk are different

There is a greater level of control and certainty with most other wastewater treatment options

High – due to midges, recycled water algae / Daphnia and odour potential if overloaded.

The risk factors will be higher due to the passive nature of the scheme. There is limited operational parameters which can be manipulated to control the changes in incoming water quality

At worst comparable risk but most likely lower

4 What pond design criteria and/or configuration do you recommend (i.e. retention time, depth, length:width ratio etc.)?

Design criteria should be specific to the individual situation.

3 lengthy and detailed responses returned, but not included here for length reasons. If anyone would like these responses, they can be inserted in a word doc and distributed separately.

5 What do you see as the future of lagoon treatment?

Advancement in upfront high rate treatment options

I think lagoon treatment will continue to move towards optimization of specific treatment processes dependent on the intended application of final effluent / desired effluent quality to have better control over the performance of a pond and reduce the amount of area required to achieve a high level of treatment

Being an effective, low-tech, low energy process, lagoon systems will remain a popular wastewater treatment option for small communities

Positive as it is a low energy, low cost treatment option. South East Water will continue to use it in small towns where land is available

Capture/dilution of SS from the Activated Sludge peak flows. Some nutrient polishing. Recycled water barrier for pathogens, chemicals of concern (EDCs, pharmaceuticals, etc..)

Will still be an effective treatment process for removal of pathogen particularly protozoa. Requires large areas of land and will therefore be limited in application to rural areas

Anaerobic ponds; integrated pond systems; shallow pond systems (<50 cm); high-rate algal ponds

6 Are there any other comments/issues you wish to raise regarding lagoon/pond systems?

The success of the current ponds is due to the low maintenance requirements for suitable quality effluent and although the effluent quality across the 56 lagoon systems varies

A website for exchange of case studies in troubleshooting will be useful

Ability to validate them and the reliability of the information produced for operational parameters