

RECOMMENDED ACTIONS TO REDUCE ODOUR RISKS ASSOCIATED WITH THE BELL ISLAND WASTEWATER TREATMENT PLANT

	Recommended Actions	Actions already implemented	Actions programmed to be completed	Intended time frame	Reason if recommendation will not be adopted.
1	Inlet Area Improvements:				
1.1	Move or add additional air offtakes directly to the screen covers		Add individual suction pipe connections to each milliscreen cover.	2019-20	
1.2	Seal leaks in the covers. (NRSBUs proposed replacement with much larger covers is an appropriate option)		New larger covers	2018-19	
1.3	Separate the internals of the screen chamber into two sections each of which can be isolated to allow maintenance of that part of the chamber and associated screen whilst the other screen and chamber are in duty.		Create separation system to allow operation of one half of the screening chamber while the other half is being maintained.	2018-19	
1.4	Provide appropriately sized air inlet ports in the covers placed to maximise the swept volume of the chamber.		as part of new cover installation.	2018-19	
1.5	Fit a drain point to the underground loop of the air pipework if one is not already installed. It may be simpler to replace this with an above ground pipe.			2019-20	
1.6	Operate the system for a period and measure the performance and the gas concentrations to confirm resulting chamber H ₂ S concentration after the above works.	Preliminary monitoring undertaken, gas monitoring options investigated. Final selection required.	Monthly Monitoring to commence April 2019 using gas sensor (add to Odour Management Plan)	ongoing	
1.7	Review the system performance and if necessary, add an additional Biofilter and fan to increase the dilution of H ₂ S being received by the Biofilter.	Initial odour "sniff" testing undertaken by NRSBU staff indicates Biofilter performing effectively after recent reconditioning.	NRSBU to engage independent contractor to undertake Monthly Monitoring to commence April 2019 using gas sensor. (add requirement to Odour Management Plan)	ongoing	
1.8	The current biofilter has an alkalinity layer at the base to neutralize acid formation, but also has sources of alkalinity within the bark mix. Monitoring of the biofilter should be undertaken to monitor the Performance and if the biofilters is found to be unable to effectively remove hydrogen sulphide an addition or alternative odour treatment may be need to be considered.	Initial odour "sniff" testing undertaken by NRSBU staff indicates Biofilter performing effectively after recent reconditioning.	NRSBU to engage independent contractor to undertake Monthly Odour Monitoring to commence April 2019. Nelmac to measure pH monthly. (add requirement to Odour Management Plan)	ongoing	
2	Primary Clarifier Improvements				
2.1	Monitoring of the situation only is recommended		Monthly monitoring by independent contractor (to be added to Odour Management Plan)	Ongoing	
3	Old Aeration Basin				
3.1	BPO recommend stopping the storage of waste sludge or other materials within the old aeration basin. Alternative disposal of these sludges should be instigated.	Use of old basin has been ceased. Most of existing sludge has now been removed and a lot of tiding has been undertaken. Alternative management options being investigated.	Basin to be cleaned out of old sludge, and pump added to keep basin empty of water. Add requirement to keep basin empty to Odour Management Plan	By May 2019	
4	Chamber C3				
4.1	The operators monitor the situation to see if odour is detectable at a greater distance towards Best Island under low wind conditions.		Monthly monitoring to be undertaken by Independent contractor (Add to Odour Management Plan)	By April 2019	
4.2	If the assessment confirms the need, cover C3 and try to maximize odour containment			2021-2022	
4.3	Add sulphide attack protection to the internal concrete surfaces of C3.			2021-2022	
4.4	Provide a small biofilter and associated pipework and fan to control odour, or			2021-2022	
4.5	Provide an activated carbon filter odour control facility.				NRSBU propose use of biofilter per option 4.4 so activated carbon filter not required.
5	Facultative and Maturation Ponds				
	Sludge bank accumulation:				

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5.1	Monitoring the sludge accumulation in the ponds on a regular basis (2 to 4 year intervals). This is the current practice.	Last done Nov 2018	Propose sludge review every second year, and also 6 months after any desludging undertaken	review of F1 and F3 required following limited sludge removal in 2019-2020, and full review required around Nov 2020	
5.2	Add and/or reposition aerator/mixers to dissipate sludge banks.	Have added 1 mixer to pond F2	Mixing plan to be developed by June 2019 following limited desludging of Pond F1 and F3		
5.3	Selective desludging of ponds where accumulation occurs. It is understood that desludging of the edges of F1 and F3 is planned in the near term to reduce the remaining sludge. F2 is not included in this action in order to not interfere with the trial of the wind powered mixers in F2..		Partial de sludging of F1 and F3, note that there is a risk of some additional odour during the desludging period.	By June 2019	
5.4	Full desludging of ponds where total accumulation of sludge reaches a point where the sludge occupies too much of the pond volume. This would typically be at 15 to 25 year intervals.		Full de-sludging	F2 2022-2023 F1 & F3 2029	
Stratification and pond inversion:					
5.5	It is recommended that additional mixing be installed or be available to be installed to combat stratification.	Investigated and trialed a number of options for mixing / re-entrainment of scum / floating algae during 2018. Submersible mixers found to be effective, and solution now being developed. New mixer in pond F2	Pond mixing plan to be developed by June 2019	F3 - 2019-2020, F2 - 2020-2021, F1 - 2021-2022	
Floating algae and scum:					
5.6	Investigate suitable portable mixing, to re-entrain the solids back into the water column, that can be placed where the problem occurs and redeployed if wind changes move the mats.	Investigated and trialed a number of options for mixing / re-entrainment of scum / floating algae. Submersible mixers found to be effective, and solution now being developed.	Pond mixing plan to be developed by June 2019	F3 - 2019-2020, F2 - 2020-2021, F1 - 2021-2022	
5.7	Investigate a floating boom or similar that can be used to "corral" the floating mats and a way of effectively removing the material. This may be some form of skimming device owned by NRSBU or maybe the hire of a vacuum tanker.	Investigated and trialed removing scum using sucker trucks which was found to be ineffective.	Investigation following implementation of 5.5 and 5.6		
Insufficient algae:					
5.8	Ensure the operators have the time and experience to operate the pretreatment systems effectively.	Have already implemented: - Joint NRSBU/ Nelmac workshops. - Pond management team workshops - Update Pond Management Plan Increased Algal and Wastewater sampling	Add to Odour Management Plan and stress to contractor importance of effective pretreatment systems.	Ongoing	
5.9	Purchase new or refurbish existing unused aerators to increase the oxygenation capacity if required.	Have received 1 new large 75 Kw Aerator, and have ordered one small 30kw aerator. Have initiated a refurbishment plan for existing aerators and one is partly complete. Refurbishment of aerators will occur sequentially.	Ensure that 1 spare aerator is available onsite so that immediate transfer can be undertaken in the event of a failure, or this can be added to a pond in difficulty if required. Initiate refurbishment based on operating data, which will be added to the Maintenance management plan	By June 2019	
5.10	Install a reseeding network that directs seeding streams to the optimal inlet areas of the ponds and in such a way that the seeding stream can be directed to the required pond or ponds easily.		Investigate options and develop Implementation plan by June 2019		
5.11	Consider installation of addition electrical distribution network capability for re-seeding pumps and/or to allow extra aerators to be moved to a failing pond or investigate whether purchase or hire of portable gensets would be a more cost effective way of meeting these temporary demands.		Investigate options and develop Implementation plan by June 2019		
Inlet bypass to F1					
5.12	Remove the inlet overflow and bypass directly to F1.			2021 - 2022	

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5.13	Add an overflow/bypass system that allows each unit to be bypassed individually.		Investigate options and develop Implementation plan by June 2019		
6	Gravity Belt Thickener				
6.1	Seal up the penetrations between the top and bottom floors			2021-2023	
6.2	Extract the air from the GBT area via the GBT. Add low level extraction ducts to the GBT room to pick up the relatively dense H ₂ S.			2022-2023	
6.3	Seal up the sump in the work shop area and increase the extraction rate inside of the sump to the odour treatment unit.			2022-2023	
6.4	Add a fan at one end of the workshop area to flush any fugitive odours out of the building. A relatively high flow is suggested but the low odour load in this area of the building once flushed should mean that this air stream would not need to be treated.			2022-2023	
6.5	Consideration on improved monitoring procedure for the performance of the Carbon filter would also be appropriate			2022-2023	
7	Sludge Storage tank and new sludge storage tank				
7.1	Construct the new tank from suitable materials for the expected concentrations of possible corrosive compounds.		design construction of a second sludge storage tank from appropriate materials.	2019-2020	
7.2	Cover the sludge storage tanks with a good quality cover such as the FRP cover used on the ATADs.		Replace roof on Existing sludge storage tank as part of tank refurbishment, after the implementation of the New 2nd sludge storage tank(with FRP roof).	2021-2022	
7.3	Provide a small air inlet pipes and elbow with mesh to exclude rain and birds respectively. A pipe provides a pathway length to minimize the risk of fugitive odours being drawn from the tanks by pressure fluctuation resulting from wind gusts.		As part of tank design, and existing tank refurbishment.	Tank 2 2019-2020, existing tank - 2021-2022	
7.4	Connect each tank to the ATAD biofilter suction manifold with a damper to control air flow from each tank.	Existing tank connected to carbon filter temporarily, new connection to biofilter to be undertaken with new manifold in item 8.2	Add new odour suction line to existing tank as part of odour ducting upgrade.	Jun-19	
8	ATAD System & Biofilter System Improvements				
8.1	Seal off the various penetrations in the top of the ATAD tanks. Some can simply be sealed with some form of cover or flange. The annulus around each foam breaker mounting plate needs a flexible seal around its perimeter to allow for the independent movement of the plate and the top of the tanks (from vibration, walkway movement and thermal expansion).	Initial sealing completed.	Ongoing monitoring and improvement required. Add monitoring requirements and frequency to Odour management plan.	Ongoing	
8.2	Add a second odour manifold and second fan to cover the secondary tanks and the biosolids storage tank. This provides for redundancy and reduces the friction head losses allowing better control of flow balancing.	Second fan has been purchased and has been received onsite, also have purchased a standby generator that can be used to run the biofilter fan if power failure occurs.	Second fan, Second manifold, and larger connections to Biosolids storage tank and new connection to sludge storage tank to be installed.	Jun-19	
8.3	Connect the proposed new sludge storage tanks to the ATAD biofilter suction pipework.		Allowance for Connection to undertaken as part of 8.2, so tank can be connected when installed.	2019-2020	
8.4	Provide automation of fans speed to control pressure in the air suction system. This will provide for better flow balancing and reduce energy consumption. Connect the Odour Management system to the SCADA so that the pressure, speed and other aspects can be easily seen, and can be recorded.		Investigate after 8.2 implemented.	2019-2020	
8.5	If necessary, add control dampers to the pipework (to allow isolation of tanks taken from service) and consider automated dampers with pressure feedback.		Investigate after 8.2 implemented.	2019-2020	
8.6	Confirm that the underground section of the suction pipework is adequately drained to prevent accumulation of condensate.		To be undertaken as part of 8.2	Jun-19	

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8.7	Add dampers to each biofilter bed to facilitate flow balancing. There are butterfly valves present that could be used for this purpose but each time a bed was isolated rebalancing would be required. Dampers could be permanently set and the butterflies used for isolation only, if isolation was relatively frequent.				not to be undertaken, as we can control the flow with the existing valves, and isolation is an infrequent activity.
8.8	Adjust the connection pipe to the far biofilter bed to fully drain condensate back to the condensate sump and repair the small hole currently draining condensate to ground.	Completed			
8.9	Level the biofilter beds and top up to the design depth.	Completed	add requiremnt to maintenance management and odour management plan to refill Biofilter bark to the top.	Jun-19	
8.10	Measure the ammonia concentration before and after the biofilters to confirm the need for an ammonia scrubber and the potential additional nitrogen load to the ponds.		Investiagte nitrogen mass being captured in ATAD offgas.	Jun-19	
8.11	If the ammonia concentrations indicate the need, add a water based scrubber using recycled pond water to scrub ammonia prior to the biofilter. The scrubber will also cool the air and extend the life of the biofilter media.		Investigate ammonia contribution to odours.	Jun-19	
8.12	If the additional nitrogen load to the ponds from a water based scrubber are considered to be too high, fit an acid based scrubber. Ensure that a cost effective method for sale or disposal of the ammonia salt solution is available and reliable.				This is not the preferred option due to the hazards associated with use of Acid.
9 Biosolids Storage Tank Improvements					
9.1	In the short term add a damper valve to the air extraction pipework to facilitate good flow balancing. This will require other works as discussed above in the ATAD and biofilter system to allow this to be effective.		to be undertaken as part of duplication of suction pipework in 8.2	Jun-19	
9.2	Consider replacing the current flexible cover with a FRP cover to minimize fugitive odour risk.		To be replace at same time as refurbishment of existing sludge storage tank	2020-2021	
9.3	Provide an air inlet with a good path length and provision to exclude rain and birds.		As part of roof replacment	2020 -2021	