



GEOFF
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The Kogarah War Memorial
Olympic Swimming Pool Centre

At

Carss Park

Report/Review

Pools, Tank Structures, Finishes and Joints

And

Filtration and Water treatment Plant

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EXECUTIVE SUMMARY

Geoff Ninnes Fong & Partners Pty Ltd (GNFP) were commissioned by the Georges River Council early in 2019 to carry out a review of the swimming pools and filtration and water treatment plant (FWT) at the Kogarah War Memorial Olympic Swimming Pool Centre at Carss Park. GNFP also carried out a similar review of the centre in April 2011, commissioned at that time by the Kogarah City Council.

As noted in the next section, very little of the structural rectification work recommended in our initial report has been carried out and only minor but absolutely necessary work has been carried out on the filtration and water treatment system.

Given the current structural condition of the pools, particularly the 50m pool, the cost of replacement of the pools would not be very much more than the cost of repair and rectification (if possible) of the existing pools. It also needs to be appreciated that rectification works would be being carried out to pools where the retained structures have already reached their expected life span, hence an effective maximum future life span of perhaps ten to fifteen years would be achievable, compared with a life of new pools in the order of fifty to sixty years.

Given the above, GNFP recommends that the pools be removed and replaced with new compliant 50m and children's pools. The children's pool could include a Learn-To-Swim area, a beach entry area and a splash pad which could include attractive and appealing water features for children.

GNFP's high-level estimates of the replacement cost of the pools are \$3,700,000 for the 50m pool, assuming a 20m wide pool with an accessible ramp, and \$450,000 for the more appealing children's pool. These estimates do not include building works alterations or additions, pools and concourses demolition and associated removal costs, council and consultants fees, builder's margins or geotechnical studies and GST.

REPORT/REVIEW ON POOL AND TANK STRUCTURES, FINISHES AND JOINTS

1. INTRODUCTION AND BRIEF REPORT COMMENT

An inspection of the pool and tank structures, the finishes and the joints was undertaken by GNFP on 7th March 2019.

Inspection of the centre was previously carried out by GNFP on the 19th April 2011. Very little has changed since that visit, with only minor repair works being carried out where necessary on some of the defective tiles and joints. The original report has been attached as an appendix to provide full description of the structural issues, which are still similar and as relevant now as when the initial inspection was carried out.

The 50m pool's geometry, condition and state is still as it was at the previous inspection, with no significant changes made to allow for the major settlement experienced by the pool. No changes have been implemented to provide gutters and return lines which will improve the current (then and now) totally inadequate and non-compliant turnover rate and period to an extent where the rate is acceptable.

The children's pool is also in a very similar state to that when last inspected, in terms of structure, tile finishes and joint condition.

It should also be noted, as was noted in the earlier report, that the stabilisation of the 50m pool and related remedial work would require extensive piling and/or underpinning of the pool. The rectification work will now be more extensive and complex compared to that required in 2011, and the related costs would be significantly higher. As also previously noted, the settlement and movement of the pool is on-going, and will have further deleterious effects on the pool structure, the tile finishes and the joints as the pool gets older.

To obtain the required turnover rates and periods, significant structural work is required to provide compliant gutters and return reticulation pipes. Given the settlement of the main pool, significant structural changes to the walls and central floor slab are likely to generate significant damage to the existing structures, particularly in terms of concrete cracking.

GNFP's recommendation in the earlier report was that serious consideration should be given to the pool's replacement within the next few years from the time of that inspection. Our current recommendation is the same, with emphasis on the greater degree of deterioration now having been experienced by the structures over a further eight years.

REPORT ON FILTRATION AND WATER TREATMENT PLANT

2. INTRODUCTION

An inspection of the Filtration and Water Treatment (FWT) plant was undertaken by GNFP on the 7th March 2019. When comparing the capacity of the existing FWT plant for both pools with the current NSW MoH Swimming Pool and Spa Pool Advisory document, the existing FWT plant contravenes the document in terms of Turn Over Period (hrs) and Filter Plant Capacity (m³/hr).

A previous inspection of the pool plant was carried out on 19 April 2011. The unacceptable plant performance at that time, both in terms of pools turnover rates and periods and the non-compliant use of only a single system for both pools, was noted in that report.

GNFP recommends the following after the 2019 inspection:

1. The water body of each pool should be separated from each other with each being each filtered using a dedicated FWT plant and balance tank. As noted in the MoH Advisory Document, the smaller Children's pool is considered to be a high risk pool due to its intended purpose and function and requires a higher Turn Over Period than that required by the 50m pool.
2. The separate water bodies as noted above, will provide the opportunity for each pool to operate at different temperatures (using separate pool water heating systems) to suit the intended purpose and function of each pool.
3. A compliant modern day FWT plant will not fit into the existing plantroom and as such should be demolished to make way a new and adequately sized plantroom.
4. The new plantroom should be designed to enable chemicals to be delivered and stored in a safe manner that complies with current Codes and Regulations.
5. Introduce mechanical ventilation to the plantroom to extract any chemical vapours to help protect plant from corrosion.
6. GNFP recommend each pool be fitted with adjustable filtered water return fittings to ensure filtered water is returning evenly across each pool.
7. GNFP recommend both pools to have wet deck gutters i.e., gutters along both long sides of the 50m pool and on all four sides of the Children's. When combined with item 6 above, this ensures that contaminants within each water body are effectively skimmed and removed from each water body.
8. Electrical works and equipotential bonding work associated with the new FWT plant should be installed to meet current AS/NZ3000.

3. EXISTING POOLS AND PLANT

50m Pool – General Description and Assessment

The 50.0m long x 18.0m wide pool has water depths ranging from 1.5m to 1.8m approximately with a volume of 1305m³. Scum gutters run along each long side of the pool with 200mm wide x 125mm high slots at approximately 2200mm centres that discharge soiled surface water into a rear channel under the concourse. Soiled water from these channels pass through 1.0m long x 0.46m wide screening chambers located at each corner of the pool before discharging into the balance tank.

Filtered water returns to the pool through outlets along the centre line of the pool. High turbulence at the deep (southern) end of the pool indicate that filtered water is not being distributed back to the pool evenly and effectively.

Due to settlement of the pool structure, approximately 40mm diameter holes have been cored through the front face of the scum gutter tile on the southern end of the pool in an attempt to get an even flow of water across the length of the gutter.

In combination with the poor filtered water return and the existing gutters, GNFP consider that contaminants are not being removed from the pool effectively. As the highest concentration of pollutants in a pool are found

to be near or at the pools surface, GNFP consider that the function of these two elements in combination act as an important and integral part of a properly designed FWT plant.

Children's Pool – General Description and Assessment

The Children's pool measures 12.0m long x 6.0m wide with water depth ranging from 0.6m to 0.75m deep with full pool width stair entry to the eastern end of the pool. Soiled water is removed via one only outlet at the western end of the pool that is connected to the rear scum gutter channel of the 50m pool. Filtered water is returned to the pool though small FW outlet slots in the base of the stairs on the eastern side.

The pool structure has dropped approximately 75mm to the southern side of the pool. Refer to the structural section of this report.

GNFP consider that the pool is not being effectively skimmed as noted in the 50m Pool Assessment above.

Filter Plant

The plantroom is located approximately 25m to the southern side of the pool. The six cell concrete sand filter has a total filter area of 24.0m². On top of the filter is a multiport valve with ø200mm diameter cast iron discharge pipework that distribute soiled water to each filter cell.

The filter is backwashed into a pit located in the plantroom. Our advice from site is that the backwash water was discharged by an pipe into the bay. We believe, given the remaining presence of the discharge pipe and its flow of leakage water into the bay, that probably the same process is still used for the backwash water.

A pipe culvert runs from the balance tank to the plantroom and contains all flow and return pipework. Soiled water from the balance tank is pumped via a Southern Cross model 150x125-250/257 (15.0kW) main recirculating pump and is providing an estimated flow of approximately 200m³/hr. The existing ø500 x 250/200 stainless steel pre-pump strainer is of unknown origin.

The suction pipe is 300mm diameter from the balance tank and reduces to 200mm diameter PVC pipe just outside the plantroom. Pump discharge is ø150mm diameter soldered copper pipe and fittings and connects to existing cast iron pipe at high level in the plantroom. The water is filtered through the concrete filter and returned to the pool via ø200mm pipe that connects to the pool structure (within the balance tank) and is returned the pool water body via outlets equally spaced along the pool length.

The suction connection of an Astral Maxim 4.0kW boost pump is connected to the filtered water return line of the 50m pool and delivers filtered water water to the children's pool.

General Assessment of Plant and Equipment

All items of plant are generally easily accessible.

A general assessment of major items of plant is as follows:

1. Main Recirculating pump – Very good condition.
2. Children's Pool Boost pump – Poor condition with corrosion evident.
3. There are no electrical interlocks between both pumps nor chemical plant. Interlocks (by way of flow switches installed in the pumps discharge line) are an important and integral part of the system design whereby all flow dependant equipment that is installed downstream of the filter cannot be operated unless power is being consumed by the recirculating pumps.
4. Pre-pump strainer – Stainless steel construction of unknown grade. Fair condition and without any visible signs of leakage. An internal inspection was not carried out to determine their internal condition.
5. Concrete Sand Filter Pipework – An external visual inspection was carried out from the embankment to the south of the plantroom. There were no signs of any leakage from any flanged joints on the multiport valve or pipework nor any from the access hatches at each discharge pipe connection the filter. Given the age of the cast iron pipework, it is quite possible that the internal surface of the pipes will have significant corrosion. Refer to the structural section of this report for its structural condition.

6. Plant Piping
 - Pump discharge pipework – Constructed from soldered copper pipe and fittings. No leakage was evident but UPVC is highly recommended due to the corrosion potential of copper and chlorinated water.
 - Plant piping is generally as originally installed and is installed as well as it can be given the constraints of the plantroom.
7. The plantroom lacks any form of appropriate ventilation particularly considering the amount of chemicals stored with in the plantroom.

Technical Details of Existing Pools

The technical details of each pool is accessed as follows:

Table 1 – TECHNICAL DETAILS FOR EXISTING PLANT		
Pool	50m	Children’s
Surface Area (m ²)	900 (50x18)	72
Av Depth (m)	1.45 (1.1 to 1.8)	0.675 (0.6 to 0.75)
Volume (m ³)	1305	50
Total Volume (m3)	1355	
Filter Area (m ²)	24.0 (6 x 4.0m2 cells)	
Filter Plant Capacity (m ³ /hr)	200 (50m = 180, Children’s = 20)	
Actual Turn Over Period (hrs)	7.2 (50m pool) and 2.5 (children’s pool)	
Required Compliant Turn Over Periods (hrs)	2.7 (50m pool) and 0.9 (children’s pool)	

Note

The plant capacity of 200 m³/hr has been assumed based from the manufacturers pump curve at the pumps BEP and should be used as a guide only. The flow of 25,500 GPM indicated on the existing flow meter installed within the plantroom has been ignored as it does not correlate with the pump curve of the installed recirculating pump.

4. CHLORINATION, pH CORRECTION & CHEMISTRY CONTROL

Chlorination

Chlorination is obtained from liquid sodium hypochlorite. Sodium hypochlorite is stored within a 2500 Lt bulk tank located within a brick bund within the plantroom. An assessment of the plant is as follows;

1. The bund does not comply with Orica requirements. The brick work structure has deteriorated and is considered to be in a very poor condition. The bund is uncoated internally and more than likely, would not contain a major spill.
2. The delivery point connection is external of the plantroom. Although in close proximity to the storage tank, the tank is not in direct sight of the delivery operator. The tank has an overflow outlet, but it is required to be located within sight of the delivery operator.
3. The storage tank is considered to be in poor condition and should be replaced.
4. No assessment of chemical delivery access was undertaken at the time of inspection. Truck delivery access is required to have spillage containment and is to be to the EPA and Workcover requirements.
5. The existing safety is a hand operated combination safety shower and eyewash. It is in a reasonable condition but is located poorly within the plantroom. GNFP consider its location would not meet

requirements of the relevant Australian Standard nor AS3000 with control panels and their locations to showers. GNFP recommend a combination hand and foot operated safety shower and eyewash.

- The chemical dose pump is in poor condition with severe corrosion and leakage evident and should be replaced.

pH Correction

pH correction is provided by hydrochloric acid with spare chemical stored within 15 Lt carboys. Carboys are manually decanted into a 100 Lt DEX Poly tank with outer bund, both bund and tank are in good condition.

The Prominent Beta 4 chemical dose pump is in a fair condition.

Chemistry Control

Water chemistry is automatically controlled by a BECS System 3 and is in a fair condition. The unit appears to have been serviced in October 2018 and is deemed to be in good working order.

Chemical Storage

Spare acid and liquid chlorine carboys are stored on raised movable pallets. All chemicals are in close proximity to each other and would not comply with AS3780 with regards to separation distances.

5. ELECTRICAL

The existing pool control (switch) board would more than likely not comply with AS/NZ3000 and will need replacement complete with PLC and display, dedicated RCD's to each electrical item and safety interlocks.

6. COMPLIANCE WITH CURRENT NSW MoH HEALTH GUIDELINES

As stated in Table 1, the turn over period for the 50m pool plant of 7.2 hours and 2.5 hours for the Children's pool are both extremely deficient at around 37% and 36% respectively of what is required currently for new pools of these sizes and uses.

GNFP would recommend each filter plant be replaced to comply with the NSW MoH Advisory document. Preliminary technical details of each pool as required by the Advisory Document is assessed as follows;

Table 2 – TECHNICAL DETAILS FOR NSW MoH COMPLIANCE				
Pool	50m		Children's	
Volume (m ³)	1305		50	
Turn Over Period	2.68		<0.9	
Filter Type	SAND	UF	SAND	UF
Plant Capacity (m ³ /hr)	488		56	
Nominal Filter Rate (m ³ /hr/m ²)	25	3.75	23	3.7
Filter Area (m ²)	19.5	130.0	2.4	15.0
No Filters x Area (m ²)	3 x 6.5	2 x 65.0	2 x 1.2	1 x 15.0
Filter Manufacturer	Chadson	Atlas	Chadson	Atlas
Budget Estimates (Excluding GST) – See Note 1	\$690,000	\$890,000	\$85,000	\$110,000

Note 1

These budget estimates are based on new pools of the same size and depth each with new dedicated FWT plant for each pool complete with reticulating pipework outside the plantroom. They do not account for any building works, pool structural works nor heating plant.

As noted in the structural report, GNFP consider the pools to be in an extremely poor condition and recommends the pools be replaced, each with dedicated balance tanks and plant systems. Separation of each pool water body and compliant Filtration and Water Treatment (FWT) plant for each pool is considered mandatory.

GNFP recommend the demolition of the existing plantroom and sand filter structures due to their poor condition. Construction of a new appropriately designed plantroom would need to be constructed to house each new FWT plant with appropriate provision for compliant chemical storage, associated delivery infrastructure and adequate plantroom ventilation.

GNFP's understanding of the disposal system for the backwash water is that currently the backwash water goes into a tank which is connected to the trade waste system. If however the tank is full when backwashes are undertaken, we believe that the backwash water tank overflows into a pipe which discharges into the adjacent sea water. This pipe also appears to act as a disposal system for leakage water from the pool infrastructure. A new adequately sized backwash detention tank should also be provided below the plantroom floor to provide detention and settlement and approved disposal of wash water to sewer.

Preliminary process treatment of each new plant will be as follows;

- Soiled water collection via a wet-deck grating systems/drains.
- Initial screening via approved gutter baskets/screen chambers.
- Discharge of soiled surface water into dedicated balance tanks.
- Direct suction from each balance tank with approved screened footvalves, recirculating pumps and pre-pump strainers.
- Automatic & proportional control of disinfection residuals using either sodium or calcium hypochlorite.
- Automatic & proportional control of pH levels using carbon dioxide gas with a supplementary dry acid system.
- TDS control (manual control for the sand filter option, automatic control for the UF Filter option).
- Filtration through medium rate sand filters with half duty pump sets or regenerative Pre-coat filters equipped with dedicated pump sets.
- Reverse flow cleaning of the filters into a Backwash Detention Tank (BDT) sized for the wash water volume plus an allowance for collected solids and over run.
- Disposal of settled clear water via a wastewater discharge pump and specified controls. Note that a bag filter/separation tank would be used with the UF option to ensure that used filter media is not inadvertently discharged to waste
- Return of treated/filtered water to strategically placed adjustable nozzles.
- Provision for pool emptying via a valved connection within the specified Balance Tanks.
- Overflow provision and automatic cold-water make-up within each pool's balance tank.
- Periodic removal of backwash sludge (from the BDT) according to a Trade Waste Agreement.
- Manual vacuum cleaning of pool floors, as and when required.
- Electrical and equipotential bonding requirement to AS3000

SUMMARY

The existing filtration and water treatment plant for the pools is significantly inadequate and non-compliant in that it services two extremely different pools of totally incompatible MoH water turnover rate requirements.

Whether the existing pools are retained, or new pools replace the existing pools, entirely new and separate filtration and water treatment systems are required for the pools. The existing plant is also inadequate to service the 50m pool alone (only approximately 30% of the required capacity) without consideration of the other pool.