Hobsons Bay City Council

Williamstown SLSC Pool

TECHNICAL REVIEW

JWC Engineers

JUNE 2018

Document History

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1 Introduction

JWC engineers has been engaged by Hobsons Bay City Council to undertake a technical review of the pool shell at the Williamstown Swimming & Life Saving Club (SLSC).

The Williamstown SLSC comprises an outdoor pool / plantroom, and clubhouse.

The age of the pool is not known but online research indicates that Williamstown SLSC was operating in the 1930's and it appears that the pool was built about this time, if not earlier. That makes it at least 90 years old.

It is located on the Esplanade, Williamstown opposite Victoria St. It is located less than 20m from the swimming beach.

2 Purpose

The purpose of the review is for future planning. Independent technical advice on the condition and remaining life of the pool shell structure will help Council's strategic direction of the facility.

Key issues have been identified that could impact on funding allocations over the next few years. Observations will be interpreted to provide high-level advice to Council.

Council's email dated 10 April requested:

> Council would like *the scope revised so that the investigation is geared to answer exactly how much remaining life the pool shell structure has. Other questions regarding eg. age of tiles, the pool plant are not important until we know the future of the pool structure. Any investigations (destructive or otherwise) would need to be completed as part of the report.*

After this email it was agreed to separate the field testing into a provisional sum so that the test scope can be better identified after the initial site inspection. However, field testing is not expected to be possible until later in the year. Refer Section 5.

The review is confined to the pool shell structure. Pool plant, buildings and other external features are not included at this stage.

3 Previous Technical Report

Council engaged FMG Consultants to undertake a similar assessment in late 2017. Their Engineering Investigation Report, 3 Nov 2017 was requested to be peer reviewed as part of this report. JWC comments in FMG clauses are provided below.

Item	FMG clause	Description / JWC comment
1	3.1 – 3rd BP	*Concourse drain near northern control joint, western end. Overflowing with sand when flow was reversed due to emptying the pool.*
		This issue will need to be investigated as part of the leak test program as it is a tell-tale sign of a problem with the piping. The sand overflow seems consistent with sand foundation / backfill, refer section 8.3 JWC report, and section 3.4 FMG report.
2	4.2	*it was likely never designed to be 'water retaining' given that the water was being pumped from the ocean directly into the pool and then flushed back out to the ocean.*
		In my opinion the designer would be striving for a water retaining pool for structural reasons alone, irrespective of the 'water treatment' adopted. However, this is now academic as both FMG and JWC agree that a water retaining pool is necessary.
3	4.3	*Significant work is required in order to retrofit sufficient waterproofing into the pool. [*remedial methods / options provided*]*
		Prior to canvassing remedial methods there is a need to firstly identify / confirm actual and potential leak paths for works to be targeted. The leak detection program recommendation has this as its primary objective.
4	4.5	*The pool is out of level. The main issue associated with a pool being out of level is an un-even distribution of filtered water / soiled water suction. As the suction is located at the deepest section of the pool and the pool is configured with scum gutters only providing limited surface skimming, this is not of a large concern to FMG. Given the age of the pool the quantity of movement is considered acceptable and will likely remain at its current level going forward (or close to).*
		In my opinion the pool being out of level potentially has material structural implications (discussed in report), as well as the mentioned loss of surface skimming capability. Surface skimming is the primary

		means of removing soiled water rather than floor suction outlets, however restoring the gutter (or pool) to level will be costly, making it difficult to justify on a 90-year-old pool.
5	4.15 (3)	*Re-tiling of the pool and coping beams. Whilst the pool is being retiled it can also be made to be 'water-tight'.*
		The implication that reliance can be placed on tiling for water-tightness is not supported by JWC. The concrete structure and expansion joint systems are the primary water proofing mechanisms, and this should remain the case if possible, i.e. remedial works should focus on the concrete structure and joints in the first instance.

4 Site Inspection

The site inspection was carried out on 8 May 2018. The pool was already in winter mode with the treatment system turned off. The pool had drained down some 600mm since the season end and the water was green; this prevented any underwater inspection.

The pool operator was not present on the day of the inspection for discussions on the technical background albeit it should be noted that background information on the water treatment plant rather than the shell is where these discussions are of most value. It is assumed that the SLSC members operate the pool.

5 Field testing

The scope included a provisional sum for field or destructive testing of the concrete shell. Unfortunately, water in the pool precluded coring of the concrete floors and walls. In addition, a leak testing program is needed but this requires the pool to be full and with clear water. Other testing may be found warranted that will help gauge the level of carbonation and steel corrosion risk on an area-wide basis rather than the sample basis obtained from coring.

Thus, it is recommended that this testing be done in spring just prior to the start of the season when the pool is firstly emptied and then filled with clear water. It is noted that the FMG inspection was undertaken at this time of the year and the pool was empty at the time.

6 Facility Description

Indicative of its age, the pool is the old imperial length of 33 yards, which converts to 30.17m.

It is understood that it was originally a seawater pool and was the converted to a treated system. The current treatment system is relatively new, and it is not known when it was originally converted from seawater-only operation.

The facility comprises:

- 33 yard (30.17m) outdoor pool;
- Plantroom / water treatment plant;
- Solar heating;
- Club house.

For the purposes of this report the pool is orientated north / south with the deep end at the north end closest to the clubhouse.

Refer to **Images 1, 2, & 3**.

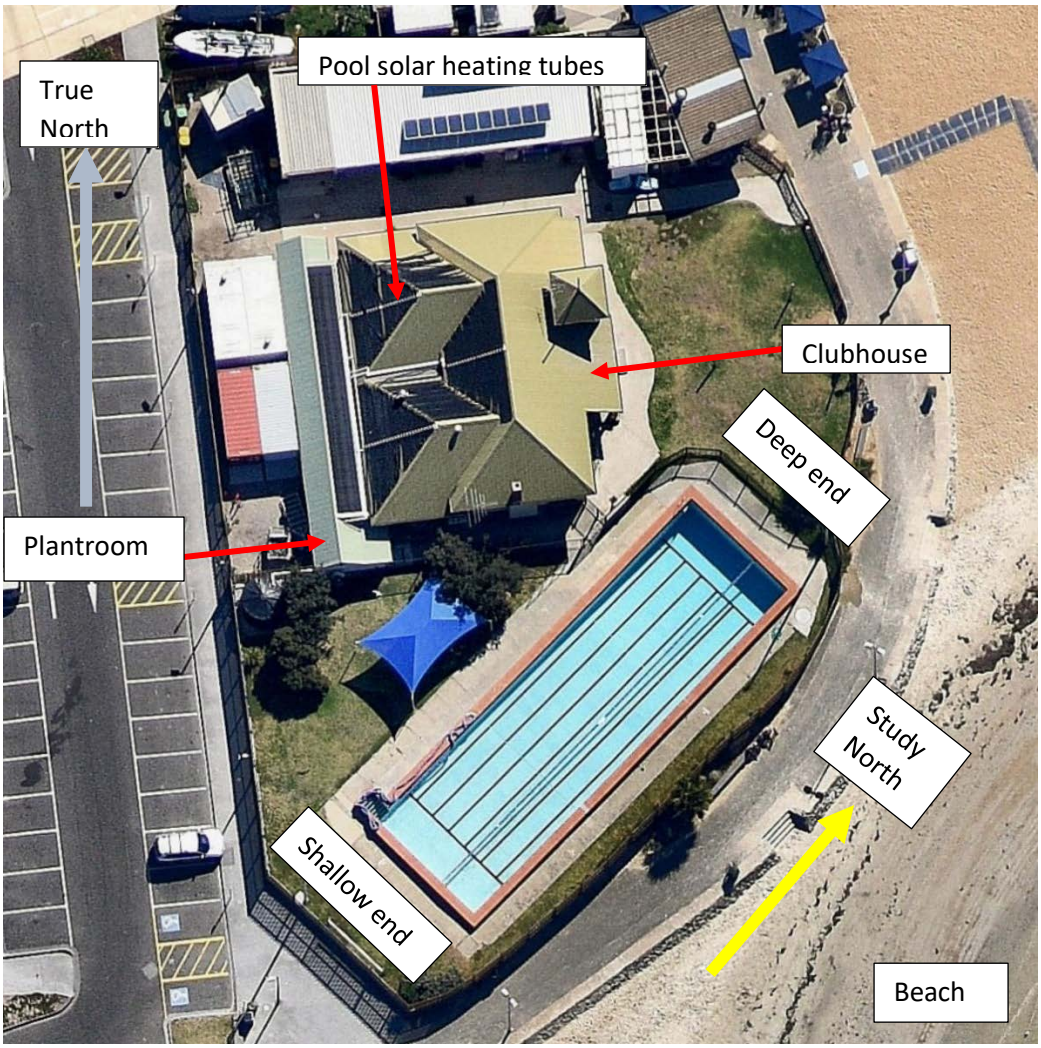

Image 1: Aerial photo

Image 2. View looking SE past clubhouse to pool.

Image 3. View looking NE to pool and clubhouse.

7 Pool

7.1 General

The 6 lane, 33 yd pool appears in poor to fair condition, indicative of its age.

Pool dimensions are provided in **Table 1** based on measured depths.

Table 1

33 yard Pool – Dimensions and Calculated Volume

	Length (m)	Width (m)	Depth sign max (m)	Depth sign min (m)	Total Volume (m^3)
33 yd Pool	30.17	9.2	2.55	0.95	**486**

Refer **Images 4, 5, 6 & 7** for general views.

Image 4. Looking SE towards shallow end.

Image 5. Looking north at deep end.

Image 6. Looking south at shallow end.

Image 7. Concourse on west side.

Image 8. Concourse on east side.

7.2 Pool Leaks

Given that the pool has dropped some 60cm in the few weeks since summer season ending, and at a time of the year when evaporation and rain would be broadly equivalent, there is clearly water loss occurring. This will be either from the pool shell / joints, and / or from the pool pipework to the plant room.

The FMG report mentions water ingress observed through the expansion joints and these have since been resealed in response to the FMG report.

FMG also mentions potential leaks through the pool pipework into the pool at the shallow end due to pipe misalignment. This is consistent with the severe settlement at this end and the implications of this on connecting pipework.

A leak testing program of the shell and pipework is recommended and should be undertaken by a specialist company such as Australian Leak Detection (ALD). This would typically involve dye tests and hydrostatic tests, as well as acoustic tests of underground pipework.

7.3 Pool Structure & Levels

The pool has two expansion joints across the width at third points and thus it is divided into three equal sections.

Levels taken around the pool perimeter show a significant settlement at the southern end of up to 6 or 7cm. Sighting along the pool hob confirms this and that the southern third has pivoted downwards around the southern expansion joint, i.e. the central and northern sections are reasonably level.

Given the proximity to the beach, there is strong likelihood of sand dominated foundation soils and with the high ground water levels observed (as above) it is possible some sand foundation material has eroded away from under that end of the pool and contributed to the settlement. In this situation there is clearly an added imperative to minimise pool leaks.

The impact of this settlement on the remaining life of the pool (i.e. separate from any concrete quality issues) can only be gauged qualitatively. If the status quo is maintained and

the settlement has stabilised, then the remaining life could be in the order of 20 to possibly 30+ years. If settlement continues (i.e. does not stabilise), then the remaining life would be significantly shorter. Settlement should be monitored on an annual basis so that there is baseline data to reference the measurement.

Notwithstanding, from the visual assessment of that above water level, there is nothing to suggest that the structure is unsound in a material way.

7.4 Water Distribution in Pool

Visual inspection of most o the pool, other than of the scum gutters, was not possible because of the water in the pool and thus these comments are based on raw data provided in the FMG report.

Soiled water is collected by scum gutter tiles around the full perimeter. The gutter drains to outlets, 100 x 50mm, and there are 7 along each side and 2 at each end, giving 18 in total. See **Image 22**. While this scum gutter tile configuration is consistent with the importance of a continuous skimming system around the perimeter, their hydraulic capacity is limited by the gutter size and is considerably less than current day systems.

FMG advise that filtered water is supplied into the pool through four (4) pipes (about 100mm dia) through the base of the wall at the shallow end.

This water distribution arrangement is not common these days and could result in 'dead' spots at the deep of the pool. This will only be compounded by the settlement at the shallow end because the scum gutters at the deep end could be above normal operating water level. This could leave the dep end of the pool with limited recirculation.

7.5 Pool Uplift Risk

The water ingress through the expansion joint described in the FMG report shows that there was a high ground water level outside the walls. This is, partially at least, likely a consequence of pool leaks themselves.

This high ground water level, when the pool is pumped down to empty, potentially presents a significant risk of pool shell uplift. This will need to be carefully monitored when the pool is next fully drained for maintenance. FMG recommend hydrostatic valves be installed and we would support that.

Further, the risk of uplift can be forecast to some extent from knowledge of the surrounding ground water levels relative to the pool floor at the deep end. The manhole in the NE corner (see **Image 9**) is expected to be for this purpose, that is:

- Identify ground water level;
- Allow pump down of ground water.

The pit should be pumped down and cleaned out so that the base can be investigated for its functionality in this regard.

The access ladder is corroded and unserviceable, replacement is needed. See **Image 10**.

Image 9. Pit at NE corner, 1.65m to water level. Expected purpose is ground water pump out.

Image 10. Pit at NE corner.

7.6 Step & Ladder Entry

There is one step entry ladder at the deep end. This is stainless steel and in average condition. There is minor rust around the base plates and fixings, but stainless-steel polishing should be sufficient to restore the aesthetics.

The bottom ends of the ladder were below water level and were not able to be seen. It is important that the bottom ends of the ladder are rounded and has no sharp protrusions that could be an injury hazard to swimmers; if so this should be rectified. See **Image 18**.

At the south west corner there is a step entry into the shallow end. See **Images 11, 12 & 13**. A horizontal offset (see **Image 13**) is a potential injury hazard and should be remedied.

The pool hob height is high at 500mm, and well above code compliant step heights which has a maximum of 225mm. Steps on the outside of the hob at both ladder and step entry are recommended. Some form of post, each side of the bottom step would be recommended to guard against the potential trip hazard.

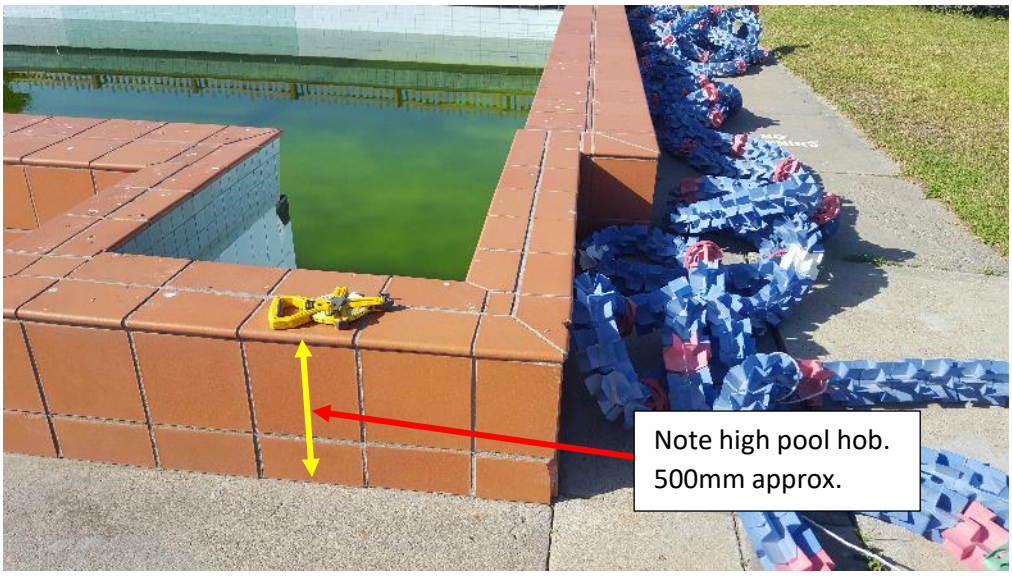

Image 11. Step entry at south west corner.

Image 12. Step entry, looking north.

Image 13. Step entry, looking west.

7.7 Depth Signage

There are no depth signs, and this is a priority in the recommendations.

7.8 Pool Blankets

There are no pool blankets. With a solar heating system installed there would be benefit in also having blankets although it is recognised that this capital cost has no monetary payback because of the heat energy is 'free'. However, it would improve the amenity but this would be a decision for Council and the SLSC.

8 Concourses

The concourse slabs around the pools are generally in fair condition.

There are a number of small rust stains around the south west corner; these indicate corroding reinforcement and should be monitored for any delamination which will demand action. However, slab reinforcement is typically for shrinkage control only and the slab is usually not structurally reliant on it. See **Image 14.**

It is noticeable that some individual slabs around the northern end / sides of the pool have settled relative to the pool shell. Settlement is up to 1- 2cm. See **Image 15 & 16.**

However, at the circular pit near the north east corner (see **Image 17**) the slab here looks relatively newer than others further south and has settled relative to the pool but not relative to the pit itself (which is deep at 1.65m to water level). This implies that there has been long term settlement of the pool backfill around this end of the pool, and to a depth that compasses the pit, and that this has driven some slab replacement at some point.

This settlement does not appear to adversely impact the concourse in a material way and cosmetic repairs around the pool hob is all that is required at this stage.

Image 14. Concourse at south west corner.

Image 15. Concourse at north west corner.

Image 16. Concourse at north west corner.

Image 17. Concourse and pit at north east corner.

9 Tiling

The pool is fully tiled, including the pool hob and down to the concourse level. Only the top portion of the walls could be observed due to the water level.

The tiling is in poor to fair condition, essentially reflecting its age. There has been recent tiling refurbishment because of the FMG report and comparing their photos in November with the situation now, these repairs have been quite extensive.

However, after many years of this approach, there are numerous patch repairs in the tiles themselves (especially the scum gutter tiles) and small areas of tile replacement, most predominantly at all four expansion joints.

Ongoing maintenance will be required on a regular basis to keep it safe for swimmers, and for aesthetics. See **Images 18, 19, 20, 21, 22, 23, 24 & 25.**

Image 18. North west corner of pool.

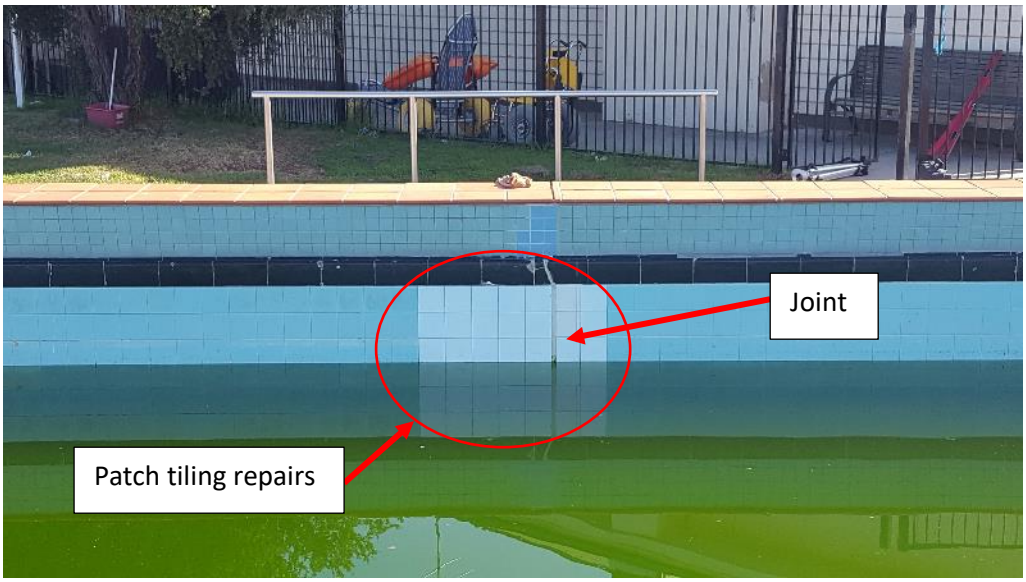

Image 19. North west expansion joint.

Image 20. South west expansion joint. Similar tiling repair as north west joint.

Image 21. North east expansion joint.

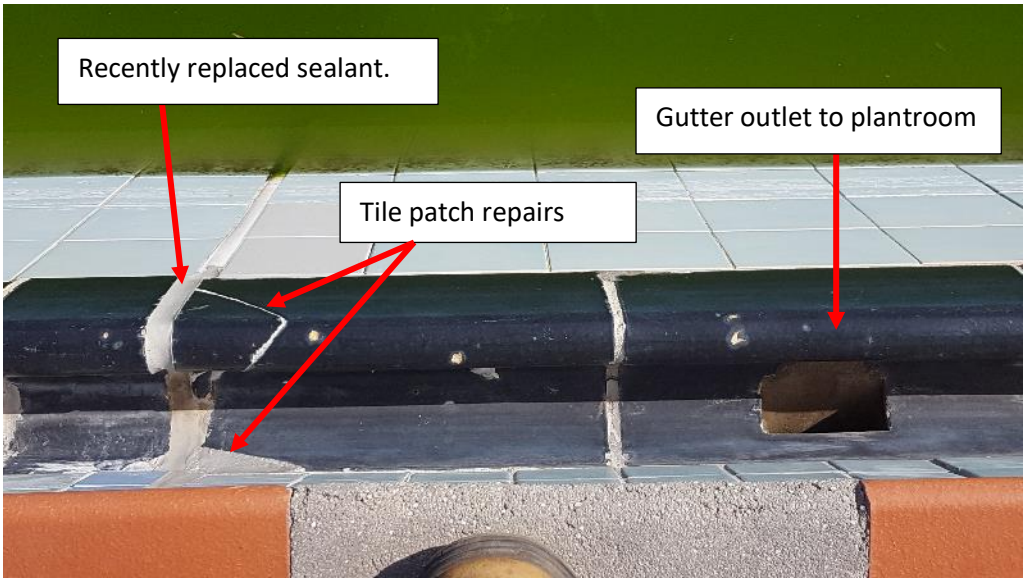

Image 22. North east expansion joint. View looking down.

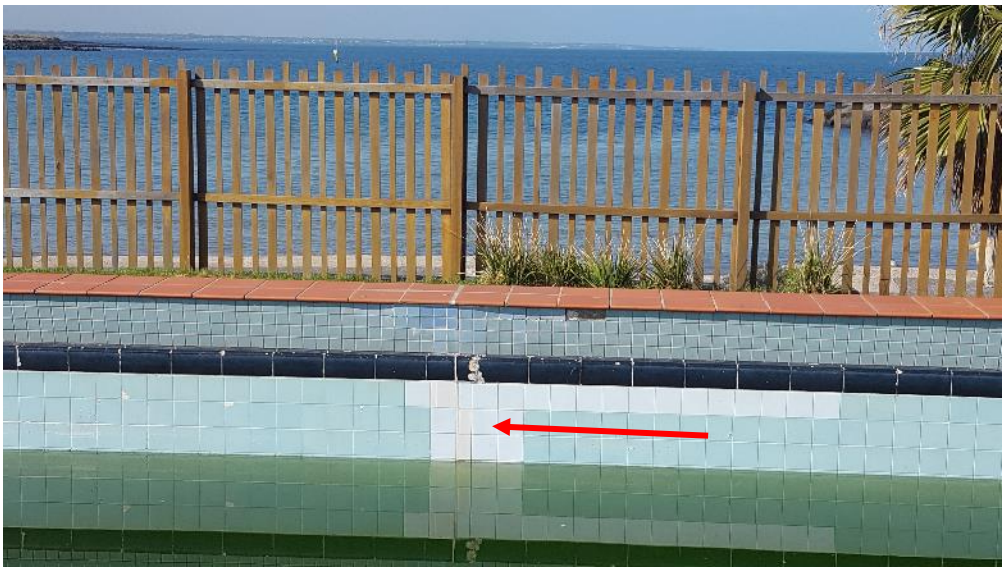

Image 23. South east expansion joint.

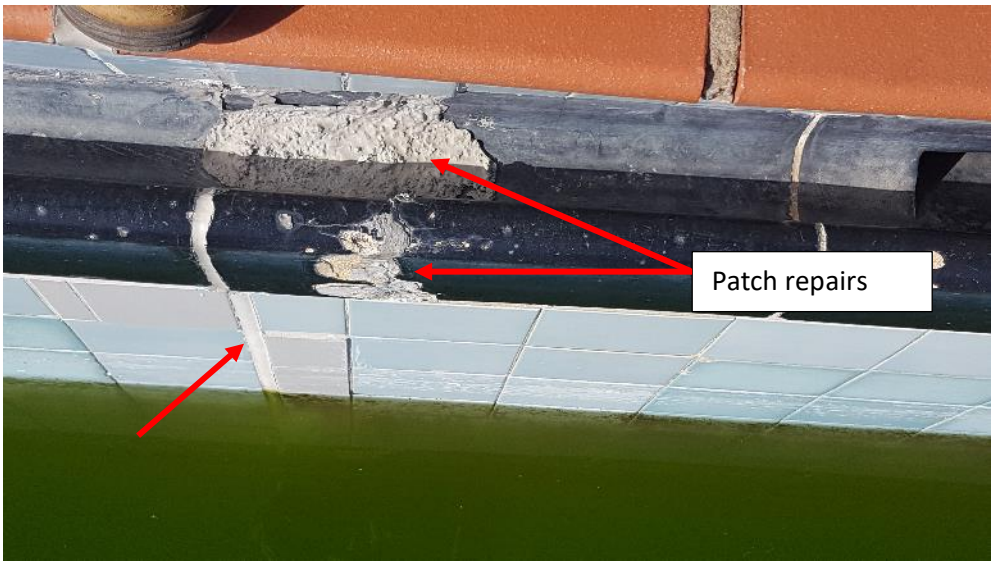

Image 24. South east expansion joint. View looking down.

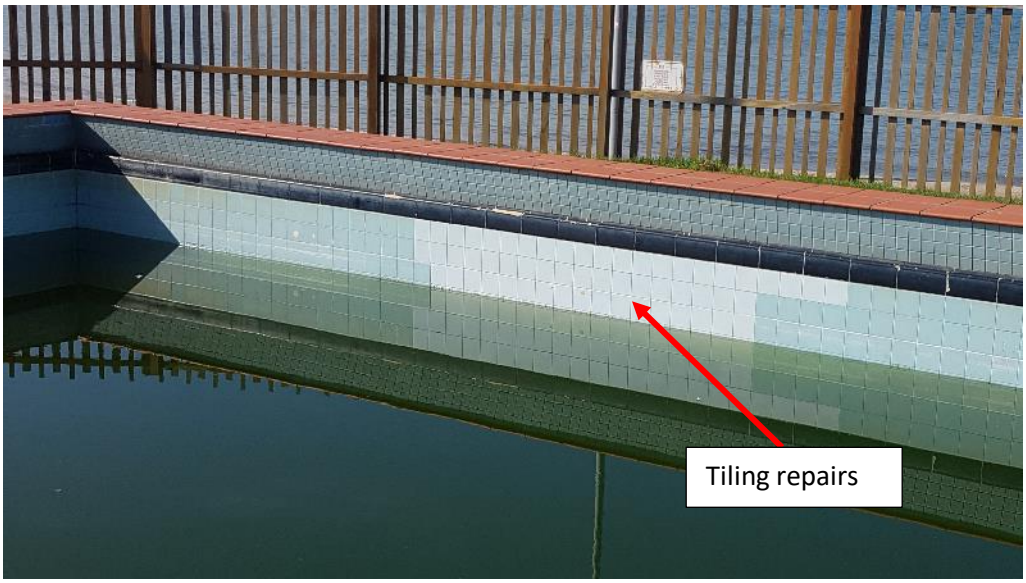

Image 25. North east corner.

10 Recommended Works / Tasks

Recommended works and tasks are provided below.

This list does not include major works that will ultimately be required based on the findings of the field and destructive testing to be undertaken later in the year.

The works list does not necessarily include all typical maintenance works (e.g. tiling maintenance), preventative or otherwise, that would be considered part of normal operations.

Recommended Works and Tasks

Item	Description	Opinion of Probable Cost (excl GST)
1	Leak test program and concrete coring of pool shell. Undertake in Spring 2018.	$2500 (nom. provisional sum)
2	Check sand entry into concourse drain at NW corner during leak testing program. Implement repairs. (refer FWG report)	$5000
3	Pump out and clean pit in concourse at NE corner and assess for incoming pipes. Test to where pipes connect and check functionality for pumping down groundwater. Reinstate or make operational as required.	$10,000
4	Replace access ladder in pit	$1000
5	Install hydrostatic valves	$10,000
	Stainless steel pool entry ladder to be checked at bottom ends of legs for safety. Allowance to rectify.	$2000
	Step entry – make sharp coping tile offset at top of hob, safe for swimmers.	$500
	Steps / post on outside of hob at ladder and step entry	$2000
	Annually monitor and record settlement of pool shell against a defined temporary benchmark	$1000 / yr
	Provide depth signage	$1000
	TOTAL	**$35,000**

11 Conclusion

Generally, this 90+ year old pool, indicative of its age is considered in poor to fair condition.

Field and destructive testing is proposed for October 2018 (prior to season start) and these findings will allow remedial works to be identified in a targeted manner, and scope documents and costings to be prepared.

Setting aside these major remedial works, this report identifies $35,000 of work required in the short term (some this winter).

The pool is leaking and has suffered from significant settlement at the southern (shallow) end and this is, partially at least, expected to be related to the pool leakage. Thus, there is an imperative to repair the leaks to help maintain a dry foundation. This will help extend the remaining life of the pool shell.

The tiling has recently had major repair works in early 2018 but is still dated and has many minor issues. It will be an ongoing maintenance item.

There are two prime factors influencing the life of the structure: settlement and concrete condition. Assuming the field tests find the concrete itself still in reasonable condition, the expected remaining life of the pool could be 20 or 30+ years provided settlement at the southern end does not become worse. If it does, then this could reduce to 10 – 20 years.

The findings of the concrete testing will allow a more comprehensive assessment to be made at the that time.

12 Closure

Thank you for the opportunity to assist Council in this project. Should you have any queries regarding this report, please contact me on the number below.

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