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Date: 12/11/2024 9:57:39 PM

Subject: Memorial Pool Meeting Notes and Recommendations

Attachments: Memorial Pool Slab on Grade Observations.pdf

Hi Mike,

Thank you for the meeting on site last Monday 9th of December. Below are the notes from our discussion. Please let me know if I have missed any points.

Meeting notes

- The Memorial Pool comprises both the lap pool and the leisure pool.
- BVL indicated that both pools are experiencing water loss, though it's unclear where the leaks originate. The average estimated water loss is about 90m³ per day.
- BVL suspects that the leaks may be occurring through cracks in the pool walls, particularly in the south wall of the main pool. This was tested using red dye in the south wall rectangular mouths, which indicated seepage into the pool through the tiles, as shown in the previously provided photo.
- The Memorial Pool complex is 70 years old and may have undergone renovations during its lifespan. However, Mike, who has worked with BVL for 17 years, has not seen the pools re-tiled during this period. It is unknown when the pool structure was last inspected for cracks, corrosion stains, or other signs of deterioration.
- Mike observed that there are no visible cracks at the bottom of the pools and no indications of concrete spalling or bowing in the walls, which might suggest potential issues.
- Cracks run parallel to the long side of the lap pool in the adjacent slab on grade, and these are evident on both sides of the pool. Refer to pages 1 and 2 on the attached PDF.
- Furthermore, the slab on grade near the leisure pool has subsided by approximately 20mm in some areas. Grinding was carried out to make the joints flush and eliminate tripping hazards. Refer to page 3 on the attached PDF.
- We understand that BVL would like to explore the causes of water losses at the Memorial Park pools. Please refer to the recommendations below.

A few questions came to mind following the meeting and might help identifying the issue:

- When did the water loss start? Do you have records of the daily top ups, or at least monthly water meter readings?
- Are there any other signs of the water loss, such as settlement in grassed areas, or seepage/wet spots/better grass growth down slope of the pool?
- From the learners (leisure) pool drawing provided, it appears that the inlet pipe runs beneath the pool bottom slab and is not encased in concrete. Pipes could have moved and cracked, or just deteriorated with time. Have BVL undertaken CCTV of the existing services? A flexible lead with camera can be used to inspect pipes for holes or cracks.

Recommendations on next steps

- BVL indicated that some work has been undertaken to reduce the water loss. However, given the significant volume lost daily, there may be issues with the inlet and outlet pipes. We recommend starting with an inspection of the existing services before exploring more complex and costly options.
- We understand that the water loss is measured directly from reading a pressure/volume gauge. Determining whether the lost water originates from within the pool itself or is lost en route can be challenging. Could you please detail the methodology used for measuring daily water loss? A marked-up drawing or a discussion during a Teams call would be highly beneficial.
- We recommend isolating the pools to measure water loss using an alternative method. An option can be to turn off the pumps and close all inlet and outlet valves to measure water loss which in theory should only escape through any existing pool cracks. We suggest measuring and extrapolating the lost volume by recording the water level relative to the concrete nib edge at all 4 corners. This should be done at night after the pool is closed to the public, and again in the morning before the pumps are activated and the valves are opened. This may assist in determining if the water loss is reduced without pump pressure which, could provide valuable insights.
- In addition, we suggest to evaluate if dye testing could be used to track flow out of the pool, when all pumps are turned off and the pool is not in use.

Recommendations for the off-season period (March-November)

We recommend completing options in 'next steps' above, before starting with the investigations below. As this may help refine areas of interest and risk.

Should the above measures not help identify the source of the water loss, we can assist with additional investigations, including:

Structural investigations:

We can assist BVL to investigate potential cracks in the pool walls and slabs. We can assist as follows:

- Undertake a review of the existing structural drawings for the two pools.

- Develop intrusive investigation sketches for a contractor to enable inspection of the pools' inside and outside wall faces and bottom slab top face. Note that this will require identifying preferred BVL (and structural) locations for investigations, as a contractor will have to remove tiles and adhesive, and cut holes in the adjacent slab on grade and remove some of the back fill around the pool to enable access for concrete inspection.
- Conduct a site inspection to identify cracks, measuring both their width and length. Additionally, examine for any other signs of concrete deterioration that may be occurring. If possible, it would help if this work was informed by dye testing at the locations of interest.
- Prepare a site visit report of the inspected area, including photos, measurements and relevant information.
- Summarise the findings and provide recommendations.

Geotechnical investigations:

BVL expressed concern that potential voids could be forming under and around the two pools. We can assist BVL to investigate this issue and recommend a staged approach is adopted as follows:

1. Carry out a non-intrusive investigation using 2-3 geophysical methods to identify locations of potential voids or anomalies (e.g ground penetrating radar and electrical resistivity test)
2. Carry out an intrusive investigation targeted at the locations of potential voids or anomalies identified
3. Review and interpret the investigation outcome, summarise the findings and provide recommendations

We can assist as follows:

- Coordinate with a geophysical investigation specialist (e.g. RDCL) to establish the most suitable investigation techniques to use. We expect this to include ground penetrating radar plus one or two other methods, e.g. electrical resistivity
- Develop a technical brief for the geophysical investigation contractor and obtain a quote on behalf of BVL to enable them to commission the contractor.
- Coordinate with the geophysical investigation specialist during the fieldworks.
- Review the findings of the geophysical investigation and develop a scope of targeted intrusive investigation. This would likely comprise hand augers with in situ testing.
- Undertake the intrusive investigation fieldwork.
- Review and interpret the results from the staged investigations, summarise the findings and provide recommendations.

We understand any pool and fieldwork investigations will need to be carried out during the off-season when the pools are closed to the public.

I hope the above notes and recommendations make sense. Please let me know how you would like to proceed.

Best Regards,

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