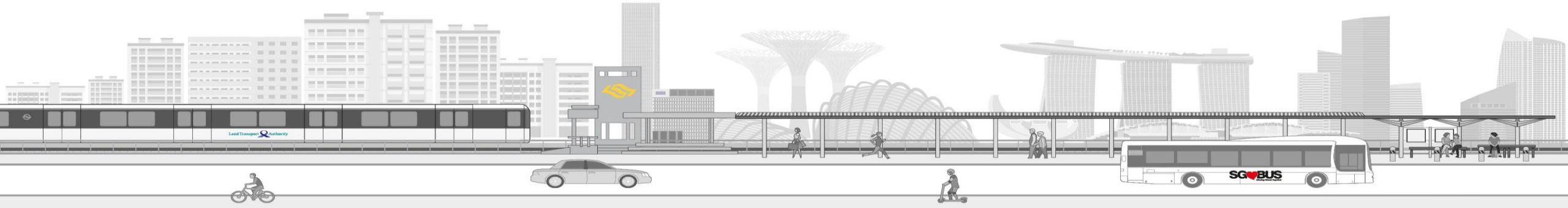
Theme 2: Lean Maintenance

Problem Statement 3:

Develop a system to detect and divert away water seepage to reduce the formation of potholes and road stains on road pavements

Presenter – Keith Cheok (Bridges & Tunnel Management)



THEME 2: LEAN MAINTENANCE
3. Detection and Diversion of Road Seepage

➢Situation:

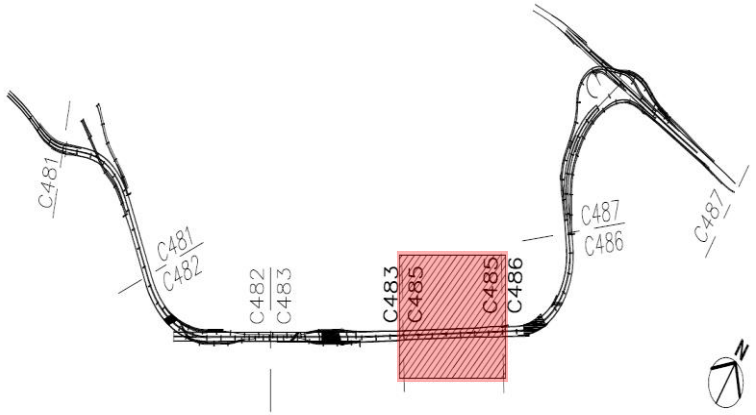
A stretch of the MCE road tunnel is located under the seabed and is subjected to constant high hydrostatic pressure

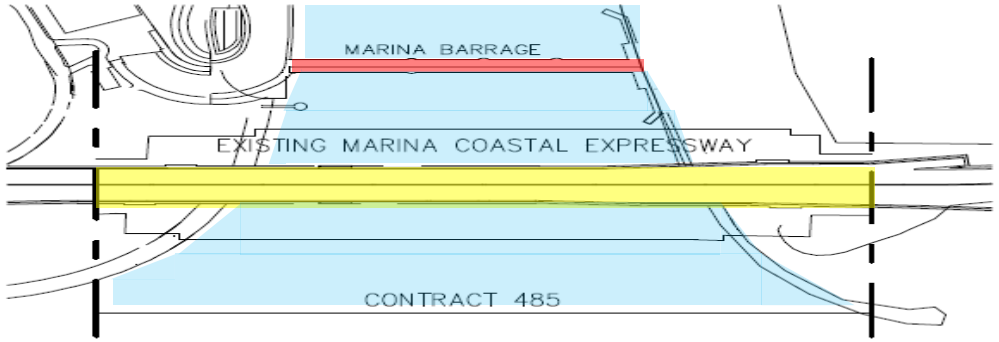
➢Problem:

Water ingress / seepage from the tunnel base slab, resulting in the formation of potholes and stain marks (seawater efflorescence) on the road pavement

➢Proposal:

To find a solution to detect, contain and divert water ingress in tunnel structures





KEY PLAN

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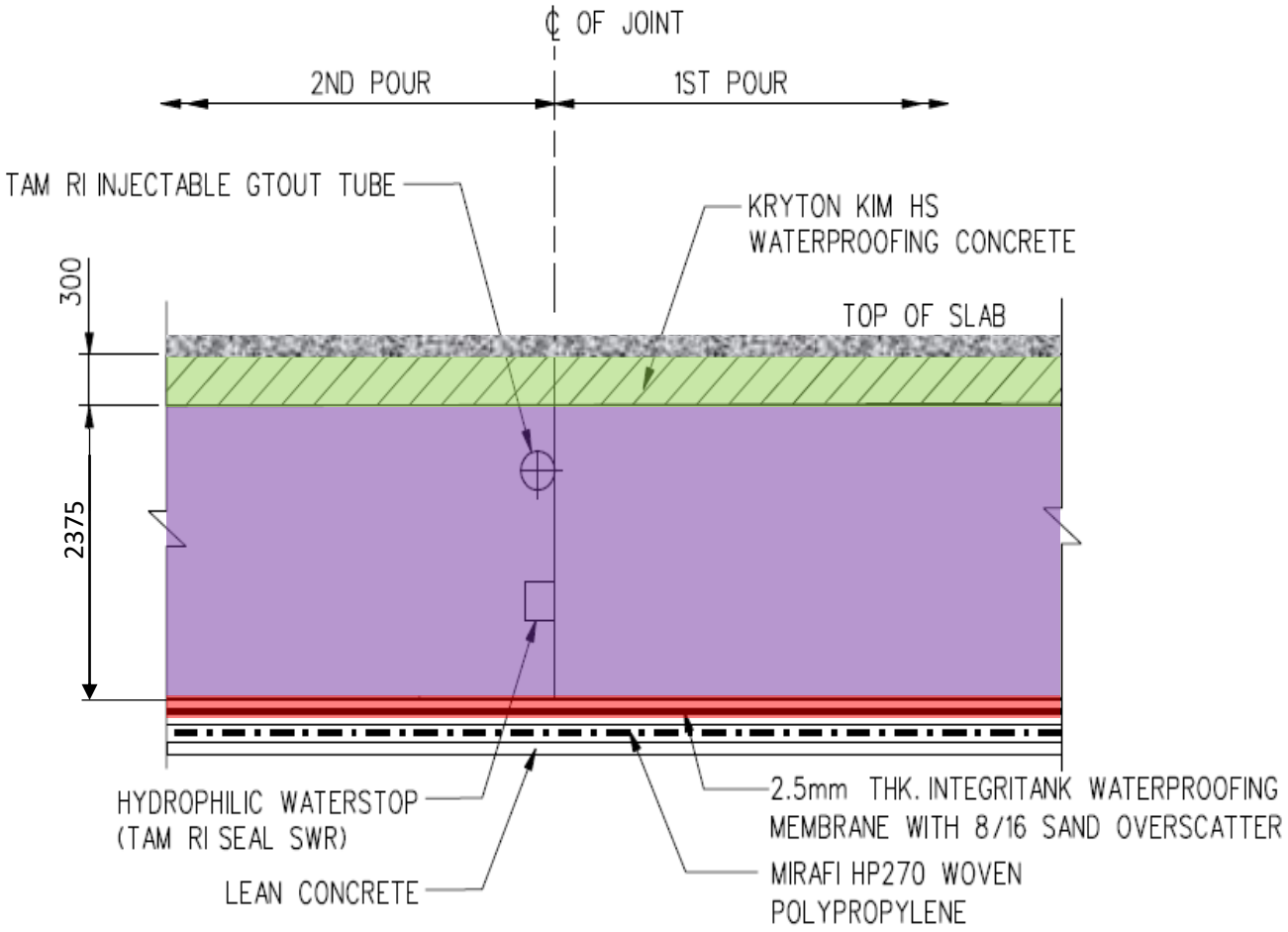
3. Detection and Diversion of Road Seepage

Typical pavement configuration:

- Pavement: 75mm thick wearing course (W3B)
- Waterproofing: 300mm thick waterproof concrete (Kryton Kim HS)
- Base slab: Thickness varies from 2060mm to 2500mm (PBFC Grade C40)
- Waterproofing: 2.5mm thick (Integritank waterproofing membrane)



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Expected Outcome:

At least **80% reduction** in the formation of potholes and stain marks along the selected segment of the tunnel road pavement


Potholes


Stain marks

Solution Requirements:

- Able to withstand traffic loading without displacement in a road tunnel environment and the proposal / solution should not result in any further road defects
- Able to detect water seepage at least 1m into the concrete base slab (2m thick)
- Structural integrity and performance of the premix layer and the tunnel structure should not be compromised in anyway
- Easy to maintain, safe for users to operate and will not result in inconvenience to motorists
- Generate report for water seepage movement within 1 week after inspection

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3. Detection and Diversion of Road Seepage

Questions & Answers:

Q1: Any approaches explored so far? Laser, thermal etc?

A1: So far rectification has been reactive (rectifying when defects appear), we welcome any inventive measures to detect seepage within our concrete base slab.

Q2: What is your current proactive engagement to this issues?

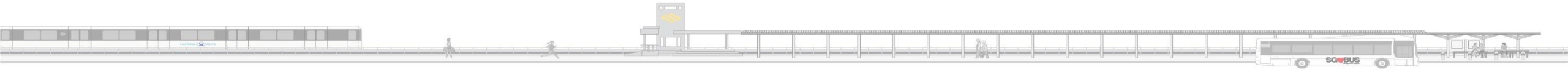
A2: The current/traditional method is to do Polyurethane grouting into the concrete base slab to seal up the cracks and stop the seepage. However due to the high hydrostatic pressure, the seepage tends to recur after some time.

Q3: Has LTA explored ground penetrating radar?

A3: No.

Q4: Does the proposed solution needs to address both parts of the challenge i.e. detection and diversion? Will LTA evaluate proposals with only one part addressed?

A4: LTA will evaluate all proposals, including those that are only able to address one part of the challenge.



THEME 2: LEAN MAINTENANCE
3. Detection and Diversion of Road Seepage

Questions & Answers:

Q5: Is there any priority between water seepage detection and stain detection? Which is more important to LTA?

A5: LTA is interested in the water seepage detection inside the base slab. Stain detection is not a priority as this can be observed via visual inspection.

Q6: What is the monitoring frequency of the water seepage (minutes, daily, monthly, etc?) Is continuous monitoring required?

A6: Monthly. We do not need to monitor continuous segments, the selected segment affected by seepage is about 1km long.

Q7: Would LTA accept solutions that require installation of sensors on the road?

A7: Yes, LTA is open to consider all solution(s) that is able to meet the requirements stated in the problem statement.

Thank You

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