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AWARDS 2019



Name of Project/ Initiative
Outram Park Linkway Tunnels (Thomson Line)

Country
Singapore

Presented by : Dr. Oskar SIGL



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Project: **Outram Park Linkway Tunnels (Thomson Line)**
Contractor: Daelim Industrial Co., Ltd.
Owner: Land Transport Authority, Singapore
Designer: Geoconsult Asia Singapore Pte. Ltd.

As part of the [Thomson Line MRT in Singapore](#), a new underground station is integrated into the existing Outram Park Station which will then provide an interchange between three MRT lines.

[Two underground pedestrian linkway tunnels](#) (Linkway 1 & Linkway 2) are part of the underground infrastructure connecting the new station with the other two existing stations.

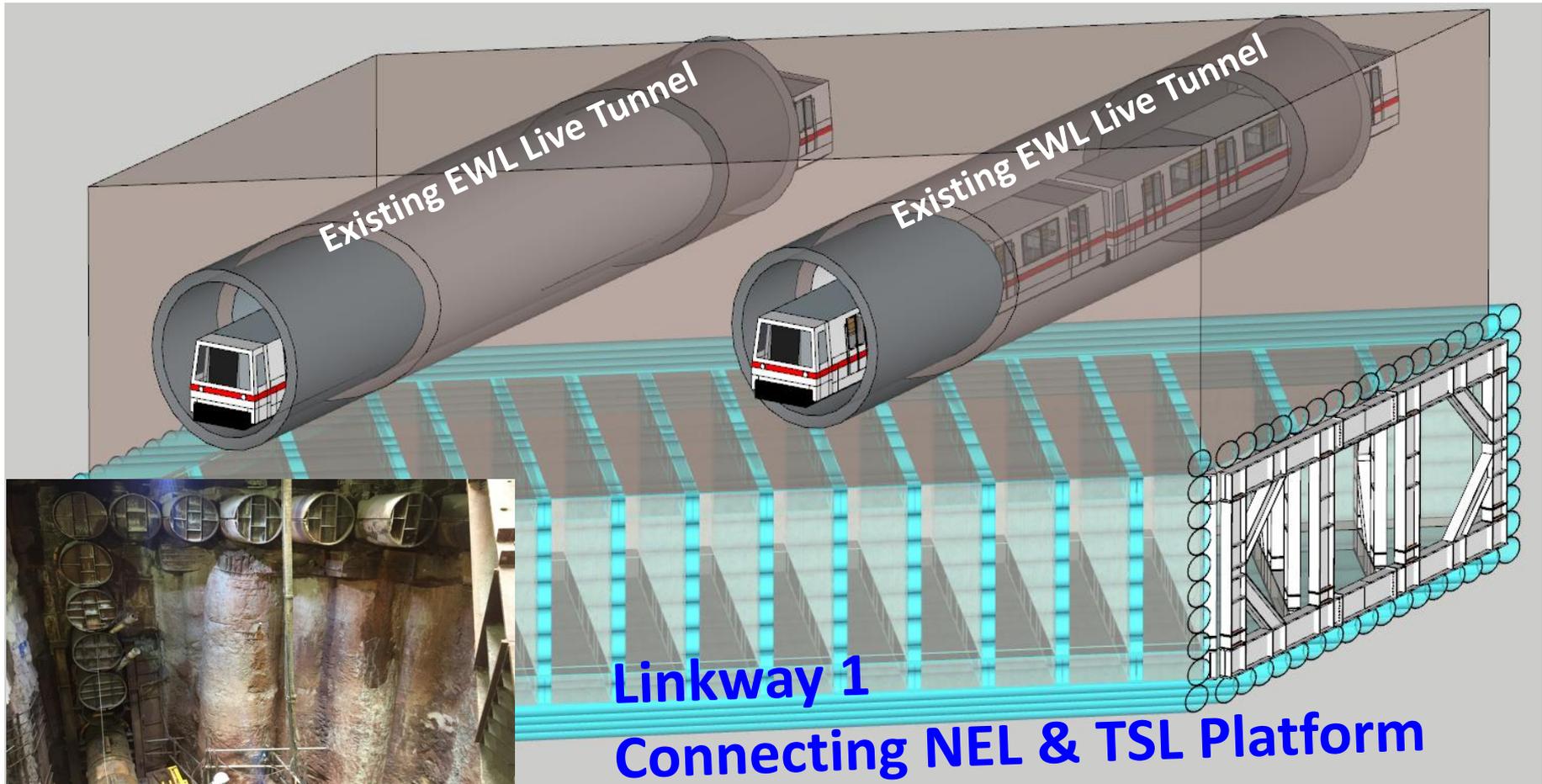
These linkway tunnels will allow [half a million passengers to interchange at this station](#) every day.

The linkway [tunnels are excavated just below existing operational running tunnels](#) and the station platform at only [0 to 2.6 m clear distance](#).



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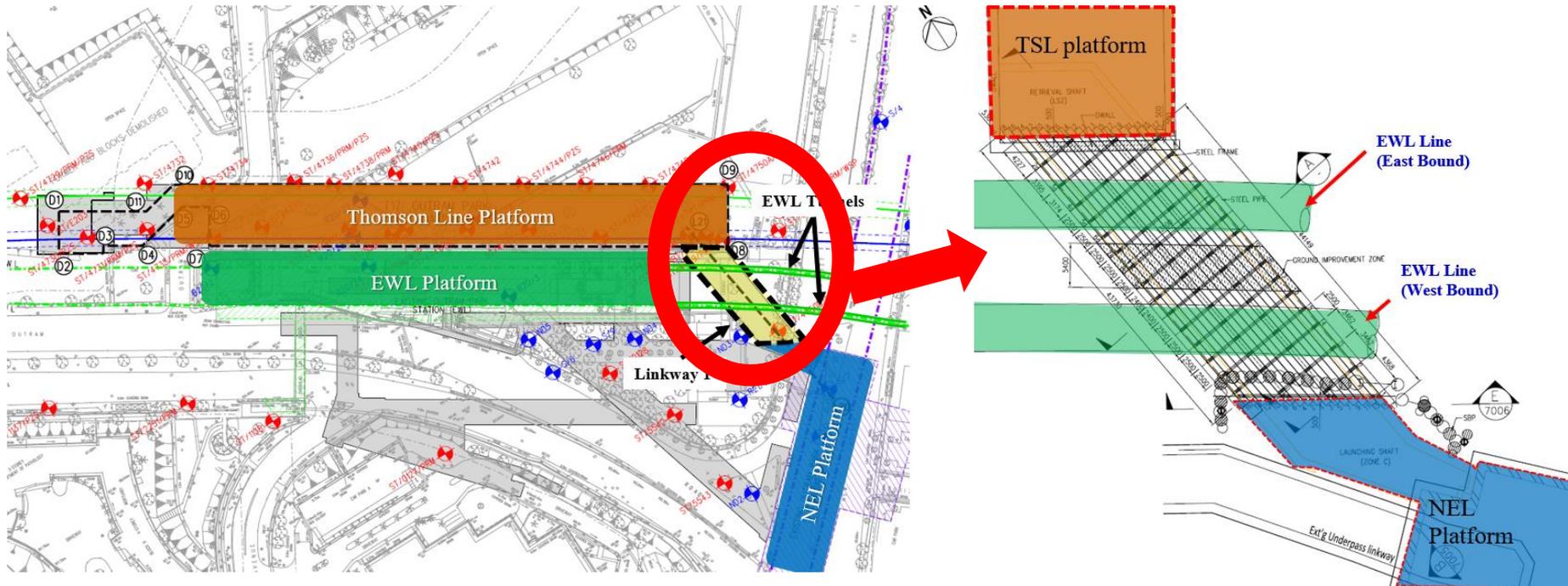
LINKWAY 1





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LINKWAY 1

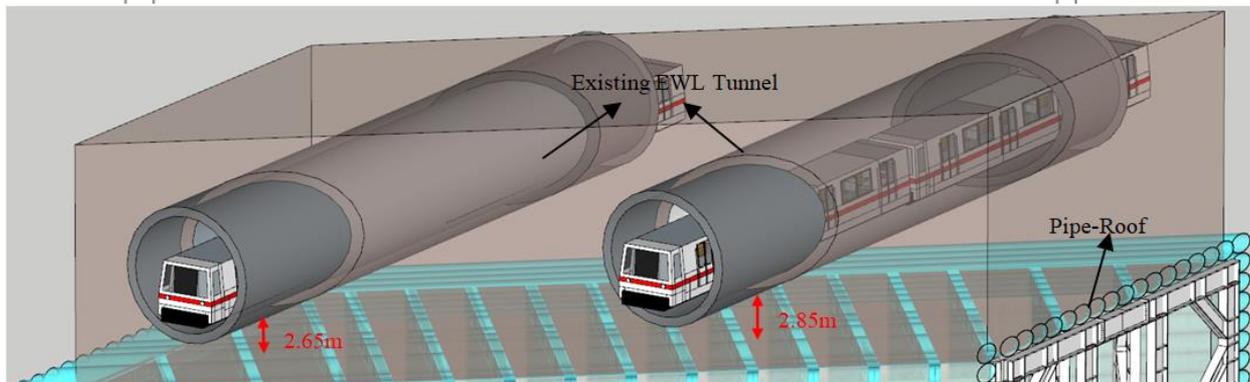
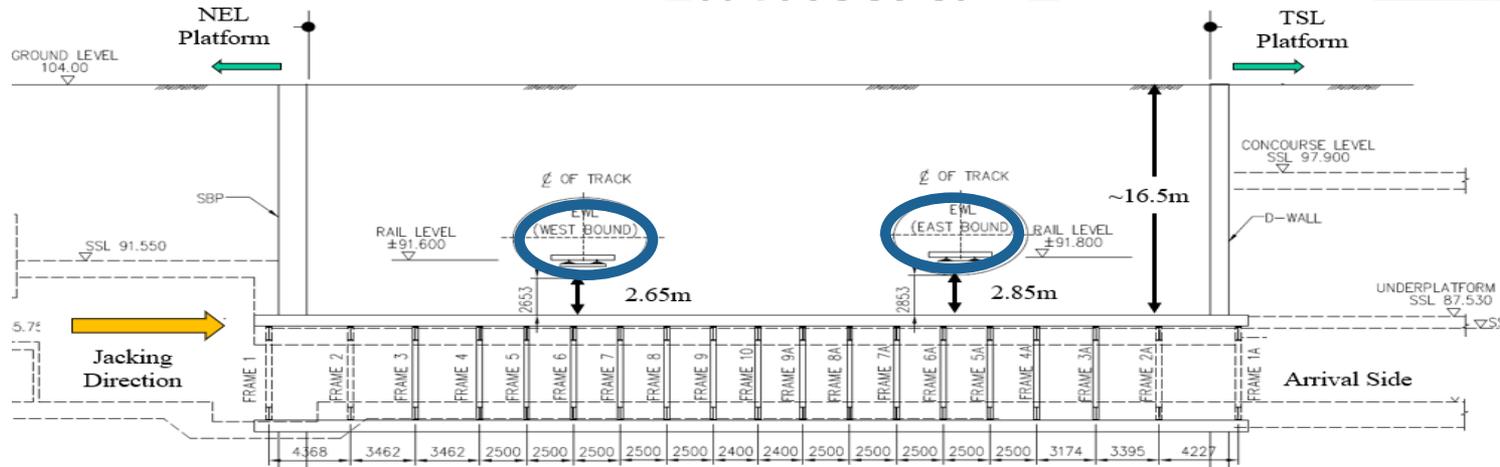


Pedestrian Linkway (13.1m wide, 6.5m high and 40m long) constructed below operational EWL tunnels at around 45 deg angle with a minimum vertical clearance of 2.65m.



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LINKWAY 1

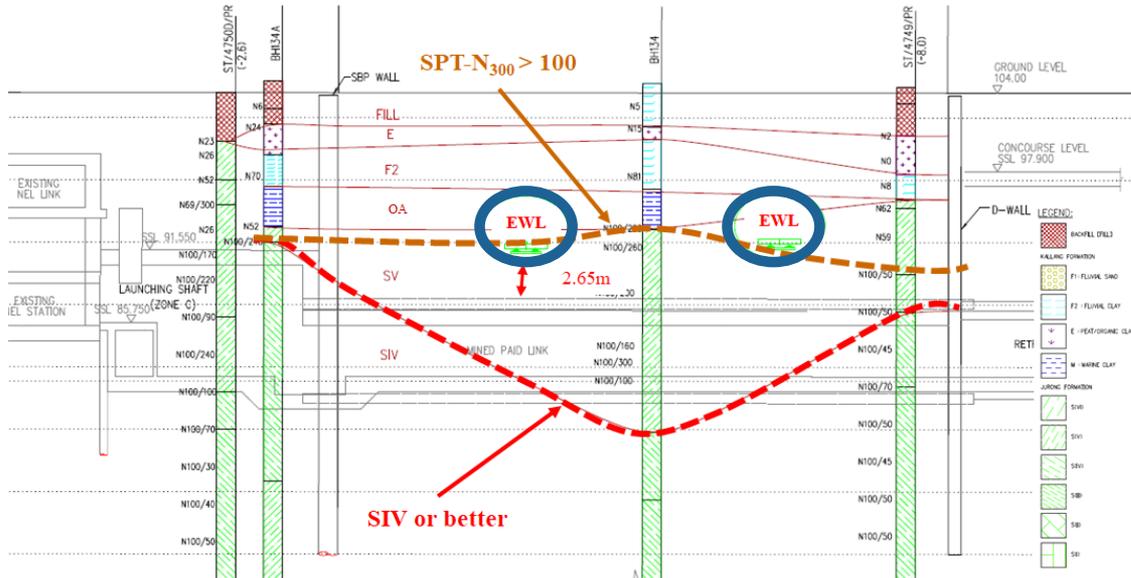


The existing tunnels (1m rings, iD 5.3m, 225mm) were built more than 30 years ago. Current condition fragile with leakages.

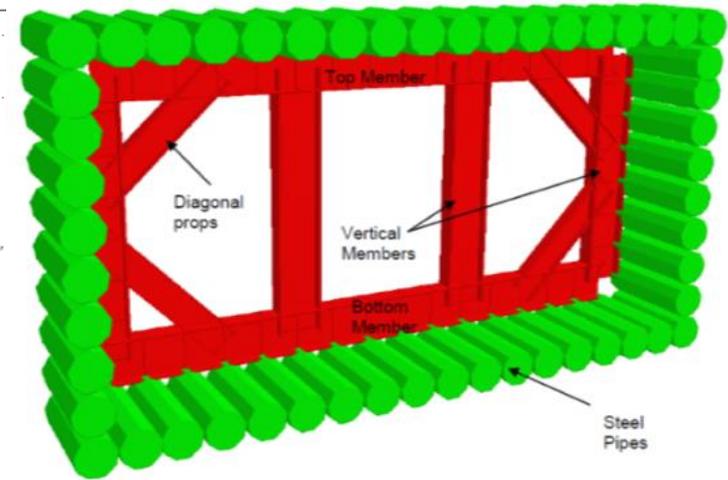


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LINKWAY 1



Geotechnical profile of Linkway 1



Pipe roof arrangement adopted in Linkway 1

Reference design considered ground treatment from the surface. However, turned out to be impossible due to surface constraints.

Mining Solution without ground treatment

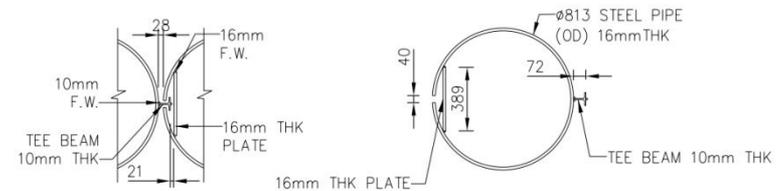


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LINKWAY 1



Pipe Jacking setup



TYPICAL T-CLUTCH DETAILS
SCALE 1:50

Cutter head: Herrenknecht AVN600XC

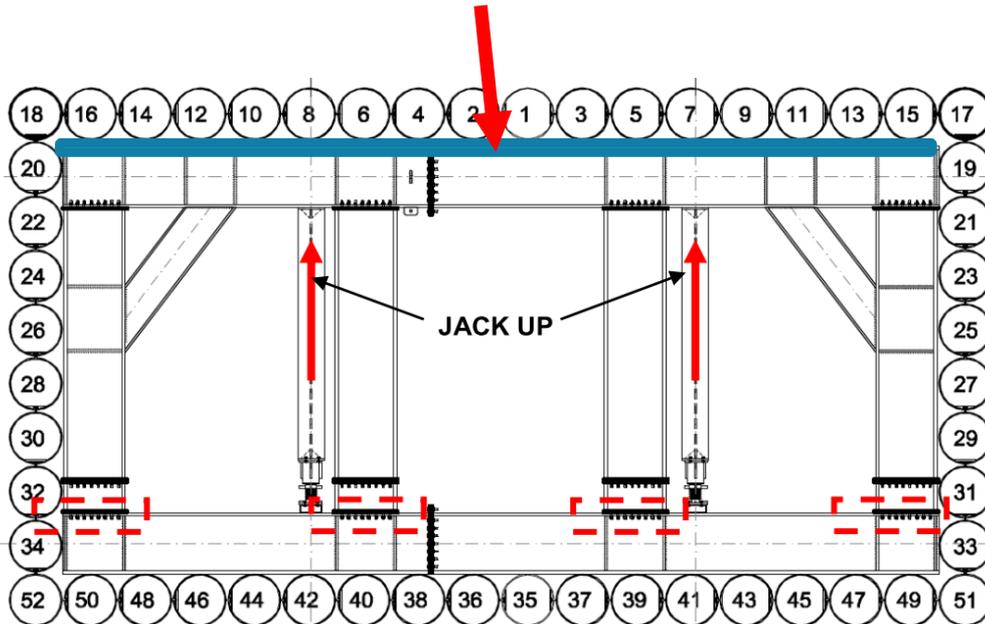


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LINKWAY 1

PROJECT
OF THE YEAR INCL.
RENOVATION
- UP TO €50 M -

INFLATABLE HOSE
FILLED WITH PRESSURIZED GROUT



PRELOADING OF STEEL FRAMES



Heading Excavation

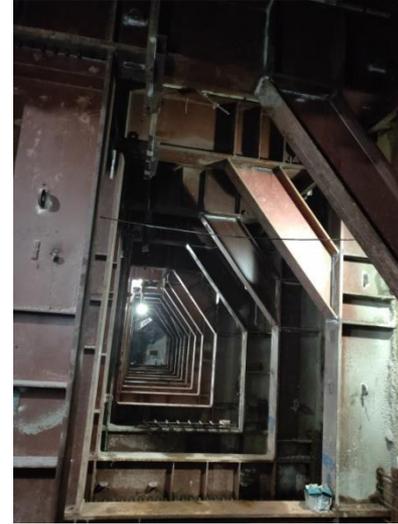
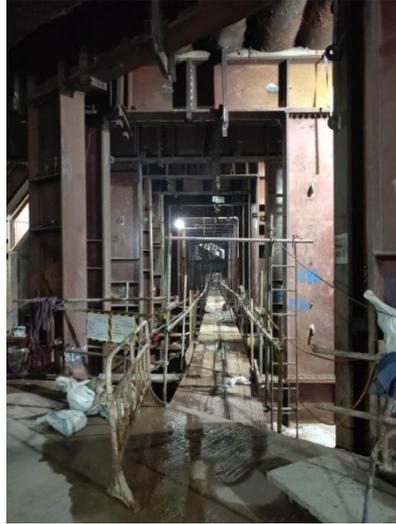


Installation of Bullflex



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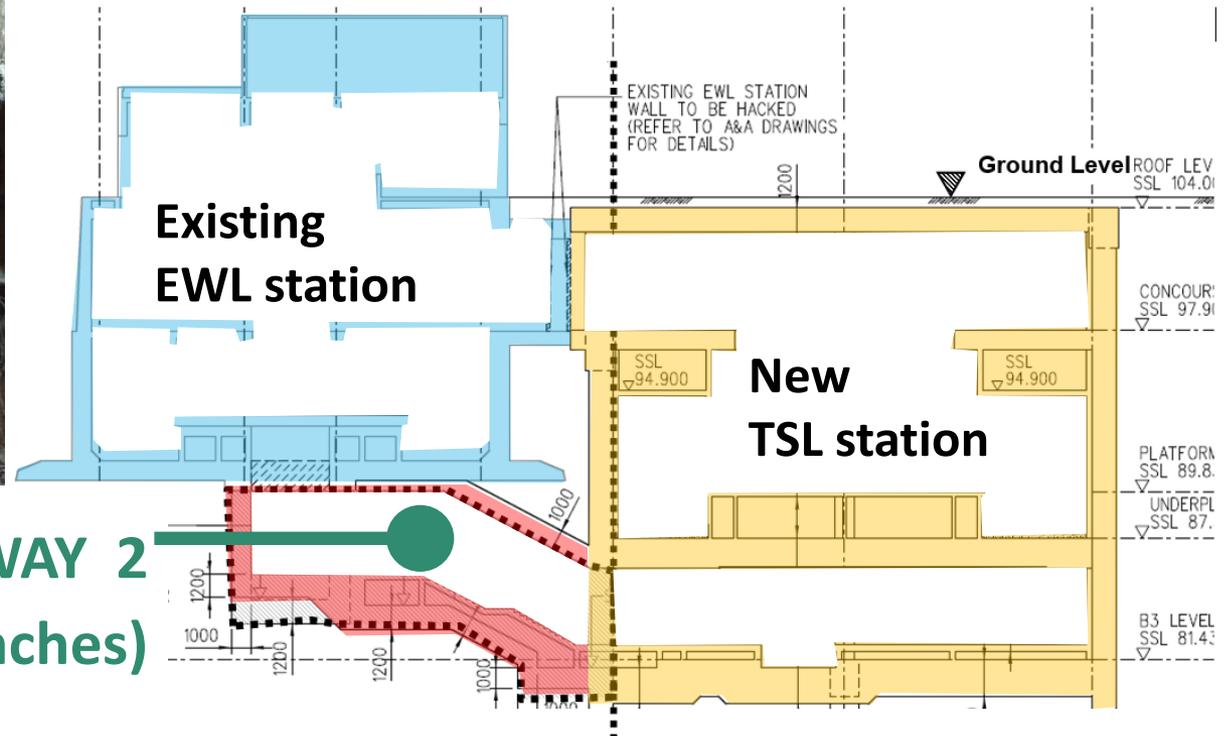
LINKWAY 1





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LINKWAY 2



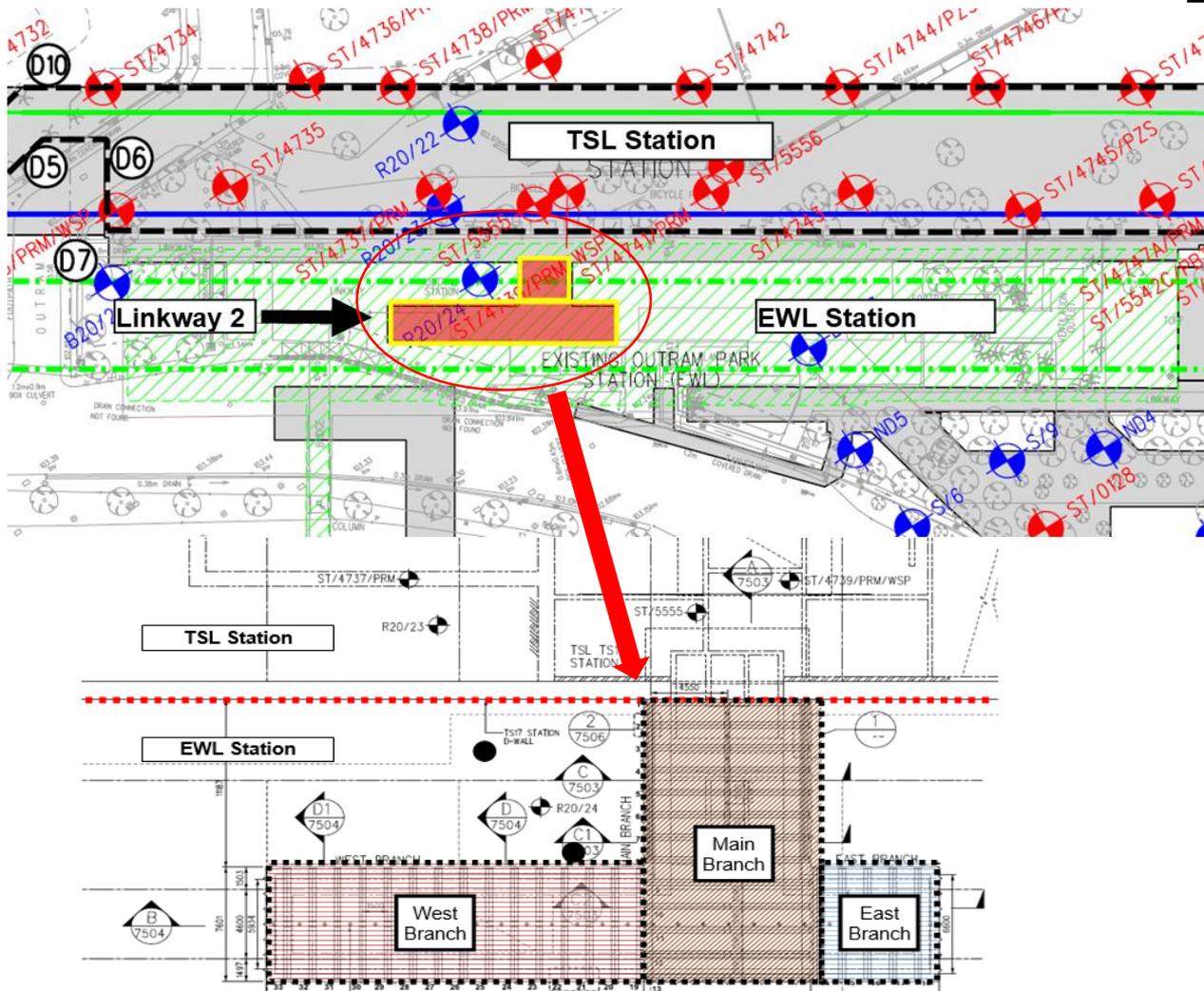
LINKWAY 2
(three branches)

Linkway 2 : Connecting EWL & TSL Platform



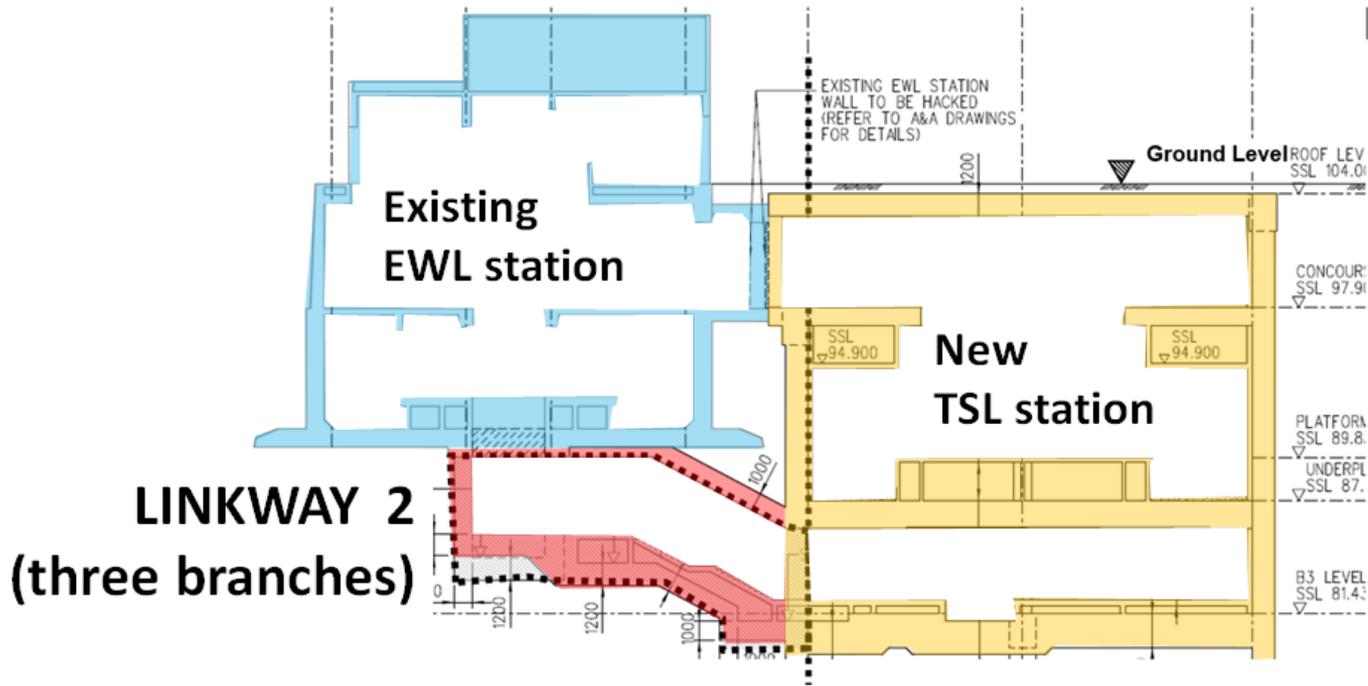
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LINKWAY 2





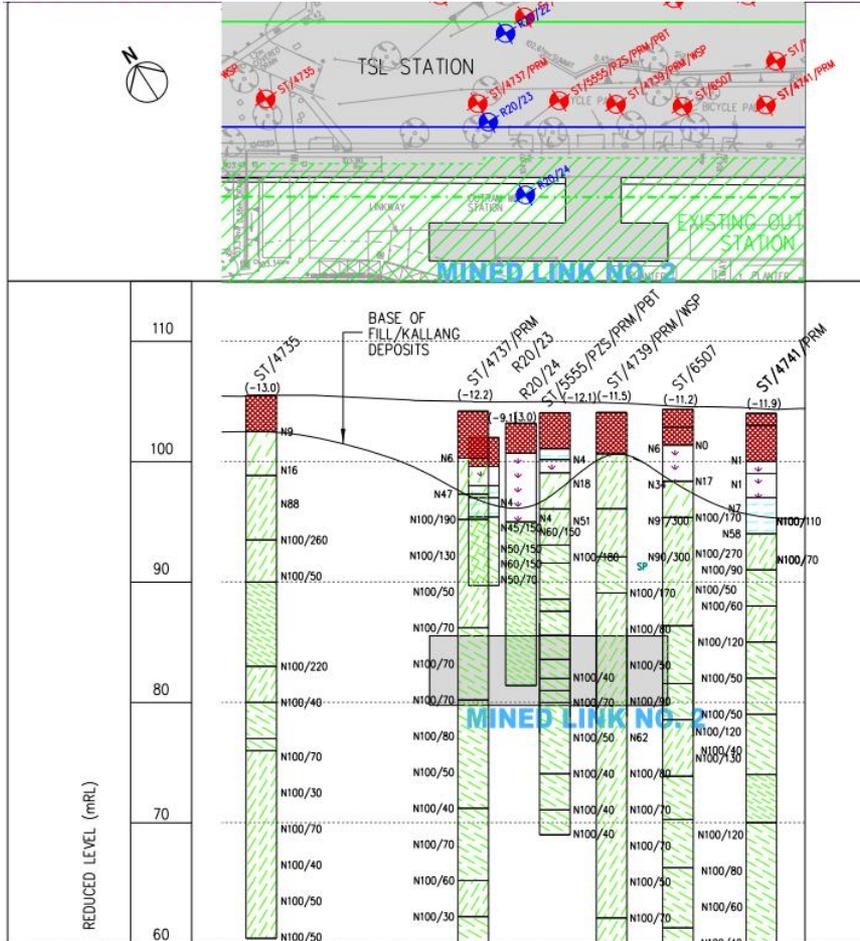
LINKWAY 2



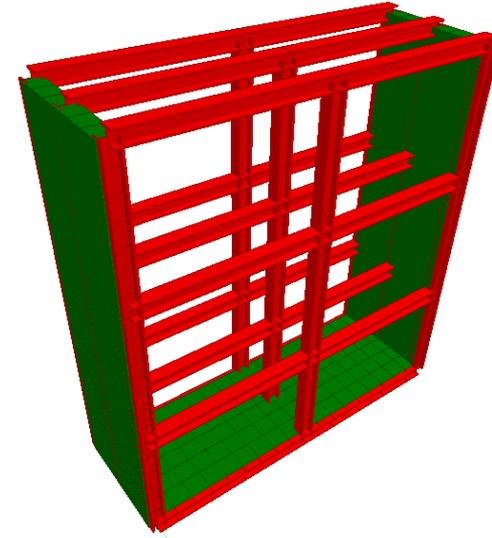
- Excavation below existing EWL station to link TSL platforms and EWL platforms with high volume of passengers (9.3m wide and 6.2m high)
- Two side drifts (East & West branch) for new staircase and escalator



LINKWAY 2



Geotechnical profile



- Existing station has raft foundation
- Linkway 2 is immediately below the station base slab
- U-shaped ground support lining
- Highly weathered silt- and mudstone (Jurong Formation)



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LINKWAY 2





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MAJOR CHALLENGES & OVERCOMING

1. Serious challenges due to working in very close proximity to existing operational MRT running tunnels and stations.
2. Contractor/ Designer team revised the notional scheme and developed a site-specific excavation scheme, which avoided surface ground treatment, provided rigid ground support based on a robust excavation sequence, resulting in acceptable construction impact.
3. A watertight pipe box system, combined with preloaded steel frames and optimized construction logistics allowed reduction of the total construction period resulting in less disturbance to the existing structures and less cost.



MAJOR CHALLENGES & OVERCOMING

4. Despite extreme spatial constraints, achieved zero lost time injury rating during the 16 months construction period.
5. Incorporating sustainability at design stage by re-using previously installed steel support elements, thus resulting in minimized total tonnage.
6. The actual ground movements were controlled to remain well within the established limits.
7. All involved major stakeholders expressed their satisfaction with the technical performance of the adopted design and construction methods.



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Thank You!