From: [redacted]
To: A303 Stonehenge
Subject: Comments on the Secretary of State"s Statement of Matters
Date: 27 March 2022 12:58:43
Attachments: AECOM PP 2017.pptx
Jacked Structures capability.pdf

Stonehenge Submission to Inspectorate 28/3/2022

Introduction

I am an independent consultant who over many years has pioneered jacked tunnel linings.

The development which first was used in UK in the late 1950s has in civil engineering terms been rapid and extensive in terms of its capabilities from originally small diameters to road and rail underpasses and tunnels with advantages over current tunneling techniques.

Precisely Guided Jacking

From my experience of box jacking, which is extensive, I recognised the limitations and developed and patented methods based on precisely guided jacking by using slide paths allowing a wide range of portal structures that could be installed with larger spans and longer drive lengths

Specifically it is a technique that is suited to alluvial soils such as those found at Stonehenge.

Key benefits:

*Allow safe working with much less cover of 2 or 3m compared to the cover required for a pressure balance TBM of 12m or more.

*Using an open shield for face excavation rather than a closed blind shield which allows for continuous observation of the face, which at Stonhenge, allows for identification and recovery of archaeological material.

*Can be complimentary to deep pressure balance tunnelling by extending the tunnel length.

Attempts to gain a hearing

When the Stonehenge tunnel scheme was proposed in 2016 I identified the potential of my innovation on the scheme and undertook a review with consultants CH2M and Jacked Structures Ltd to identify the potential for its use. This resulted in identifying a significant length of tunnel that could be installed at shallow depths and a considerable cost saving.

Due to a variety of non-technical issues the original scheme was delayed and was amended.

This scheme and a later version were put out for public consultation to which I contributed both by direct discussion, submissions and meeting with the AECOM

At a public consultation meeting I met an experienced engineer from Highways England who was interested and thought that our methods could have a very useful role and I should pursue the matter.

It became obvious that client, consultants and contractors were wedded closely to the use of pressure balance deep tunnelling. This not surprising in that the industry has a very large investment by some of the bigger contractors and close links to consultants.

My focus was changed in to not replacing any of the deep tunnel section but extending the underground sections in the conservation area.

I was of the opinion to construct roads in deep cuttings took a lot of land and was environmentally a poor solution.

Our innovations are a relatively low cost tunnelling solution with much less impact than pressure balance tunnelling and any increase in cost would be small.

To extend the in tunnel was a relatively straightforward project and all the road would be underground which would satisfy one of the main criticisms of the proposed scheme

In 2017 I took a meeting with AECOM at their Bristol office with a director and their head of tunnelling a lady who was rather rude as she announced that she knew all about box jacking and

she was not interested. Finally I was able to explain my methods were a major advance on box jacking and overcame the limitations. The meeting continued with expressions of interest.

The result was that AECOM came up with a modified scheme based on my approach but their version presumably was to avoid my patent. . However is was a poor substitute and never progressed. I don't think they ever presented my solutions to Highways England.

As an aside the large leading consultants can be less than supportive of innovations not theirs. I can cite both my experiences and of others. Innovation by definition is a threat to established methods.

In early 2021 three contractor groups were shortlisted for the scheme each were led by European large contractors with a few UK sub-contractors.

Attempts to contact them to put forward our innovations were met with no response.

I should also confirm that I had some direct E mail discussions with David Bullock of Highways England proposing that we would make an initial evaluation to provide HE with a better understanding of how the roads could be put underground in the conservation area. Mr Bullock was polite but appeared to be limited in what he could say and nothing came of our offer.

Currently my innovations include successfully completed projects at Cliffsend and Werrington both opened by Government ministers. In addition Jacked Structures Ltd have a number of schemes under development. All involve road or rail underground structures and require installation without surface disruption. My jacked installation methods have also been used in a number of countries.

The government promotes innovation but experience in trying to obtain a proper engineering evaluation over 6 years it would seem that some major organisations and government departments like Highways England have not subscribed to innovation.

I can make available supporting documents such as submissions and reports relating to the above report if required.

James C Thomson MICE, EU.Eng. M.ASCE

Attachment 1 Power Point submitted to AECOM in 2017 illustrating the innovative methods.

Attachment 2 Power Point providing information regarding Jacked Structure Ltd projects

It should be noted that the innovations allow for changes of cross sections to meet client specifications and specific project conditions.

Chris Howe Director

[redacted]

PUSHING THE BOUNDARIES

Capability Statement
for
None Disruptive Installation of Underground Structures

1. **Introduction**

JSL is a UK based independent international consultancy specialising in creating and implementing engineering solutions to enable installation of large underground structures where a key consideration is to avoid disruption and maintain surface activities. Typical applications include road/rail underpasses, shallow tunnels, culverts and subways below existing traffic arteries, often with shallow cover, to avoid the disruption costs of traditional 'cut and cover'. Our developments are also capable of installing a wide range of structures in terms of length, spans and configuration such as TBM launch boxes, launch portals to minimize the size of launch boxes, metro station and underground caverns for a variety of uses.

JSL is largely a project led organisation offering world-wide consultancy services. With its blend of technical skills and experience in design and construction. JSL aim to bring flair and creativity to projects whilst retaining the important concept of producing practical cost-effective solutions.

JSL philosophy is to create value for key stakeholders by developing leading edge technology solutions for the installation of underground space with minimal disruption. The development and introduction of many pioneering techniques and innovations have become conventional practice in many applications.

JSL is familiar with the complex issues that arise when new facilities intersect existing rail and road infrastructure requiring costly possession or occupation which can disrupt existing surface operations for long periods. Individually our team brings together the experience from over 100 jacked installation projects both in UK and overseas beneath existing highways, railways, airfields and buildings.

2.Structure Jacking

The basic technique of constructing a concrete or steel structural unit and installing by jacking and mining techniques has been developed over many decades. It is very adaptable and allows the possibility for options to suit particular demands. The principle aim of jacking underground structures is to minimise disturbance to the surrounding ground, to the ground surface and essentially to maintain surface operations and risks by providing a full structural lining at all stages of installation. The technical aspect of minimising the installation time, coupled with developments to avoid possible disturbance to the ground above are constantly being improved with increasing size and complexity of projects.

Temporary Works represent a significant proportion of a structure jacking project and warrant careful consideration to achieve an economic but safe design. Close inter-relationship of temporary and permanent works and construction methodologies requires early consideration at the project feasibility and planning stages.

The company specialises in jacked structures providing conceptual, outline design support and site management assistance during installation where requested. We work closely with consultants appointed for the permanent design allowing full integration of temporary works considerations for a jacked installation and contractors delivering complex subsurface schemes.

A considerable number of under-bridges and tunnels have been designed by JSL using various configurations of jacked structures to form abutments, bridges, tunnels, subways and service corridors. Choices range from single rectangular box structures forming tunnels, or with bridge decks installed on top of modular foundations, either tubes or multi-tier structures, with removable ‘lids’ and portal deck structures.

3. Innovation

Most of the great advances in engineering and construction have been achieved by companies with the imagination and courage to push technological boundaries to their safest limits.

JSL is an organisation with a breadth of expertise and experience, with the vision to create innovative solutions able to translate their ideas into reality. We continue to pioneer new advances that set the organisation apart.

It is our determination to pioneer new advances that set the organisation apart. Our overriding goal is to provide innovative solutions that keep our clients at the cutting edge of their industries, in the same way that we have kept at the forefront of ours.

The organisation has a global strategy towards innovative solutions to reduce the costs of projects. Our business areas are across the spectrum and include management and engineering in the construction industry hence it is naturally part of our outlook to derive cost reduction solutions for our clients.

JSL has prior experience on major tunnel installations around the globe and its founder holds a number of patented approaches to the jacked installation of major underground structures, which may be of interest.

4. Project Experience

Each member of the company has extensive experience of working within this field of specialist engineering and brings together an extensive portfolio of successfully completed major jacked structures including;

- Boston Central Artery: Full Size Highway Jacked Box Tunnels (Contract 9A) – USA
- Don Valley Parkway Full Size Interstate Rail Jacked Box Tunnel Underbridge – Canada
- Manggarai Jakarta Full Size Rail Jacked Box Underbridge – Indonesia
- East Kent Access Road Full Size Rail Jacked Portal Underbridge and Bored Tube Abutments– UK
- Ingatestone Essex Jacked Box Pedestrian Underpass - UK
- London A406 North Circular Road: 5 Rail Underbridges with Modular Jacked Box Abutments and Piers- UK
- Kettering Northern By-Pass: Portal Rail Underbridge with Jacked Abutments- UK
- Newcastle Western By-Pass: Portal Rail Underbridge with Jacked Abutments- UK
- Wilmslow By-Pass: Rail Underbridge with modular Jacked Abutments and Pier - UK
- Hook By-Pass: Full Size Highway Jacked Box Tunnel - UK
- M25 Brentwood: Rail Underbridge with Modular Jacked Abutments- UK
- M25 Radlett: Rail Underbridge with Modular Jacked Abutments- UK
- Chelsea Harbour Development: Full Size Highway Jacked Box Tunnel - UK
- Preston Penwortham By-Pass: Rail Underbridge with Modular Abutments - UK
- London A41 Brent Cross: 2 Full Size Highway Jacked Box Tunnels - UK
- Milton Keynes A5 By-Pass: Rail Underbridge with Modular Jacked Abutments- UK
- Farnborough Blackwater Valley Route: Rail Underbridge with Modular Jacked Abutments - UK

Most of these projects have provided new highway intersections beneath existing major traffic arteries such as multi-track railways, highways and airport runways providing major benefits including maintenance of existing traffic movements whilst tunnel installation proceeds.

Recent Project Data Sheets are appended providing various jacked applications.

Cliffsend Rail Underpass

Cliffsend, Ramsgate, UK

Project Information

Client
East Kent County Council

Delivery Type
Design-build

Project Capital Cost
Original: US$26M

Final: US$35M

Change orders: N/A

Project Schedule
Original: July/2009 - July/2012

Final: Oct/2009 – May/2012

Project completed 5 months ahead of schedule

Project Relevance

- Comparable in complexity
- Similar scale
- Low tunnel cover in sands and chalk
- No impact to rail service above
- Local community sensitivity
- Instrumentation and monitoring of live rail corridor
- Size of excavation minimized
- Design-build
- A sizeable project that demanded exceptional solutions
- Many interdependent designs for temporary and permanent elements

PROJECT DESCRIPTION

The Cliffsend Underpass involved the construction of a 23m wide, 126m long tunnel that was constructed under an active rail corridor and road, by jacking only a roof structure along slide tracks that were constructed in bored pilot tunnels. From within the pilot tunnels, low headroom minipiling rigs we used to construct closely spaced reinforced concrete piles that were ultimately exposed and faced to form the lower sections of side walls for the underpass. Reinforced concrete pile caps were constructed within the tunnels to tie the piles together, and subsequently a low friction slide track was set onto the pile cap to ensure very high installation accuracy.

ROLE OF PRIME TEAM MEMBERS

Jacked Structures Limited developed the conceptual design of the Cliffsend Underpass construction and worked with the team to integrate the methods of installation with the permanent works design.

ROLE OF KEY INDIVIDUALS

Andy Robinson, Chris Howe and Terry Ingold were integral to the development of the scheme and the installation of the Cliffsend Underpass.

DESIGN AND/OR QUALITY OBJECTIVES, CHALLENGES AND SOLUTIONS

The underpass was constructed under the Network Rail Javelin Train system that services the high-speed rail link to St Pancras International, as well as a local access road. The scheme was devised to minimize ground settlement, and a comprehensive 'real time' instrumentation and monitoring program was established. Jacking load calculations were evaluated and maintained within an envelope by designing soil drag reduction measures (drag sheets and

lubrication), and by establishing inter-jacks between individual 22m long deck units. Quality assurance on precast units was carried out to ensure accuracy for installation and finish standards.

GROUND / SUBSURFACE CONDITIONS

The geology consisted of up to 6m of Thanet Sand, underlain by weathered chalk with occasional flints or boulders.

INSTRUMENTATION SYSTEMS

Continuous automatic monitoring of the railway with total stations providing results and feedback to relevant parties.

UNIQUE ASPECTS

By designing a structure of these dimensions with only a roof structure and slide tracks within bored pilot tunnels, one of the world's longest examples of jacking has been constructed, all with minimal disruption to existing road and rail infrastructure.

LESSONS LEARNED

Maintain integrated team working throughout the permanent and temporary works design phases

PROBLEMS ENCOUNTERED

High jacking resistance encountered during the latter stages of installation caused overstress to the rear jacking anchorages. This was resolved with the use of kentledge load to increase the available resistance which proved adequate for completion.

Water seepage through the construction joint between deck and substructure on completion of construction works emanating from an area of chalk overlain with made ground. This was successfully resolved following cement based grout injection along the shoulder of the deck.

AWARDS

Institution of Civil Engineers (ICE) South East England Engineering Excellence Awards 2013 Innovation Award and highly commended in the Structures category. The Awards recognize the best civil engineering projects across South East England.

CLIENT REFERENCE

Network Rail Asset Protection Sussex

Logan Subramaniam

INGATESTONE PEDESTRIAN RAIL UNDERPASS

INGATESTONE, ESSEX, UK

Project Information

Client
Network Rail Anglia Region

Delivery Type
Design-build

Project Capital Cost
Original: US$ 6M

Final: US$ 6M

Change orders: N/A

Project Schedule
Original: Jun/2013 - Apr/2014

Final: Sep/2013 – Apr/2014

Project completed on time for official opening by Minister of Transport

Project Relevance

- Complex shallow installation
- Small scale - big technical challenges
- Low tunnel cover in variable embankment fill materials
- No impact to rail service above
- Instrumentation and monitoring of live rail corridor
- Local environmental constraints
- Design-build
- A difficult project with unusual track support
- Many interdependent designs for temporary and permanent elements

PROJECT DESCRIPTION

The Pedestrian Underpass at Ingatestone to replace an unmanned level crossing involved the construction of a 3.8m wide, 26m long tunnel that was constructed under an active rail corridor, by jacking a single preformed concrete tunnel section beneath active rail lines. The distance between the roof of the tunnel and the rail sleepers was only 800mm which required the installation of a Track Support System (TSS). This comprised precast post tensioned concrete beams positioned beneath the main line rail tracks supported on low strength concrete bedding. The levels were such that the jacking shield penetrated the lean mix concrete by approximately 150mm during the installation.

ROLE OF PRIME TEAM MEMBERS

Jacked Structures Limited provided specialist engineering support to the Main Contractor and supervised the installation of the subway during the jacking period.

ROLE OF KEY INDIVIDUALS

Andy Robinson, Chris Howe and Terry Ingold were integral to the development of the scheme with James Thomson providing Pier Review.

DESIGN AND/OR QUALITY OBJECTIVES, CHALLENGES AND SOLUTIONS

The underpass was constructed under the Network Rail Main Line and Passenger Loop line. The project was politically sensitive with a local agreement to open the completed underpass by an agreed date. The site was located close to residential properties with the need to minimize environmental disturbance in particular during night time operations. The scheme was devised to avoid disruption to the rail operations and to minimize ground settlement. A comprehensive 'real time' instrumentation and monitoring program was maintained throughout the construction phase. Quality assurance on precast units was carried out to ensure accuracy for installation and finish standards.

GROUND / SUBSURFACE CONDITIONS

The original railway embankment was constructed of clay fill and widened with ash fill consisting of a mixture of general fill materials overlying the Claygate Beds described as slightly sandy clay.

INSTRUMENTATION SYSTEMS

Continuous automatic monitoring of the railway with total stations providing results and feedback to relevant parties.

UNIQUE ASPECTS

The shallow cover dictated the need for a TSS to avoid settlement/heave to the rail tracks. A number of designs were examined and the precast beam solution was selected and installed during a possession of the tracks.

LESSONS LEARNED

Maintain a system of Confined Space working from commencement of shield entry into the ground until exit at reception side to control access to competent persons.

PROBLEMS ENCOUNTERED

Towards the end of the TSS section the shield encountered a thicker and stronger section of concrete bedding which sheared and was carried forward causing some heave to the adjacent passenger loop line which had previously been closed during the installation phase. Measures were put in place to ensure the main line tracks remained operational throughout.

AWARDS

Client recognition of the commitment and completion on time

CLIENT REFERENCE

Network Rail Anglia Route Managing Director

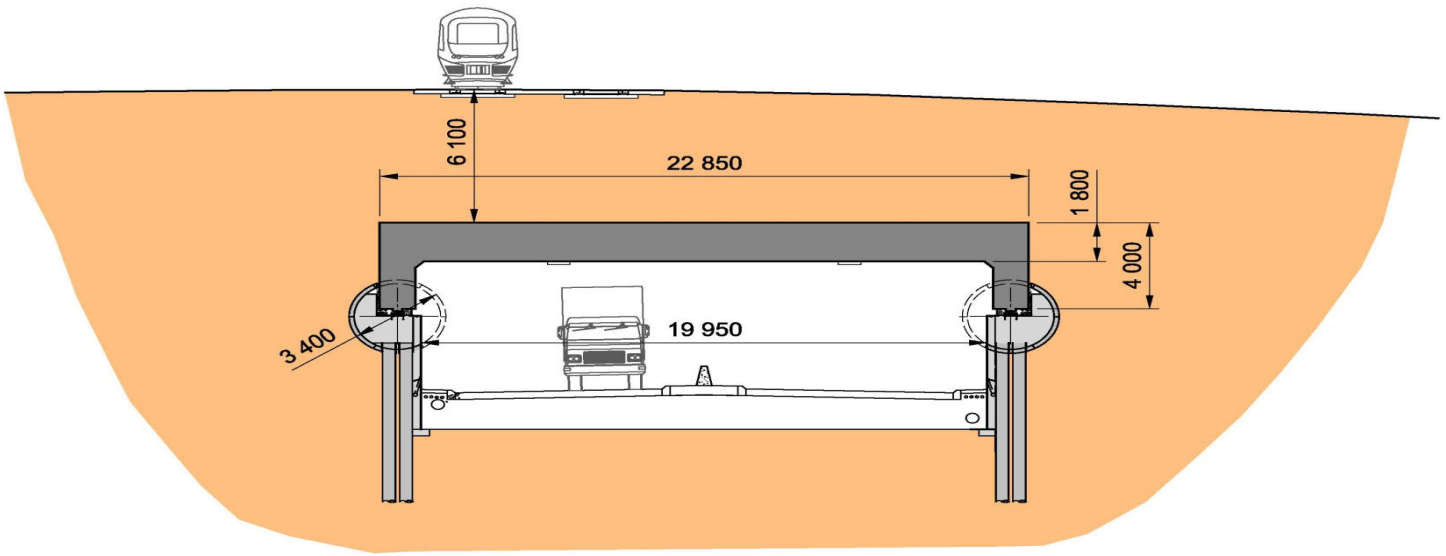
Richard Schofield

AECOM STONEHENGE

25th September

Jacked Structures Ltd

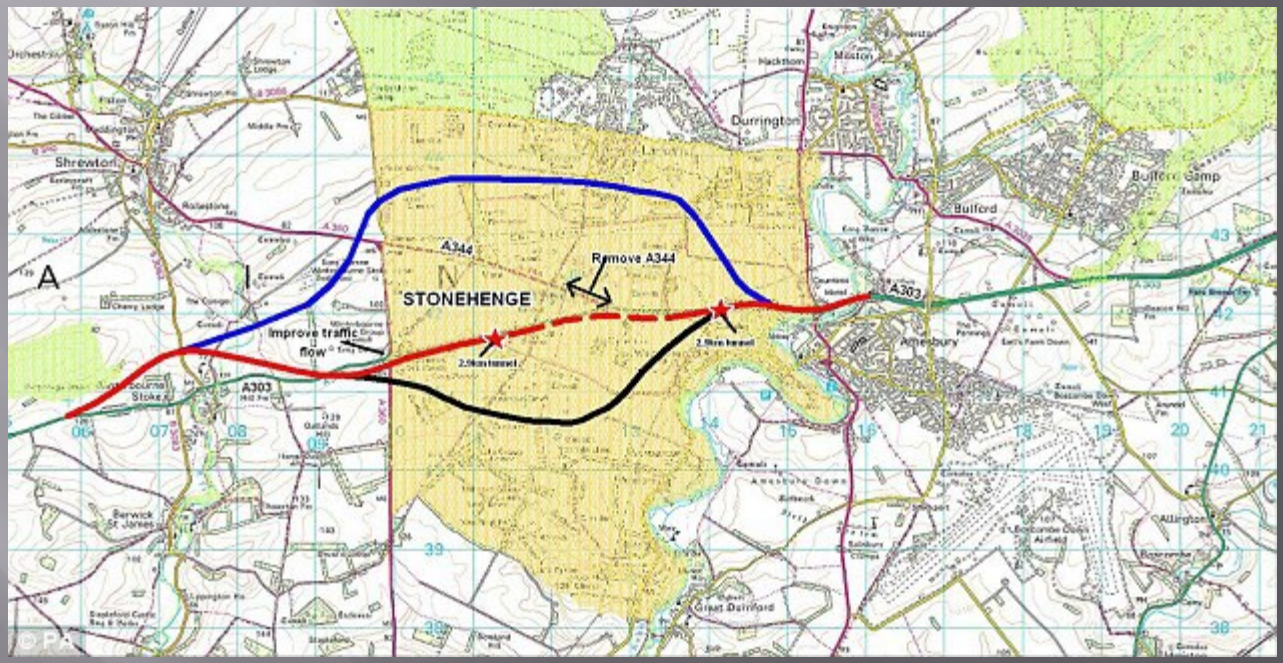
Cliffsend Underpass
The Jacked Deck



Cliffsend Road Underpass – Aerial View

Cliffsend Road Underpass Jacked Deck Face Excvation

Cliffsend Road Underpass Deck Jacking Installation



Stonehenge By-Pass

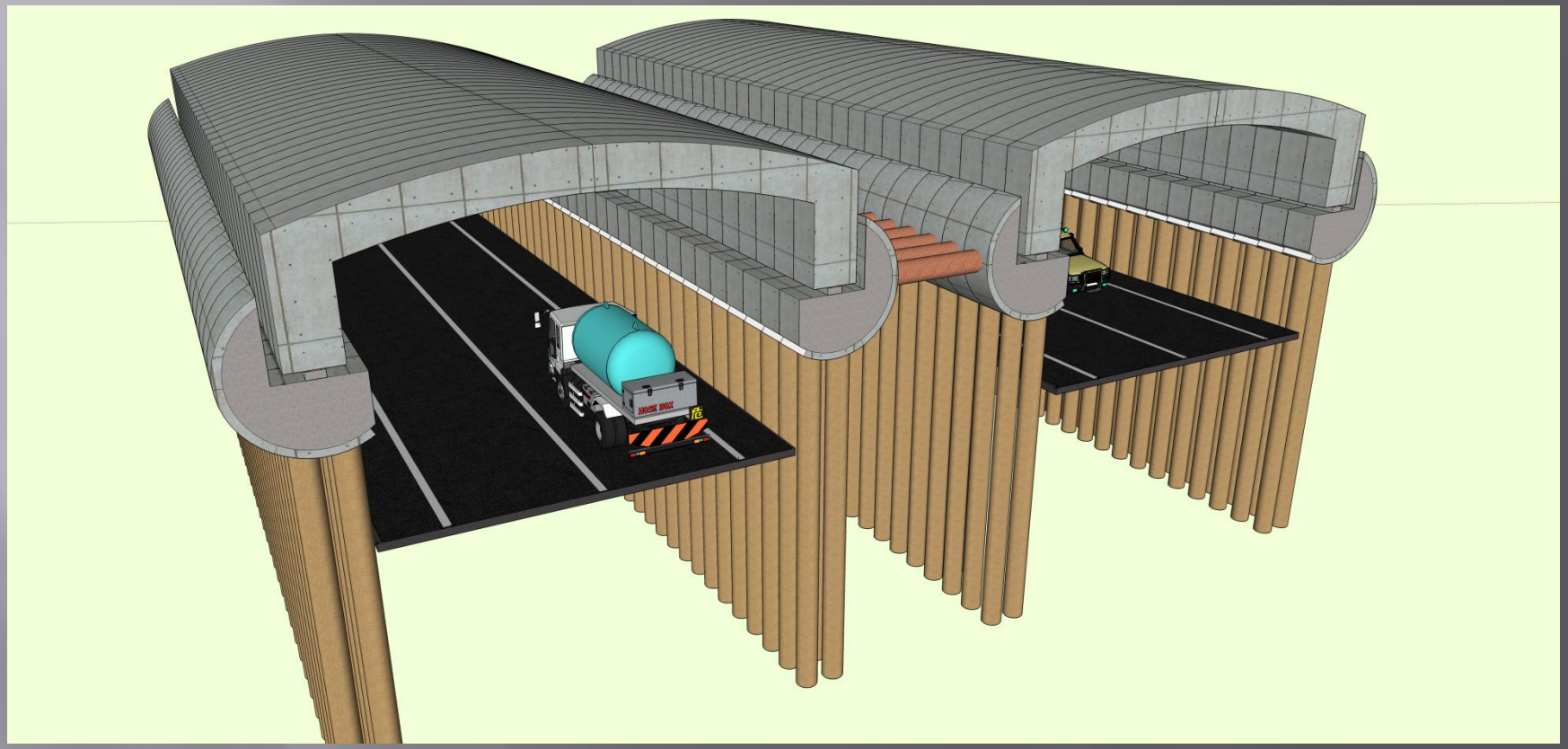
Stonehenge- Proposed Portals in Conservation Area

Potential Application Stonehenge

- To continue the road from the current portals in underground shallow tunnel
- Thus eliminating the massive portals, road in
- cutting and at the surface within the heritage site
- The whole heritage site will be restored to its natural state
- Eliminating visual, noise and air pollution

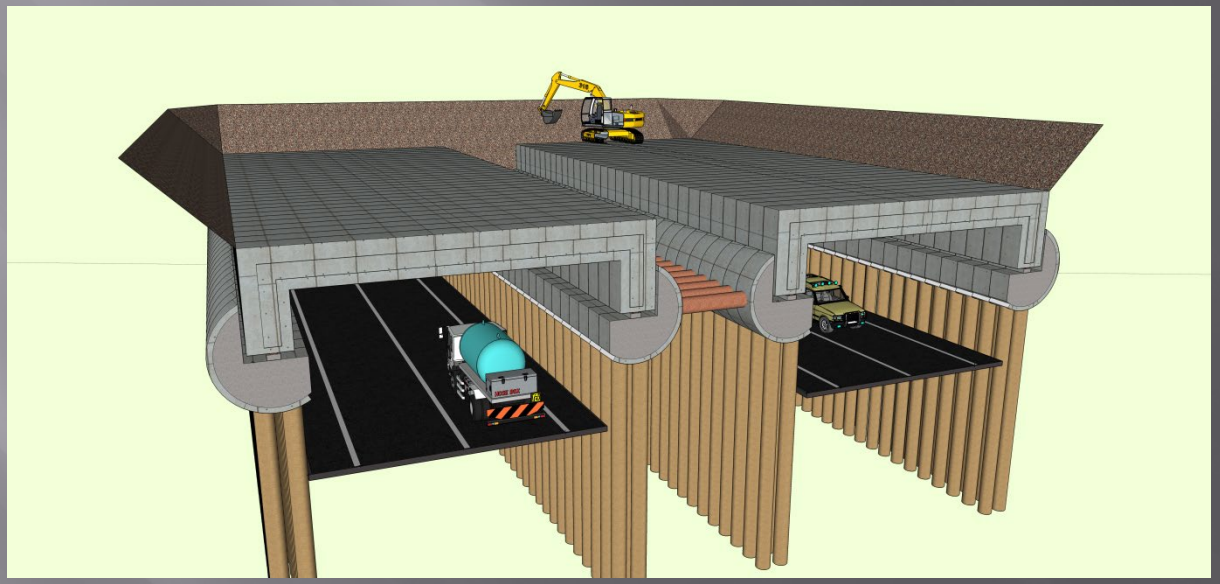
Stages of Construction

- Access tunnels four in number are driven from launch pits from end of tunnel section at both west and east ends.
- The lengths from the end of the proposed tunnel section would be driven in tunnel mode to a suitable shallow cover.
- The remaining lengths to the boundaries would be driven in Green Tunnel mode where the surface would be reinstated and reseeded to its original condition.
- The whole length could be installed in tunnel mode but would increase cost

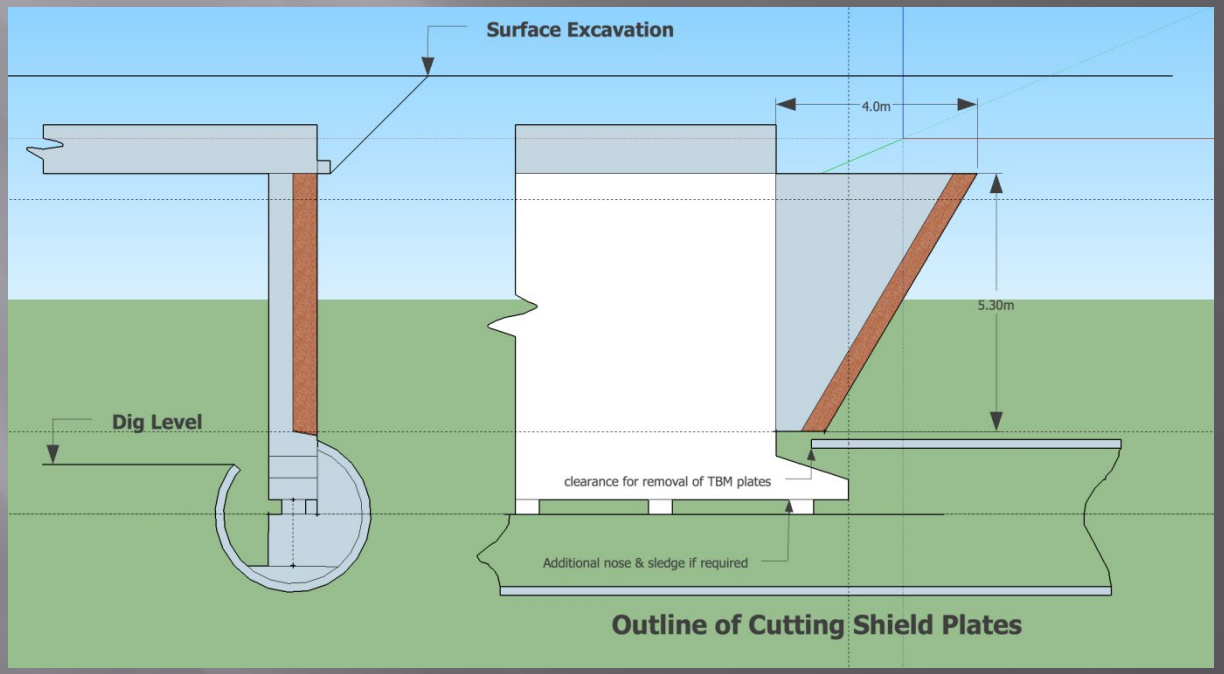


Tunnel Mode

Green Tunnel
Jacked deck



Portal Deck


Surface Excavation
4.0m
5.30m
Dig Level
clearance for removal of TBM plates
Additional nose & sledge if required
Outline of Cutting Shield Plates

Portal Deck Green Tunnel