



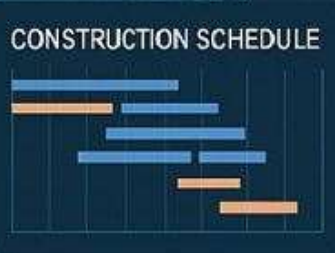
Digital Twin

on HIMP

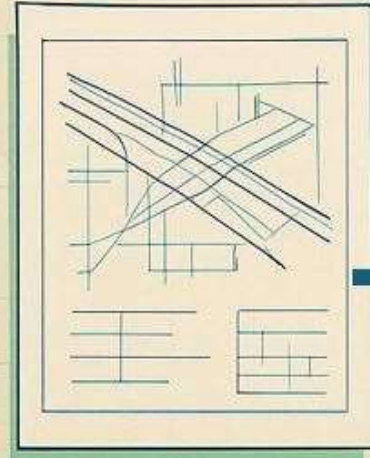
Highway Information Modeling Platform

5D HIGHWAY INFORMATION MANAGEMENT PLATFORM

NATIONAL HIGHWAY AUTHORITY OF INDIA

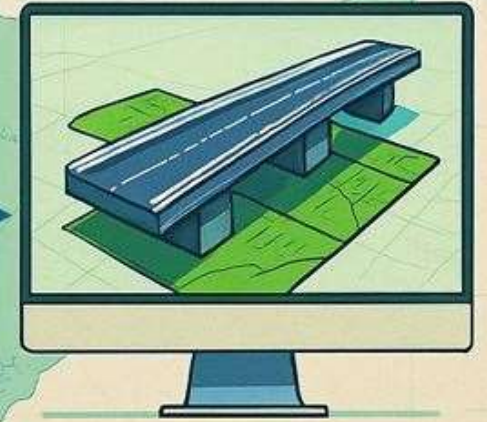


TRADITIONAL INFRASTRUCTURE MANAGEMENT SYSTEMS



- 2D DRAWINGS
- MANUAL SCHEDULING
- DISCONNECTED COST TRACKING
- FRAGMENTED DATA SILOS

5D HIGHWAY INFORMATION MANAGEMENT PLATFORM (HIMP)



- INTEGRATED 3D MODELS
- DYNAMIC SCHEDULING (4D)
- COST ESTIMATION (5D)
- EVIDENCE-BASED COS/EOT ANALYSIS

Understanding 3D,4D and 5D in HIMP



1D

(Conceptual Design)

- Linear representation of road path
- Defines basic route
- Early planning C Feasibility Studies



2D

(Plan View)

- Road layout
- Plans and Profiles
- Cross sections
- Initial construction planning



3D

(Geometric Modelling)

- 3D Road model of the road and surrounding terrain
- Information
- Clash Detection
- Visualisation C Stakeholder communication



4D

(Time Integration)

- 3D Model + Construction schedule
- Construction phases and sequencing
- Project management
- Progress C Delay



5D

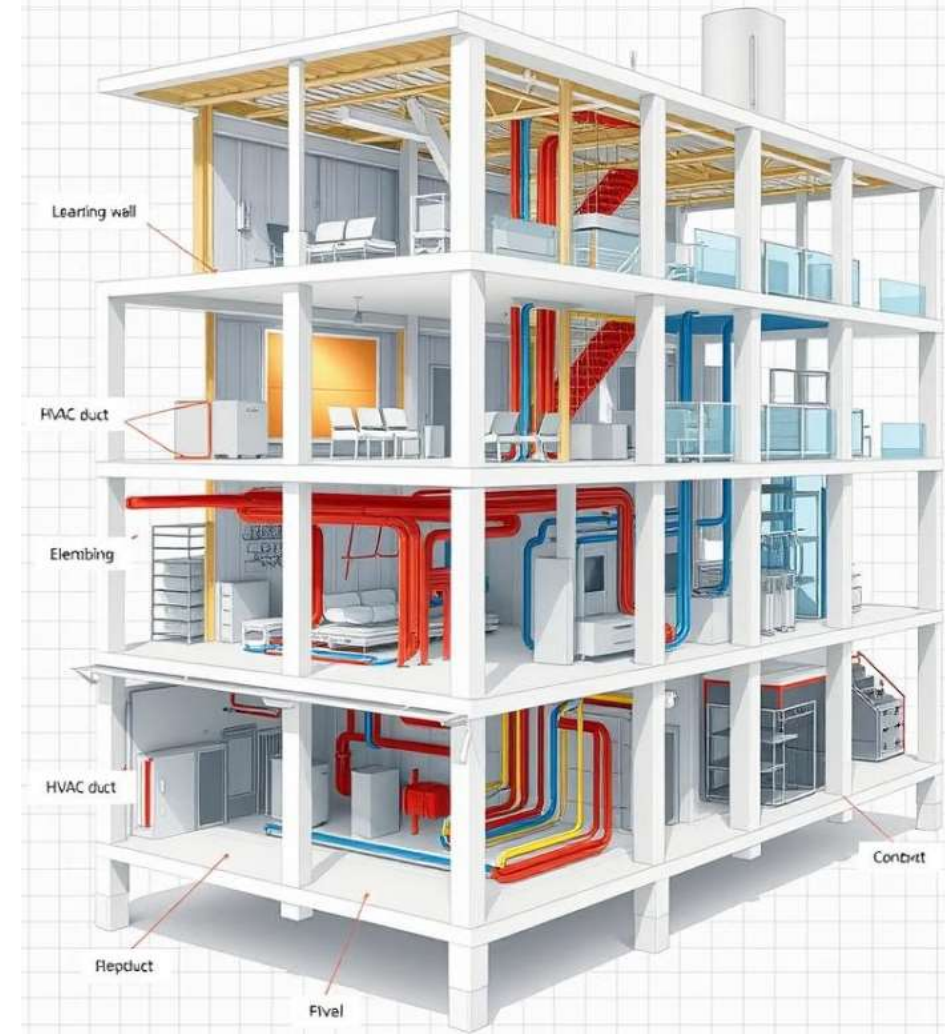
(Cost Integration)

- 4D Model + Cost Data
- Cost Estimation
- Budgeting
- Resourcing

Building Information Modelling (BIM)

(being Used in AAI, CPWD, Metro Rail)

In BIMS – **Building represents Physical Asset** in Digital Model of structure with details of Design, Construction & Operational aspects.



NHAI attempted **Digital Twin for Highway Projects** on

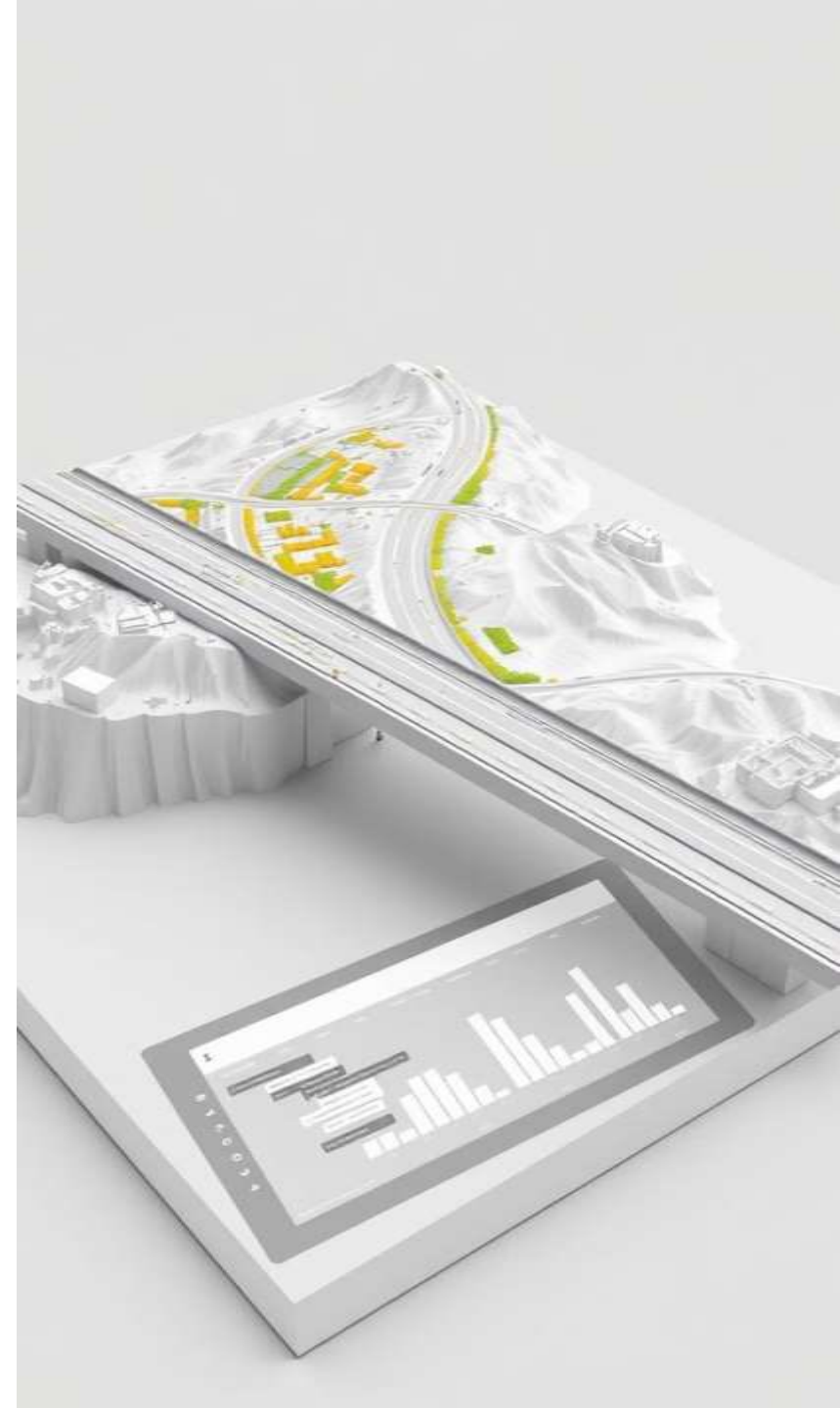
HIMP - Highway Information Modelling Platform

A Custom Solution (Not a Software Product)

HIMP - Platform to creating **Digital Twin** of 3D Digitized Model of Highway Projects with information related to Survey, design, BOQ estimation, Scheduling of activity.

The Digital Twin of Highway Project should itself establish communication among the stakeholders wrt

- Management of the project during the Life cycle of Construction phase (Progress based Billing....., Delay....., Resources requirement....., Quality level....., Address Time & Cost overrun,.....)



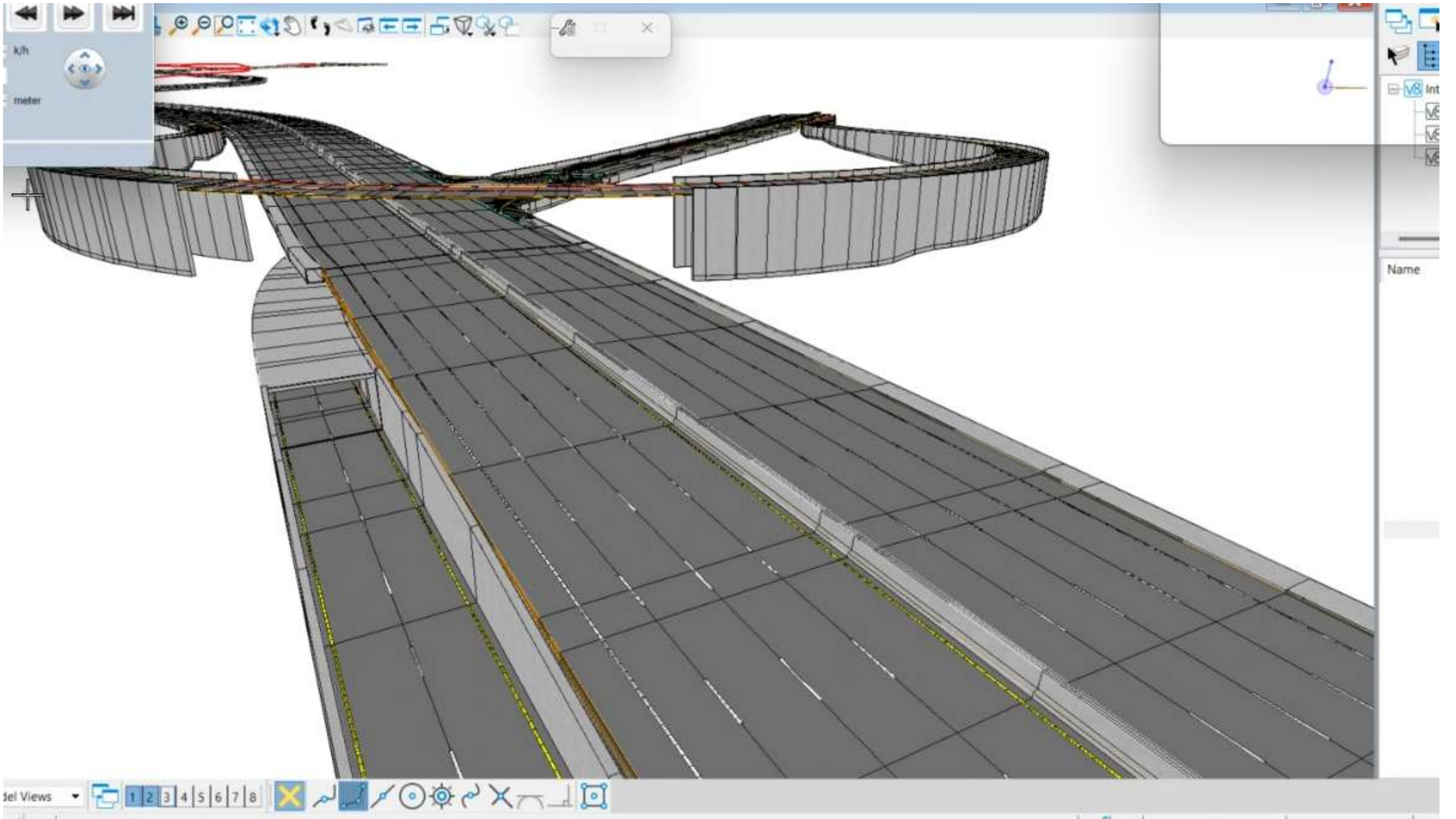
Keeping in view the National Geospatial Policy 2022

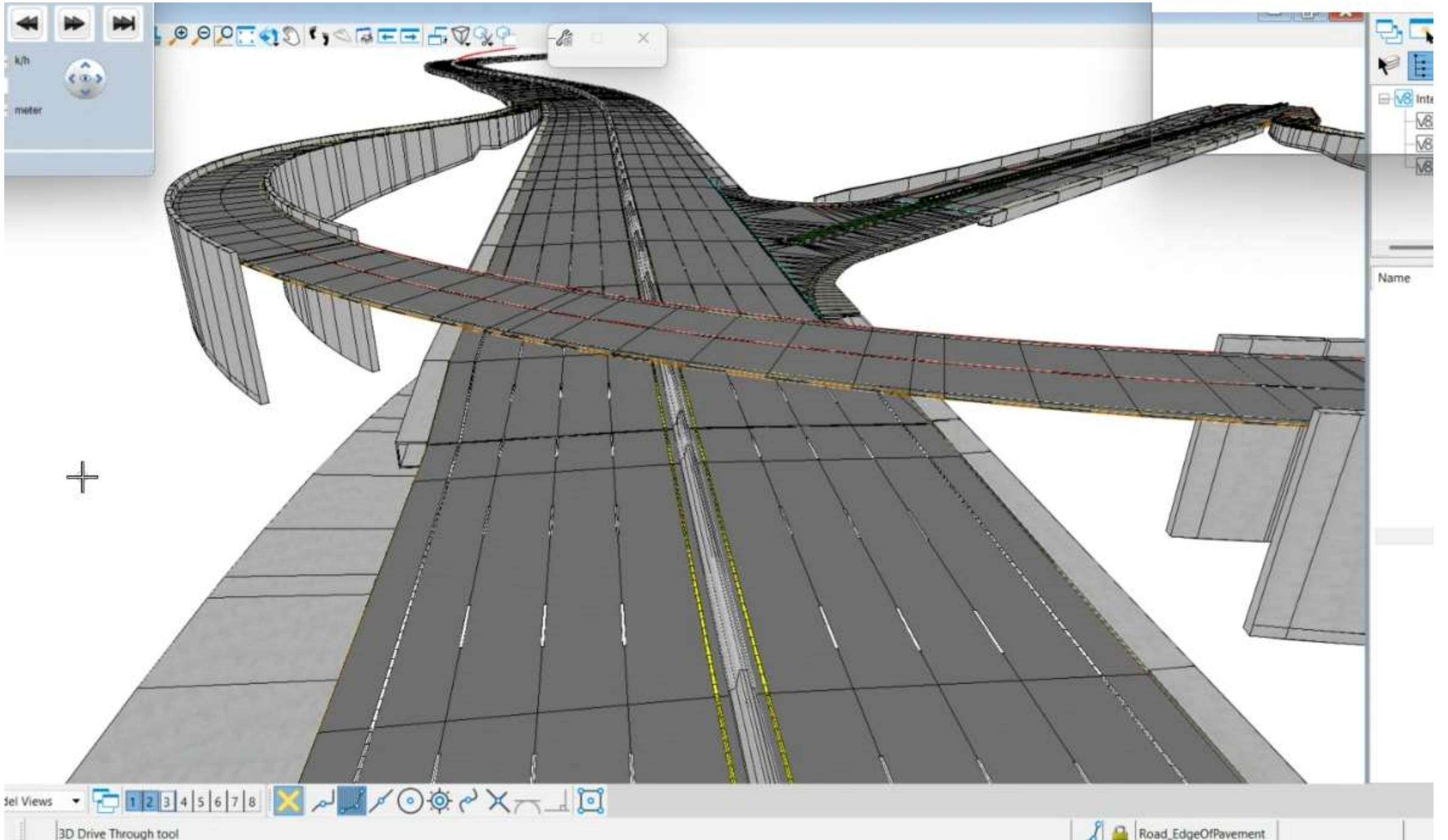
Key Tasks for Highway sector

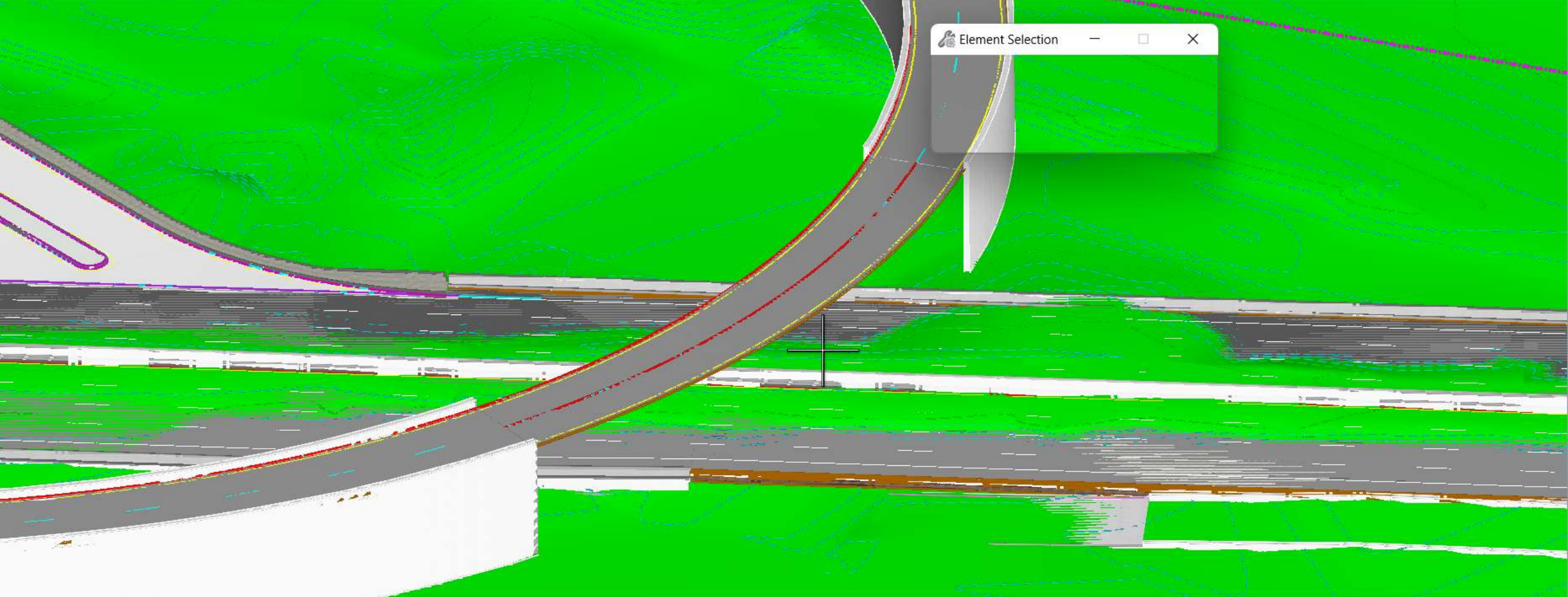
- Digital Elevation Model (DEM)
- Geospatial knowledge Infrastructure (GKI)
- Mapping of Surface and Subsurface Infrastructure
- Digital Twin for Major Cities and towns

NHAI took lead for use of Geospatial in Highway Sector

- Highway Information Modeling Platform (Digital Twin)
- Introduction of 3D MGC Technology (Geospatial+ Instrumentation+ AI)
- Multi Lane Free Flow Toll collection system,
- NSV and Drone Analytics,
- Integration of Highways to Flyways









Element Selection

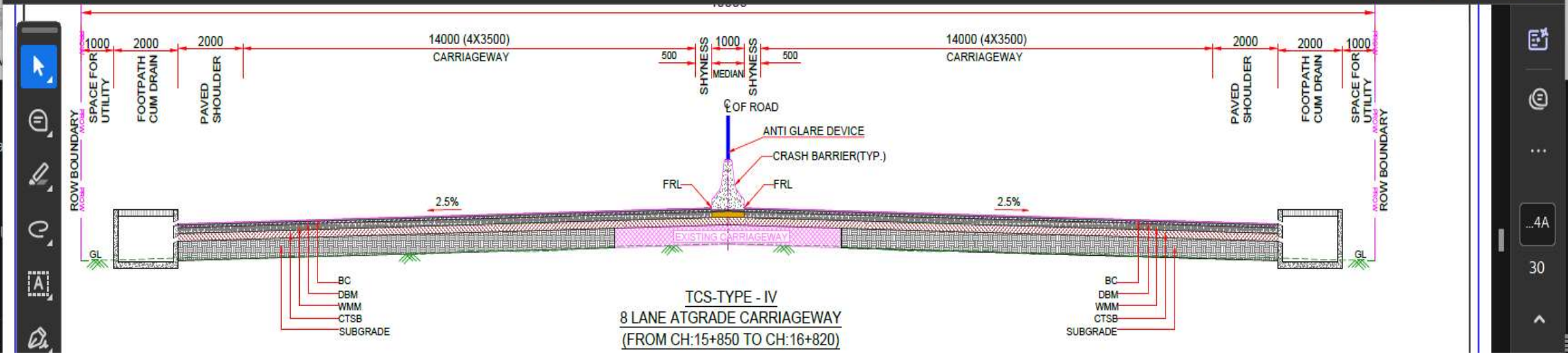
Close buttons: — □ ×

Menu Home TCS R2.pdf + Create

All tools Edit Convert E-Sign Close tab

Find text or tools

Sign in AI Assistant



Select v

Videos

Pushpendra

4(1)

WhatsApp

Travel

1 item

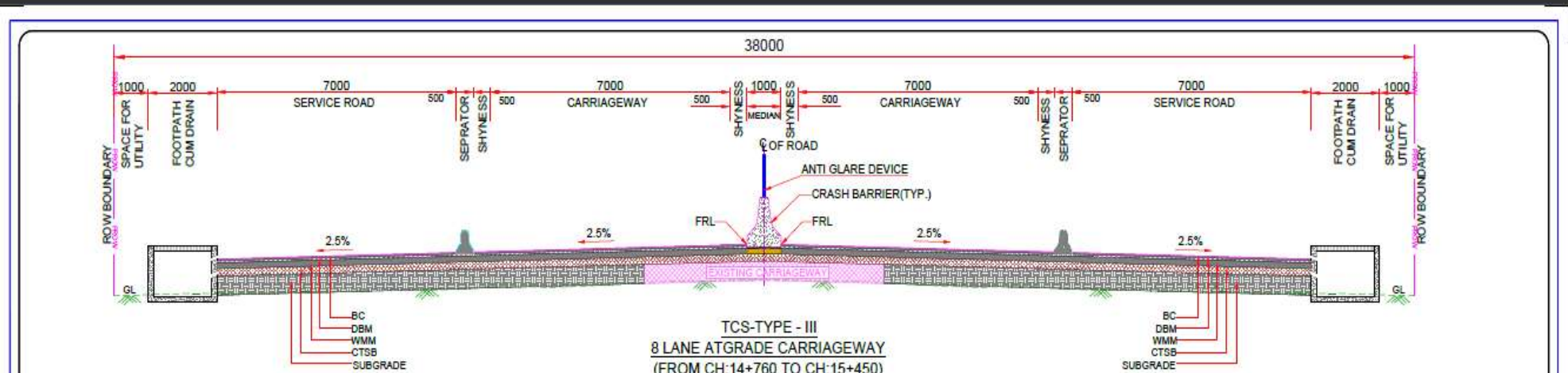
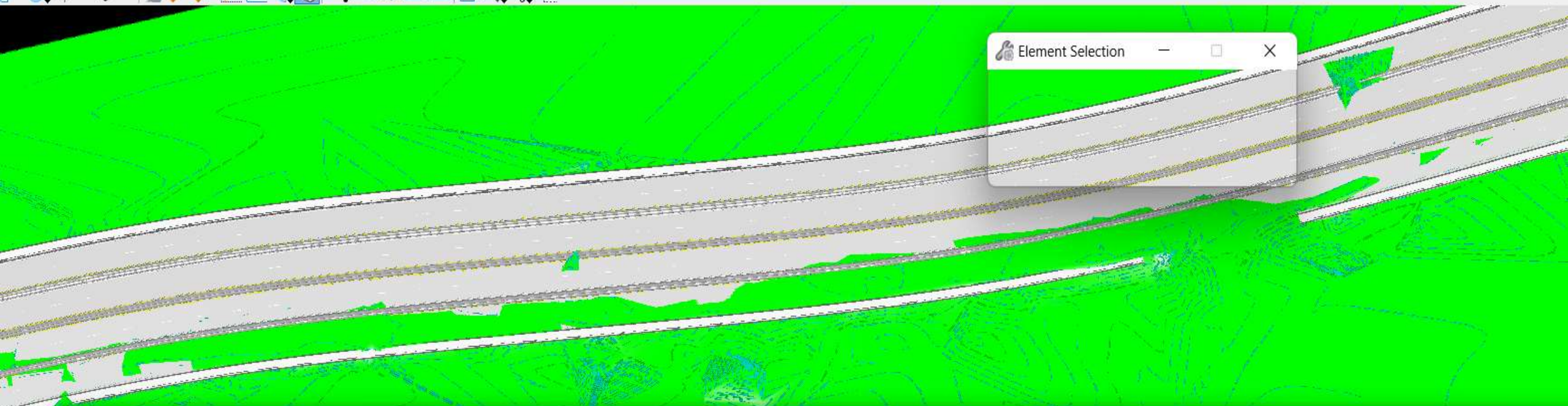
4A

30

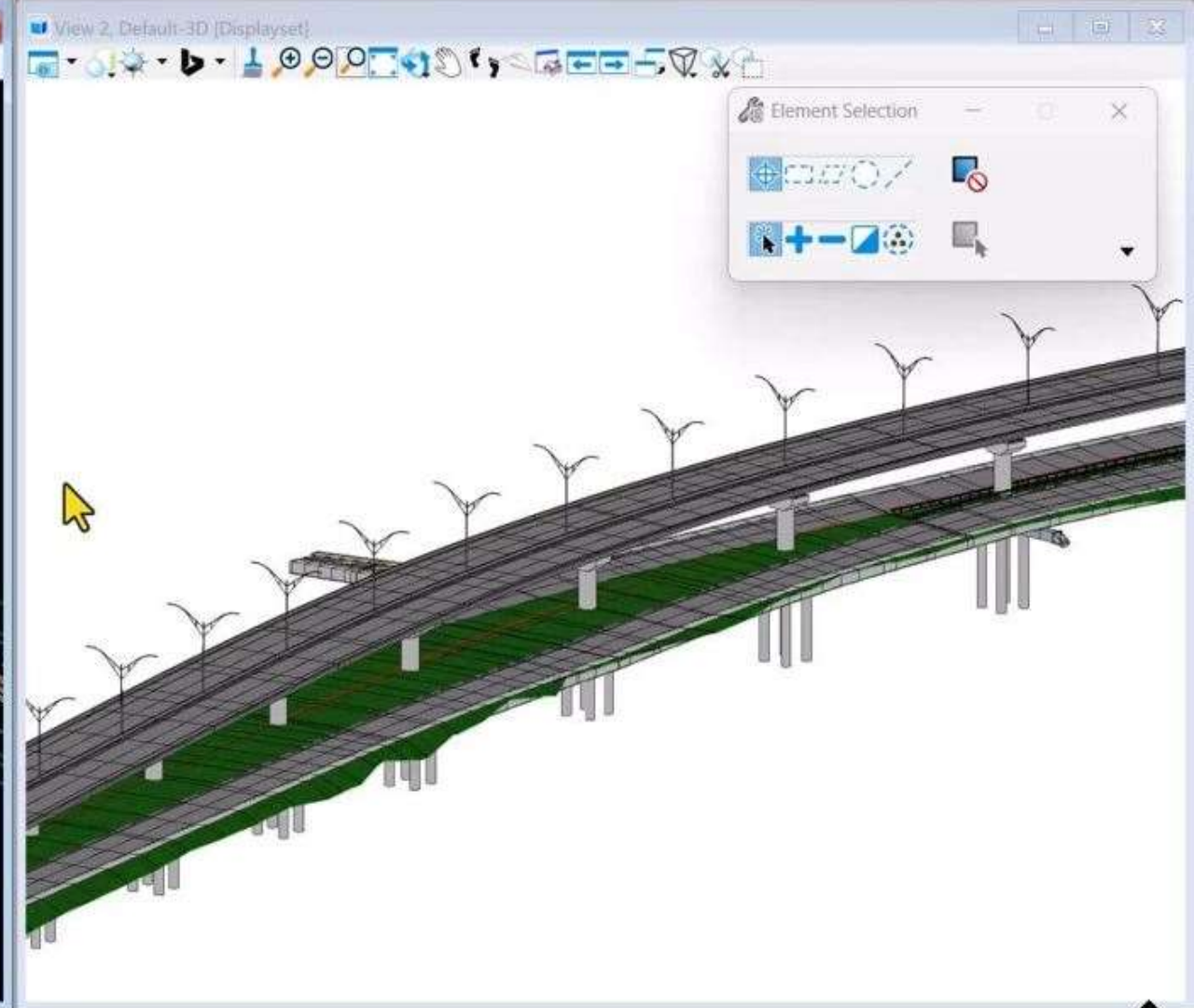
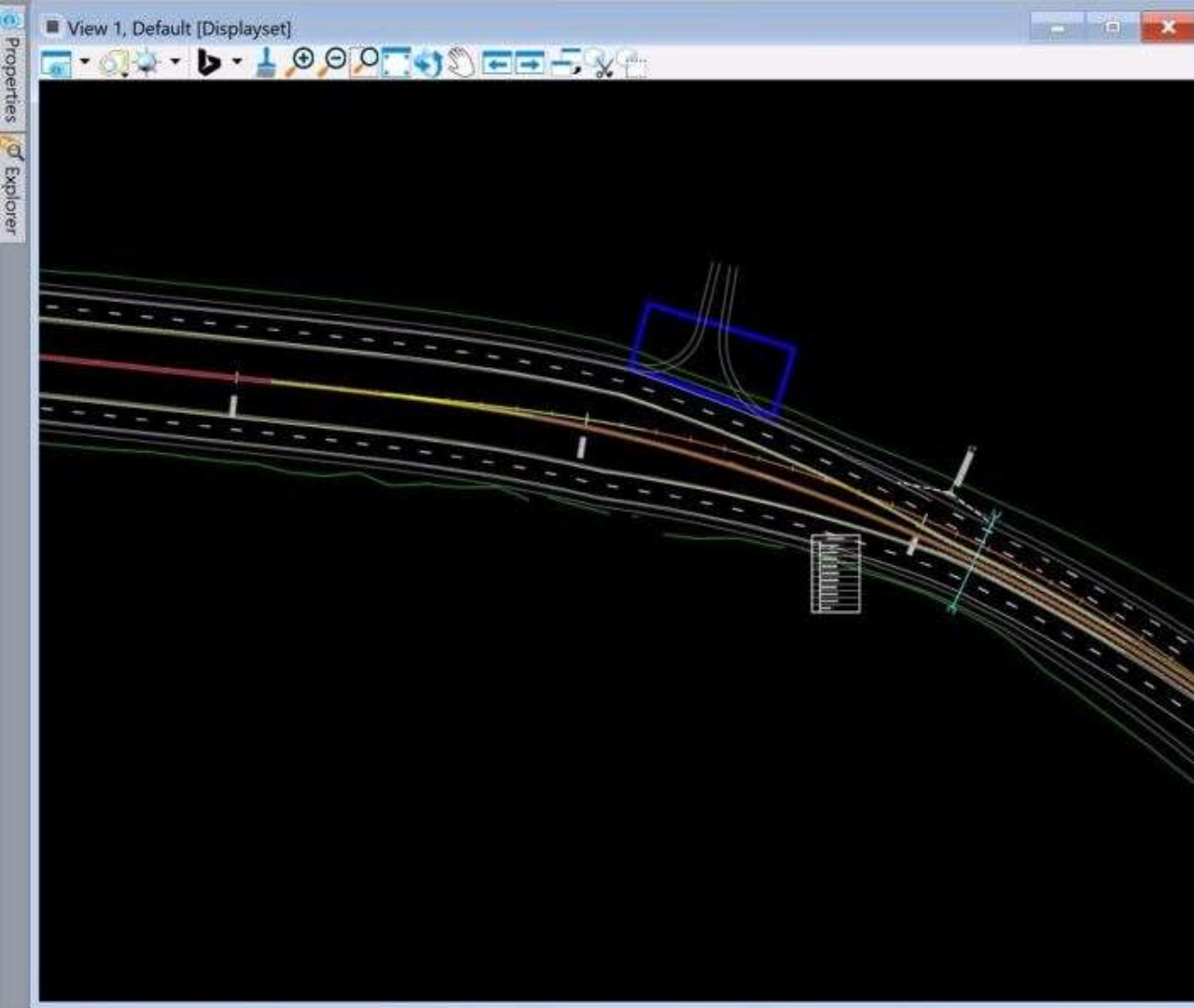


Element Selection

— □ ×



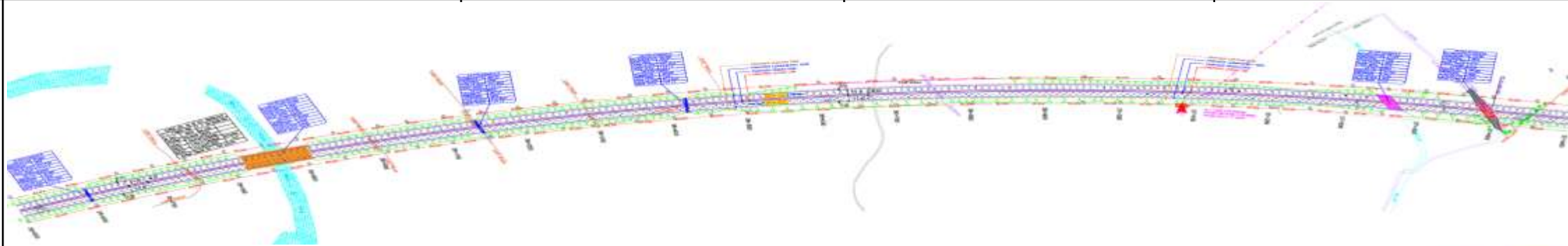




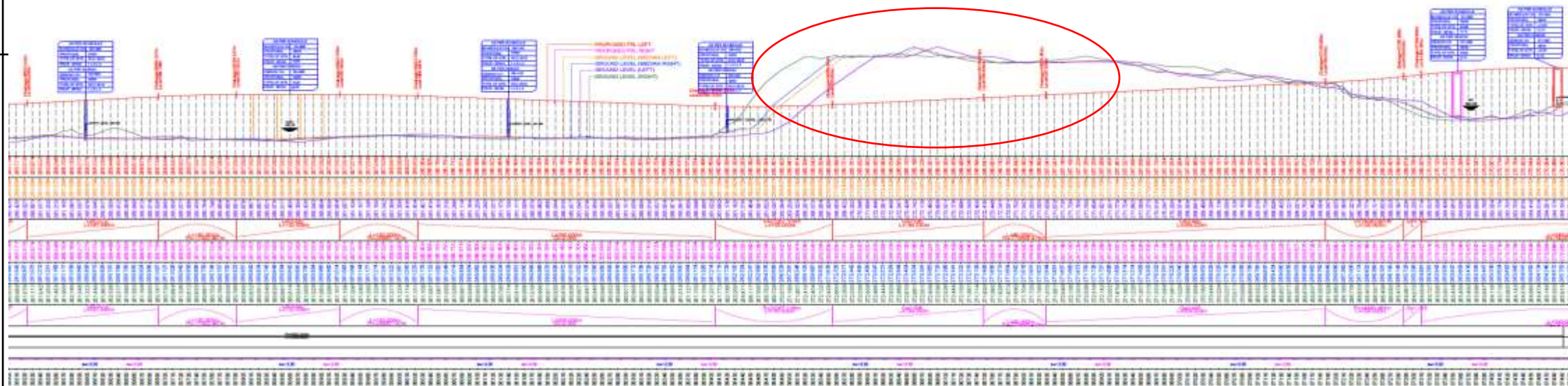


ILLUSTRATION

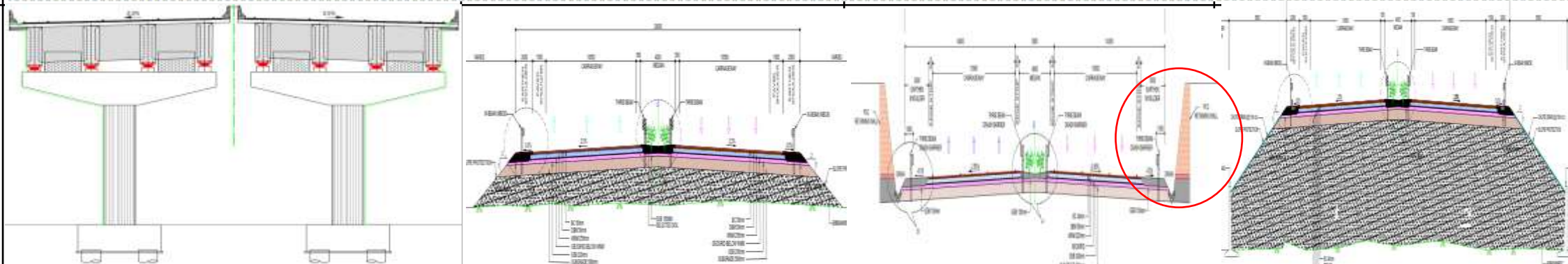
Plan



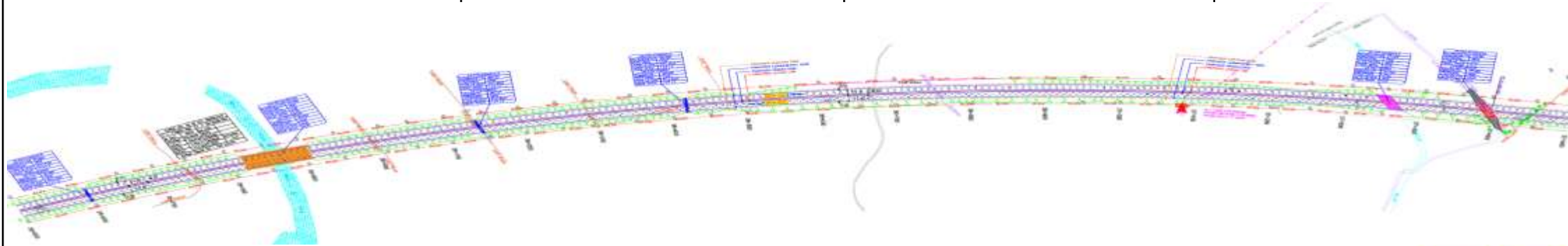
Option-2



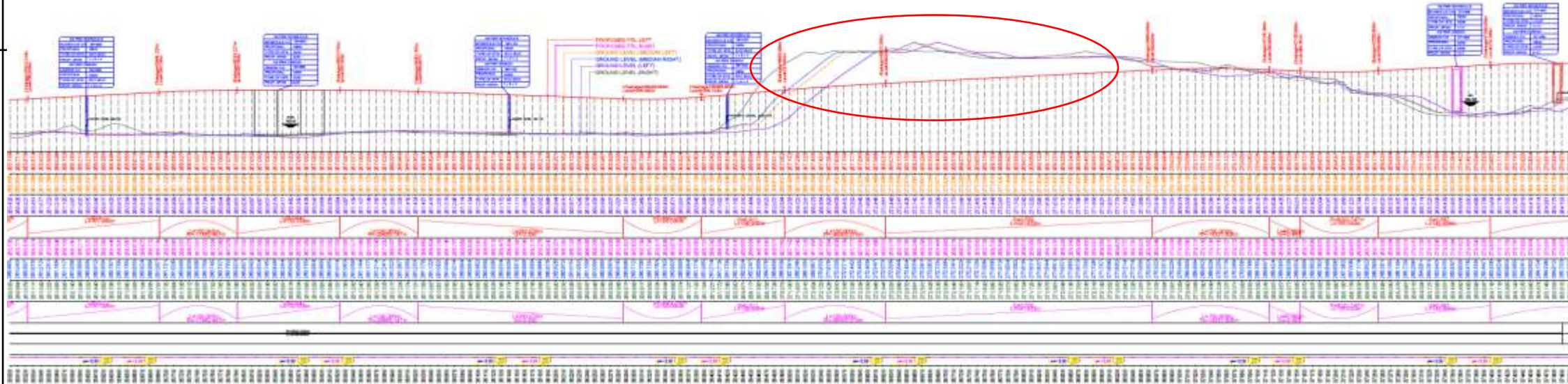
TCS-2



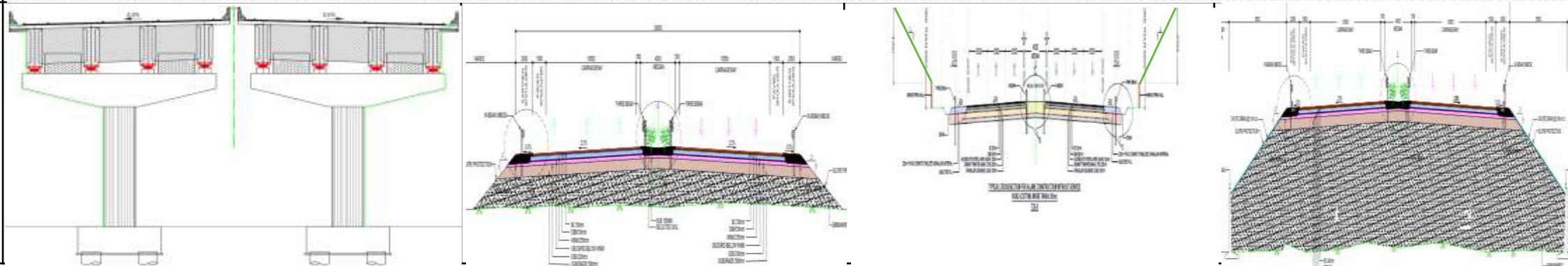
Plan

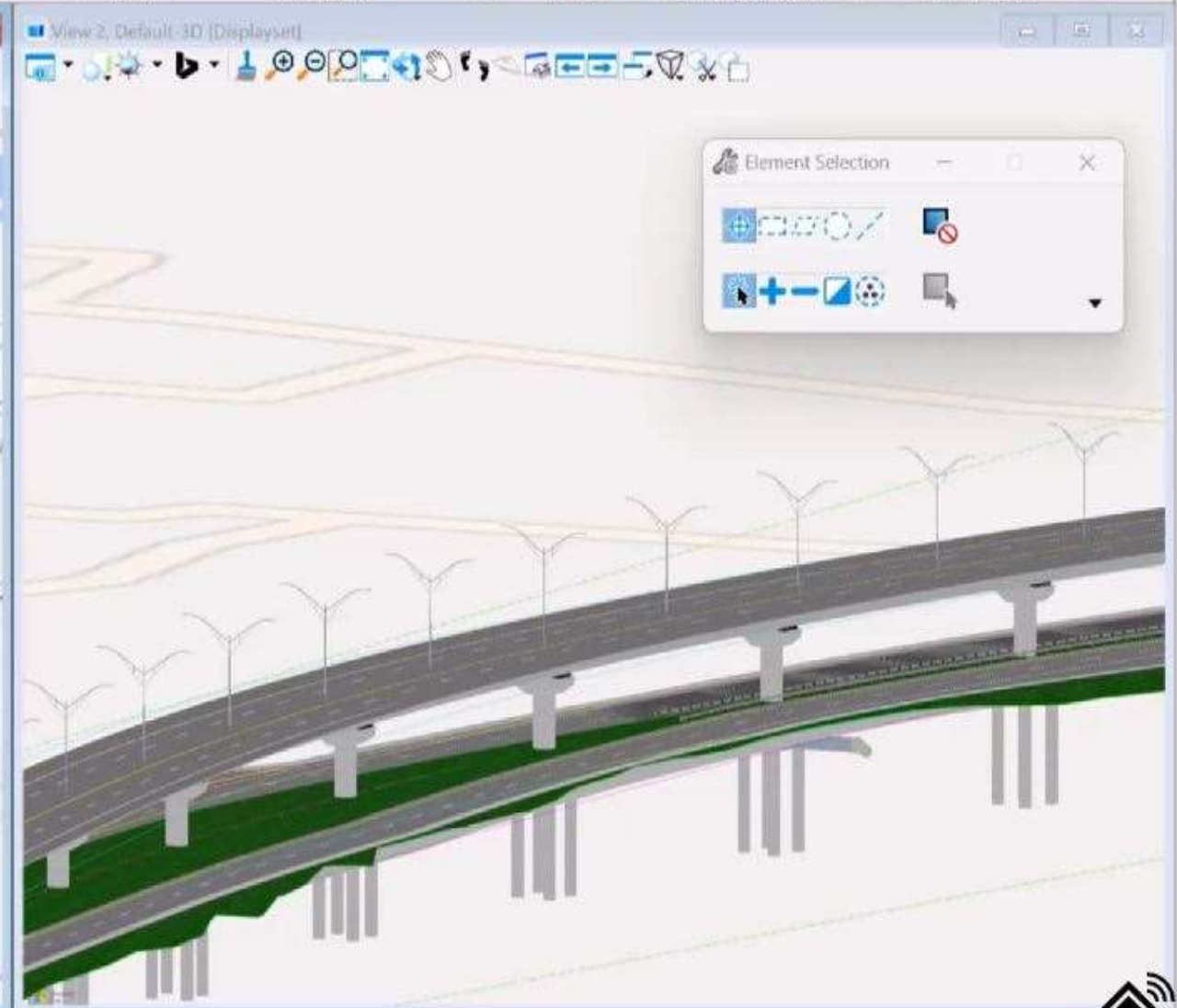
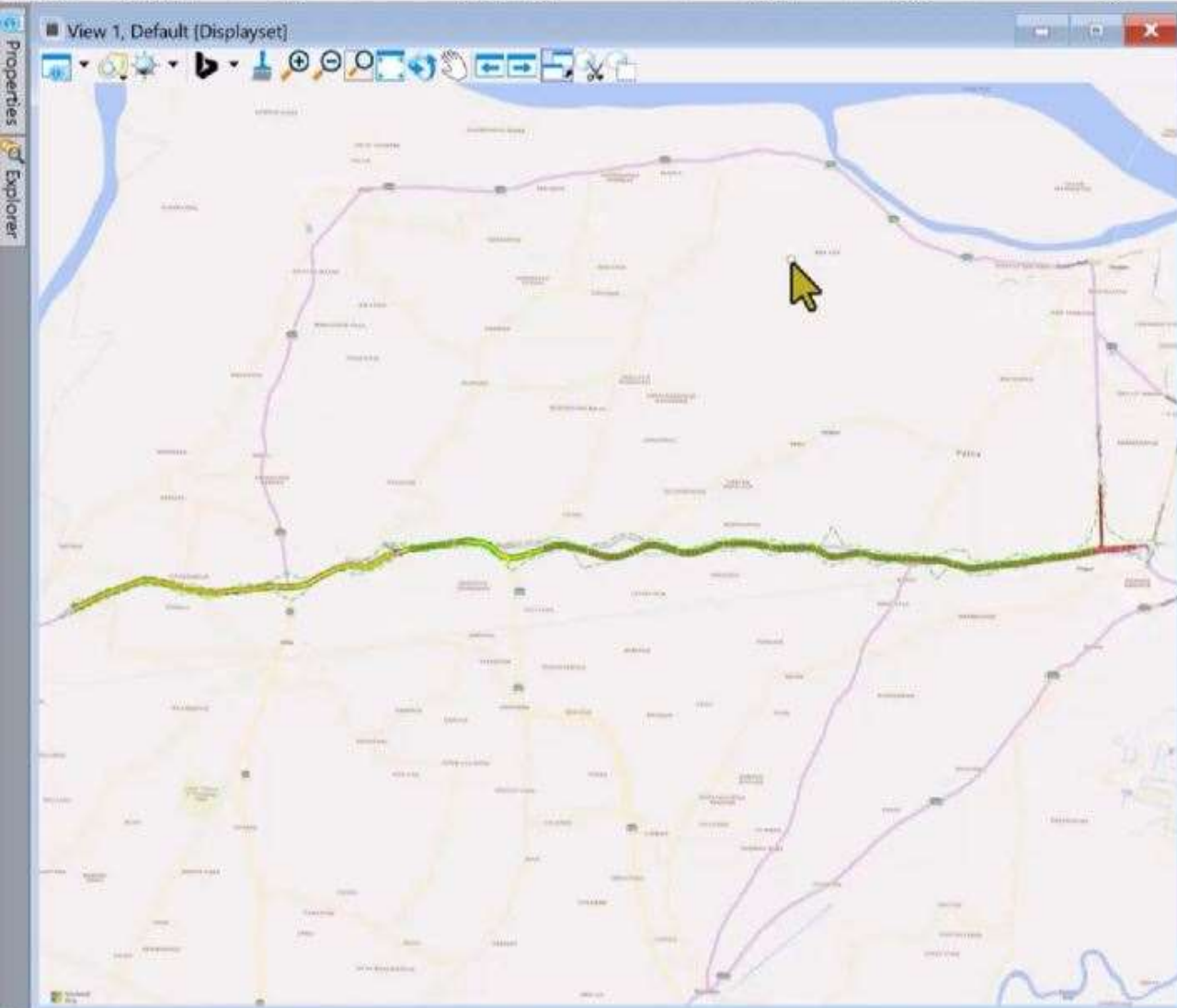


Profile-1



TCS-1





Element Selection

Tools for element selection, including a selection tool, a selection set tool, and a selection filter tool.

Way Forward

- POC done by Bentley & GT has been studied and observed that Technology is available in market.
- Solution has been seen from Auto desk too.
- Efforts done by some DPR consultant has also been observed
- Tentative Work Flow needs to be included in DPR document in
 - Scope of work
 - Estimation and Renumeration part
 - Payment stages
 - Will not indicate in qualification because it will restrict the bidders.
- So the inference draw down is:
 - Invite the bid of DPR with 3D requirement
 - Then Technology provider will wed with Consultants & come out with fruitful way-out.
 - Since it is in preliminary stage so certain leverages is to be given wrt Time and risk of cost needs to be addressed through small CoS.

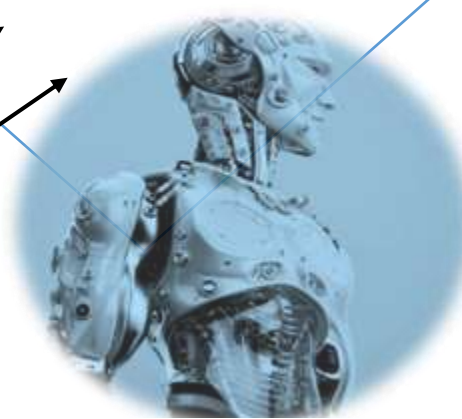


Highway Information Modelling Platform- HIMP

Design Software & Highways Data Management

- Survey/Geotech
- Highway
- Structures
- Utilities
- Quantity/ Cost
- Construction Time
- Modelling
- Animation
- O&M/Tolling/ATMS

Input



Better Understanding, Quick decision making, Variation, COS, Triggering Billing, EOT, COD,

Output



Tentative Work Flow for Development of Static 3D Digitised model with scheduling as 4D & Time based costing as 5D at DPR stage

SI N	Sources	Assignment	Executor
1	<p><u>Survey data-</u> Lidar (Point cloud) -Topographical, PBM & TBM -GPR, Geotech -Existing features -HT & ET line, UG Services, GIS LA MAP</p>	<p><u>Capturing all Data</u> under different requisite formats and its transferring in acceptable format to other platform of model creation for Terrain Modelling On Satellite Map (preferably Navic)</p>	<p>DPR Consultant</p>
2	<p><u>Survey data</u> -Lidar (Point cloud) -Topographical ; GPR ; Geotech; - PBM & TBM ; Existing features -HT & ET line ; UG Services, GIS LA MAP</p>	<p><u>3D Modelling for all the captured data</u> -Terrain Modelling On Satellite Map (Navic) In Layers of :- -Existing features -HT & ET line -Geotech -Terrain Model -UG Services (Pipe / Cables) - Layer showing Land in possession (Colour Coding)</p>	<p>DPR Consultant & Technology Provider</p>

Tentative Work Flow for 3D Digital model with 4D 5D contd...

SIN	Sources	Assignment	Executor
3	Design as per IRC guidelines (Design & Drafting, BOQ, Estimation, Scheduling, segment-wise, costing)	2D drawings. 3D data to be exported to 3D modelling platform.	Consultant
4	Design with 3D data for all desired typical C/S Segments	<p>Design Driven 3D Model with LOD 450+ with cast in place(rebar)/ precast/ steel fabrication related information extracted from the 3D model. Model Shall be data rich , parametric and had ability to extract engineering and Construction level of drawings and documentation.</p> <p>Revit/library-based, 3D Model with walk through for all the requisite segment on Satellite images and Survey layers showing all features with all the components as envisaged in Schedule 'B' & 'C' on HIMP for creation of Digital Twin.</p> <p><u>Segment-wise Layers for respective typical C/S.</u></p> <ul style="list-style-type: none"> -EW&SG / Foundation -Granular base / Sub structure - Rigid or Flexible Base / Super Structure -Finishing (separate layer for Marking, Signages, Furnitures) 	Technology Provider with Consultant -

Tentative Work Flow for 3D Digital model with 4D & 5D contd...

SIN	Sources	Assignment	Executor
4	Resource evaluation & planning w.r.t. Material, Quantity, Required Processing equipment, processing time.	Segment wise scheduling of all required activities on time scale with available set of resources.	Consultant
5	Layered 3D Model of Projects. Schedule of activities for contributing segments of project as development of 4D.	Scheduling of activity on appropriate software for each segment with defined set of resources & its integration with 3D Model.	Technology Provider with Consultant 4D window in Dashboard to operate 4D of Digital Twin of project.
6	Segment wise 4D Model of the project.	Associating time-based costing for each segment showcase the 5D in the Digital Twin of HIMP	Technology Provider with Consultant. 5D switch may be below 4D so that window showing development.

Automated Machine Guidance & Control Technology



3D Automated Machine Guidance & Control Technology

Initiated in Lucknow – Kanpur Package ... for Automating the Highway Construction

Conventional Survey



Data Driven Machine Aided Construction

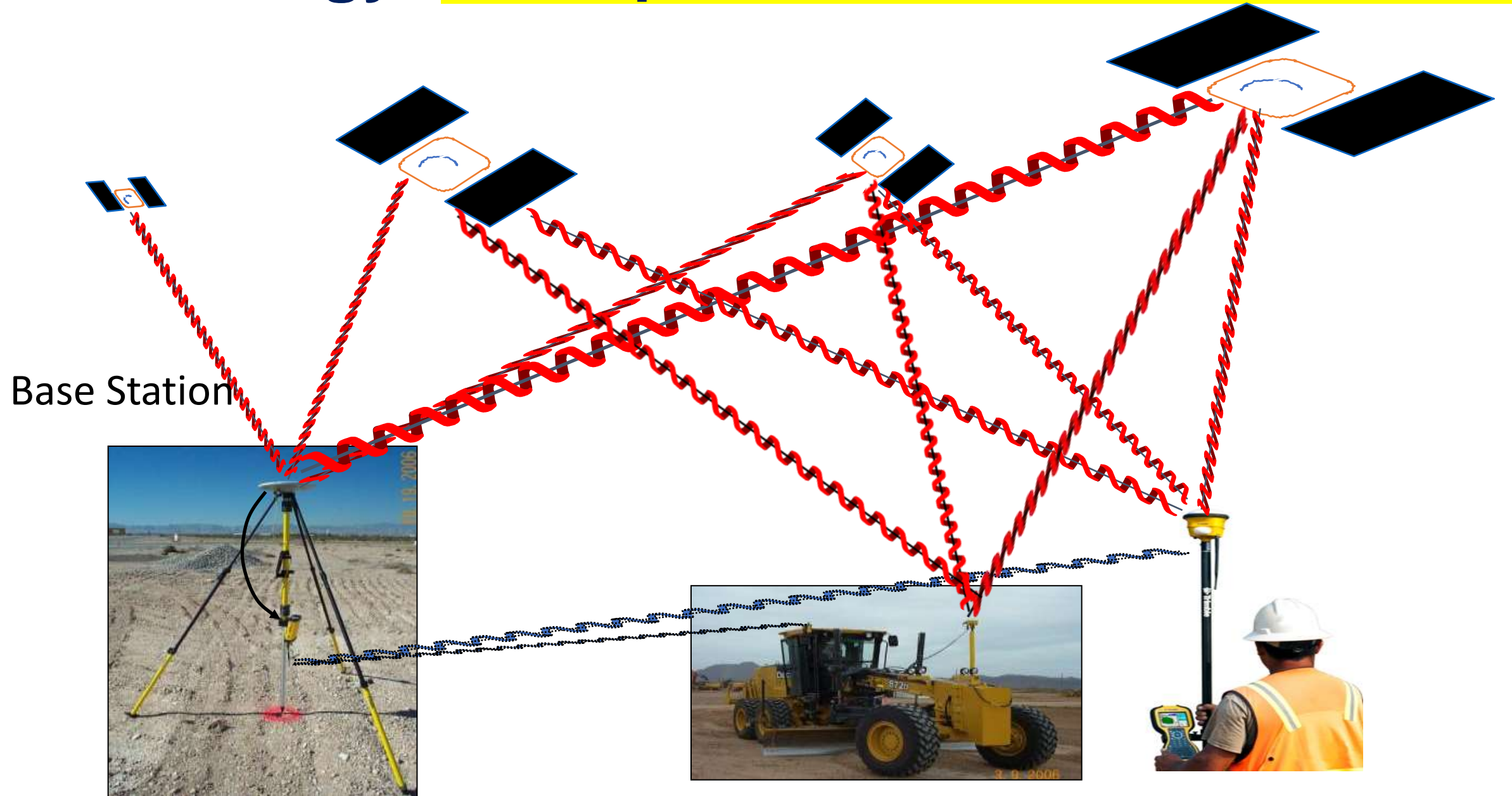


Optimize & Automate the Process

- Eliminate Stakes & Strings,
- Ensure human safety
- NO constraint of daylight

Enhance Productivity

Technology- Geo-spatial, Instrumentation, AI...



3D Automated Machine Guidance & Control Technology



Automated & Intelligent Machine–Aided Construction

Observed advantage- Facilitate the Implementation &

Enforcement of laid-down SOPs

Flying Machines onFlyways Landing Stations onHighways

Integration points of Highways & Flyways.- Clover leaf Junction, Wayside Amenities



Multimodal logistic Infrastructure (Highway Taxies ↔ Drone Taxies)

Highways Network established to cater Multimodal Transportation

Flyways Low level Geo-fenced Grade seperated 6-axis Routes

Landing Stations Integration of Highways with Flyways

