

Brownfield Roadway Design Challenges

SJE Consultants Ltd



01

DEFINING
BROWNFIELD

02

GETTING STARTED

03

DESIGN ELEMENTS,
CHALLENGES
CONSIDERATIONS

04

CONCLUSION &
QUESTIONS

WATER
PERFORMANCE



BROWNFIELD

Refers to a site that is currently occupied by existing road network, homes, businesses, and occasionally historical sites.



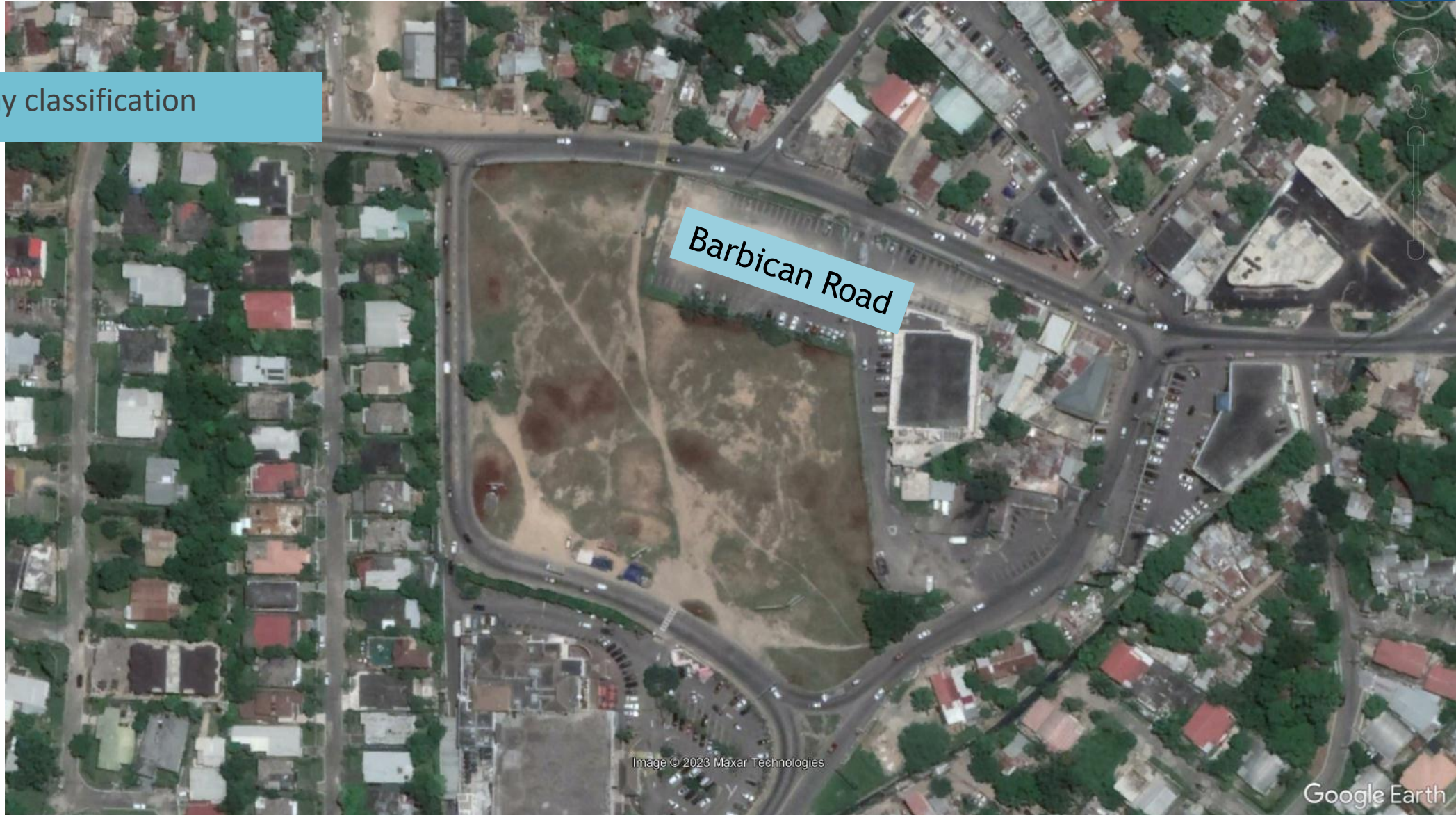
Examples

- ▶ Widening of existing arterial



Examples

- ▶ Upgrading roadway classification



Where do we start?

Employer's Requirements

Topographical Survey

Traffic capacity analysis

Safety Audit

Drainage
Assessment

Cadastral
Survey

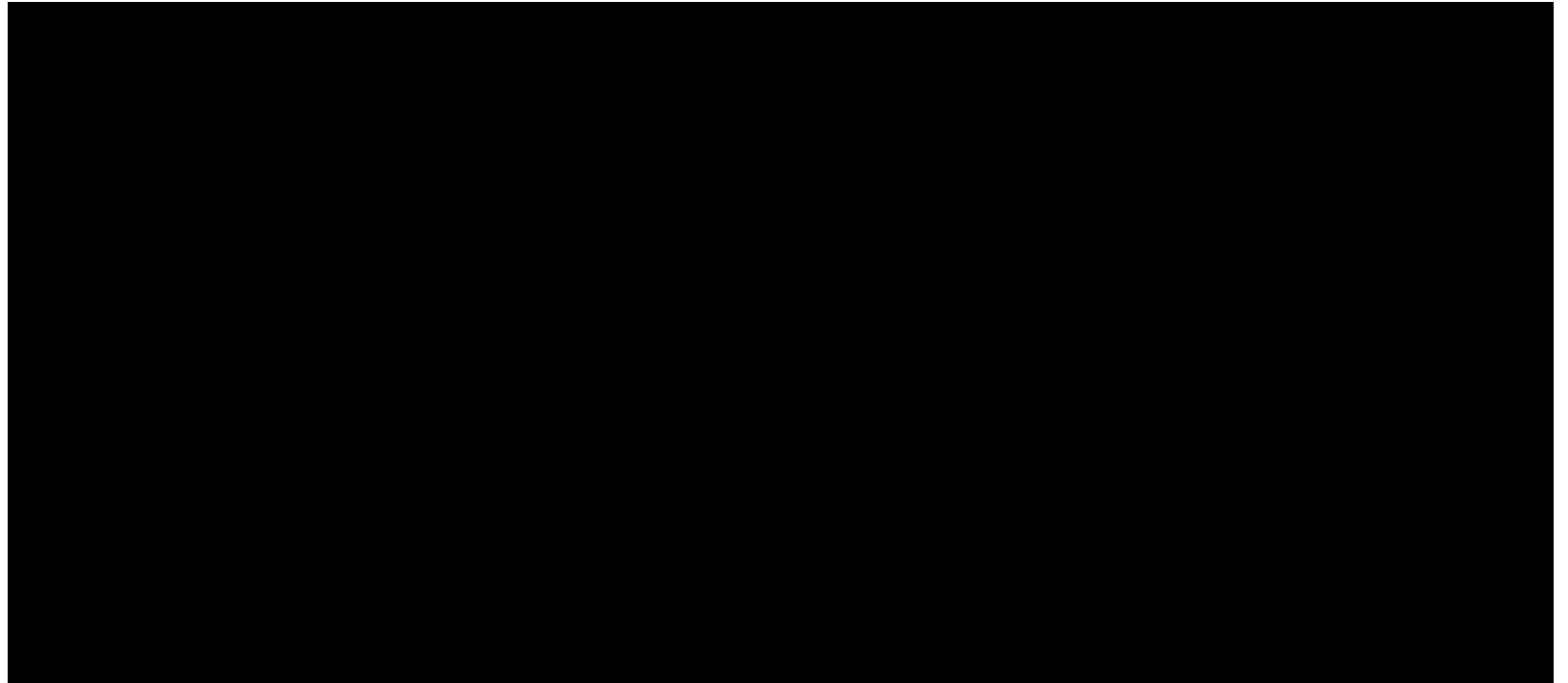
Pavement
Assessment

Utility
Assessment

Where do we start?

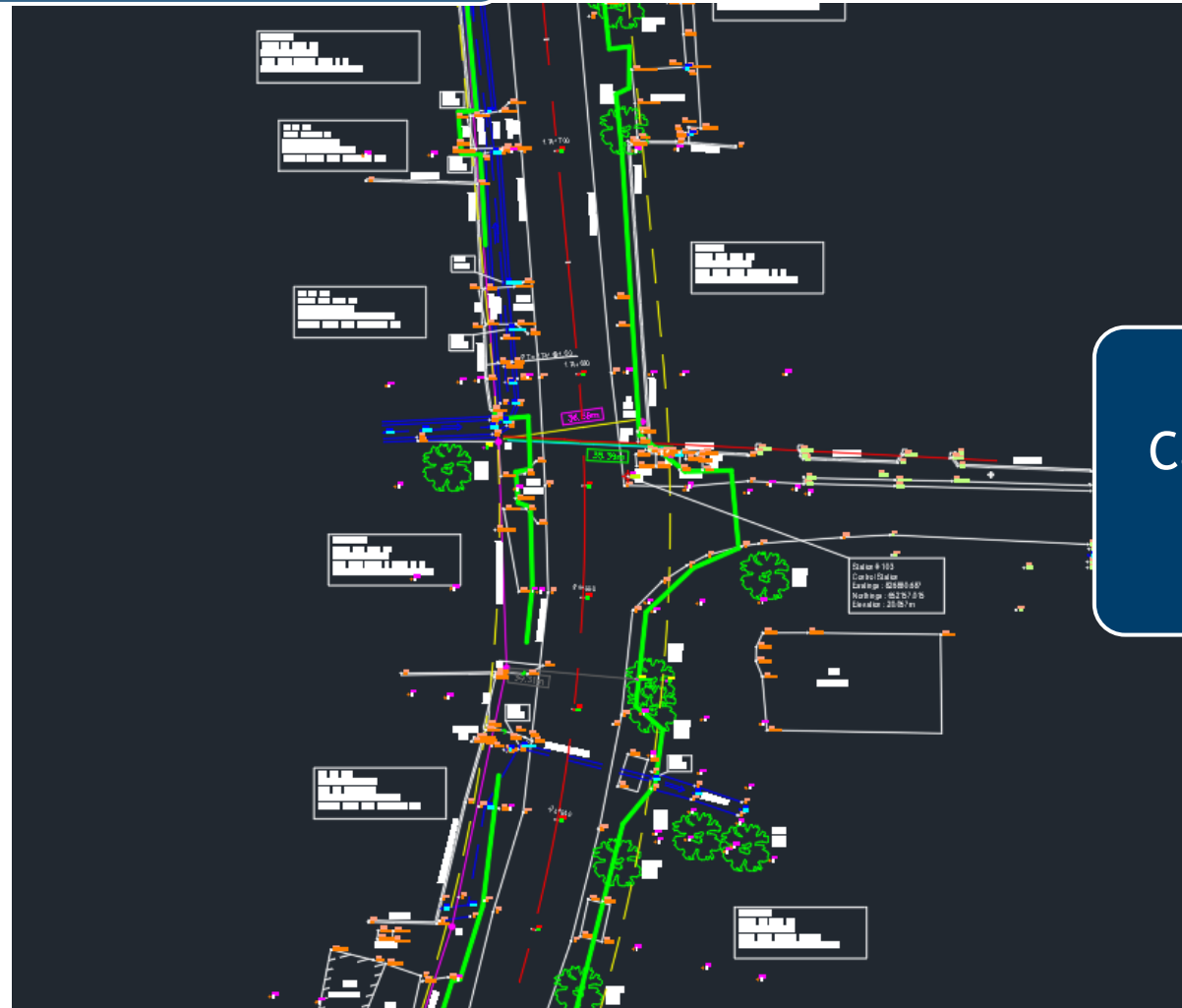
Employer's Requirements

- Lane widths
- Number of lanes
- Median width and type
- Sidewalk width
- Intersections



Where do we start?

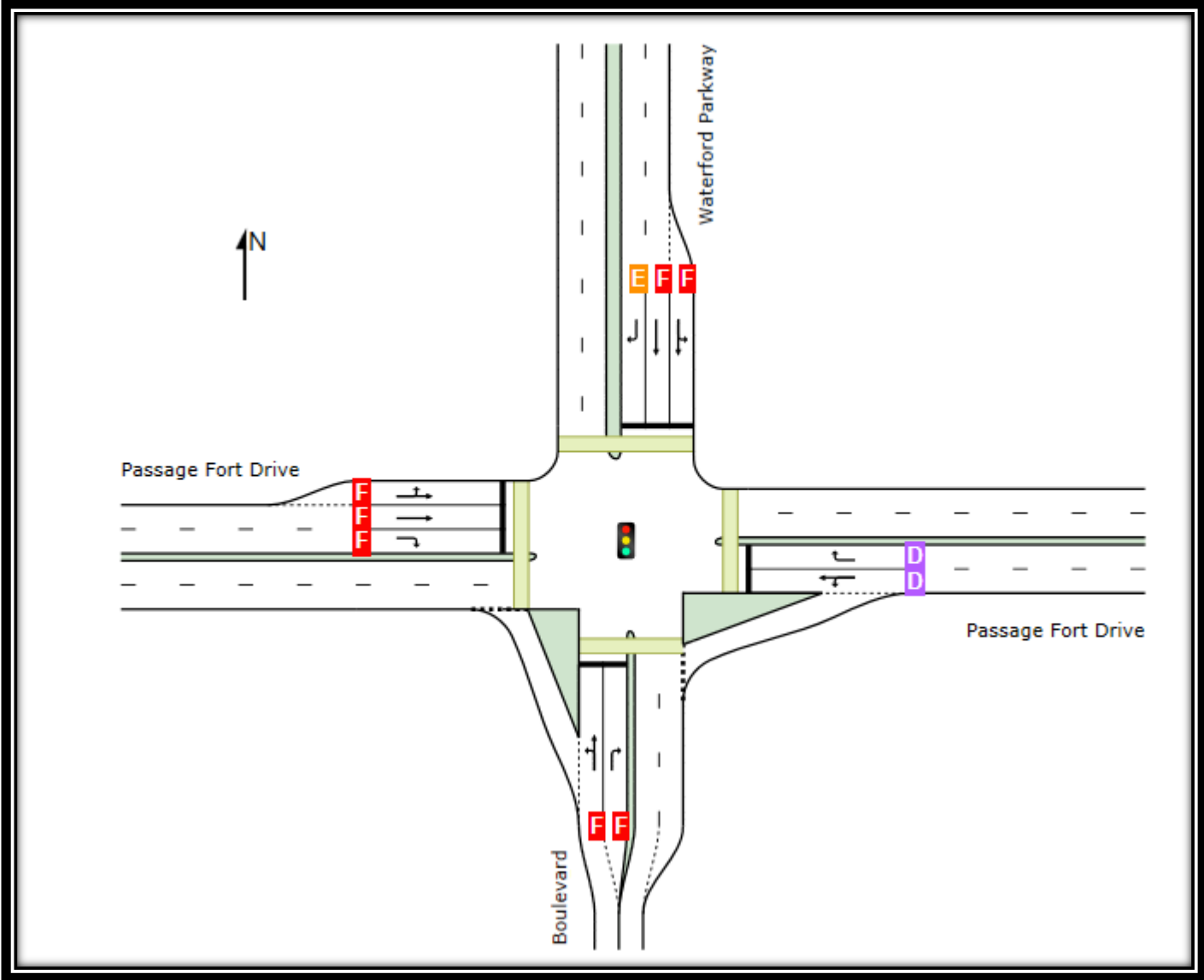
Topographical Survey



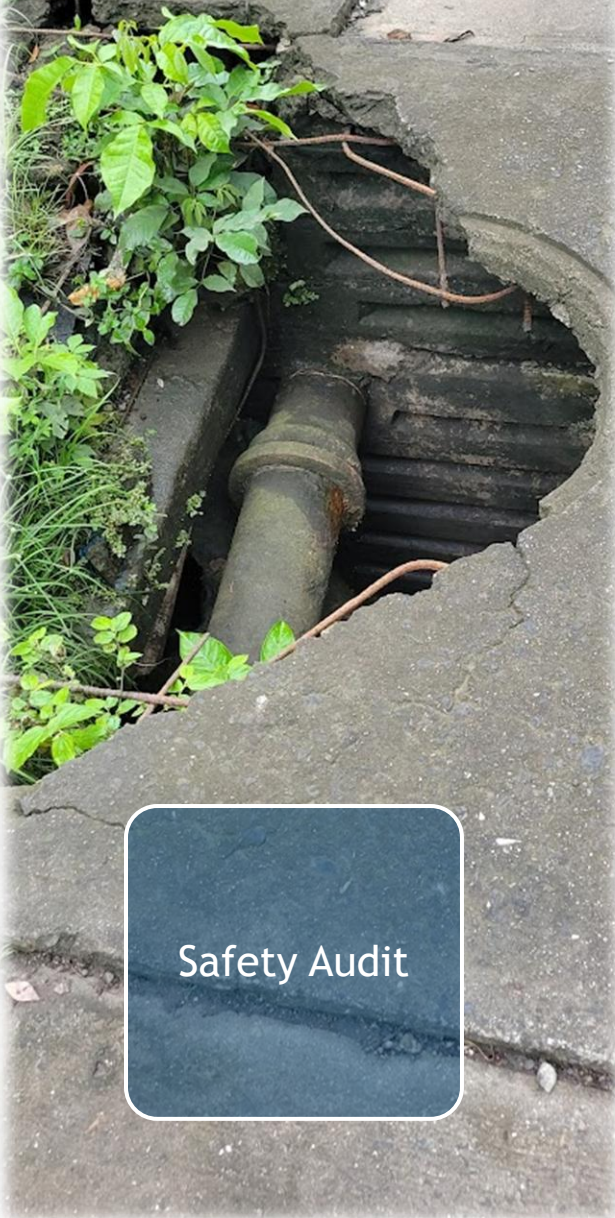
Cadastral
Survey

Where do we start?

Traffic capacity analysis



Where do we start?



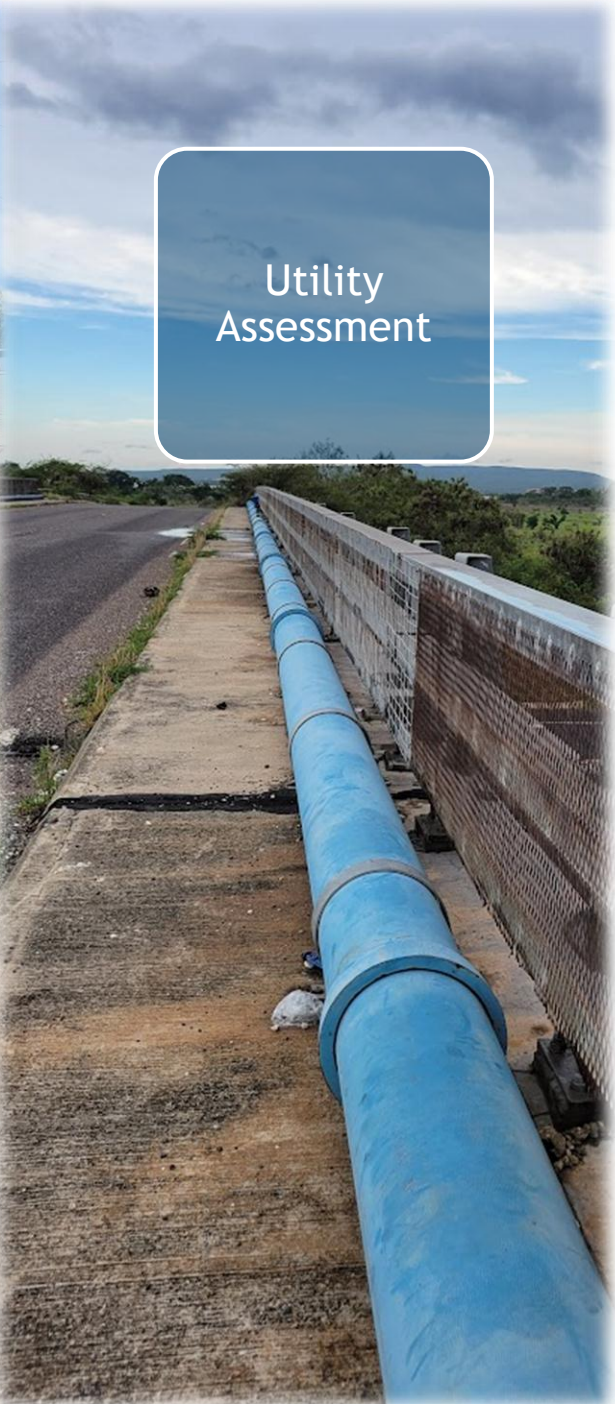
Safety Audit



Pavement Assessment



Drainage Assessment



Utility Assessment

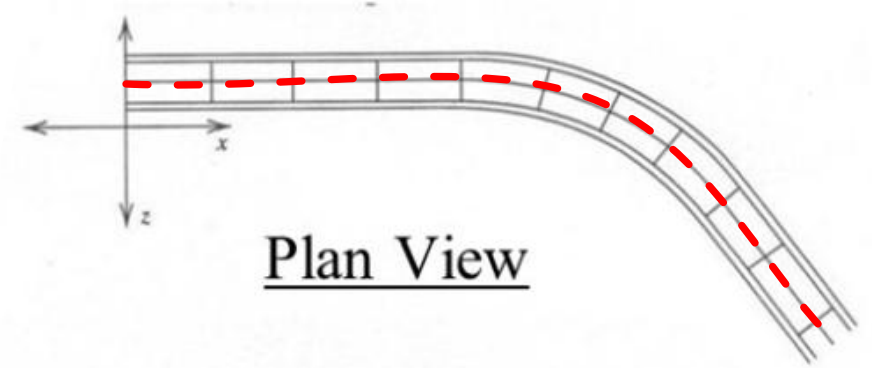
DESIGN ELEMENTS & CHALLENGES

- *Horizontal Alignment*
- *Vertical Alignment*
- *Cross Section*

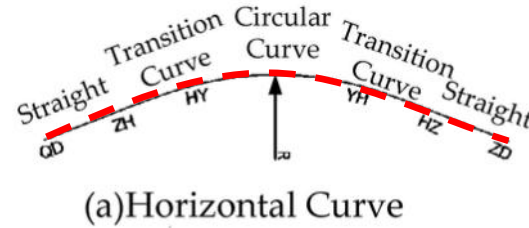
ROADWAY DESIGN



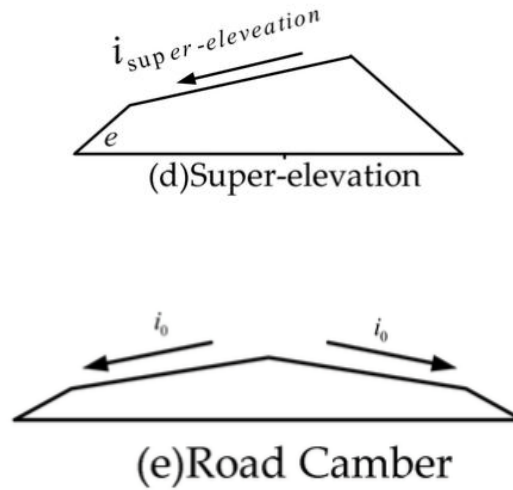
HORIZONTAL ALIGNMENT



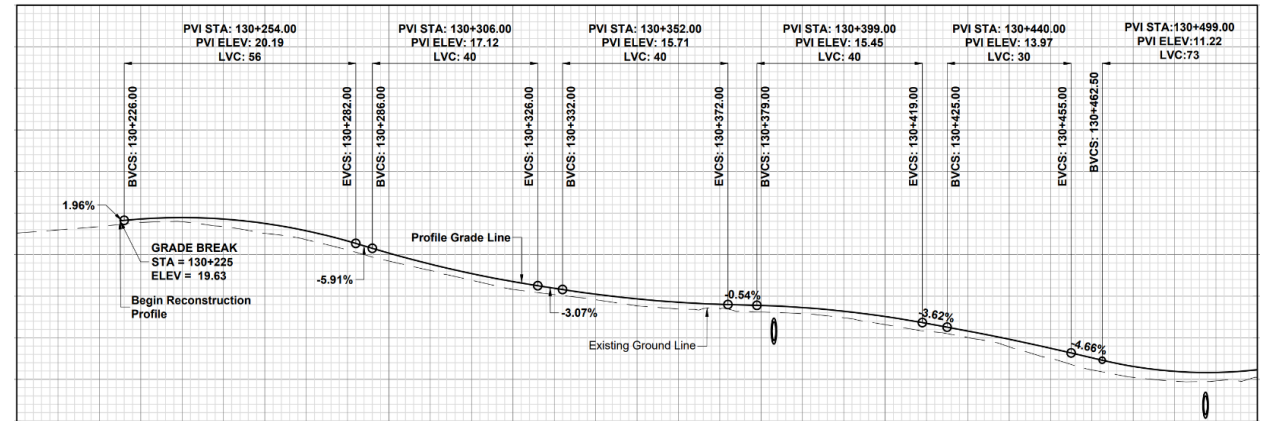
Alignment
(horizontal curve)



Transverse
Slope
(superelevation)
(camber)



VERTICAL ALIGNMENT



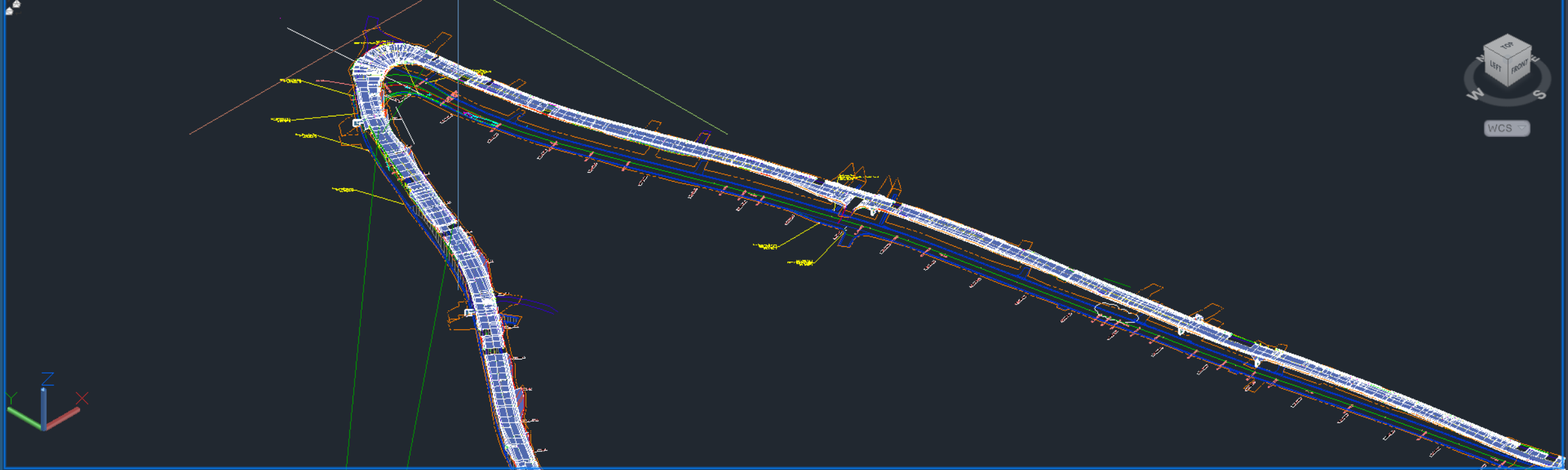
The vertical alignment or road profile is comprised of vertical curves and lines used to create crests, sags and tangents.

Vertical curves are typically constrained by a typical driver's sight distance, stopping distance and comfort.

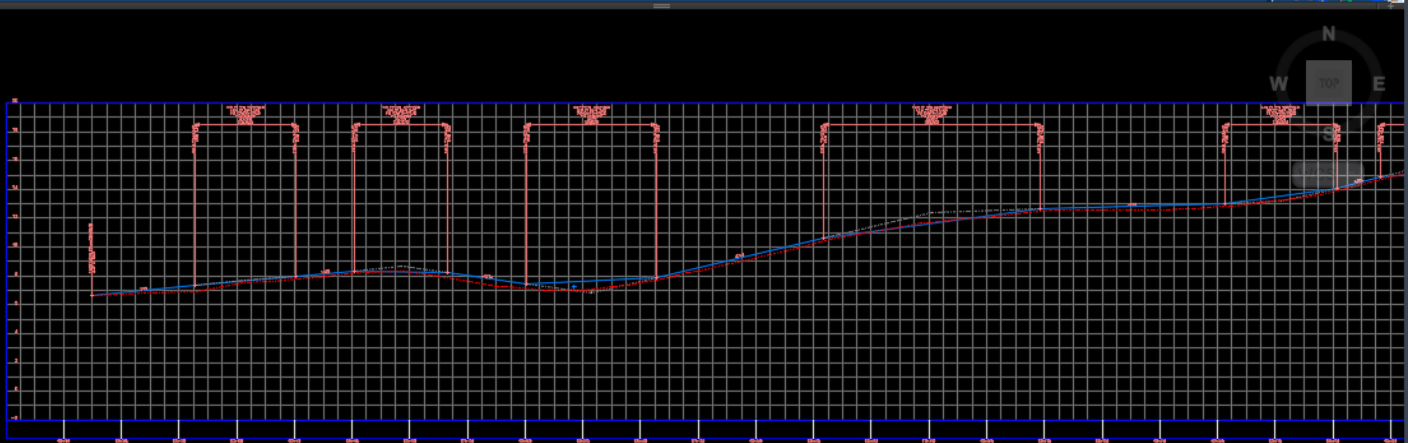
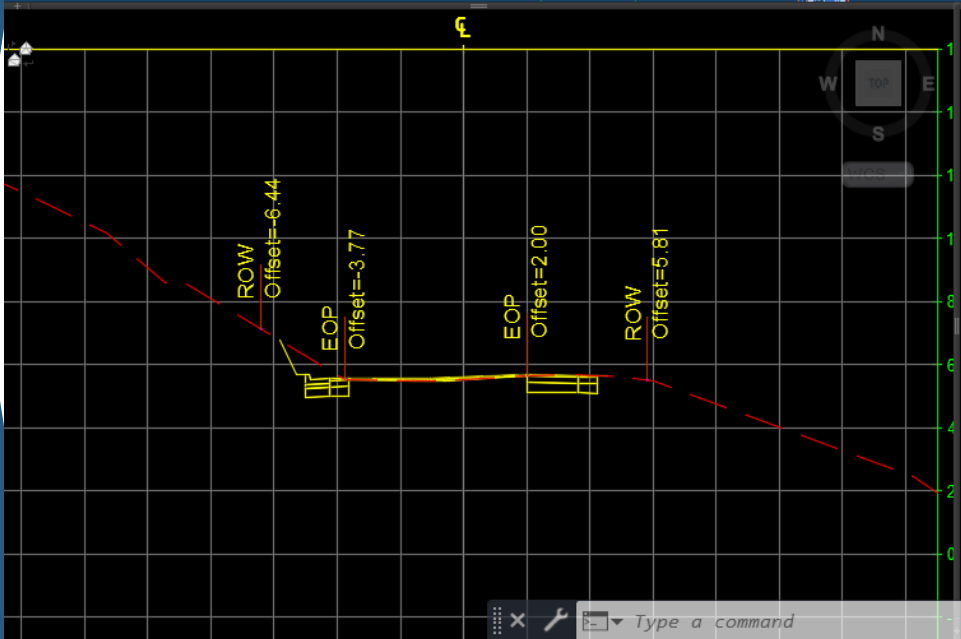
CROSS SECTION



Cross section defines number and width of lanes, sidewalks, shoulders, additional end treatments.



WCS



DESIGN TOOLS

The screenshot displays the Autodesk AutoCAD Civil 3D 2017 software interface. The main window shows a 3D terrain model with a road design. The ribbon menu at the top includes tabs for Home, Insert, Annotate, Modify, Analyze, View, Manage, Output, Survey, Autodesk 360, Help, Add-ins, Express Tools, Featured Apps, BIM 360, Performance, Raster Tools, Geolocation, and Drive. The Command Line at the bottom shows the command: `Command: Command:`.

The interface is divided into several panels:

- TOOLSPACE:** Contains the Active Drawing View, Prospector, Settings, Survey, and Toolbox. The Prospector shows a tree view of the drawing's structure, including Watersheds, Definition, Boundaries, Breaklines, Contours, DEM Files, Drawing Objects, Edits, Point Files, Point Groups, Point Survey, and Figure Survey. The Toolbox contains various design tools.
- Properties Panel:** Located on the right, it shows the properties of the selected object. The selected object is a road, and its properties are listed below.

PROPERTIES	
No selection	
General	
Color	ByLayer
Layer	0
Linetype	ByLayer
Linetype sc...	1.000
Lineweight	ByLayer
Transparency	ByLayer
Thickness	0.000
3D Visualization	
Material	ByLayer
Plot style	
Plot style	ByColor
Plot style ta...	None
Plot table at...	Model
Plot table ty...	Not available
View	
Center X	467161.169
Center Y	4481979.088
Center Z	0.000
Height	41.745
Width	75.069
Misc	
Asymptote	1.1000

ROADWAY DESIGN CHALLENGES



- *Hydrology & Hydraulic Study*
 - *Catchment Areas*
 - *Return Period*
 - *Existing Outfalls*
 - *Flooding Issues*

DRAINAGE DESIGN



A Map showing the Catchment Areas

Along Red Hills Road Corridor

Legend

- B** Redhills'
- A** Redhills''

Redhills' **B**

Redhills''

**HYDROLOGICAL
STUDY**



HYDRAULIC ANALYSIS

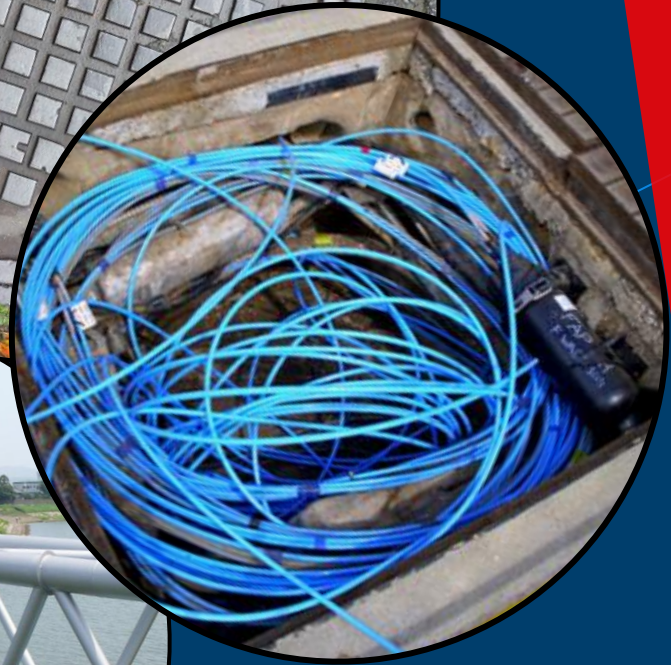
Culvert Sizes
& Inlet
Spacing

Kerb & Gutter
Capacity

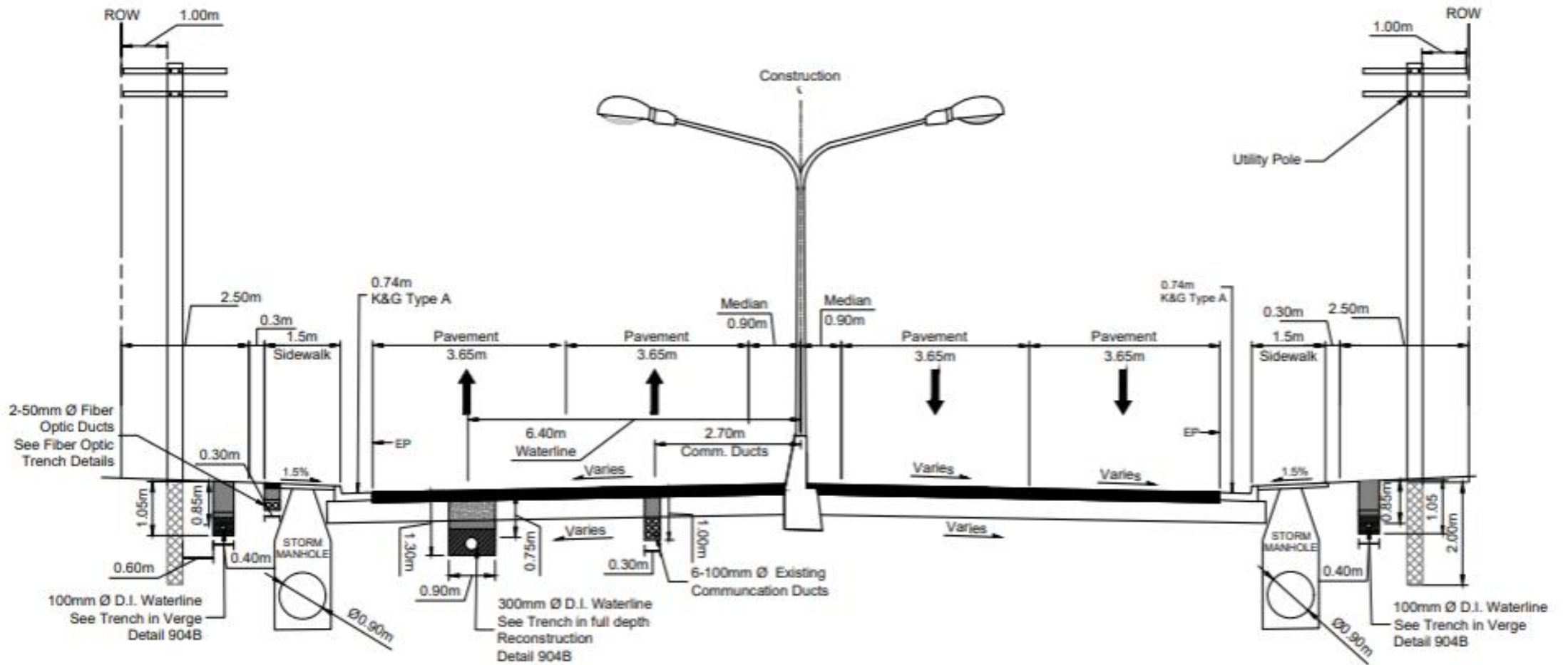
Channel Sizes

DRAINAGE DESIGN CHALLENGES





UTILITIES DESIGN & LAYOUT



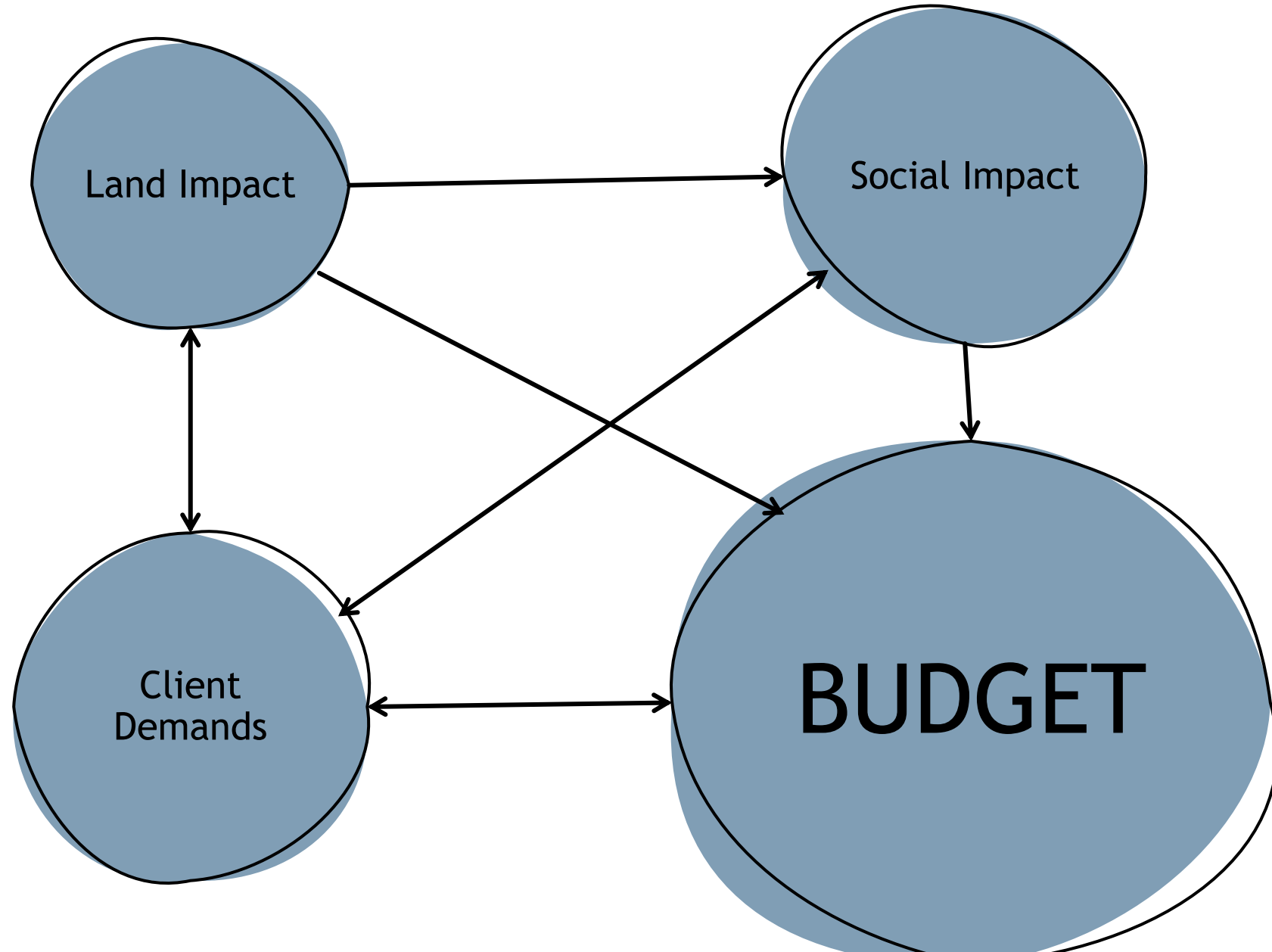
UTILITIES DESIGN CHALLENGES

Con
Ro
Drai



THE CONUNDRUM

The Conundrum Matrix



Recommendations?

1. Invest in Preliminary Works
2. Proper Site Reconnaissance
3. As-built database
4. Value Engineering and Construction Feasibility Study

Thank you!

The background features a white space with abstract geometric shapes in red and blue on the right side. These shapes are overlapping triangles and polygons, creating a modern, layered effect. The colors range from a vibrant red to a deep, dark blue.