always powering ahead

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Pigging the Unpiggable

An asset futureproofing initiative

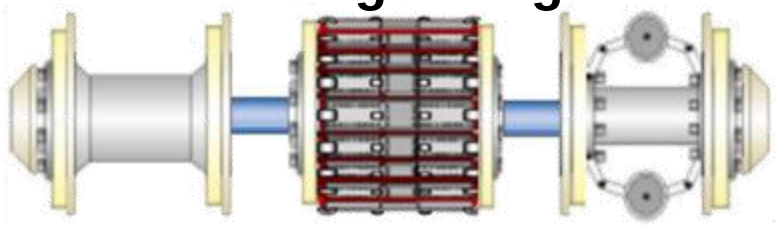
June 2021

What is Pigging?

In gas transmission pigs are a device used for;

- **pipeline cleaning**
- **internal inspections e.g. gauging or intelligent inline inspections**

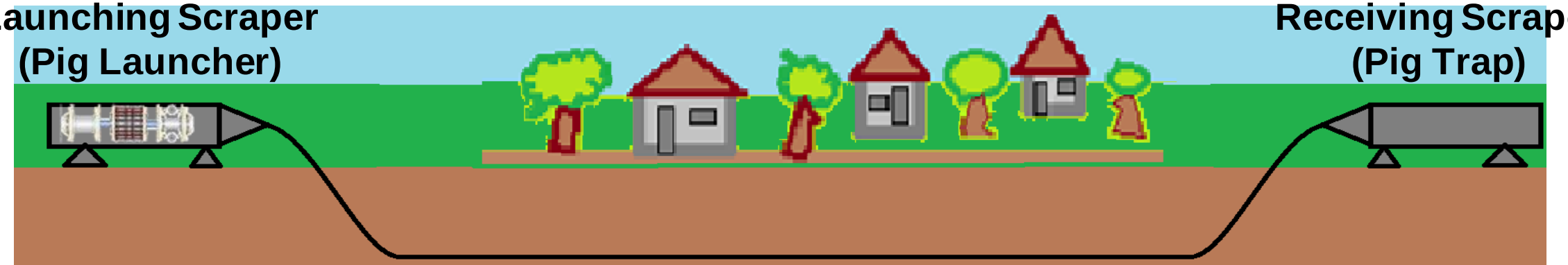
Intelligent Pig



- **Collects pipeline condition/location data while travelling in the pipe. Once retrieved this data is assessed to identify features that require direct assessment/repair.**
- **Provides invaluable integrity information 'condition snapshots' to predict and prevent failures.**
- **Enables efficient targeted maintenance campaigns.**

Launching Scraper (Pig Launcher)

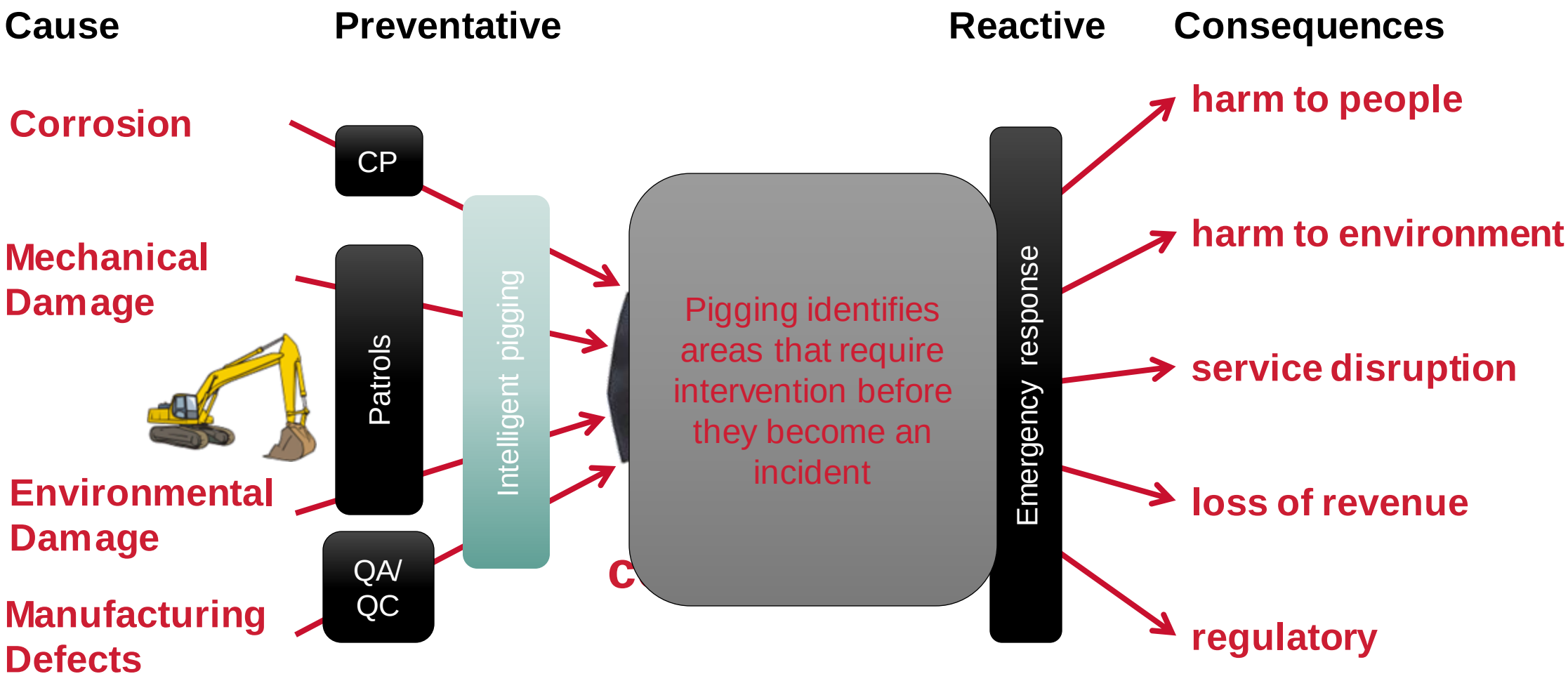
Receiving Scraper (Pig Trap)



But how does the pig move?
Gas pressure is steadily increased behind the pig in the launcher and decreased in a controlled manner downstream, the pressure differential propels the pig steadily along the pipe and into the receiver.

Pipeline Inspection Gauge (PIG) also known as Scrapers (think pipe cleaner) Gauge Pig = checking the pipe for deformity (damage) also used to check that an intelligent pig will not be trapped
Inline inspection (ILI) Electromagnetic acoustic transducer (EMAT) Magnetic Flux Leakage (MFL) Slug = Fluid that has gathered in pipeline low point Cleaning Pig = used to move deposits, slugs etc. to the receiver.

Why intelligent pigging?



Cathodic Protection (CP)
Quality Assurance (QA)
Quality Control (QC)

Why intelligent pigging?

PGE San Bruno incident 2010

- 8 fatalities and 58 injured.
- Civil claims settled US$558m
- Shareholder class action US$90m
- Mandatory US$32m in governance improvement
- US$800m into rates case for integrity work
- Six years of court actions (2010-2017)

- **21st century societal expectations now exceed traditional integrity targets**
- **Even if we can show our risk is ALARP by conventional measures, 21st century expectations require us to go further**
- **We must act to make our unpiggable pipelines safer!**

As low as reasonably practicable (ALARP)

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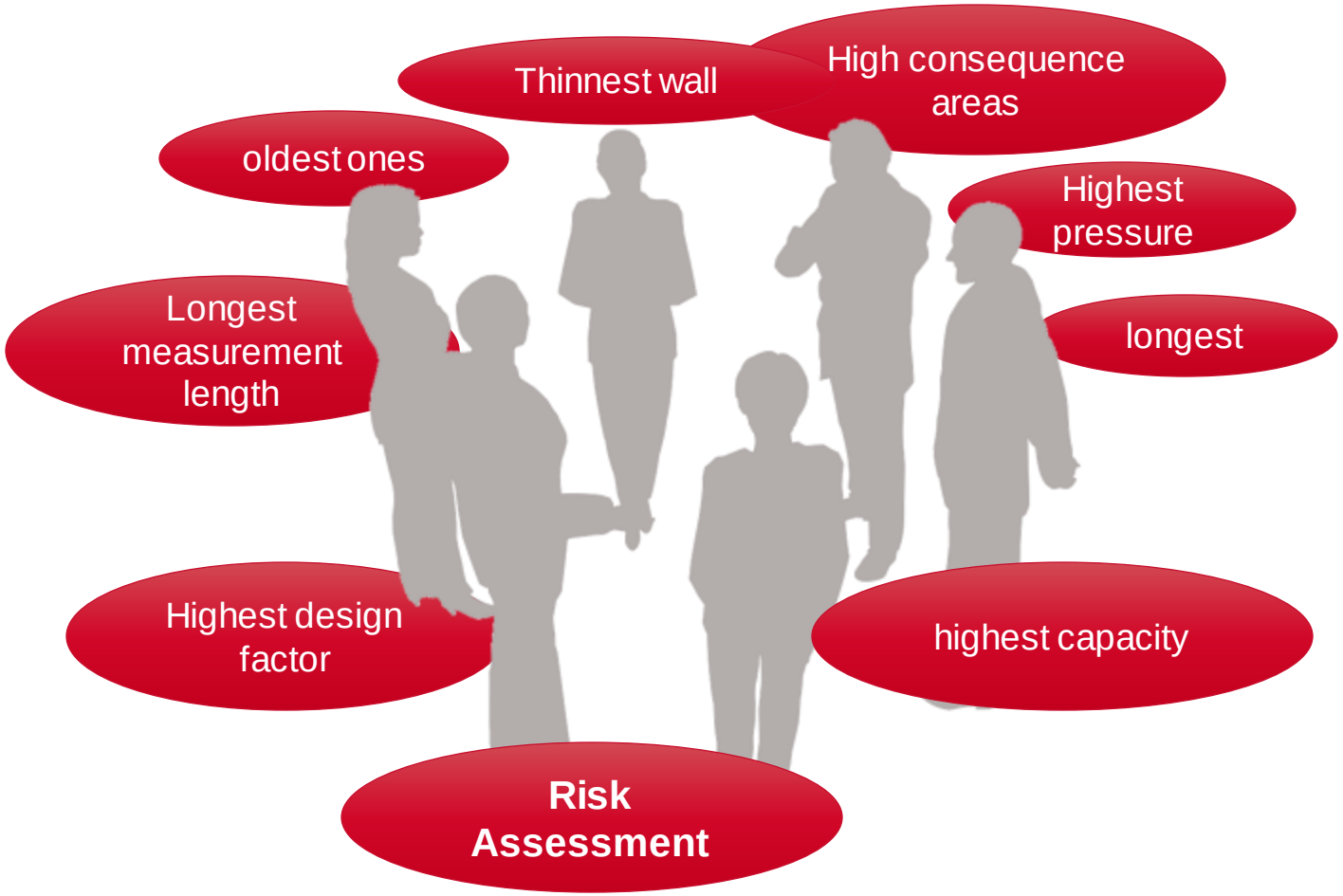
Decision process

OK,
So VTS has 17 unpiggable assets!
Where do we start?



Risk assessment

prioritise by risk

probability x consequence

probability modifiers:

- age
- design (WT, DF, CDL…)
- length in hca*

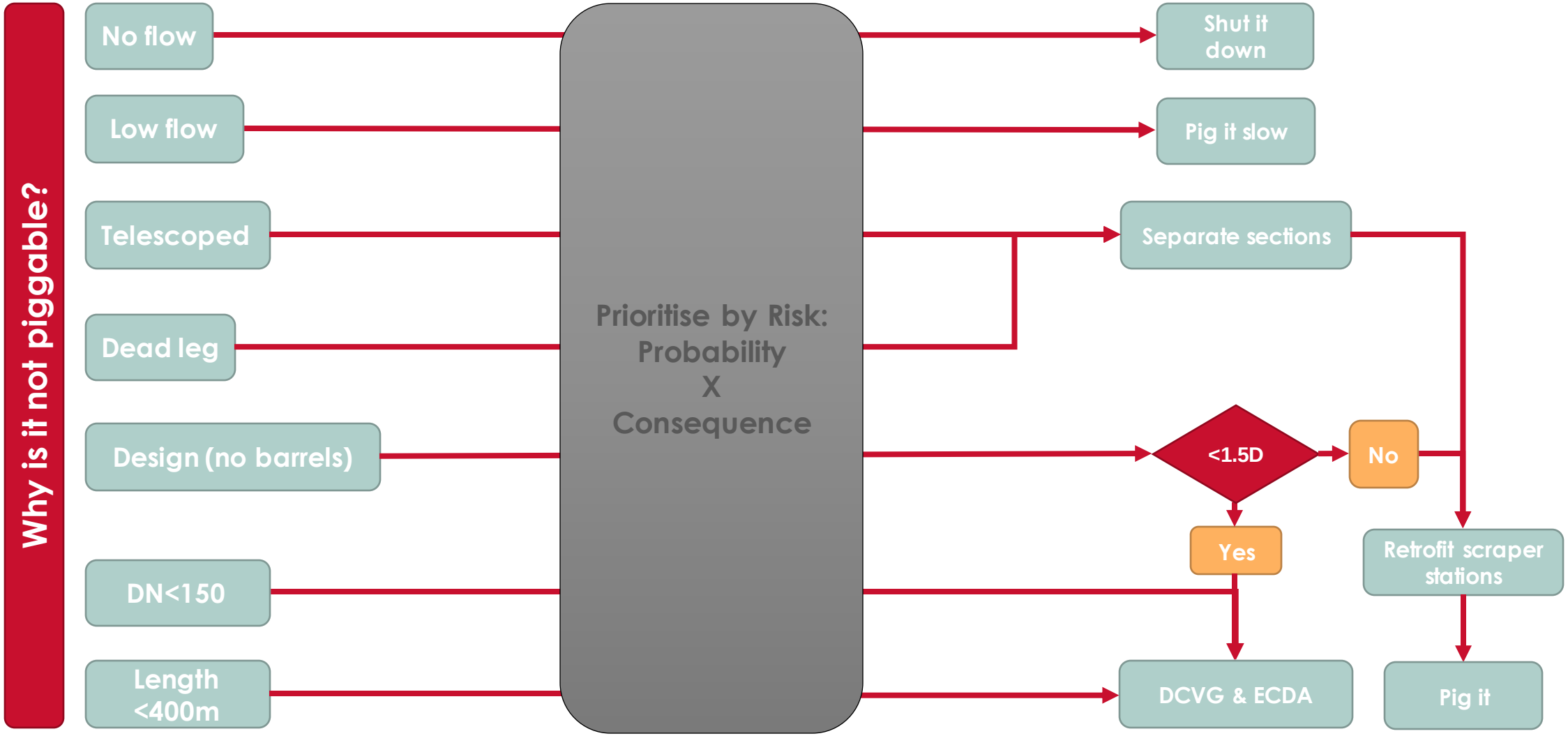
HCA = High Consequence Area

consequence modifiers:

- location class
- measurement length

probability score x consequence score = risk score

Decision process when considering non-piggable pipelines



Electromagnetic acoustic transducer (EMAT)
External Corrosion Direct Assessment (ECDA)

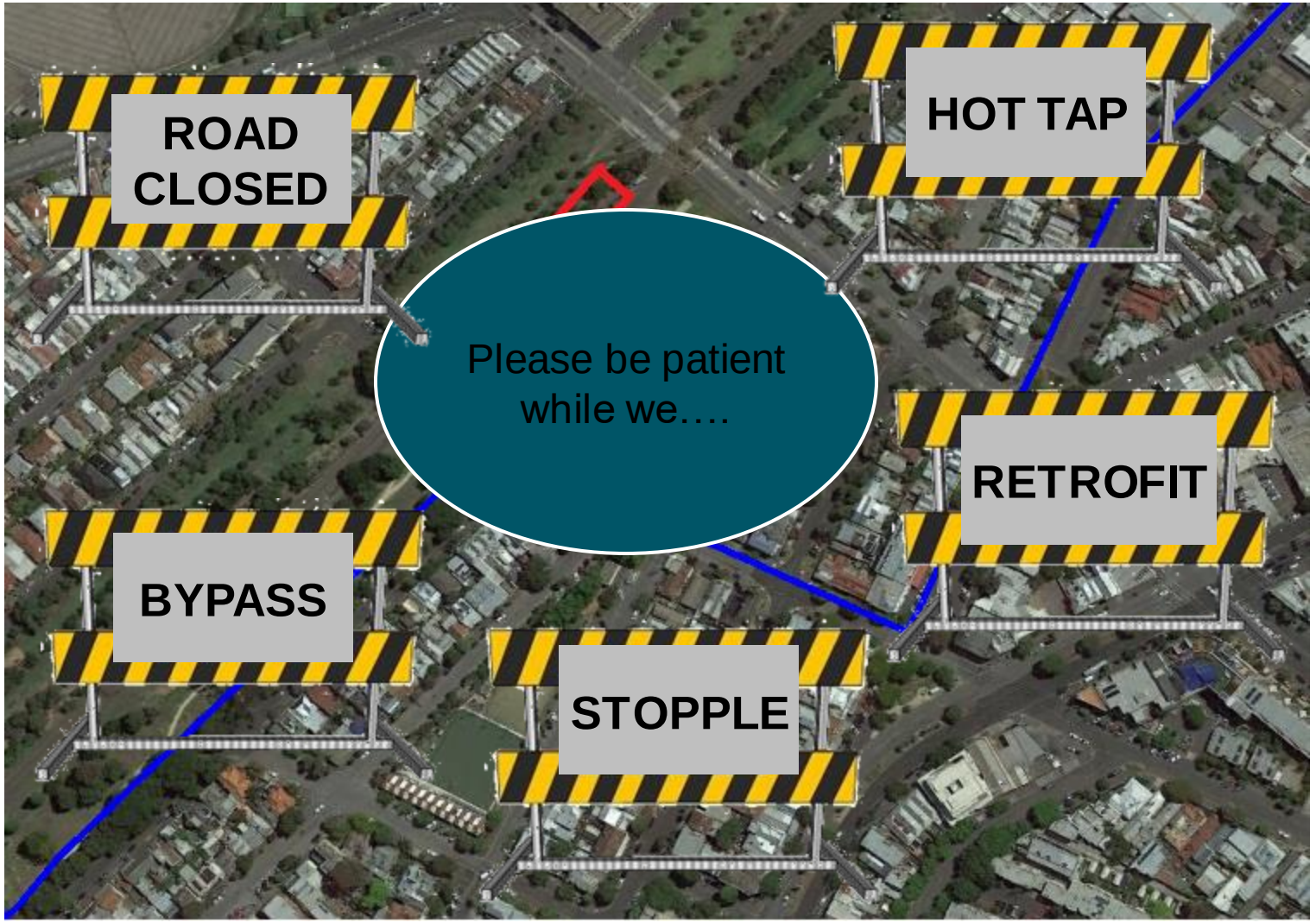
Telescoped = changing internal diameter
Direct Current Voltage Gradient Survey (DCVG)

Scraper Station = Pig launcher/receiver
1.5D = bend radius piggable constraint

What does a piggable conversion look like?

What does a piggable conversion look like?

- Traffic management
- Civil design
- Site de-watering
- Induction bends
- Custom fittings
- Pipeline welders
- Engineering design
- Nitrogen generator
- Local business compensation
- Intelligent pig



Piggable conversion site work