Pipe Pacific Cable – 1 (PPC-1)

Presentation by:

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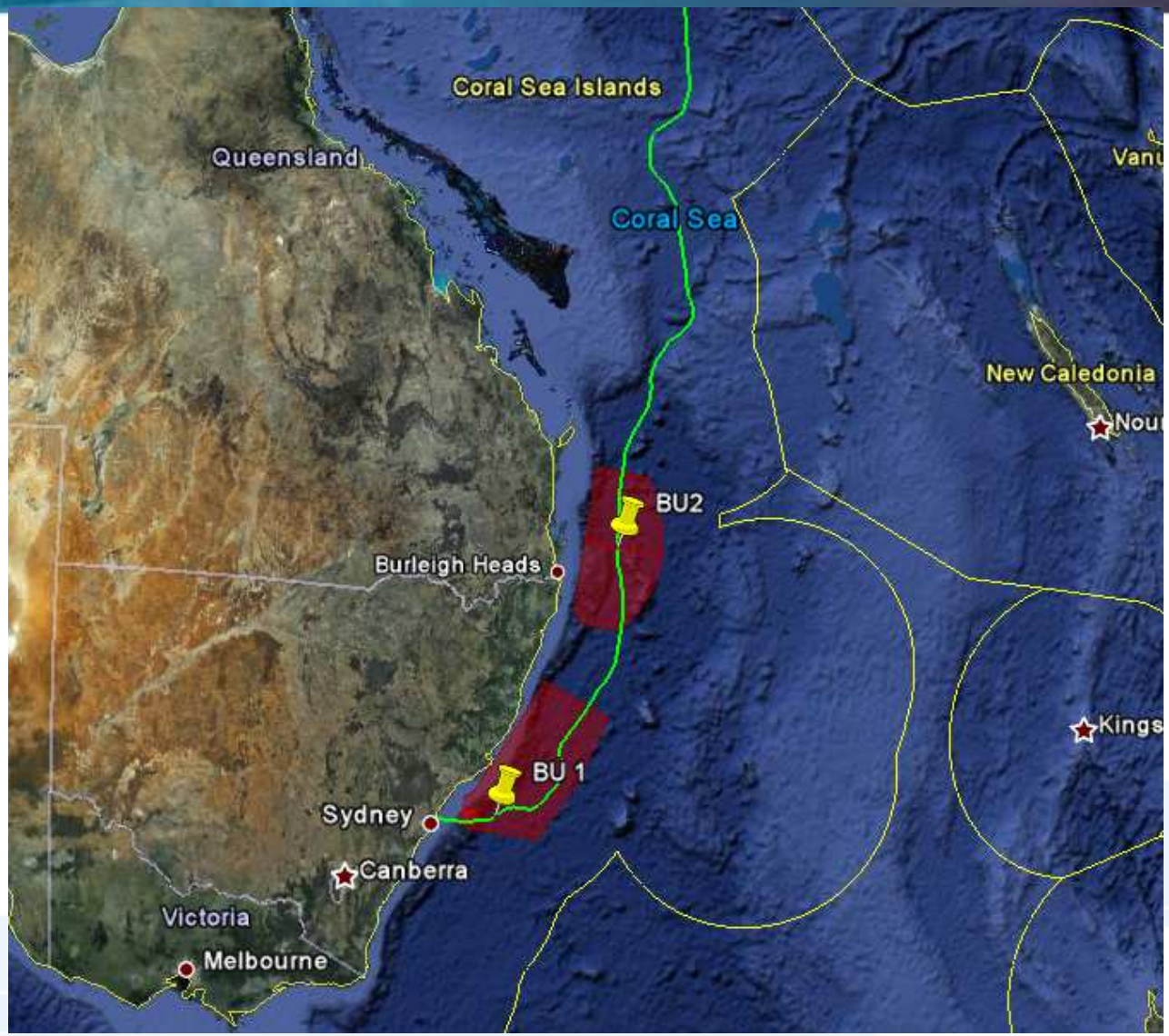
Chief Operating Officer
Pipe International

Contents

Connectivity and Route (southern portion)

- Sydney to Guam with connection to Madang PNG
- Trunk length approx 6900kms
- Future drops to NZ, Brisbane and Port Moresby
- Design capacity using 2 FP 33GHz 10G DWDM is 1.92 Terabit



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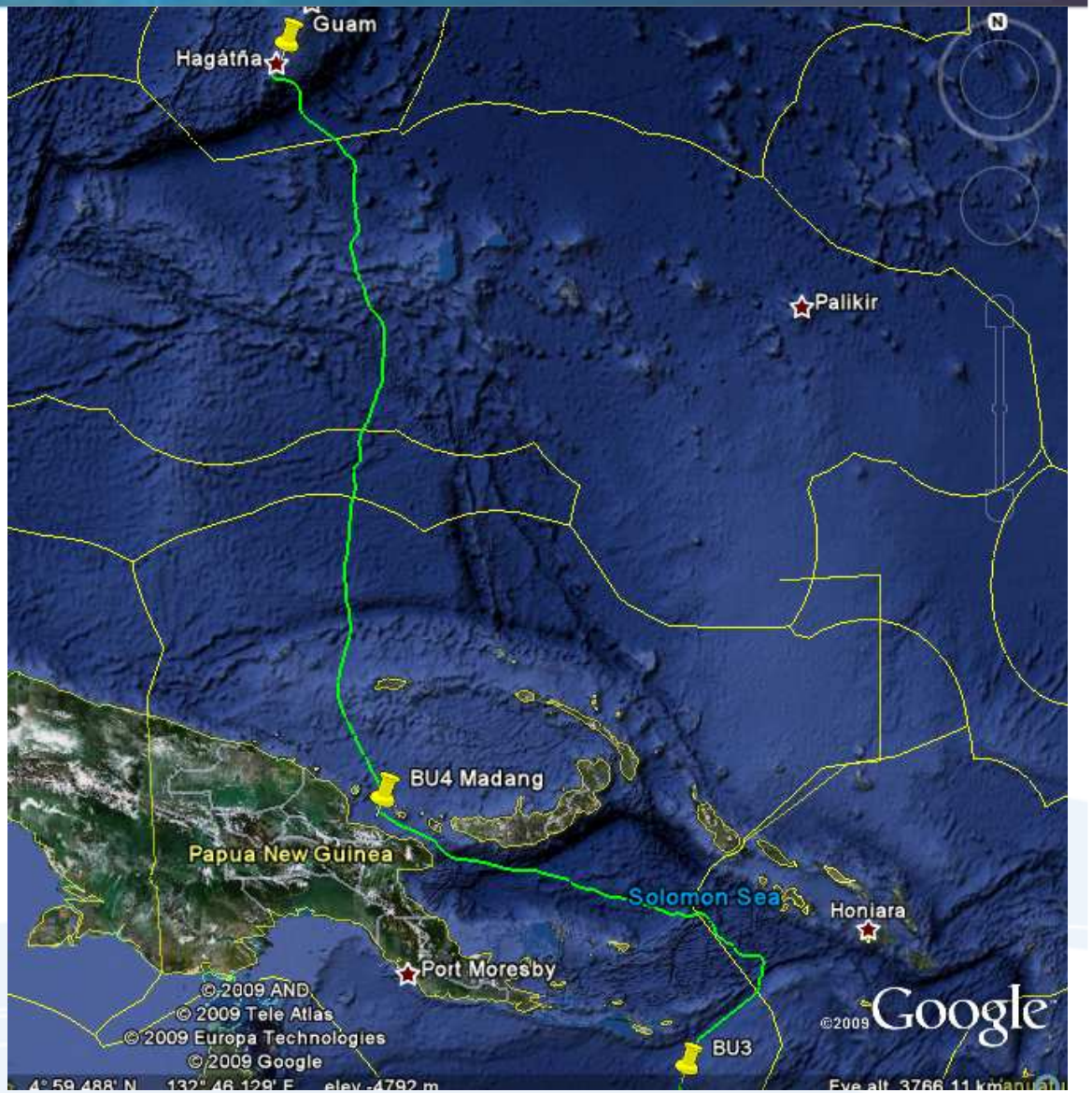
Connectivity and Route (northern portion)

- Sydney to Guam with connection to Madang PNG
- Trunk length approx 6900kms
- Future drops to NZ, Brisbane and Port Moresby
- Design capacity using 2 FP 33GHz 10G DWDM is 1.92 Terabit



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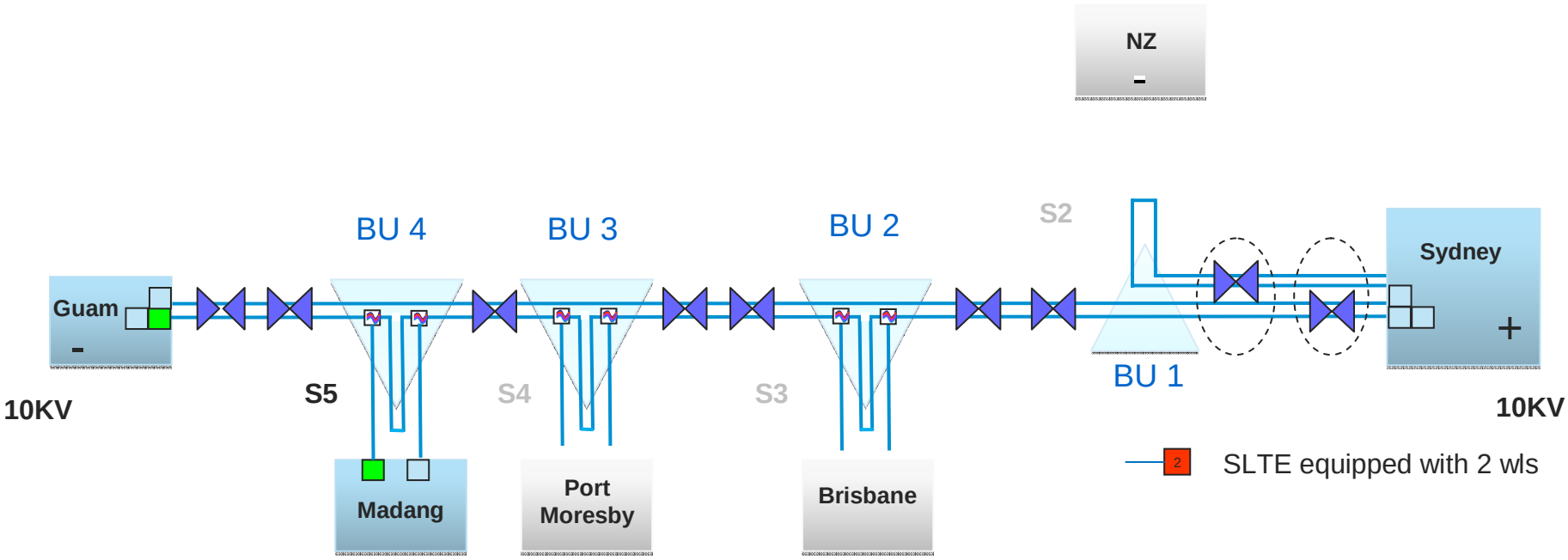
PPC-1 Physical Configuration



S1.5	S1.4	S1.3	S1.2	S1.1	
2329.951	1801.89	1867.712	723.14	159.906	TOTALS
26 rep	20 rep	21 rep	8 rep	3 rep	6882.6 km
					78 rep

Power required is 7.2KV @ 0.95A

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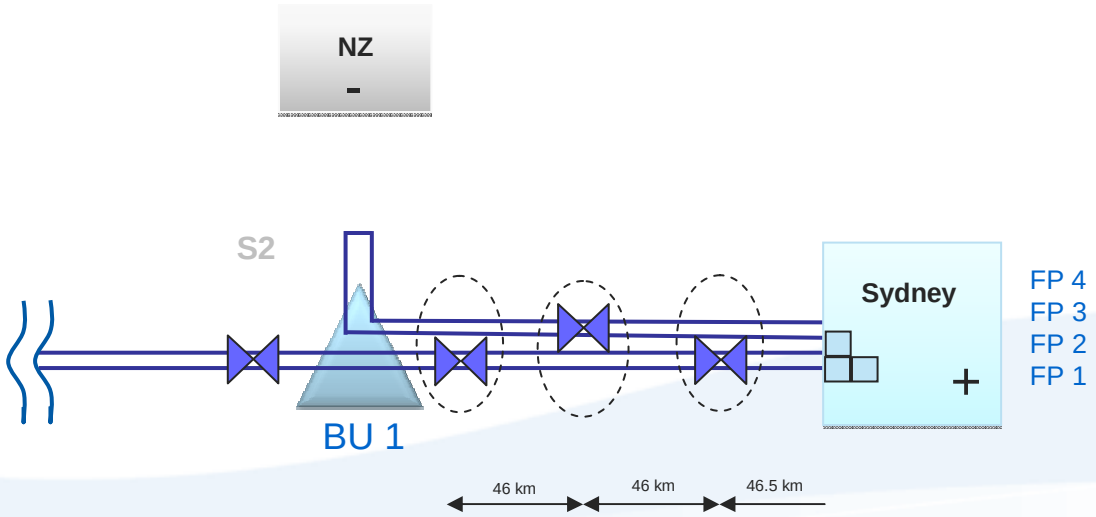
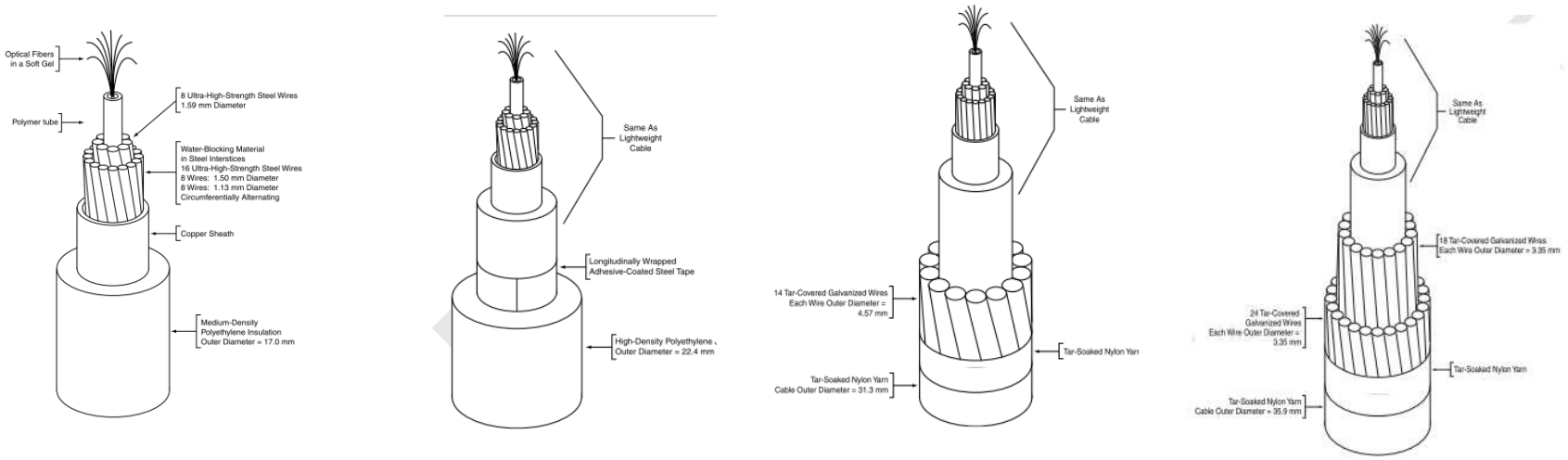
PPC-1 Configuration – SEG 1.1

- Base system is 2FP.
- In segment 1.1 all repeaters are 2FP with 2 pass through fibres.
- As shown, there is a repeater provisioned for the future S2 segment.
- Eases sparing (no need to have 4FP repeaters or spares).



Submerged Plant SL17 family (17mm OD for LW to 39mm for DA)



Deployment depths and NTTS (nominal transient tensile strength)

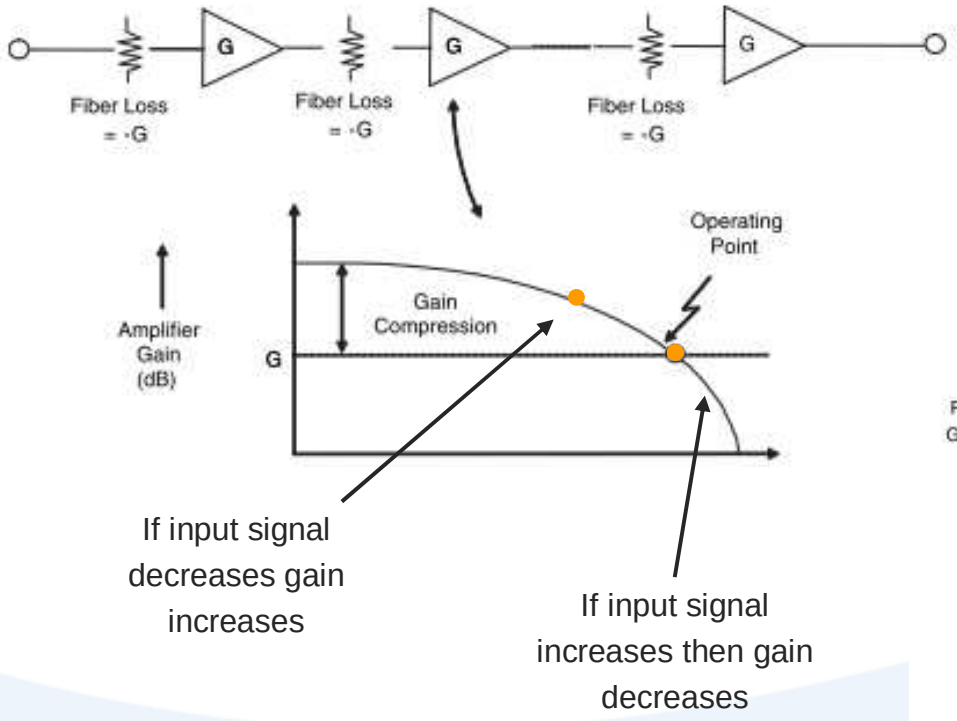
- DA to 800M 39.4 Tonne
- SA to 1500M 26.2 Tonne
- SPA 6,500M 5.8 Tonne
- LW 8,000M 5.8 Tonne

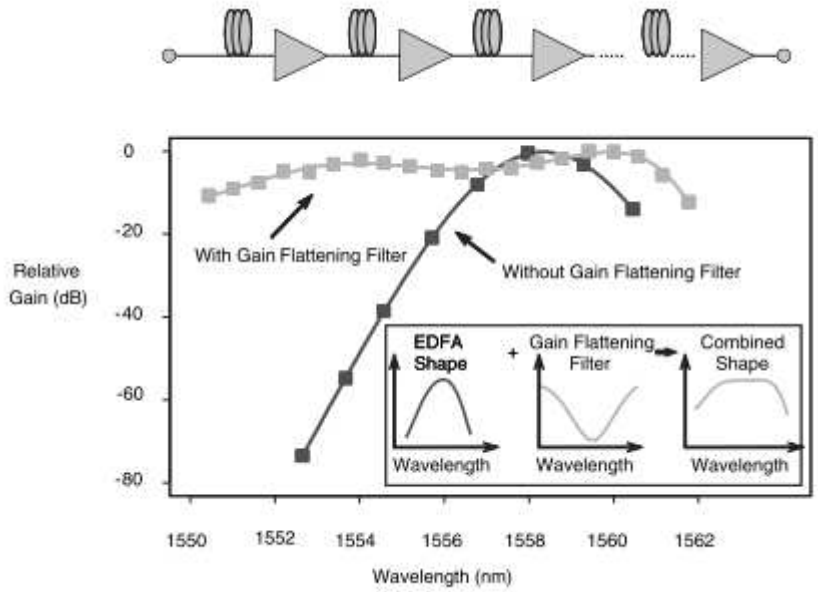
Fibre Dispersion

- 1/3 N type : -44 ps/nm/km
- 2/3 P type : +20 ps/nm/km >>>> net -2ps/nm/km
- Compensated for gain tilt and gain shape every 500km (approx)

Submerged Plant - Repeaters

- 78 dual pumped EDFA based amplifiers
- Repeaters operate in gain compression mode and vary their gain based on input signal level





- Every 500km gain shape and tilt compensation filtering

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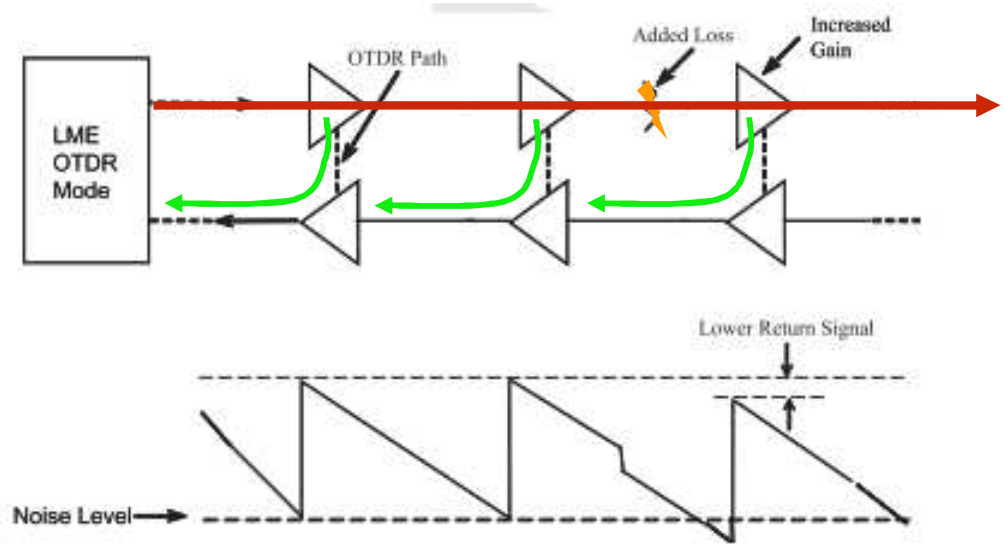
Submerged Plant - Repeaters High Loss Loop back path



- An OOB monitoring tone is tapped off in each repeater and coupled back into the receive path.

- Same occurs in TX and RX directions so a view of the concatenated chain of repeaters is built up from each end

- If a fault occurs then this is immediately discernible from the trace.

Submarine Line Terminal Equipment

- SLTE is largely a passive mux/demux and dispersion compensation device interspersed with active elements for loss compensation and pre-emphasis.

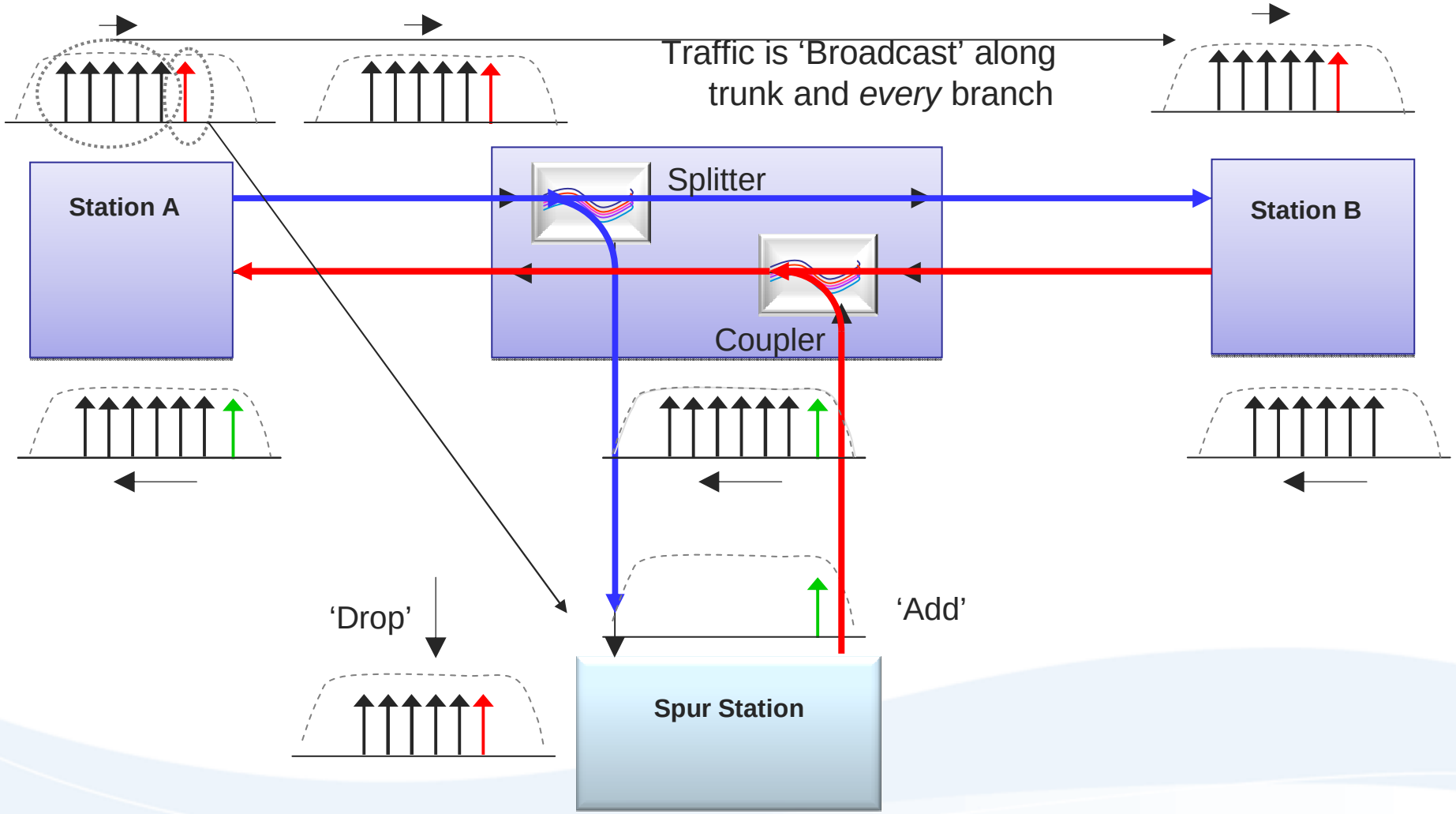
- On the transmit side it receives up to 96 x 10 Gbit/s (STM-64/OC-192) signals and creates a DWDM signal with channels 33GHz (~ 0.26nm) apart in a 27nm wide bandwidth (1537.003 to 1563.863nm).

Line Terminal Equipment

- Relatively compact SLTE and PFE in 55sqm!
- Commissioning is underway here we are working on the full system characterisation testing

- PFE's are 10KV (1+1) units sharing the line load in a dual end feed so two layers of redundancy in power

OADM Broadband BU (Station A to Spur traffic only)

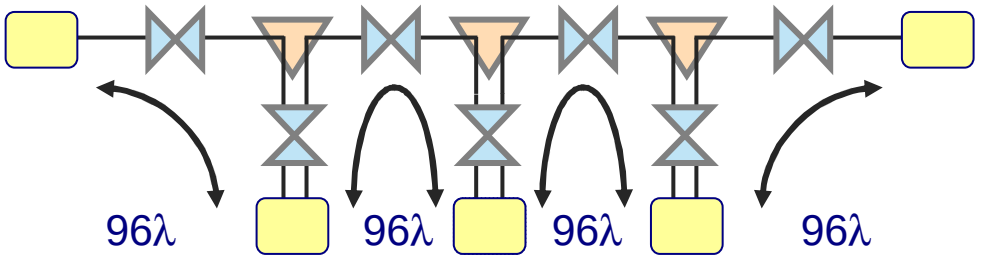


Broadband OADM vs Full Fibre Drop BU

1. CAPACITY

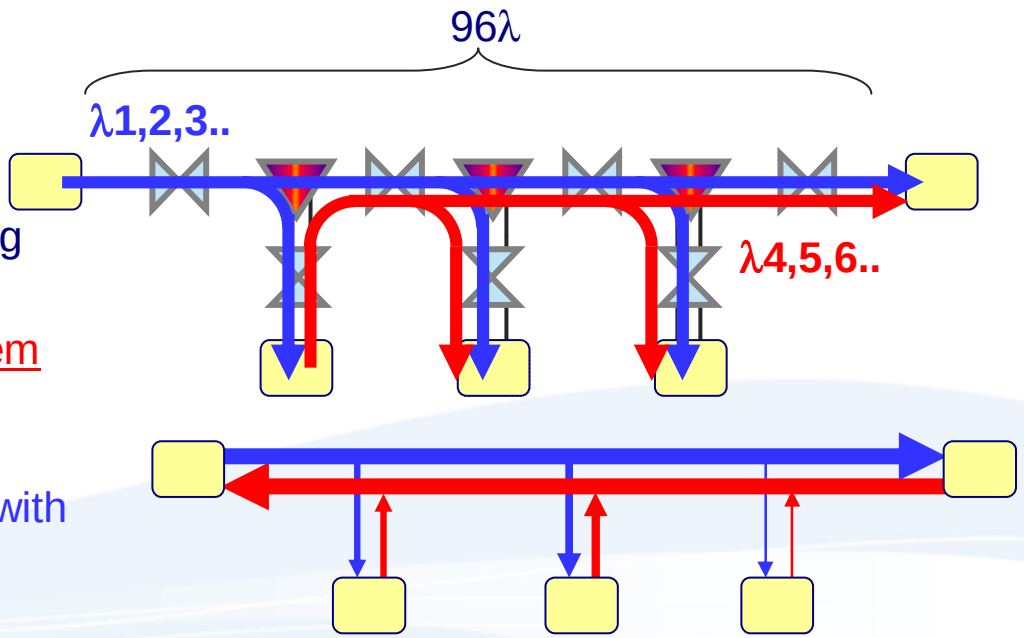
Full Fibre Drop

- 'n' *separate* transmission segments
- 100% of capacity on every segment
  (can 're-use' wavelengths)
- Good where high capacity required **between** adjacent landings



Broadband OADM BU

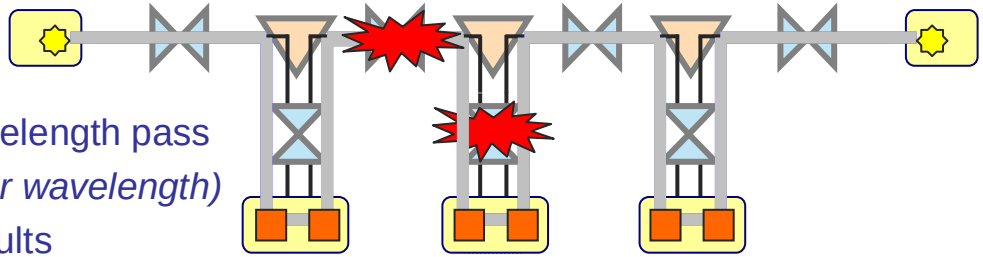
- 1 optical segment
- Broadband signal is 'broadcast' along trunk and branches *(no filtering)*
- 100% of capacity available per system
  ↙ *shared* between segments
  (cannot 're-use' wavelengths)
- Good where most traffic is end-end with 'thin' branch add/drop requirement



Broadband OADM vs Full Fibre Drop BU

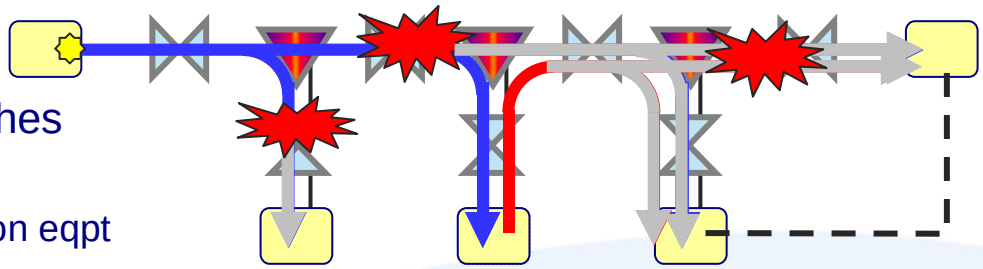
2. TRAFFIC ROUTING & RESILIENCE

Full Fibre Drop



- ALL traffic routed via branches
  - Requires 'back-back' SLTEs or wavelength pass through *(higher incremental cost per wavelength)*
  - 'Thru' traffic vulnerable to branch faults
- Each fibre DLS is independent from the next
  - If the adjacent segments can be powered, remaining traffic can be maintained

Broadband OADM BU

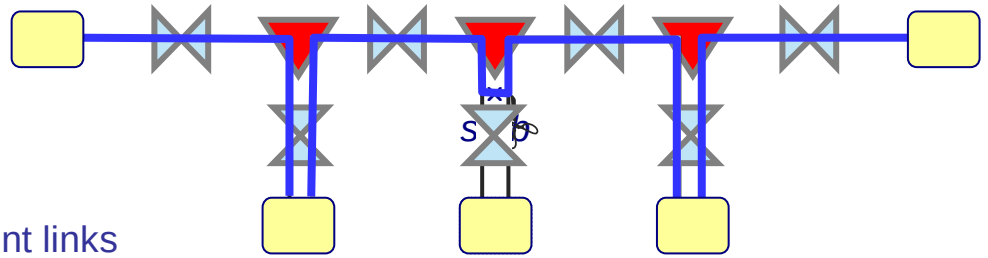


For 'thin' add/drop systems:

- 'Thru' traffic is independent of branches
  - Improved 'thru' traffic reliability
  - No additional back-back transmission eqpt
- But branches now dependent on trunk traffic for line loading
- All branches see all trunk traffic – option for shore end diversity via restoration path

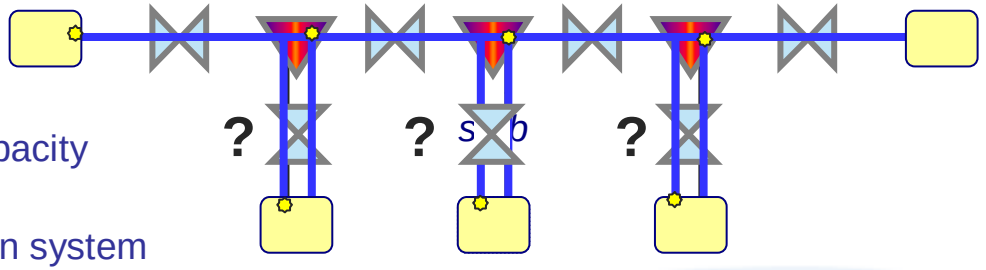
Broadband OADM vs. Full Fibre Drop BU

3. IMPLEMENTATION



Full Fibre Drop BU

- Easy to design
  - All segments are simple point to point links
  - Capacity is fixed by design for each segment
- All branches should be built from the outset
  - Stubbed branches require a significant traffic interruption to implement later



Broadband OADM BU

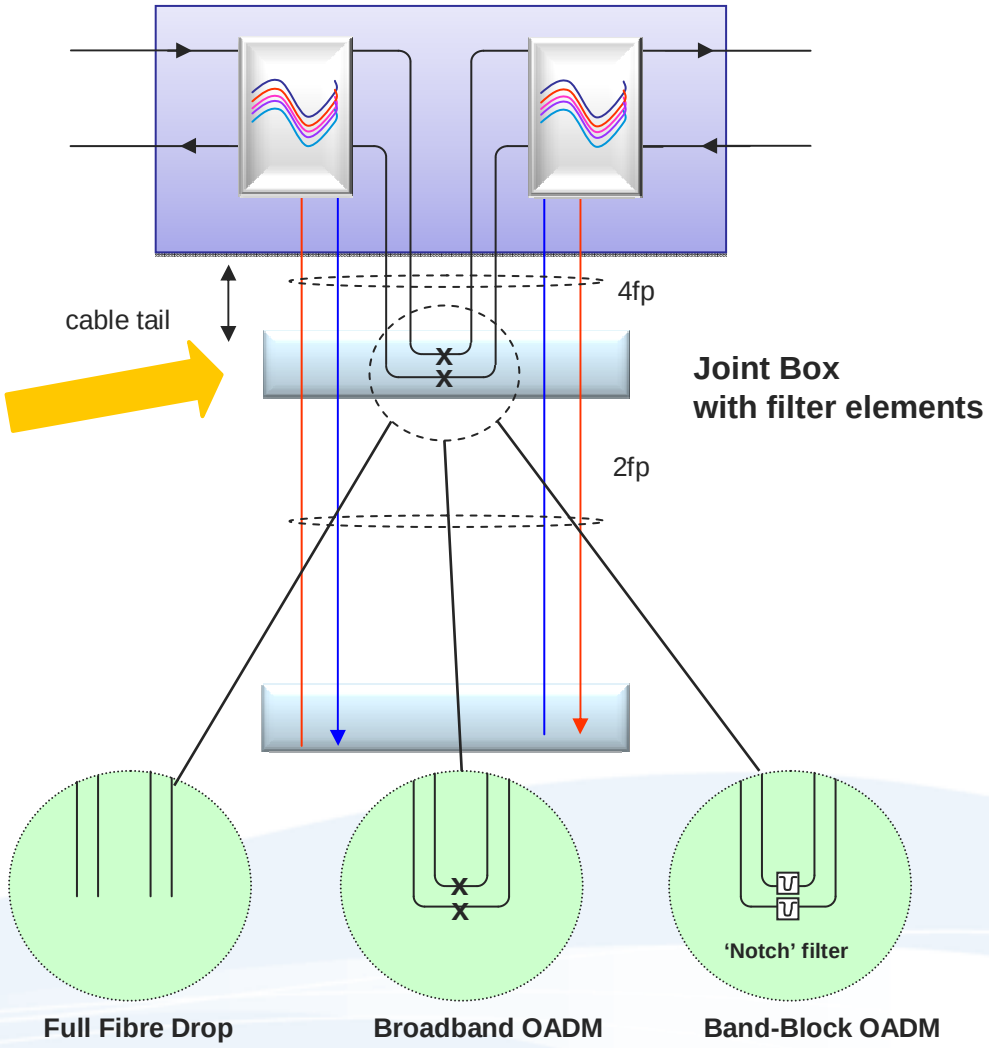
- More Complex to design
  - Need to consider max. add/drop capacity in advance
  - actual add/drop capacity depends on system performance (power budget)
- Branches can be added later without interrupting traffic

PPC-1 Configuration – Universal BU's

- PPC-1 has two Universal OADM BU's that allow future flexibility in BU configuration for the landings at:
  - Port Moresby and Brisbane.

- Universal BU can be configured LATER by picking up an intermediate joint that will configure the BU to be either;
  - Full Fibre Drop,
  - Broadband OADM, or
  - Band-block OADM

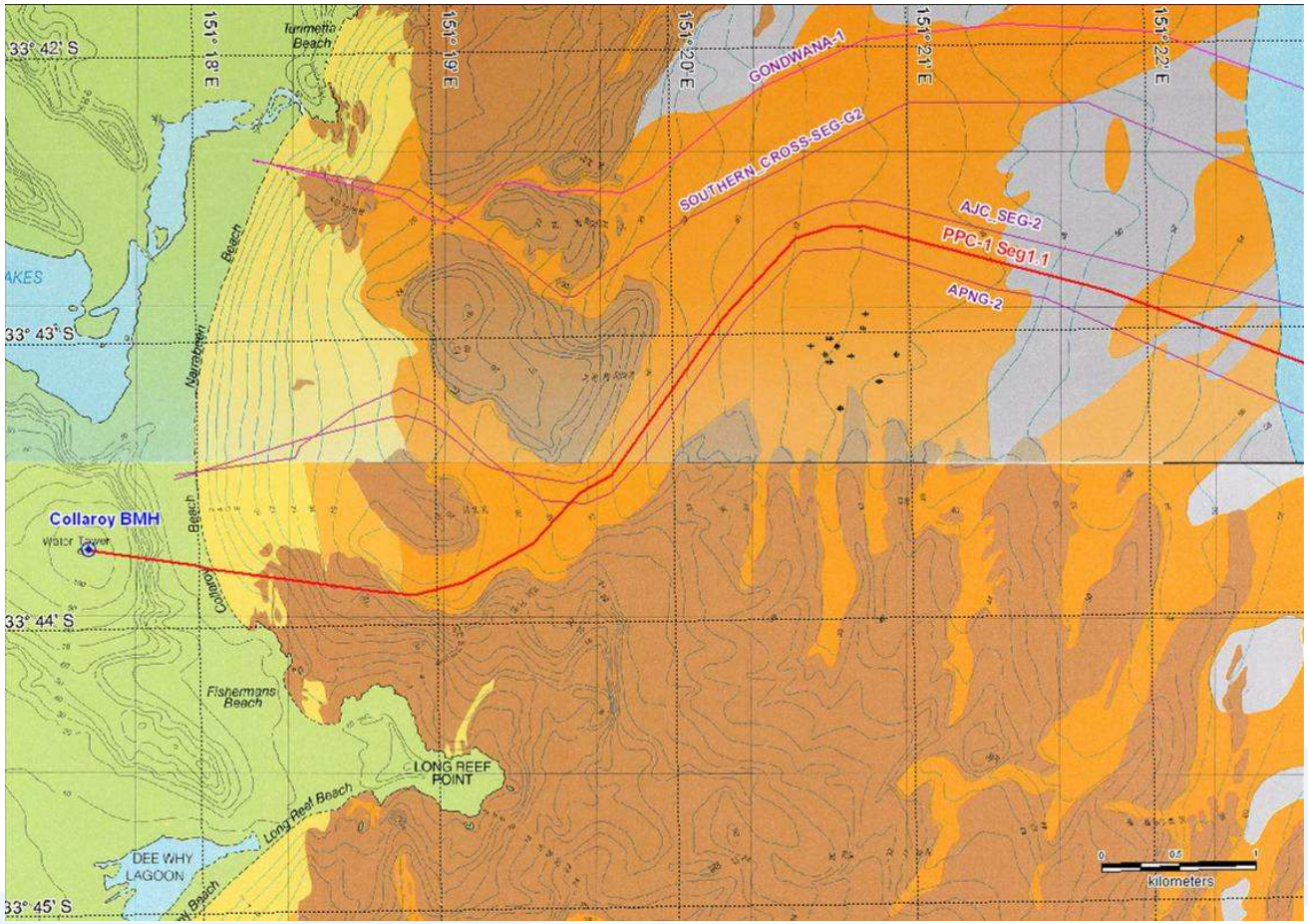
  to suit traffic needs at the time



Contents

Sydney Landing in NPZ

- We use ACMA Sydney - Northern protection zone
- Route lies south of SX and AJC and north APNG2
- Burial to 2000M contour
- Uses 1500m HDD from park in Collaroy



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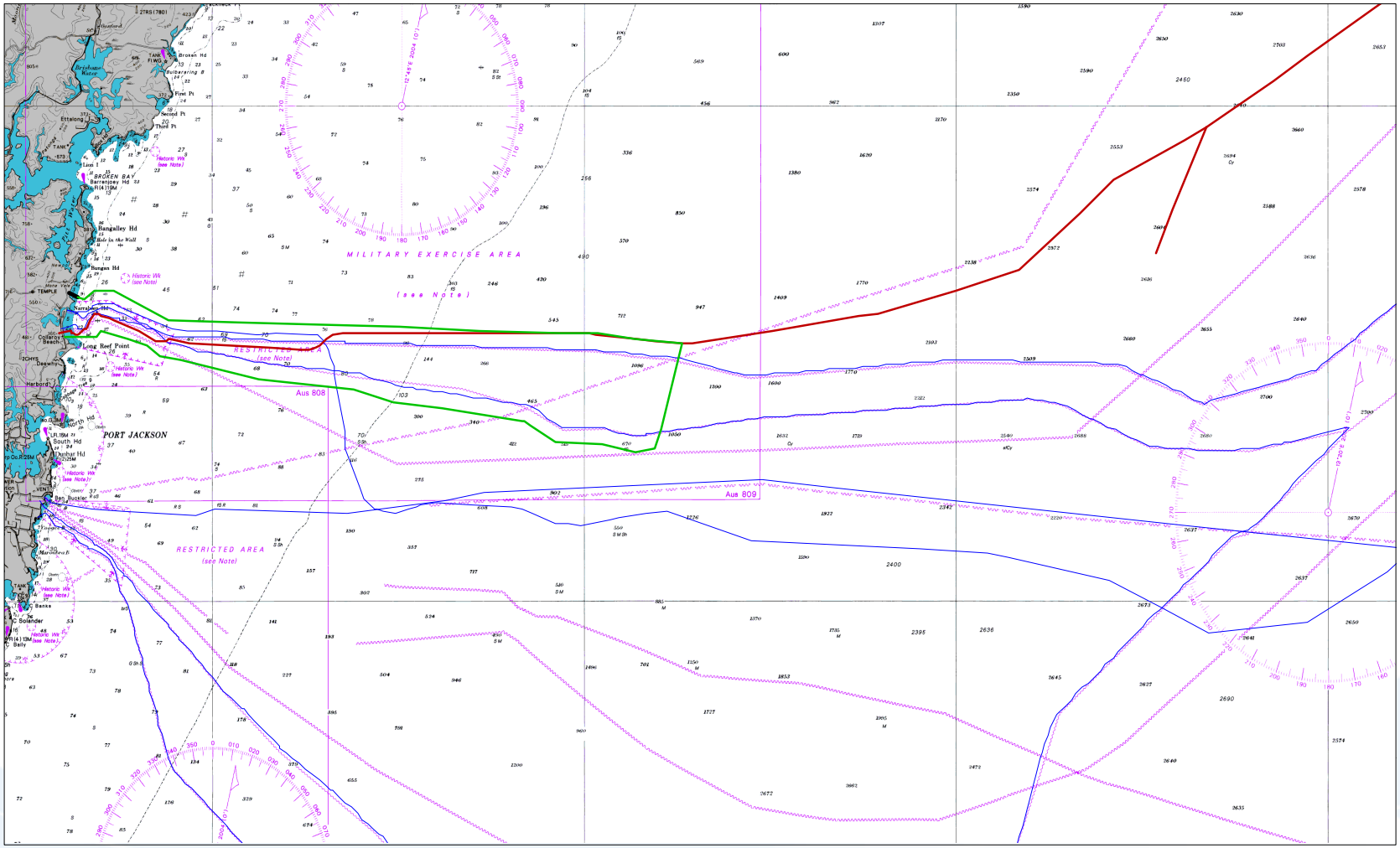
Sydney Offshore PZ and NPZ



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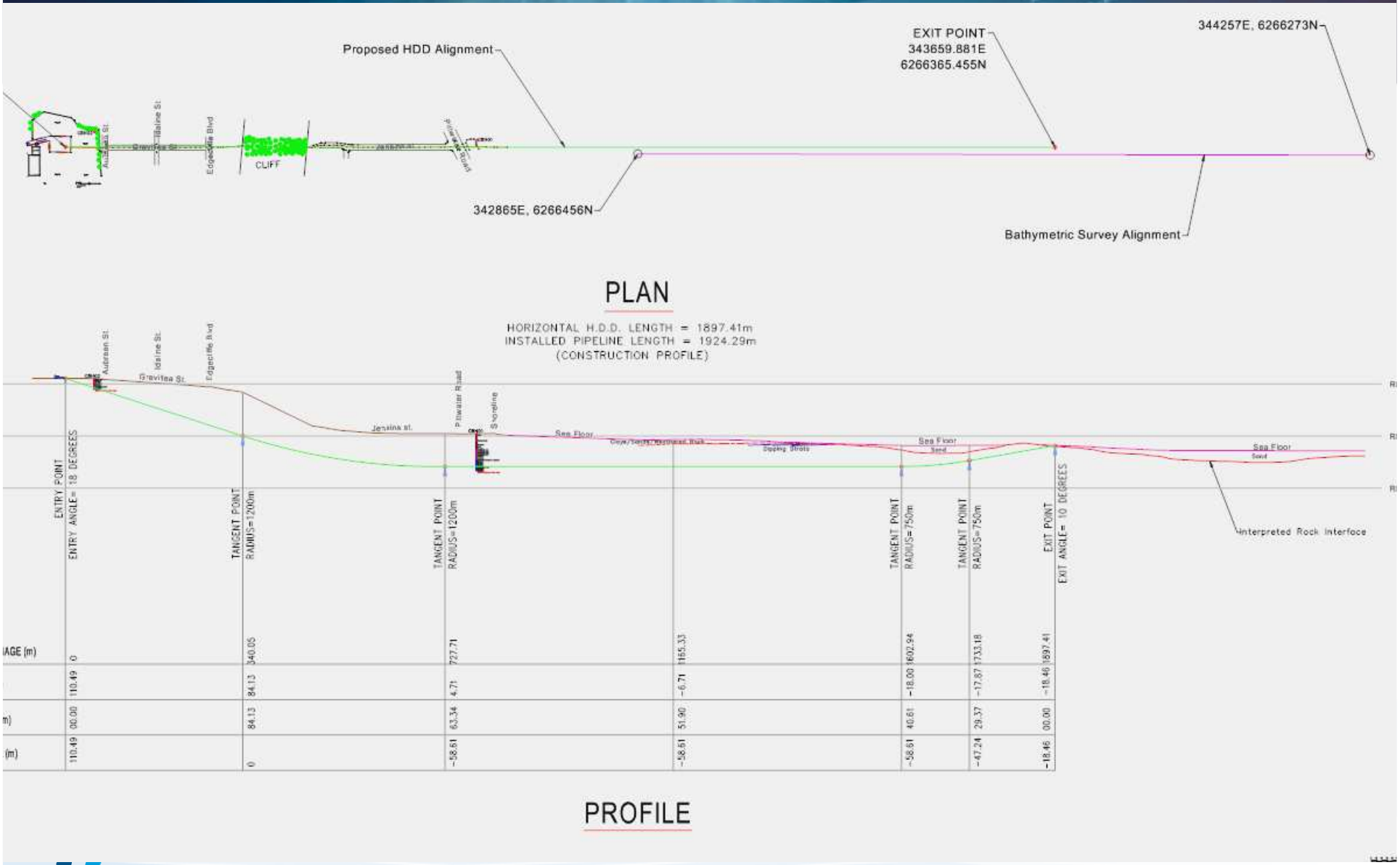
Sydney HDD


Proposed HDD Alignment
EXIT POINT
343659.881E
6266365.455N
344257E, 6266273N
342865E, 6266456N
Bathymetric Survey Alignment
CLIFF
PLAN
HORIZONTAL H.D.D. LENGTH = 1897.41m
INSTALLED PIPELINE LENGTH = 1924.29m
(CONSTRUCTION PROFILE)
Grevillea St
Edgecliffe Blvd
Jessima st
Shoreline
Sea Floor
Interpreted Rock Interface
ENTRY POINT
ENTRY ANGLE= 18 DEGREES
TANGENT POINT
RADIUS=1200m
TANGENT POINT
RADIUS=1200m
TANGENT POINT
RADIUS=750m
TANGENT POINT
RADIUS=750m
EXIT POINT
EXIT ANGLE= 10 DEGREES
PROFILE

Sydney Landing HDD -1500 M HDD 106m elevation

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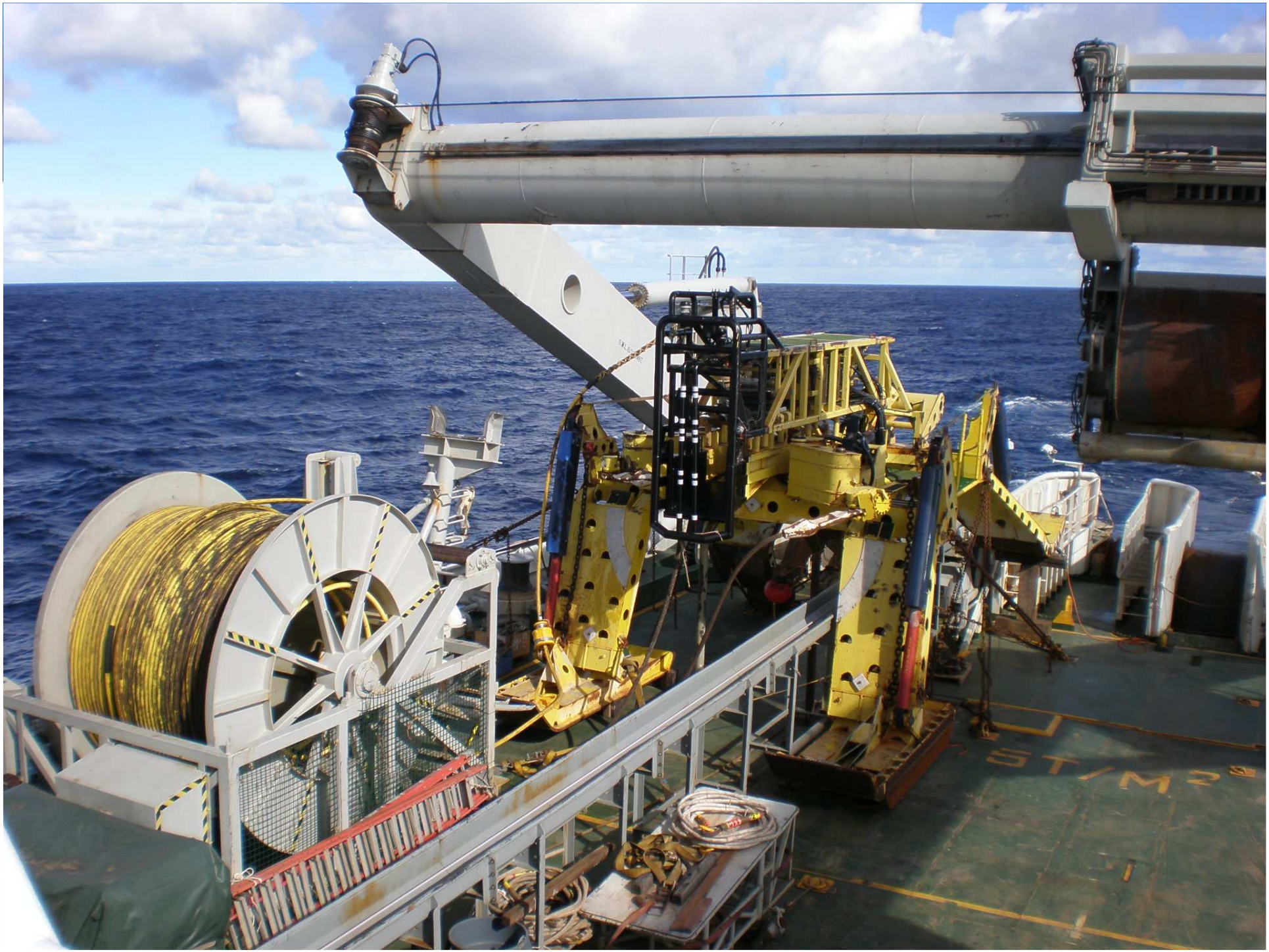
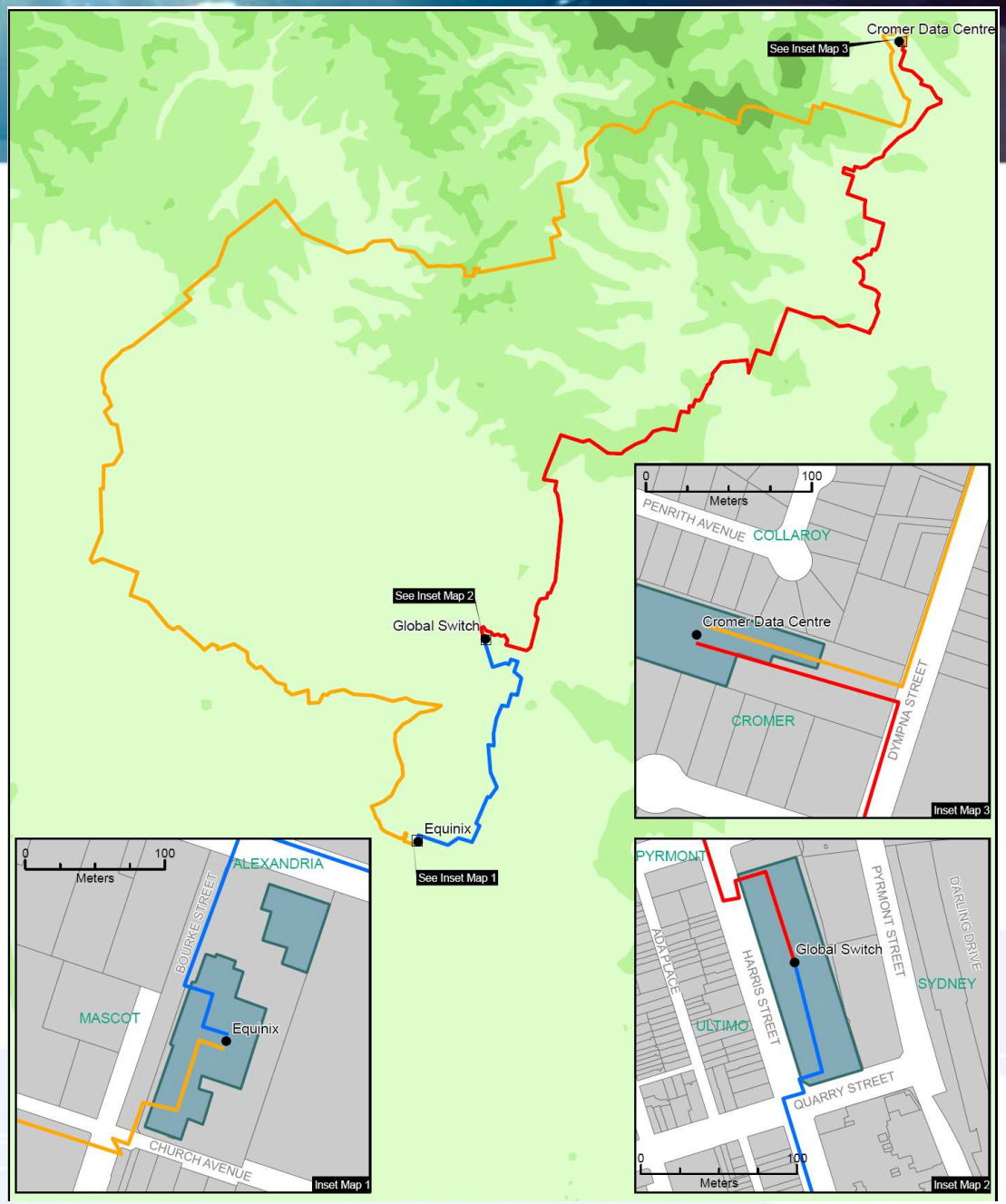



TRITON ST 214
tyco

Sydney Backhaul

- Diverse fibre routes to Global Switch and Equinix in Sydney CBD
- On Pipe Networks extensive Sydney fibre network so can get to many places on our own fibre in Sydney



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Madang Landing

- New landing point to the north of coaxial cable SEACOM
- New direct landing across volcanic shoreline
- No burial proposed due to rapid drop off and risk of UXO

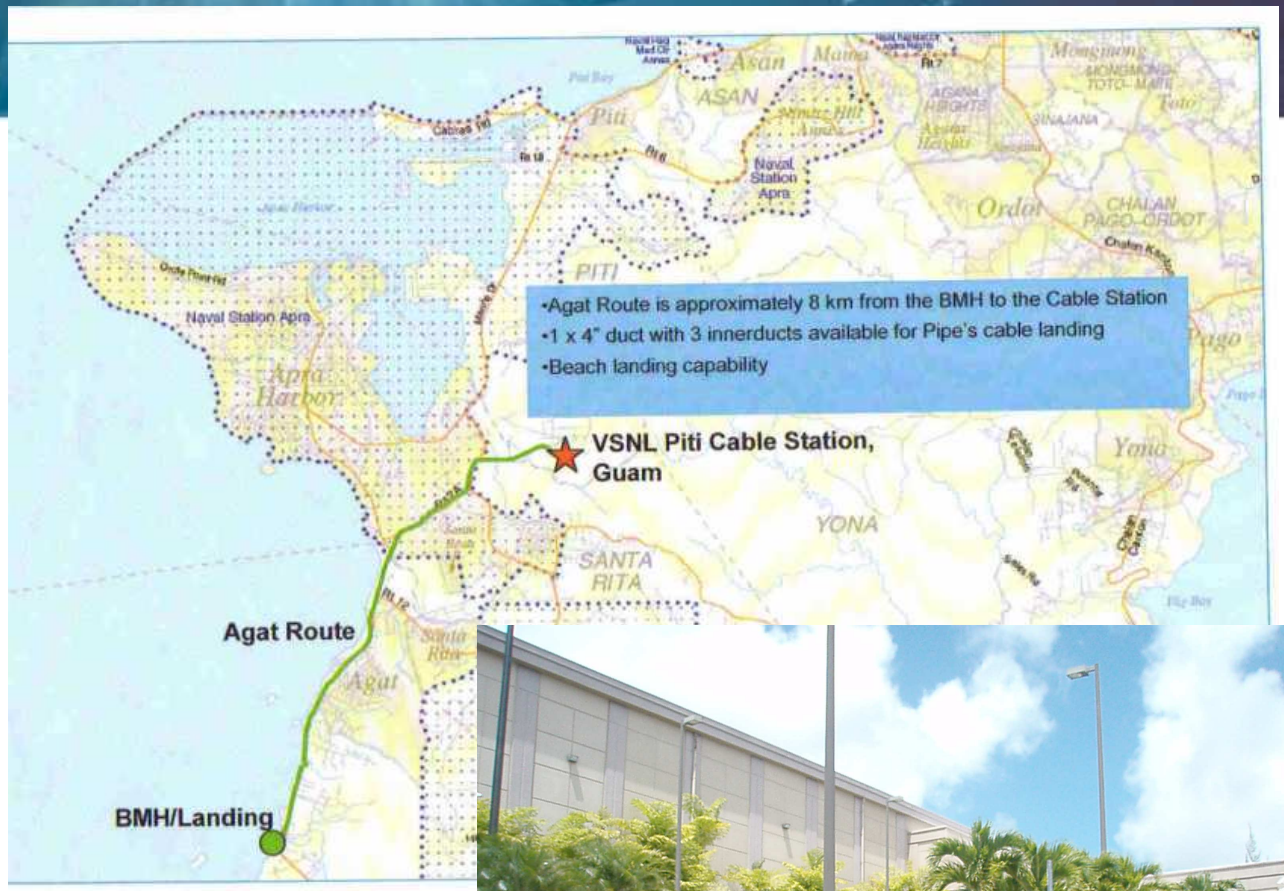
Madang CLS and OSP

- Expanding existing telephone exchange
- New land duct route and beach manhole

Madang CLS under construction

Guam Landing

- Landing into existing landing facilities and OSP in Guam owned by Tata
- Landing party agreement and remote hands services from Tata



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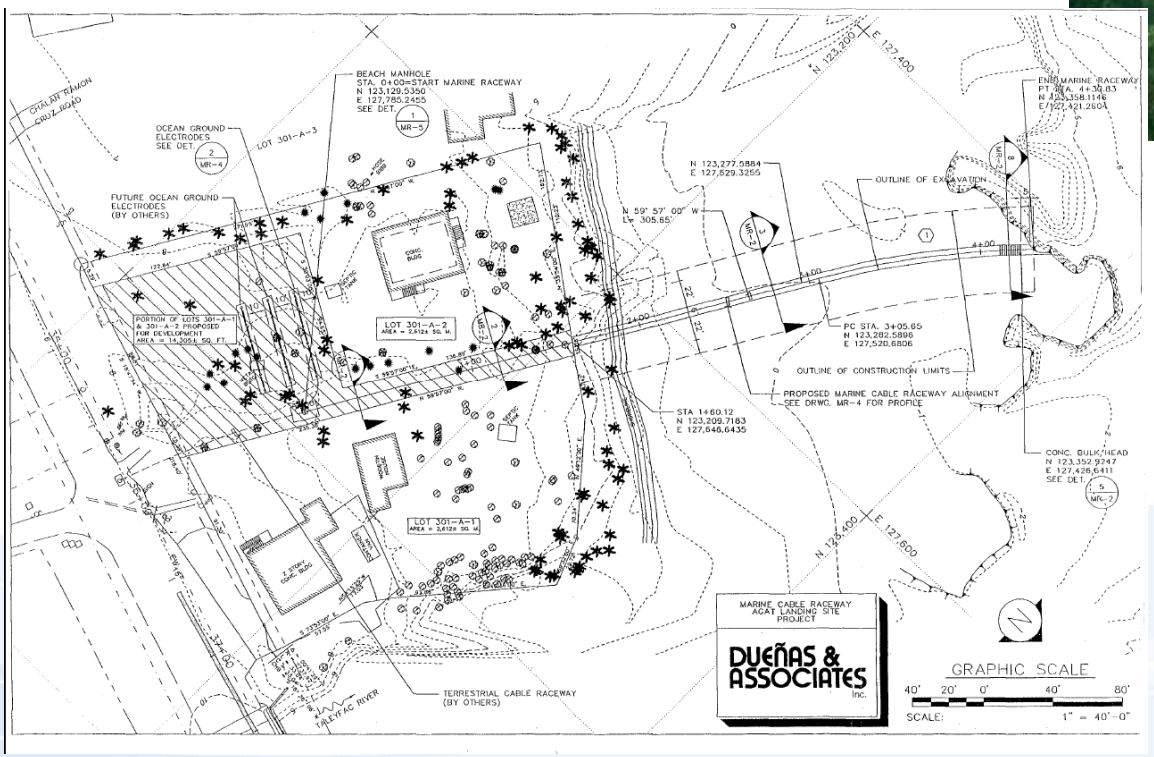
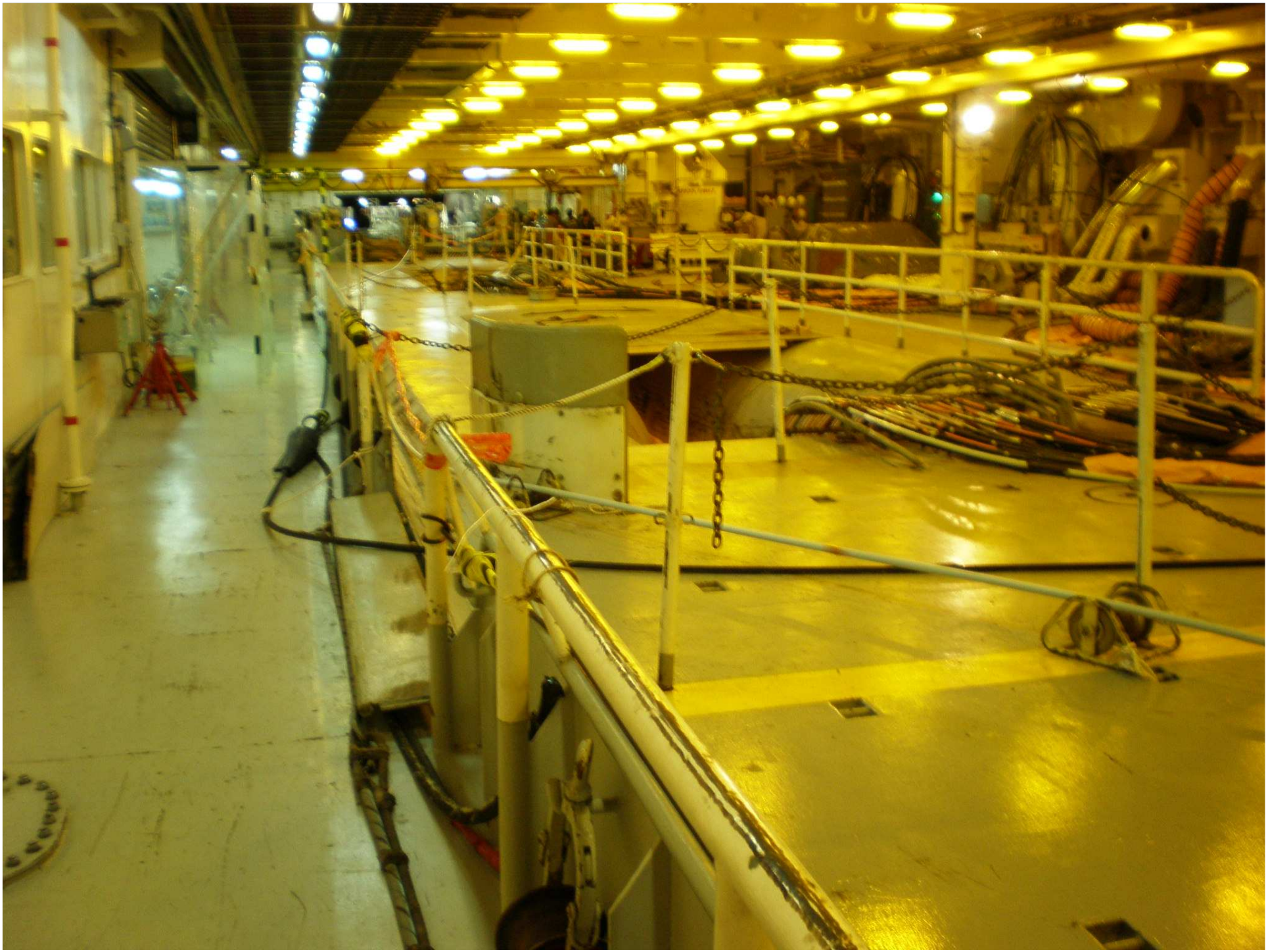
Guam Landing

- Arrangement of landing facilities at Agat
- Direct landing into existing duct.



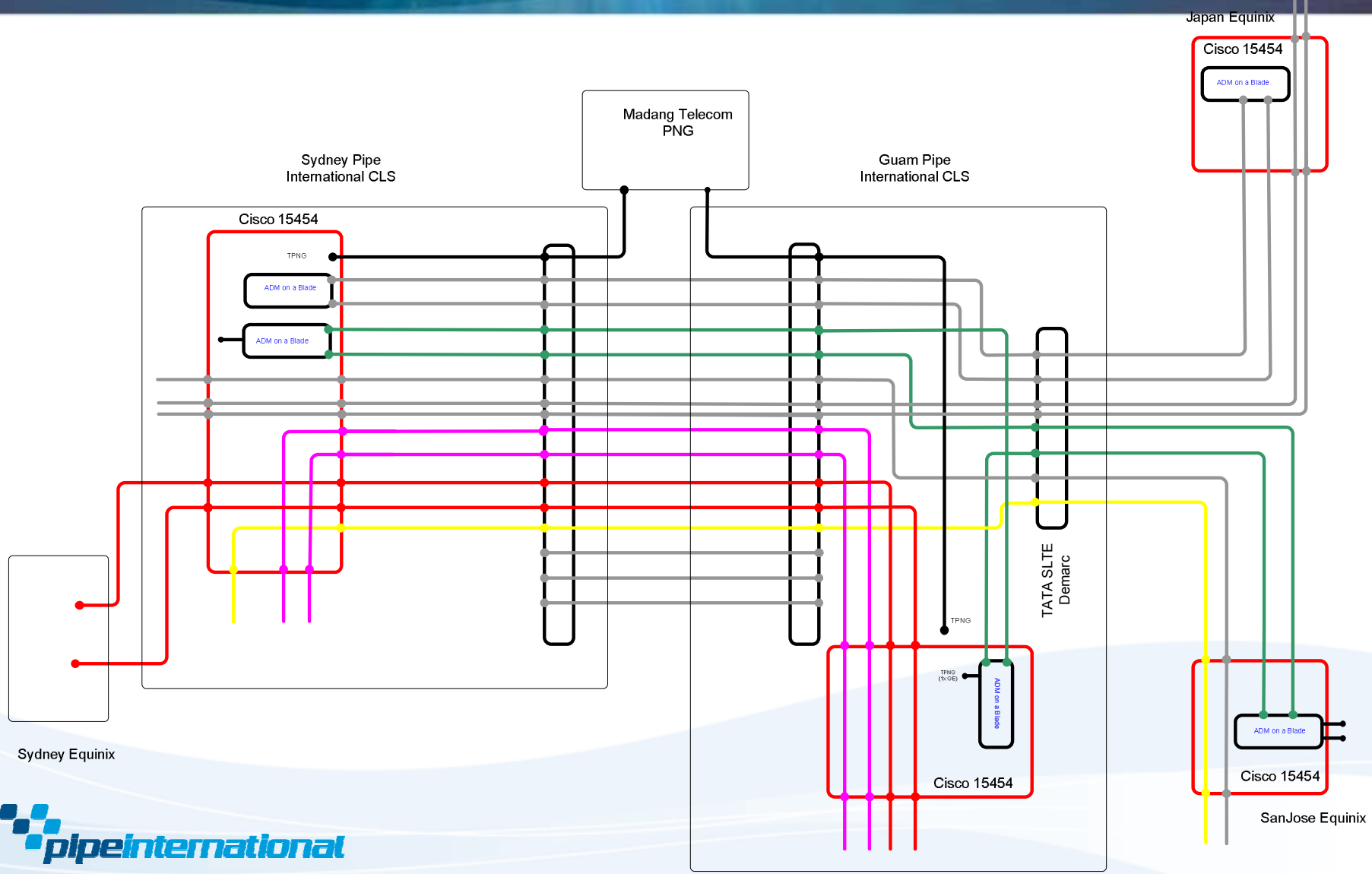


Network Operations Centre

- Tier 1 NOC in Brisbane
- Tier 2, 3 from PIPE CLS in Sydney and Engineering in Brisbane
- Covers
  - Fault management and customer trouble resolution
  - Network event notifications (planned or otherwise)
  - Customer enquiry
  - Planned works management
  - Configurations management
  - Capacity activations
  - Change management (e.g. software, hardware upgrades, or records keeping)
  - Network management and operational support system administration
- Backup and security NOC in Sydney CLS

Contents

PPC-1 and Onwards Network Connectivity (Day 1)



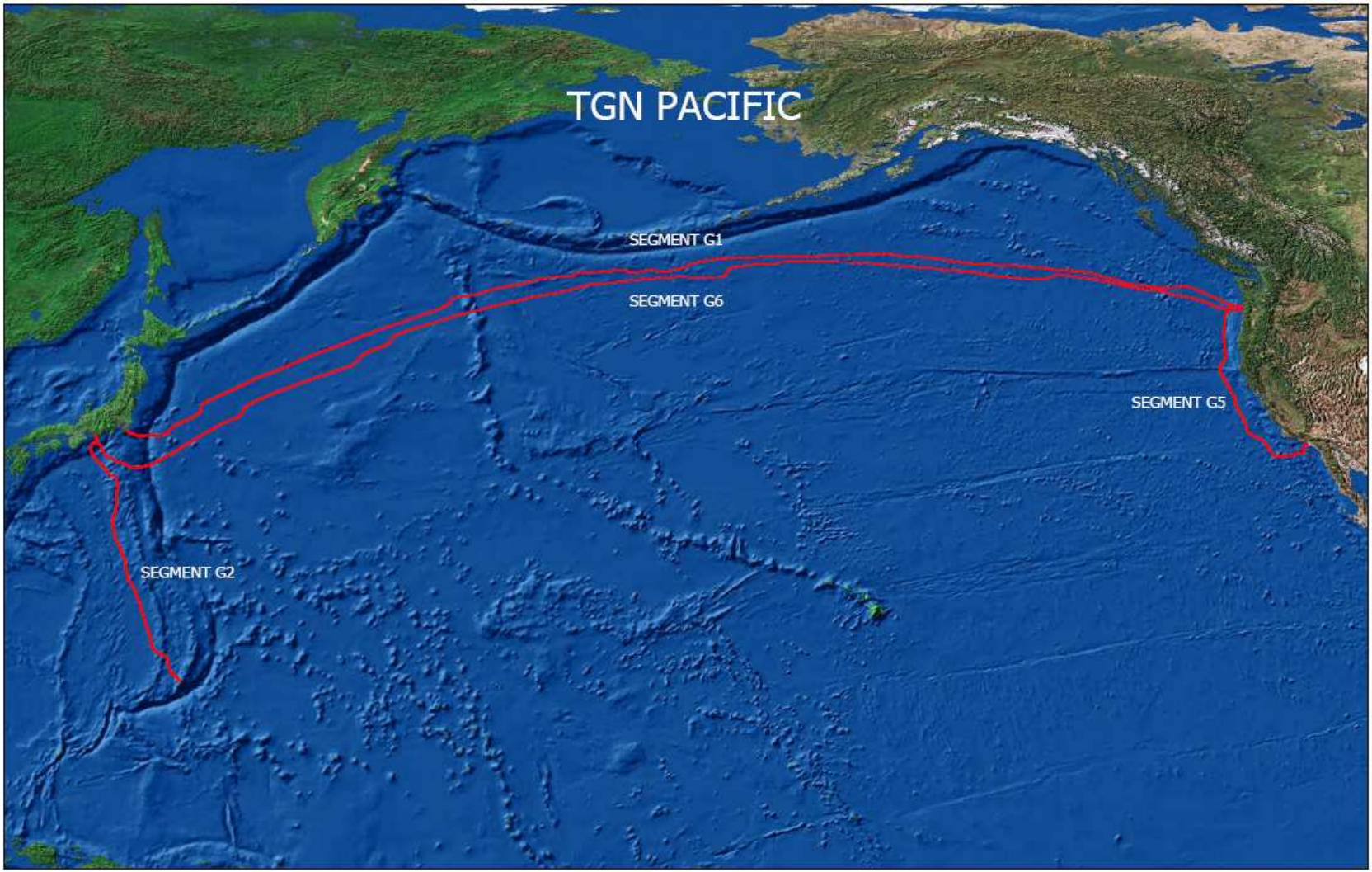
PPC-1 Bandwidth Products

- Wavelengths:
  - 2.5 Gbps wavelength (Sydney to Guam) transparent
  - 10 Gbps wavelength (Sydney to Guam, Sydney to Japan, and Sydney to USA)
- SDH/SONET
  - STM-16/OC-48
  - STM-64/OC-192
- Ethernet
  - Gigabit Ethernet
  - 10 Gbps Ethernet
- Purchase options
  - Leases
  - Convertible leases
  - Indefeasible Rights of Use

Backhaul Co-location

- Availability of handoff points in the following POPs:
  - Equinix, San Jose
  - PAIX, Palo Alto
  - ONE Whilshire, Los Angeles
  - Global Switch, Sydney
  - Equinix, Sydney
  - Equinix, Japan

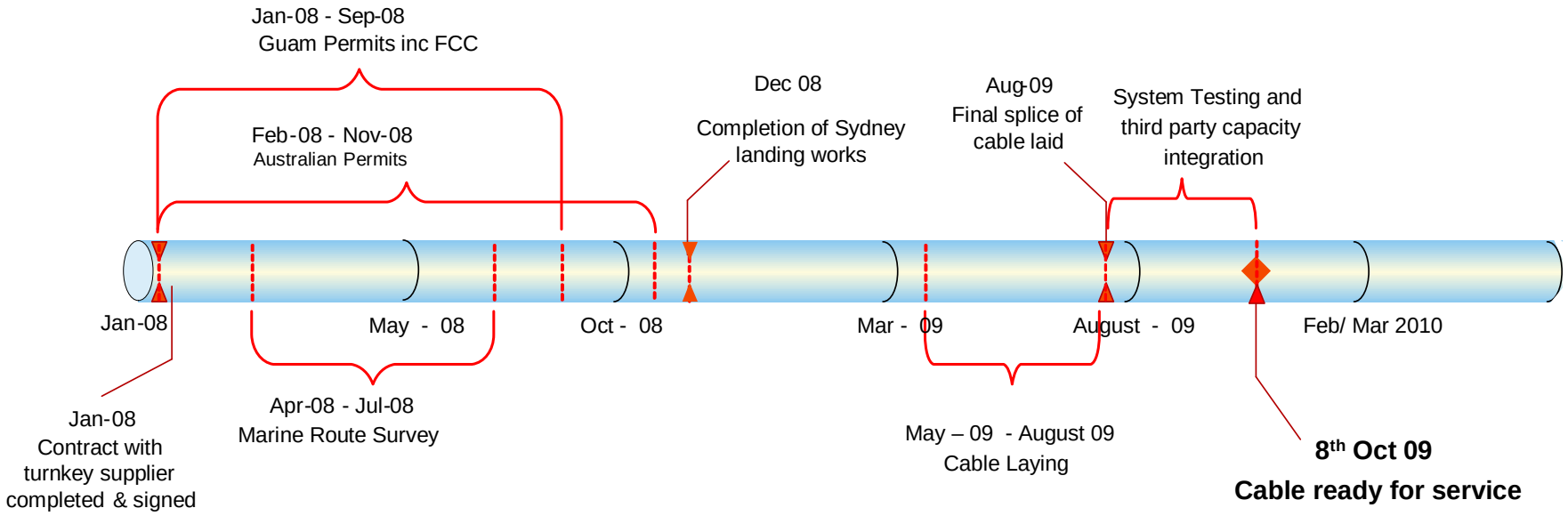
North of Guam …Onwards Connectivity



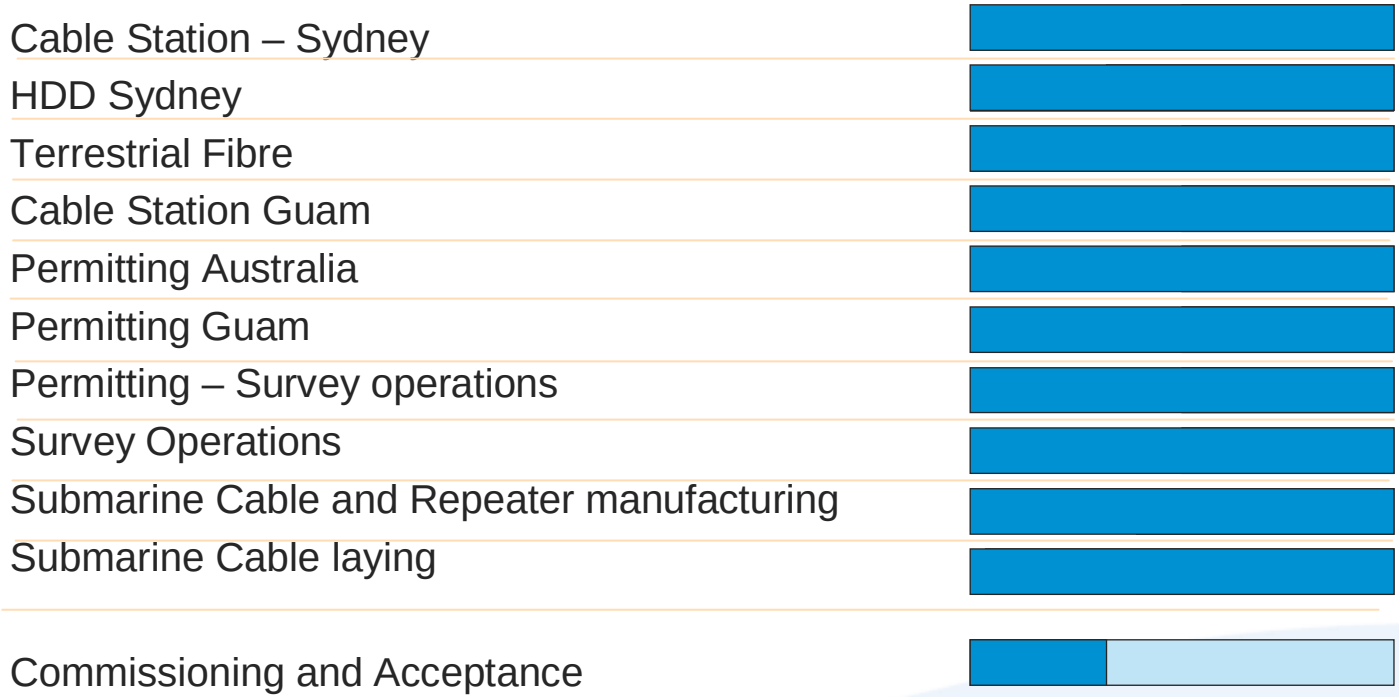
Contents

- Connectivity and Route
- Engineering
- Installation and Facilities
- Product Offerings and Specifications
- Expansion possibilities
- Timeline

Timeline – in commissioning period right now



PPC-1 Progress (as of 25th August 2009)



PPC-1 Futures… and comments

- Wavelength switching and grooming in core as PPC-1 volumes grow.
- G709 service layer across the SLTE line to facilitate OTN multiplexing and transport (… maybe a dream in the international space!!)
- Upgrades to 20G rails or 40G rails with new and funky modulation schemes are now being worked we hear !!
- Hopefully connect up Brisbane/Port Moresby and NZ if business cases stack up.
- Northern Protection Zone is now very full .. ACMA will need to consider next steps for future east coast Sydney cables.

PPC-1 is coming
Are you ready?

Thank you for listening

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