Commonwealth Environment Management of Change

Change No*:	DECOM ENV #16	Date Raised:	01/03/2025

*use ID# from change register for relevant business area

SECTION 1 (Identify)

Approval Title	Minerva Decommissioning and Field Management (Commonwealth and State) Environment Plans		
EP Document No.	1401801116	**EP Current Revision No.**	Rev 3

Brief description of proposed change(s) and justification

This MOC has been prepared in response to the unplanned release of plastic piggyback clamps to the marine environment whilst decommissioning the Minerva pipeline. This Management of Change (MoC) is intended to address the impacts and risks from floating plastic debris in both Commonwealth and State waters not envisioned in the Minerva Decommissioning and Field Management (Commonwealth and Victorian State Waters) Environment Plans. This Management of Change (MoC) is intended to address both Commonwealth and State waters, as the petroleum activity is being completed under the same Minerva decommissioning campaign by Subsea7 using the Seven Sisters vessel.

An environmental risk assessment on the accidental loss of plastic piggyback clamps (polypropylene) was undertaken in response to this incident to review ecological effects resulting from the presence, movement or degradation of lost components within the marine and coastal environment (Appendix A). The assessment includes consideration of all controls, analysis of the risk reduction proportional to the benefit gained and final acceptance or justification if the control was not considered suitable. The environmental risk assessment found the cumulative total of plastic (186kg as of 5 May 2025) poses a potential impact on the environment from the long-term degradation of plastic and poses a short-term ingestion risk to nearby marine fauna. The plastic also poses a potential aesthetic and reputation risk from washing up on Otway coastline.

The Minerva pipeline bundle comprises of approximately 10km of 10-inch concrete coated rigid-steel flowline, bundled with an electro-hydraulic umbilical and two 2-inch steel chemical injection lines in Pipeline Licences VIC-PL33 and VIC-PL33(v). The Minerva pipeline bundle is secured together with approximately 1600 polypropylene piggyback clamps spaced 6m apart and secured together with two stainless steel tensioned straps. The pipeline was laid in 2003 and the clamps have a 20 year design life. As the plastic saddles and banding straps are over 20 years their structural integrity may have reduced.

During pipeline bundle cutting and recovery operations a small proportion of the piggyback saddles have been dislodged and released to the marine environment. ROV footage during pipeline cutting with the hydraulic shears, observed fragments of piggyback clamps being dislodged and floating to the surface. Stored energy held within the uncoiled 2-inch injection lines is released following cutting placing lateral stress on the piggyback clamps resulting in the release of plastic piggyback clamp components (in particular the weaker C and E components) to the marine environment.

The piggyback clamps consists of eleven separate components (A to E) that are held together with two stainless steel straps made of nickel-based alloy. There are four C and four E components per piggyback saddle. The approximate dimensions of the clamps are 360 mm x 446 mm x 400 mm. Some of the dimensions individual components are below the debris criteria in the EP of 300 mm x 300 mm.

Figure 1: Minerva pipeline bundle and individual piggyback clamp components

As of 8 May 2025, Minerva Pipeline cutting and removal is sitting at 45% complete. It has been estimated that approximately 429 individual components have been released from Commonwealth and Victorian State Waters, resulting in a release of 186 kg of polypropylene into the marine environment over the period from the 12 January until the 2 May 2025. This equates to an overall release rate of approximately 2.6% of the piggyback saddles over the 4.5km of Minerva pipeline bundle recovered to date.

As of 8 May 2025, current estimated releases in Commonwealth and Victorian State Waters (under the two EPs) are:

- **Commonwealth:** 160 individual components weighing 87 kg of polypropylene, over a period from 12 January until 24 April 2025
- **Victorian State Waters:** 269 individual components weighing 99 kg of polypropylene, over a period from 16 April until 2 May 2025.

This MOC is intended to assess the current cumulative total loss of plastic to date in the project and a forecast of the potential losses of plastic piggyback clamps forecast to complete the remaining pipeline removal activities, noting increasing environmental sensitivity. The Southern Right Whale peak calving period (1 May to 31 October) is where pregnant and nursing southern right females and calves, are known to be resident for long periods (weeks to months) in near shallow coastal waters across the Otway region.

The cumulative total for removing the complete 10 kg pipeline from continuing pipeline removal work as per current environmental approvals and General Direction requirements is estimated to be 324 kg of polypropylene into the marine environment over the period from 12 January until the 30 June 2025. Based on the effectiveness of current controls and estimated release rate of 2.6%.

This can be broken down further under the two EPs as:

- **Commonwealth:** an estimated 64 kg of plastic from the removal of 2,130 km of pipeline remaining in Commonwealth Waters
- **Victorian State Waters:** an estimated 71 kg of plastic from the removal of 2,367km of pipeline remaining in Victorian State Waters

SECTION 2 (Define and Decide)

Refer to Environmental Approval Requirements Australian Commonwealth Guideline WM1050PF10239249 Appendix B for further guidance.
This form must include (or reference) sufficient supporting evidence.
This document is intended as a general guide only.

OPGGS (Environment) Regulations		
1) Is it a new activity? *Consider activity at a broad level of activity type such as levy category.*	☐ **YES**	☒ **NO**
Justification: There is no change to the activities with what is described in Section 3 of the Minerva Decommissioning and Field Management (Commonwealth and Victorian State Waters) Environment Plans (Revision 3). The pipeline bundle cutting and recovery using hydraulic shears is a planned activity as described in Section 3.7 of the EP and the piggyback clamps are included in Table 3-9 Inventory of Minerva Gas Field Infrastructure. There is no change to levy category.		
2) Is it a significant modification to the activity?	☐ **YES**	☒ **NO**

Consider whether changes to <u>how</u> the activity is being conducted (e.g. methods, equipment, controls, standards, measurement criteria, consultation) significantly alter the basis upon which the EP was accepted. Change to Environmental Performance Outcomes should be used as an indicator of significance.		

Justification:
The loss of plastic debris identified under this MOC is not considered a significant modification to the activity nor will it change the accepted EP environmental aspect risk/impact rankings or substantially change the Environmental Performance Outcomes described in the EP.

Whilst marine debris from the petroleum activity is identified as a risk and managed to a level that is acceptable and ALARP (Section 8.4). The unplanned discharge/accidental discharge of plastic piggyback clamps was not identified as a hazard as part of the Environmental Hazard Identification (ENVID) workshop conducted for these EP. This is because ROV surveys conducted prior to decommissioning works had determined the clamps to be in good condition and to be in place holding umbilical and chemical injection lines onto the pipeline.

Infrastructure	Quantity	Approximate Dimensions	Weight	Primary Materials	Current Status and Condition	State and Cth Waters
Piggyback clamps	1,642 across 10km pipeline	360 x 446 x 400mm	10.5 tonnes total (6.4kg per clamp)	Polypropylene Nickel-based alloy Black rubber (B)	Current status: design life of 20 years.	Total across state and Cth waters

Consideration has been given to ensuring that after implementing the change, relevant Environmental Performance Objectives (EPOs) within the EP will be achieved. The impacts and environmental performance objectives from the EP relating to the accidental loss of plastic piggyback clamps (polypropylene) to the marine environment within Operational Area:

Discharges during recovery of subsea infrastructure
Section 7.6.2.2 of the EP outlines discharges associated with subsea infrastructure removal activities and describes the generation of plastic and steel swarf from cutting of the pipeline.

The EP assesses that the potential impacts of subsea discharges may result in localised, minor and temporary reduction in water quality and to sediment quality.

Description of subsea decommissioning discharges:

- *Concrete spalling:* Cutting of the pipeline bundle may release small amounts of material, such as concrete spalling off the pipeline when cut with shears. The rigid spools will be cut with shears, which will result in little discharge of spool material the environment, as the spools will deform rather than fragment. A small amount of concrete may spall from the pipeline as it is cut. Estimates of the volume of concrete released to the sea using the hydraulic shears are approximately 4.75 m^3 concrete spalling.
- *Bailing twine (discharge not anticipated in EP):* within the concrete coating of the Minerva pipeline there is blue plastic bailing twine and steel rods to hold the concrete onto the plastic pipe. Bailing twine has been released from the concrete spalling when cut with shears and been collected during coastal surveys.

Figure 2: Recovered pipe section showing plastic inner lining, concrete coating and bailing twine

- *Plastic and steel swarf:* No concrete, plastic or steel swarf was expected to be released to the sea from cutting with the hydraulic shear cutting tool. The EP did assess the potential for approximately 5mm or less of polyethylene plastic and steel swarf to the sea with each cut, using the contingency method of chop or diamond wire saw. The estimates of plastic and steel swarf from a single cut was approximately 240g concrete, 50g plastic, 190g steel.
- *Field joins:* The heat shrink sleeves are securely attached to the field joins and covered by a double layer of PVC tape coated with bitumen adhesive. Delamination of the heat shrink sleeves and PVC tape resulting in release of these materials to the sea will not credibly occur if cuts are made at the field joins.

Environmental impact of subsea decommissioning discharges:

- *Water quality*: The EP outlines localised short-term impacts to water quality from the release of seawater ballast and residual chemicals and hydrocarbons during decommissioning activities. No impact to water quality is expected from the accidental loss of plastic piggyback clamps (polypropylene) to the marine environment as the clamps are external to the pipeline and have not been in contact with production fluids.
- *Sediment quality:* The EP outlines that sediment quality may be impacted by the discharge or release of materials during the cutting and removal process. Laboratory studies have identified that microplastics can be lethal, but only when animals are exposed to microplastics at concentrations that are order of magnitude higher than environmentally realistic levels (Lenz et al. 2016). Given only negligible amounts of the microplastics will be released during pipeline bundle removal and recovery activities, the filter -feeding animals living directly adjacent to the pipeline bundle are unlikely to encounter – to eat – enough microplastics to cause lethality.
- *Benthic habitats:* Solid waste/equipment (dropped objects) lost to the marine environment will be recovered where safe and practicable to do so. Where retrieval is not practicable and/or safe, material items (property) lost to the marine environment will undergo an impact assessment and will be added to the inventory for the title.
- *Marine fauna:* Unplanned discharge has secondary impacts relating to potential contact of marine fauna with wastes and debris. The EP assessed that the temporary or permanent loss of waste materials/ equipment into the marine environment is not likely to have a significant environmental impact, based on the location of the Operational Area, the types, size and frequency of wastes that could occur, and species present.

Section 8.4 of the EP outlines unplanned loss of solid waste (including dropped objects), which is primarily focused on dropped objects with potential impacts and controls for collecting debris on the seabed.

Loss of Solid Waste (Plastic debris):
Section 7.7.2 of the EPs assess the generation of solid waste from the decommissioning activities. The EP assesses subsea discharges as a potential hazard derived from discharges of material from cuts to seabed infrastructure during recovery.

An additional Unplanned Discharge will be appended to the Minerva Decommissioning and Field Management (Commonwealth and State) EPs, refer to Appendix A: Plastics Risk Assessment. This unplanned discharge outlines the potential to release plastic debris to the marine environment, the risks associated and that best endeavours will be made to retrieve lost plastic through the controls listed.

All other EPOs in the EP remain unaffected by the increase in plastic debris and current controls are effective in achieving the EPOs.

3) Is it a new stage? *Consider change to <u>where</u> and <u>when</u> the activity is conducted, or works specifically identified as a future new stage under the existing EP. Intent is a critical consideration when determining whether a change in timing or location constitutes a new stage*	☐ **YES**	☒ **NO**

Justification:
This loss of plastic debris is not considered a new stage. There is no change to the activities outlined in Section 3.7 of the Minerva Decommissioning and Field Management (Commonwealth and Victorian State Waters), therefore, activities will occur within the same timeframe and location as described in the accepted EP and EPBC Referral.

The accepted EP outlines timing constraints in accordance with General Direction 831 Direction 2: *Remove or cause to remove, to the satisfaction of NOPSEMA, from the title area all property brought into that area by any person engaged or concerned in the operations authorised by the title as soon as practicable and no later than 30 June 2025.*

The proposed change outlined in this MoC meets the General Direction requirements.

4) Does it introduce a significant new impact or risk and/or does it significantly increase an existing impact or risk? *Conduct a gap analysis to identify C+ new or increased <u>impacts</u>, and new B+ or Very High or Severe increased environmental <u>risks</u>.*	☐ **YES**	☒ **NO**

Justification:
The loss of plastic debris does not introduce a new impact or significant increase in the existing impact. The proposed activity includes potential for ingestion with marine fauna and dropped objects that have not explicitly been described in the EP. The below assessment provides justification for why this activity and associated marine fauna interaction and dropped object potential does not introduce a new risk or significant increase in the existing impact.

All other impacts associated with the proposed activity have been directly addressed in the EP and have therefore been considered within the impacts and risks already described and assessed.

Aspect – Discharges during recovery of subsea infrastructure	
Source of Impact	Removal of pipeline resulting in loss of piggyback clamp components, caused by release of tension in 2-inch MEG lines while cutting.
Change to Impact Assessment	Potential for this unplanned risk not previously identified in Environment Plan.
ALARP and Acceptability Assessment	Control measures or performance standards have not been removed or altered. The level of environmental management has not been degraded. New controls have been assessed and included, refer to Appendix A: Plastic Risk Assessment.

All other impacts associated with the vessel campaign have been considered within the impacts and risks already described and assessed within the accepted EP.		
5) Does any non-significant impact or risk change interact with previous changes since EP acceptance to constitute a significant increase?	☐ **YES**	☒ **NO**
Justification: This MoC does not relate to any changes previously made to the Minerva Decommissioning and Field Management (Commonwealth/State) EPs.		
6) Is the manner in which impacts and risks are managed altered as a result of a titleholder change?	☐ **YES**	☒ **NO**
Justification: Titleholder has not changed.		
If the answer to any of the above was YES: • *A revision and resubmission of the EP is required* • *You must proceed to assessment under the EPBC Act (below).* • *It must be noted that a new activity which is related to an existing activity can also only be the subject of a revised EP with NOPSEMA consent, otherwise a new EP is required.* • *If it is a new activity, significant modification or new stage, the revision must be accepted prior to the change.* • *If the change involves a significant increase in risk, or a change in titleholder/manner the revision must be submitted as soon as practicable in agreement with the regulator.*		
EPBC Act *(only required if YES for any of the OPGGS section)*		
1) Is this change associated with an Offshore Project (a large scale offshore petroleum development – i.e. production drilling, construction/commissioning/operations of facilities or pipelines and not appraisal activities) If YES, proceed to step 2). If NO – no further action required.	☐ ***YES***	☒ ***NO***
2) Is the change contemplated in the primary approval documentation? Consider the type of infrastructure, construction methods, operating parameters, location, and timing. If NO, proceed to step 3). If YES – no further action required.	☐ ***YES***	☒ ***NO***
Justification (identify any delta):		
3) If NO for 2), does the change alter the impact on matters of National Environmental Significance (mNES)? If YES, the change is not included/equivalent and either an OPP or EP revision for a new stage may be required. If NO – no further action required.	☐ ***YES***	☒ ***NO***
Justification: Not relevant.		

SECTION 3 Analyse and Review

Does the MOC assessment demonstrate reduction of impacts and risks to ALARP and acceptable levels has been maintained? *Justification:* There is no change to risks and impacts associated with the proposed activity (Refer to Section 2, Question 4 of this MOC). No change to the Environment Impact Assessment is associated with the proposed activity, therefore impacts and remain ALARP and acceptable as described in the accepted EP.	☒ ***YES***	☐ ***NO***
Evaluation of the need to consult with relevant stakeholders regarding the change (regardless of the need to resubmit the EP) completed with Corporate Affairs input. Outcome for Exploration and Development MOC documented below.* *Justification:* Consultation with relevant stakeholders not required as the change will not alter the risk or the way in which the activity will occur. Therefore, no impact on stakeholders beyond previous consultation. **Changes at operational facilities are much less likely to trigger stakeholder interaction due to their continuous nature*	☐ ***YES***	☒ ***NO***
Evaluation of the need to conduct a Financial Assurance review regarding the change (regardless of the need to resubmit the EP) completed. Outcome of this review below. *Justification:* Hydrocarbon spill risk as described in the EP is not affected by the activity scope covered under this MOC. As such, this MOC does not influence financial assurance criteria and therefore no requirement to conduct a financial review audit.	☐ ***YES***	☒ ***NO***
Any proposed changes to controls have been assessed to determine if managed by a separate functional area of the business. *Justification:* Not applicable as no changes to controls resulting from this MOC. *If proposed change to controls are managed by a separate function, this function has been consulted.* *Justification:* Not applicable as no changes to controls resulting from this MOC.	☐ ***YES*** ☐ ***YES***	☒ ***NO*** ☒ ***NO***

SECTION 4 (Sign off)

Approval/Concurrence

The typical roles involved in a Sign Off are listed below. Consideration should be given to the nature and scale of the change as per section 3.3.2 in Environmental Approval Requirements Australian Commonwealth Guideline WM1050PF10239249. The Decide role can vary depending on the nature and scale of the risk. Consult relevant line manager to agree sign off if required. Signature for the input role is optional.

	Role	Name	Signature	Date
Recommend	[redacted]			09/05/2025
Agree				
Input				09/05/2025

Perform	[redacted]
Decide	[redacted]
The approved MOC should be added to the relevant register and internal electronic copies of the approval documents updated.	

Appendices:

Appendix A: Plastics Risk Assessment

Appendix B: Pipe Saddle Clamp Components

Appendix C: Piggyback Clamp Spacing and Details

Appendix D: Saddle Loss Mitigation Methods

APPENDIX A

Discharge: Loss of Solid Waste (Plastic debris)

Context															
Impacts and Risks Evaluation Summary															
Source of Risk	***Environmental Value Potentially Impacted***							***Evaluation***							
	Soil and Groundwater	*Marine Sediment*	*Water Quality*	*Air Quality (incl Odour)*	*Ecosystems/ Habitat*	*Species*	*Socio-economic*	*Decision Type*	*Severity factor*	*Likelihood factor*	*Current Risk Rating*	*ALARP Tools*	*Acceptability*	*Outcome*
Accidental loss of plastic piggyback clamps (polypropylene) to the marine environment within Operational Area		X	X		X	X	X	B	10	3	30	LCS GP PJ CV SV	Acceptable	EPO 16

Description of Source of Risk

Project vessels produce a variety of solid wastes, including industrial wastes. There is potential for plastic debris from the piggyback clamps to be lost to the marine environment, during cutting and recovery of the Minerva pipeline.

The Minerva pipeline bundle comprises of approximately 10km of 10-inch concrete coated rigid-steel flowline, bundled with an electro-hydraulic umbilical and two 2-inch steel chemical injection lines in Pipeline Licences VIC-PL33 and VIC-PL33(v). The Minerva pipeline bundle is secured together with approximately 1600 polypropylene piggyback clamps spaced 6m apart and secured together with two stainless steel tensioned straps. The pipeline was laid in 2003 and the clamps have a 20 year design life. As the plastic saddles and banding straps are over 20 years their structural integrity may have reduced.

Polypropylene (PP)

Plastic components contained within the piggyback clamps were determined to be primarily polypropylene. PP has densities that are lower than seawater so dispersed material is expected to float on or near the water surface and be dispersed by wind, waves and currents. Dispersed neutral and low density plastics (such as PP) will break down into smaller pieces over time as they continue to degrade (also now subject to UV degradation and physical degradation due to the waves). Some pieces will wash ashore on coastlines near and far whilst others may be ingested by marine fauna (depending on the size) or circulate in the ocean indefinitely.

Some plastic components may have potentially contained chemical additives such as antioxidants, stabilisers and plasticisers to assist the performance of the polymer (Fred-Ahmadu et al. 2020). The specific additives used in this polypropylene will depend on the intended application and the specific polymer formulation. Often these formulations are considered proprietary information and not readily available.

Plastic piggyback clamps were installed in 2003 and have had prolonged exposure to the aquatic environment, including the action of physical stress, water current, sediment transport and abrasion, increased UV light, fluctuating temperatures and oxygen levels would have resulted in increased weathering and degradation of plastic by mechanical, biological and chemical processes since installation.

Impact Assessment

Potential impacts to environmental values

Loss of plastic to the marine envrionment

When the plastic piggyback clamps are lost from the pipeline in fragments, some pieces float, some sink and some travel through the water. If plastic hits into the rocky cliffs along the Victorian coastline, it can fragment, creating increasingly smaller fragments of plastic (microplastics) and travel further from the pipeline.

According to drift modelling, clamps in the Commonwealth waters are more likely to float west and clamps in the State waters are more likely to float east.

Leaching of additives

Polypropylene will include a number of additives such as antioxidants, UV stabilisers and plasticisers which can leach into the environment under certain conditions because the additives are not covalently bonded to the polymer matrix causing them to migrate/leach into surrounding environments (Iftikhar et al. 2024). The leaching of polypropylene additives into the marine environment is a complex process influenced by various environmental and material factors.

Common antioxidants found in polypropylene, that may pose an environmental concern, are a generic stabiliser (CAS 82451-48-7) and a generic antioxidant (CAS 96-69-5). According to the Globally Harmonized System of Classification and Labelling of Chemicals (aka the GHS System), developed by the United Nations the additives both fall within the Hazard Code H410 and H400 (respectively). GHS hazard code H400 refers to a 'very toxic to aquatic life' and H410 refers to 'very toxic to aquatic life with long lasting effects'. Both additives then have a precautionary statement within the GHS System stating, 'avoid release to the environment". However, as the plastics have been exposed to seawater for the last 20 years it would be safe to assume that any additives at the plastic/water interface have leached out and into the surrounding marine environment and been dispersed widely. On this occasion, as the pipeline was not buried and the piggyback clamps have been exposed to seawater for over 20 years it is not predicted that the additives will have a significant (if any) toxic effect on the surrounding environment. Even if it were to leach, after all this time, it would be leaching into large bodies of water and disperse quickly.

Degradation of the plastics

Degradation of plastic may result in a variety of chemicals and degradation products being released over time into the environment. Plastics may also be chemically harmful in some contexts, either because of their potential toxicity or because they absorb other pollutants (Rochman et al., 2013). The additives (antioxidants, stabilisers, plasticisers) differ in their bioavailability, toxicity and potential to bio-accumulate. A review of most commonly produced polymers and the associated plastic additives found that polypropylene commonly contain antioxidants which can contain a number of hazardous substances that may pose a risk to the environment (Hermabessiere et al. 2017).

Plastics have a variety of degradation mechanisms in the environment, including:

- Ultraviolet light
- thermal ageing
- weathering
- chemical degradation
- ionizing radiation
- creep, fatigue and environmental stress cracking
- biological degradation.

Plastic in the environment is subject to degradation from mechanical weathering (thermal, water, abrasion), ultraviolet solar radiation (abiotic degradation) and biological action (ie microorganisms and invertebrates).

As plastic debris accumulates in the environment, exposure to physical, chemical and biological processes results in its fragmentation into smaller pieces, and the potential ingestion by animals increases (Browne et al. 2008). Microplastics are produced from the fragmentation of larger plastic items. Specifically, polypropylene experiences higher rates of mechanical degradation in turbid waters compared to other polymers such as high-density polyethylene and as such will more likely form micoplastics (Al-Darraji et al. 2024).

Polypropylenes are synthetic polymers with high hydrophobic characteristics, high molecular weight and are considered inert to degradation (Pelegrini et al. 2019) and as such are generally non-susceptible to biodegradation. P. This is particularly the case for high-density, crosslinked polypropylene which would only biodegrade over extremely long timeframes (hundreds to thousands of years).

It is a rigid plastic that resists abrasion and chemicals, has low moisture absorption, and is non-biodegradable (unless manufactured with a degradable polymer additive).

Any degradation of the plastic would be limited chemical degradation (hydrolysis, oxidation) over very long timeframes (potentially hundreds to thousands of years). Given the quantities of this plastic, and the extremely slow rate of degradation, no substantial decline in water or sediment quality is likely to occur in the short-term.

No short-term significant impacts are likely to occur to any sensitive receptors in the vicinity of the pipeline (e.g. sediment macrofauna/infauna; benthic habitats/fouling communities; benthic fish assemblages; demersal and pelagic fishes targeted by recreational and commercial fishers) and the nearby coastline on which the plastic is washing onto shore.

In the long-term any components of the clamps not retrieved may, over time, become microplastics. The impact of microplastics on sensitive receptors will vary. Of note is the Bonney Upwelling which is responsible for supporting a rich and productive ecosystem and attracting numerous marine species and commercially important fisheries. Zooplankton in marine environments are a food source for many other organisms, connecting primary producers such as phytoplankton with larger predators such as fish (Lin 2016).

Absorption of microplastics has been demonstrated in phytoplankton (Bhattacharya et al. 2010, Long et al. 2015). Research has shown that microplastics are readily ingested by several zooplankton taxa. Consequently, this represents a route whereby microplastic and associated chemicals could enter the food web and transfer up the trophic levels (Botterell et al. 2019).

Due to the proximity to land and the overlap of a number of seabird foraging BIA's the impact of microplastics on seabirds needs to be considered. Seabirds, in particular, albatrosses and petrels are the species with the highest known ingestion rates of plastics and other marine rubbish/debris (Gall and Thompson 2015). These seabirds feed on small prey near the water surface, where microplastics may be concentrated making them more likely to consume microplastics which they mistake for food items.

Potential impacts to protected species, values of the Otway Basin, KEFs and social values

Any physical or biological degradation of the polypropylene will not result in the short-term release of contaminants that could potentially become bioavailable and bioaccumulate in any protected species that utilises the waters in the vicinity of the pipeline (e.g. pygmy blue whales, southern right whales, marine turtles, sharks, seabirds). Any decline in water quality from degradation of the polypropylene will not impact on any physical or ecological values of the Otway Basin, or of any KEFs in the region.

Marine debris

Pollution of the marine environment by solid waste termed "marine debris" is a growing global challenge that has concerns to the welfare of all marine wildlife, including charismatic megafauna such as whales (Roman et al. 2021). The United Nations Environment Program define marine debris (or marine litter) as any persistent, manufactured or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment (Macfadyen et al. 2009). Marine debris may cause injury or death through drowning, injury through entanglement and internal injuries, or starvation following ingestion. Marine debris that causes injury and fatality through entanglement and ingestion was recognised in 2003 as a key threatening process for marine vertebrates under the EPBC Act. In response, the Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans 2018 (Marine Debris TAP) was developed. Marine debris is defined under the Marine Debris TAP, consists of:

- land-sourced garbage
- fishing gear from recreational and commercial fishing abandoned or lost to the sea, and
- vessel-sourced, solid, non-biodegradable floating materials disposed of or lost at sea.

Based on this the plastic piggyback clamps would be classed as marine debris, but have a low entanglement risk.

The mostly polypropylene clamp fragments are likely to degrade into microplastics over long extended timeframes and pose a potential ingestion risk.

The Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (Commonwealth of Australia, 2018): Ingestion of plastic by cetaceans can cause internal damage and the blocking of the digestive tract which can lead to starvation. Ingestion may result in the loss of reproductive fitness or mortality. It therefore has the potential for impeding the recovery of populations if these consequences are impacting a sufficiently large number of individuals. It was noted that it would be unlikely for southern right whales to ingest marine debris in Australian coastal waters given whales are less likely to be feeding.

National Recovery Plan Southern Right Whales (Commonwealth of Australia, 2024)

Microplastics are ingested by marine animals in a range of ways, such as up the food web via trophic transfer and of particular concern for baleen whales, directly consumed in large volumes of water while foraging (Zantis et al. 2022). Ingestion of marine debris, however, is thought to be unlikely for southern right whales in Australian coastal waters given whales are less likely to be feeding. in Australia coastal waters, southern right whales are typically engaged in reproductive behaviours and do not feed, such that their energy stores decline.

Plastics often float and can travel large distances in the ocean currents, and as they not generally biodegradable they can remain in the environment for long time periods. Marine debris are found in areas where oceanographic features promote their concentrations such as enclosed seas or inside gyres which can trap marine debris like the sub-tropical gyre of the South Pacific Ocean (Barnes, 2009).

Summary of potential impacts to environmental values(s)

There are four relevant objectives under the Threat Abatement Plan for the Impacts of Marine Debris on the Vertebrate Wildlife of Australia's Coasts and Oceans (Commonwealth of Australia, 2018):

- Objective 1: Contribute to the long-term prevention of the incidence of marine debris.

- Objective 2: Understand the scale of impacts from marine plastic and microplastic on key species, ecological communities and locations
- Objective 3: Remove existing marine debris
- Objective 4: Monitor the quantities, origins, types and hazardous chemical contaminants of marine debris and assess the effectiveness of management arrangements for reducing marine debris.

Species/Group	Threats identified that may arise from the Petroleum Activity	Relevant conservation actions
All invertebrate fauna	Ship-sourced marine debris as a risk to vertebrate marine life through entanglement or ingestion	No explicit management actions for non-fisheries related industry (note that management actions in the plan relate largely to management of fishing waste (for example 'ghost' gear) and State and Commonwealth management through regulation).
Sei Whale	Habitation degradation, pollution and marine debris	No explicit relevant management actions; habitat degradation, pollution and marine debris identified as threats
Blue Whale	Habitation degradation, pollution and marine debris	No explicit relevant management actions; habitat degradation, pollution and marine debris identified as threats
Fin Whale	Habitation degradation, pollution and marine debris	No explicit relevant management actions; habitat degradation, pollution and marine debris identified as threats
Southern right whale	Marine debris	No explicit relevant management actions. Marine debris from the petroleum activity is identified as a risk and managed to a level that is acceptable and ALARP.
Australian sea lion	Marine debris	Develop and implement measures to mitigate the impacts of marine debris on the species (including reducing the amount of these marine debris entering the oceans), noting linkages with the Threat Abatement Plan for the Impact of Marine Debris on Vertebrate Marine Life.
EPBC Act listed Marine turtles: - Loggerhead Turtle - Green Turtle - Leatherback Turtle	Marine debris	Action Area A3: reduce the impacts from marine debris: - Support the implementation of the EPBC Act Threat Abatement Plan for the impacts of marine debris on vertebrate marine life
Seabirds	Pollution (marine debris)	Manage the effects of anthropogenic disturbance to seabird breeding and roosting areas. Hooded plover nesting signs were observed at Peterborough beach during coastal walks.

Environmental values of the Great Ocean Road and Scenic Environs National Heritage Place which lies approximately 5 km from the operational area at the closest point includes:

- Historical values, as the road itself was constructed as a memorial to First World War servicemen by returned servicemen. The diverse landscapes and views from the route have made its a famous coastal drive.
- Aesthetic value of the natural landscapes and seascapes along the Great Ocean Road's 242 km length. The Great Ocean Road offers spectacular views of the coastline, hinterland, and Bass Strait seascape, with few intrusive built structures. Lookout points along the route provide travellers opportunities to experience the natural beauty of the coastline, including the Twelve Apostles and Johanna Beach.

These values support nature-based tourism activities, which in turn supports towns along the Great Ocean Road, such as Lorne and Port Campbell.

Environmental values of the Twelve Apostles Marine National Park and The Arches Marine Sanctuary include:

- Unique limestone rock formations
- A range of marine habitats representative of the region
- Indigenous culture based on spiritual connection to sea country
- Wreck of the Loch Ard
- Opportunities to view scenery and marine life, including a renown scuba diving site.

Control measures:

Drift modelling and Coastal Survey Planning

Following repeated occurrences of loss, environmental and operational concerns prompted the initiation of a targeted coastal survey. The goal was to locate and recovery as many of the lost plastic components as possible. To predict the likely areas where the plastic components may have made landfall, hydrodynamic drift modelling was undertaken. This modelling incorporates prevailing ocean currents, wind conditions and tidal movements from the time of release to coastal landing. Based on the modelling runs conducted for 12 different cases of clamp loss in Commonwealth waters, the coastal region between McGennans Beach, Warrnambool in the west to Gibson Steps Beach in the east was identified as the most probably area for debris deposition.

Coastal Survey 1: 10-11 April 2025

Field team of 2 was deployed over a two-day period (10-11 April 2025) to conduct systematic coastal surveys and binocular observations. The survey area covered approximately 77 km of coastline, segmented into manageable search zones based on accessibility and drift model heatmaps. The coastline included 24.5km of beach and 52.5km of predominately inaccessible cliff coastline. The cliff sections, due to their steep topography and lack of safe access points, were deemed unsuitable for effective ground-based survey efforts.

Of the 24.5 km of beach, accessibility was further evaluated, revealing that 10km was not practicably accessible due to natural barriers such as dense vegetation, unstable terrain, or lack of entry routes. This left 15km of beach considered accessible for survey purposes. From this accessible beach section, a total of 8.2kms was actively surveyed during the first coast survey. This coverage equates to approximately 33% of the total beach area within the area of interest and about 11% of the entire 77km coastal extent. The priorisation of survey coverage was based on both logistical feasibility and areas identified as having higher potential relevance based on drift modelling outputs.

Focus was on walking beaches and observing coast and beach via binoculars when access was not possible. Survey method involved visual inspection and manual collection along the high-tide line, wrack zones and adjacent dune areas. GPS tracking and photographic documentation were used for each find. Search locations were determined through review of drift forecast, accessibility and public use.

Coastal Survey 2: 23-25 April 2025

Field team of 3 was deployed over a three-day period (23-25 April 2025) to conduct another series of systematic coastal surveys and binocular investigations. Based on drift modelling from the most recent cuts the survey area covered approximately 120 km of coastline, segmented into manageable search zones based on accessibility and drift model heat maps. The coastline included 31.5 km of beach and 88.5 km of predominately inaccessible coastline. The cliff sections, due to their steep topography and lack of safe access points, were deemed unsuitable for effective ground-based survey efforts.

Of the 31.5 km of beach, a total of 25 km was actively surveyed during the second coastal survey. The total area could not be accessed due to natural barriers such as dense vegetation, unstable terrain or lack of entry routes. This covered area equates to approximately 21 % of the entire 120 km coastal extent. The priorisation of survey coverage was based on both logistical feasibility and areas identified as having higher potential relevance based on drift modelling outputs.

Focus was on walking beaches and observing coast and beach via binoculars when access was not possible. Survey method involved visual inspection and manual collection along the high-tide line, wrack zones and adjacent dune areas. GPS tracking and photographic documentation were used for each find. Search locations were determined through review of drift forecast, accessibility and public use.

Findings

In the first survey a total of 2 plastic saddle pieces and a shot length of concrete twine were recovered during the survey along with approximately 10kg of miscellaneous plastic. The discovery of two clamp fragments, a section of umbilical and length of pipe wrap twine provides clear evidence that material lost during the Minerva Decommissioning Project has the potential to reach shorelines, including those with high public accessibility and environmental sensitivity. These findings validate the outcomes of the hydrodynamic drift modelling, which indicated a plausible transport pathway to these coastal zones.

While the direct deposition of bundle clamp debris onto an accessible beach is considered possible, it is not the most likely scenario. The more probable outcomes involve the material reaching high-energy sections of the coastline, where sustained wave action and mechanical abrasion contribute to the fragmentation of components. Over this time, this degradation process will result in smaller fragments (and potentially eventually microplastics) being deposited on the beach, making detection more difficult.

In the second survey, approximately 10 kg of plastic was recovered (including bailing twine and small umbilical pieces). This further supports the initial evidence that the material loss has the potential to reach the shoreline and supports the accuracy of the drift modelling.

Future Risk Management and Coastal Surveys

The volume of clamp material potentially lost during the upcoming cut and recovery operations should be carefully considered in conjunction with hydrodynamic drift modelling. Given the demonstrated potential for debris to reach environmentally sensitive and publicly accessible coastal areas, it is recommended that drift modelling be conducted for each day of cutting activity, particularly when operations are undertaken in close proximity to the shoreline. This day-by-day modelling would enable a more accurate assessment of the likelihood and direction of material transport. Should the modelling indicate a heightened probability of material reaching shore, it may be appropriate to initiate additional coastal monitoring and assessment activities. External contractors have been onboarded to continue to conduct the coastal surveys as described above, after each section of pipeline cut and recovered. The recovery and coastline will be recorded and compared to previous data without latest controls listed below.

Satellite/Drone Footage

To secure satellite imagery of the coastline an acquisition plan with industry providers Kongsberg Satellite Services (KSAT) would need to be established to agree imagery source and type.

Based on Woodside's experience in receiving previous spill imagery in 2023 at NWS and for other international locations, KSAT will struggle to pick up pieces of white saddle/plastic debris at the standard resolutions.

Drones could be used as a secondary support service to supplement the in-person beach reconnaissance, particularly in areas that are hard to access/egress. They require a pilot with the appropriate licence/training certification and can be limited by line-of-sight signal strength (depending on the style of drone). The coastal area has several restricted areas which prohibit drone use, including the area within and adjacent to the whale sanctuary, airport and the Twelve Apostles.

Both techniques run the risk of poor weather/ cloud cover interfering with image quality and the high chance of reporting false-positivise however drone use is to be utilised by the coastal survey contractor in sanctioned areas.

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[1]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Legislation, Codes and Standards (other than OPGGS Act)				
Good Practice				
Reactive manual recovery of saddle pieces from shoreline.	F: Yes CS: $200k AUD. Requires personnel and minor equipment for shoreline retrieval.	Recovery and appropriate disposal of the plastic found on the beach, avoidance of marine pollution, minimisation of microplastics being released.	Benefits outweigh cost/sacrifice.	Yes
Conduct drift modelling on the plastic losses.	F: Yes CS: $15 k	To assist in the coastline surveys, saves time and effort from persons involved as they can prioritise the impacted beaches.	Benefits outweigh cost/sacrifice.	Yes
Professional Judgement – Eliminate				
Continuing pipeline removal work as per current environmental approvals and General Direction requirements.	F: No CS: None	Current controls do not eliminate the risk and impact of plastic debris associated with pipeline removal activities. Elimination can only be achieved by stopping work and investigating additional engineering controls. Stopping work poses a risk to removing the Minerva subsea infrastructure before 30 June 2025 as required by General Direction 831.	Continued cumulative loss of plastic has potential unacceptable reputation and environmental risk. 2,130km of pipeline remains in Commonwealth Waters and 2,367 km in State Waters an estimated 135kg of plastic could be lost to the environment in this scenario using the current controls.	Continuing work is not advised as current controls are not effective at reducing risks to ALARP and acceptable. This option would result in an additional 135kg of plastic debris, bringing the cumulative total under the campaign to 324kg of plastic, which has an unacceptable environmental and reputation risk.

[1] Qualitative measure

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[1]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Stop work in Victorian State Waters and prioritise completion of pipeline removal works in Commonwealth Waters to meet General Direction timeframes.	F: Yes CS: Continued cumulative loss of plastic has potentially unacceptable reputation and environmental risk.	Based on current progress, a 1km section of pipeline will remain in Victoria State waters within the Southern right whale BIA. Another campaign is anticipated to recover this section after the peak southern right whale calving period and in more favorable weather conditions. Stopping work in Victorian State Waters and priorising pipeline removal activities in Commonwealth Waters ensures Minerva subsea infrastructure is removed before 30 June 2025 as required by General Direction 831. Current controls do not eliminate the risk of plastic debris associated with pipeline removal activities. Elimination can only be achieved by stopping work and investigating additional engineering controls.	Continued cumulative loss of plastic has potentially unacceptable reputation and environmental risk. Stopping at the end of May following the completion of pipeline removal works in Commonwealth Waters reduces financial impact from fixed costs in the contract and gives the notice to stand down vessel and crew. 2,130km of pipeline remains in Commonwealth Waters, an estimated 64kg of plastic could be lost to the environment in this scenario using the current controls.	Continuing work is not advised as current controls are not effective at reducing risks to ALARP and acceptable. This option would result in an additional 64kg of plastic debris, bringing the cumulative total under the campaign to 253kg of plastic, which has an unacceptable environmental and reputation risk.
Immediately stop work on pipeline removal activities. Leave field and return after the peak southern right whale calving period and in more favorable weather conditions.	F: Yes CS: Costs of contracting and mobilising a new vessel	Allows for time to discuss a new engineering technique to prevent clamp loss. Metocean analysis suggests the most suitable weather conditions for the subsea infrastructure removal campaign (less than 2 meter seas) is October to March. Completing work in better weather conditions will improve visibility and cutting accuracy and result in less weather and whale downtime.	Immediately stopping work on the eliminates the further loss of plastic to the environment. Allows for additional time to discuss a develop an engineering technique to prevent clamp loss.	
Professional Judgement – Substitute				
Professional Judgement – Engineered Solution				

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)[1]**	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
Cut pipeline bundle at field joints. Increased cutting efficiency, reducing loads on MEG lines and saddles, reducing likelihood of saddle breakage and loss.	F: Yes CS: No additional costs. No additional equipment or modifications required.	Less strain on pipeline as it is cut, less likely for piggyback clamps to be released.	Control adopted due to no additional cost.	Yes
Cut pipeline bundle into double joints. Reduced number of cuts reduces likelihood of saddle breakage and loss.	F: Current Primary Vessel does not have enough deck space to perform this method. Significant engineering and deck layout / handling mods required. CS: $2M AUD Requires substantial deck layout mods and extra equipment to cut joints on back deck.	Halve the number of cuts being made so the likelihood of piggyback clamp release is lower.	Cost of the control is disproportionate to the benefit. Control will not meet the schedule requirements.	No
Cut pipeline bundle using alternative method (chop saw or DWS instead of shears) that may induce less stress in MEG lines reducing likelihood of saddle breakage and loss.	F: Yes CS: No additional costs. No additional equipment or modifications required. Large chopsaw was already a contingency cutting option if shears did not work, as per EP.	Induce less stress in MEG lines reducing likelihood of saddle breakage and loss.	Control will not meet the schedule requirements.	No
Cut umbilical and MEG using GR29 before cutting 10" line with shears to induce less stress in MEG lines reducing likelihood of saddle breakage and loss.	F: Yes CS: $500k AUD. Requires hire of larger GR29.	Induce less stress in MEG lines reducing likelihood of saddle breakage and loss.	Cost of the control is disproportionate to the benefit. Control will not meet the schedule requirements.	No
Reactive recovery of saddle pieces from sea surface from Primary Vessel using scoop nets.	F: Yes CS: No additional costs. No additional equipment or modifications required.	Quick and minimal cost. If plastic floats at the point of cutting it can be retrieved straight away before it floats out to sea.	Benefits outweigh cost/sacrifice (no additional costs).	Yes
Reactive recovery of saddle pieces from sea surface using small watercraft and scoop nets (not from Primary Vessel)	F: Yes CS: $1M AUD. Requires hire of small craft and personnel for	Small watercraft can collect plastic if it is too far to reach with the scoop net from the vessel.	Cost of the control is disproportionate to the benefit and health and safety risk is too high.	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**[1]	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
	remainder of project.		Vessels cannot enter the Biologically Important Area during the scheduled project time.	
Proactive restraint of saddles subsea using ROV installed tooling to reduce chance of saddle loss during pipe joint recovery.	F: Installation of additional clamping system(s) is medium complexity and requires engineer and testing of restraint methods. CS: $500k AUD. Requires PME and fab of clamshells or similar.	Captures the saddle so they are not lost to the sea, and they can be brought up with the pipeline.	Cost of the control is disproportionate to the benefit. Control will not meet the schedule requirements.	No
Proactive cutting and removal of saddles subsea using ROV prior to pipeline cut and recovery.	F: Cutting of saddles straps is simple. Capture and recovery of saddles pieces via ROV would be difficult and requires engineer and testing of nets/clamps/baskets etc. CS: $500k AUD. Requires PME and fab of clamshells or similar.	Have control over the clamps so they do not float away. Captures the saddle so they are not lost to the sea, and they can be brought up to the vessel via ROV.	Control is disproportionate to the benefit. Control will not meet the schedule requirements.	No
Proactive cutting and removal of saddles subsea using divers prior to pipeline cut and recovery.	F: Simple technical solution. Divers can cut saddle straps and recover saddle pieces in bags/nets or similar. CS: $18M AUD. Assuming 14 day saturation diving campaign to remove all saddles.	Have control over the clamps so they do not float away.	Cost of the control is disproportionate to the benefit. Control will not meet the schedule requirements. HS risk is disproportionate to benefits.	No
Proactive instalment of a fishing net over each clamp whilst cutting the pipeline bundle.	F: Yes CS: Minor additional costs of acquiring nets.	In the event that a clamp is dislodged it will be caught in the net and loss to the environment will be prevented.	Risk to the environment of the control is disproportionate to the benefit. Potential for marine life to become trapped	No

Demonstration of ALARP				
Control Considered	**Control Feasibility (F) and Cost/Sacrifice (CS)**[1]	**Benefit in Impact/Risk Reduction**	**Proportionality**	**Control Adopted**
			in the nets is too high in comparison to the likely benefit of the control.	
Proactive instalment of "lobster pots" over the clamp during cutting of the pipeline bundle (refer to Appendix D for diagram).	F: Yes CS: No additional costs.	In the event that a clamp is dislodged it will be caught in the "lobster pot" and loss to the environment will be prevented.	Benefits outweigh cost/sacrifice (no additional costs).	Yes

ALARP Statement

On the basis of the environmental risk assessment outcomes and use of the relevant tools appropriate to the decision type, Woodside considers the adopted controls appropriate to manage the impacts and risks from release of plastics from the Minerva pipeline bundle. As no reasonable additional/alternative controls were identified that would further reduce the impacts and risks without grossly disproportionate sacrifice, the impacts and risks are considered ALARP.

Demonstration of Acceptability
Acceptability Criteria and Assessment
Principles of ESD The impact and risk evaluation has taken into account the following relevant principles of ESD: • decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations; • the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations; and • the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making. **Internal Context** The Petroleum Activities Program is consistent with Woodside corporate policies, culture, processes, standards, structure and systems as outlined in the Demonstration of ALARP and Environmental Performance Outcomes, including: • Woodside Health, Safety, Environment and Quality Policy (**Appendix A**) • Woodside Risk Management Policy (**Appendix A**). **Other Requirements** As demonstrated in **Section 6.8**, the residual risk of accidental release of plastics from the pipeline is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice and wildlife conservation plans during the assessment of potential risks. There are no additional legislative requirements that apply. The impacts and risks from plastic debris are not inconsistent with the Marine Debris Threat Abatement Plan (TAP), which has the same level of statutory standing as a recovery plan. See: https://www.environment.gov.au/biodiversity/threatened/publications/tap/marine-debris-2018
Acceptability Statement The impact assessment has determined that, given the adopted controls, accidental release of plastics to the marine environment from the pipeline represents a low risk rating that is unlikely to result in a potential impact above slight, short-term impact on species, habitat (but not affecting ecosystems function), physical or biological attributes. Further opportunities to reduce the impacts and risks have been investigated above. The adopted controls are considered good oil-field practice/industry best practice and meet legislative requirements. As demonstrated in **Section 6.8**, the residual risk of accidental release of plastics from the pipeline is not inconsistent with the relevant objectives and actions of any applicable recovery plans or threat abatement plans, based on the adopted controls. Regard has been given to relevant conservation advice during the assessment of potential risks. Therefore, Woodside considers the adopted controls appropriate to manage the impacts and risks of these unplanned discharges to a level that is acceptable.

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
EPO 16 Pipeline cutting managed to limit plastic release to severity level of 1.	**C 16.1** Cut pipeline bundle at field joints.	**PS 16.1** Cut the pipeline at the field joints and 500 mm away from the plastic pipeline bundle clamps.	**MC 16.1.1** Records demonstrate pipeline was cut at field joints.
	C 16.2 Reactive manual recovery of saddle pieces from shoreline.	**PS 16.2.1** Undertake coastline survey and recover any plastic washed up on shore.	**MC 16.2.1** Records (photos or specimens) of found plastic and records of beaches covered.
		PS 16.2.2	

Environmental Performance Outcomes, Standards and Measurement Criteria			
Outcomes	***Controls***	***Standards***	***Measurement Criteria***
		Utilise drone footage to survey beaches with limited access.	
		PS 16.2.3 Establish a contract with a service provider to undertake ongoing coastline surveys.	
	C 16.3 Reactive recovery of saddle pieces from sea surface from Primary Vessel using scoop nets.	**PS 16.3** Scoop nets on board the SS7 vessel used to retrieve floating plastic where safe and practicable to do so.	**MC 16.3.1** Records demonstrate recovered plastic via scoop method.
	C 16.4 Conduct drift modelling on the plastic losses.	**PS 16.4** Drift modelling informs likely locations of lost plastic for use in manual recovery.	**MC 16.4.1** Drift modelling filed for records.
	C 16.5 Stop work and leave the field, returning after the southern right whale migration/breeding period.	**PS 16.5** Don't work during the peak calving period of the southern right whales.	**MC 16.5.1** Records of the moored vessel during this time.

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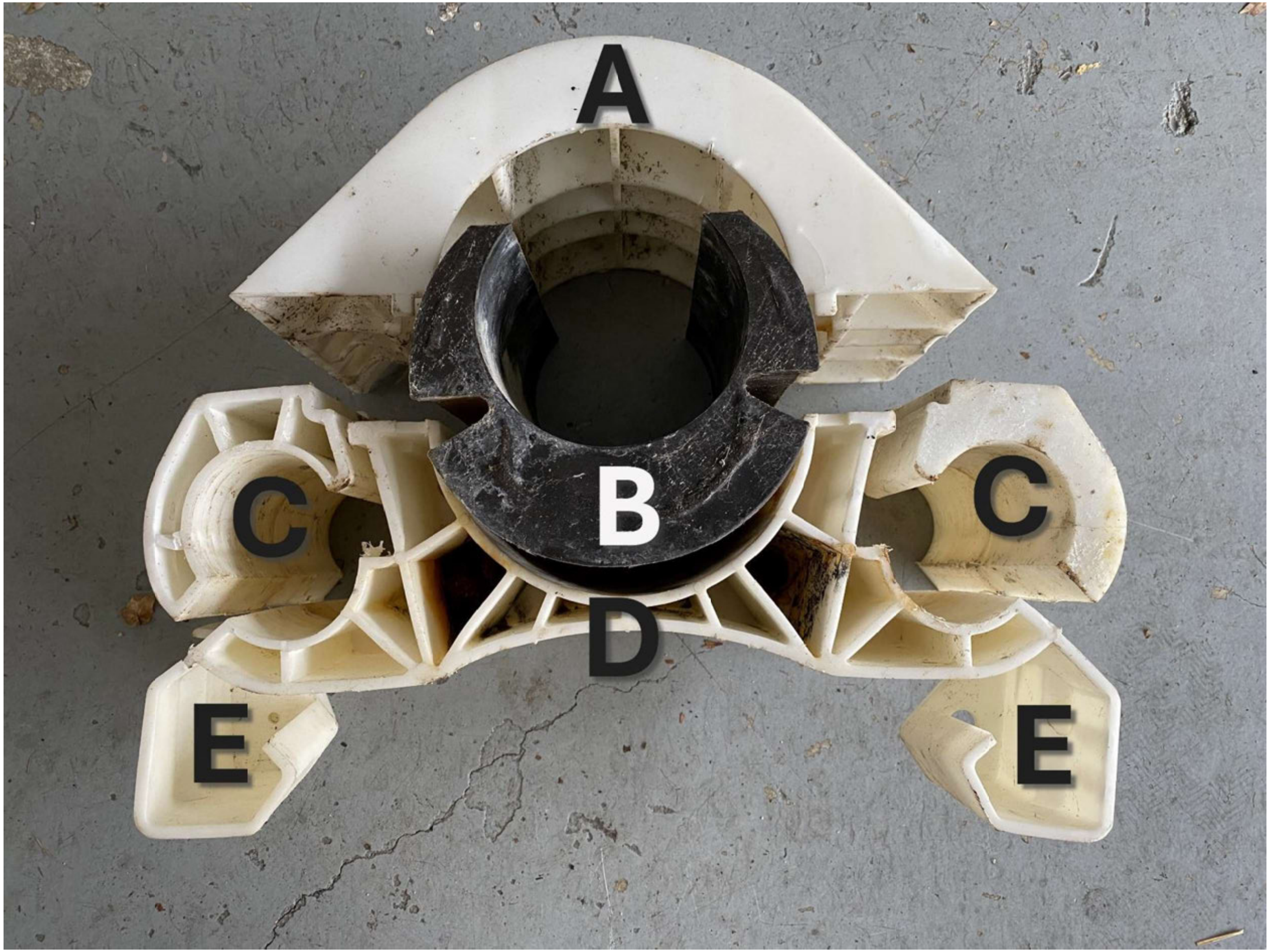
APPENDIX B

Minerva Saddle Clamp Components

Description	#	Code	Weight g	Float FW	Dimensions	Photo
Top Saddle	1	A	958	Yes	337 L x 150mm W x 200 D	
Black Rubber	1	B	2538	Yes	223mm L x 160mm W 1800 D	

Two inch saddle	4	C	172 X4 688	Yes	120mm L x 100mm W x 70mm D	
Base Plate (with bolts)	1	D	1876	Yes	400mm L x 200mm W x 200 D	

Separate Wing	4	E	88 X4 352	Yes	100mm L x 90mm W x 65mm D	
Steel Strap	2		422 X2 844	No	Approx 100mm L x 32mm W	
		Total Weight	7,256	Plastic	6,412	


A
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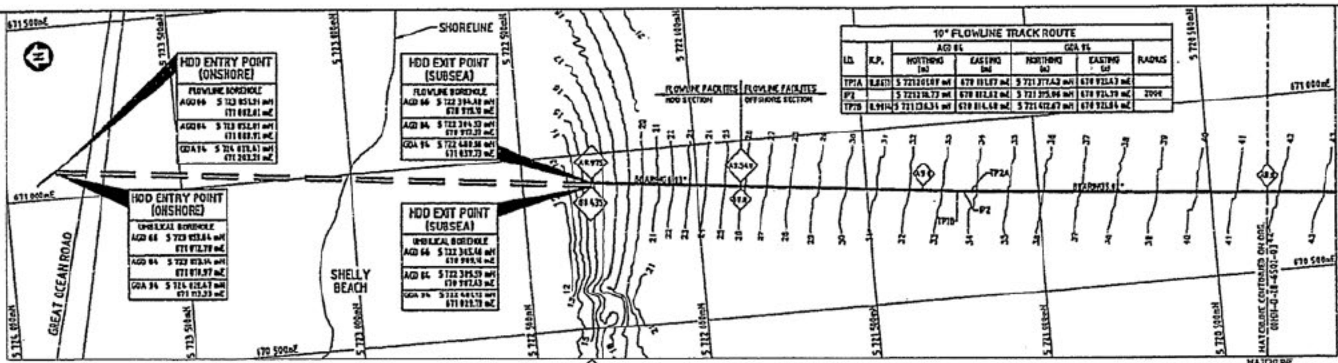
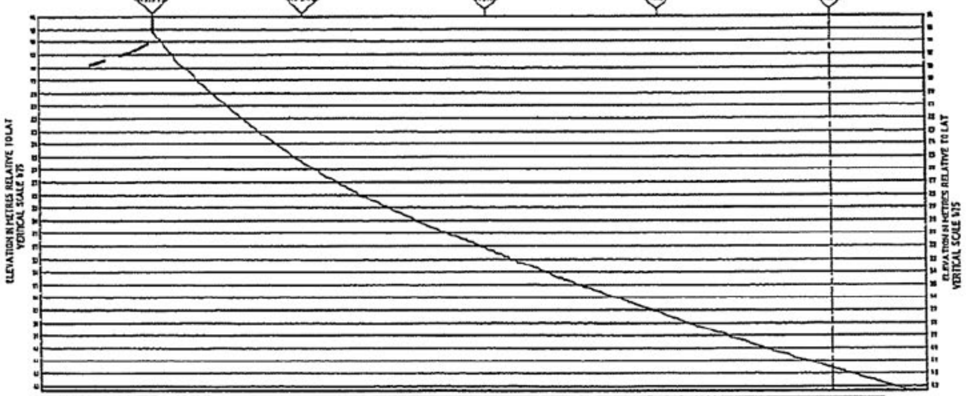
APPENDIX C

APPENDIX B

MISCELLANEOUS DRAWINGS



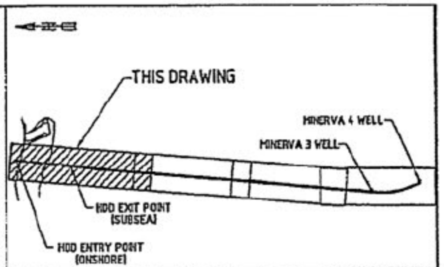
SEABED BATHYMETRY PLAN



SEABED PROFILE ALONG ROUTE

BUNDLE DATA

		HDD	Subsea		
	KILOMETRE POINT (KP)	A9.975 / 00.435	A9.540 / 00.0 A9.5 A1.219 A9.0	A8.709 A8.5	A8.0
	SOIL NATURE	MEDIUM DENSE SAND			
PRODUCTION FLOWLINE	LINEPIPE PROPERTIES	273.1mm OD x 12.7mm WT – API 5L X60 – NOTE 3			
PRODUCTION FLOWLINE	EXTERNAL CORROSION COATING	HAPROCK – 1mm THICK 1600kg/m³ DENSITY	ASPHALT ENAMEL – 5mm THICK – 1300kg/m³ DENSITY		
PRODUCTION FLOWLINE	CONCRETE COATING DETAILS	NOTE 13	60mm THICK – 3044kg/m³ DENSITY		40mm THICK – 3040kg/m³ DENSITY
PRODUCTION FLOWLINE	FIELD JOINT COATING	2 PART EPOXY	HEAT SHRINK SLEEVE CORROSION COAT – NOTE 9		COLD APPLIED TAPE INSULATION – NOTE 14
PRODUCTION FLOWLINE	ANODE TYPE AND SPACING (NOTE 4)	NOTE 6	TYPE E BRACELET ANODE EVERY 11 JOINTS	TYPE E BRACELET ANODE EVERY 13 JOINTS	TYPE D BRACELET ANODE EVERY 5 JOINTS
CHEMICAL INJECTION LINE (2 OFF)	LINEPIPE PROPERTIES	60.3mm OD x 11.1mm WT API 5L Gr.B	COILED PIPE – 60.3mm OD x 4.8mm WT – API 5L CP X52C – NOTE 5		
CHEMICAL INJECTION LINE (2 OFF)	EXTERNAL COATING	3 LAYER POLYETHYLENE – 180mm THICK – 900kg/m³ DENSITY			
CHEMICAL INJECTION LINE (2 OFF)	FIELD JOINT TYPE	2 PART EPOXY	HEAT SHRINK SLEEVE CORROSION COAT – NOTE 9		
CHEMICAL INJECTION LINE (2 OFF)	ANODE TYPE AND SPACING (NOTE 4)	NOTE 8	BRACELET ANODE EVERY 145m	BRACELET ANODE EVERY 170m	
UMBILICAL	UMBILICAL SECTION	HDD UMBILICAL	SUBSEA UMBILICAL		
UMBILICAL	UMBILICAL OD/ OPERATING WEIGHT	163.0mm OD/ 9.2kg/m			
BUNDLE	BUNDLE SPACE BLOCK TYPE/ SPACING	TYPE F – 5m SPACING	TYPE E – 6.1m SPACING – NOTE 12		TYPE D – 6.1m SPACING – NOTE 12
BUNDLE	MIN. BUNDLE SUBMERGED WEIGHT – SG OPERATION	63.9kg/m/ 1.19	181.3kg/m/ 2.25		132.5kg/m/ 1.80
BUNDLE	ALLOWABLE FREESPAN LENGTH (NOTE 10) – INSTALLATION	22.3m	33.7m		38.6m
BUNDLE	– HYDROTEST	15.9m	22.8m		24.6m
BUNDLE	– OPERATION	14.8m	19m		18.9m



KEY PLAN

NOTES

1. ALL SEABED AND SOIL DATA IS TAKEN FROM DOCUMENT NUMBER 00MN-H-28-6481 PRE-ENGINEERING SURVEY REPORT SEPTEMBER 2002.
2. DUPLEX LINEPIPE SPECIFICATION IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-S-28-6564.
3. CARBON STEEL LINEPIPE SPECIFICATION IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-S-28-6550.
4. FOR ANODE DETAILS REFER ANODE DRAWINGS 00MN-D-28-6504-02 AND 00MN-D-28-6405-03.
5. COILED PIPE SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6519.
6. THE FIRST FOUR CONCRETE COATED JOINTS ADJACENT THE TAIL SECTION SHALL HAVE ANODES ATTACHED TO PROVIDE CP COVERAGE OF THE TAIL SECTION.
7. HDD ENTRY AND EXIT COORDINATE LOCATIONS ARE DERIVED FROM LUCAS DRILL PROFILE 2002.
8. SIX ADDITIONAL ANODES SHALL BE ATTACHED TO THE FIRST 100m OF COILED PIPE ADJACENT THE TAIL SECTION TO PROVIDE CP COVERAGE OF THE TAIL SECTION.
9. FIELD JOINT CORROSION COATING SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6556.
10. ALLOWABLE SPAN LENGTHS FOR BUNDLE ARE BASED ON ALLOWABLE LENGTHS FOR 10" PRODUCTION LINE IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-R-28-6539.
11. ALL DESIGN AND HYDROTEST PRESSURES, REFER TO DOCUMENT: FLOWLINE/ GLYCOL LINE WALL THICKNESS ANALYSIS REPORT, 00MN-R-28-6516
12. SPACER BLOCK TYPES ARE DEFINED IN DRAWING 00MN-022-5401.
13. ADDITIONAL STABILISATION REQUIREMENTS FOR THE TAIL ARE IN ACCORDANCE WITH DOCUMENT No. 00MN-R-28-6510, TAIL STABILITY ANALYSIS REPORT.
14. INSULATION LAYER TO CONSIST OF DOUBLE WRAP OF 1.65mm THICK PVC COLD APPLIED TAPE WITH BITUMEN ADHESIVE. THE INSULATION LAYER SHALL EXTEND TO THE CONCRETE COATING ON EACH SIDE OF THE JOINT.

LEGEND

MINERVA FLOWLINE BUNDLE
HDD
DRAWING MATCHLINE
KILOMETRE POSTMARKS IN KILOMETRES

AUSTRALIAN HEIGHT DATUM (AHD)
LOWEST ASTRONOMICAL TIDE (LAT)
DEPTH
SEABED

BATHYMETRY REDUCED TO LOWEST ASTRONOMICAL TIDE (LAT).

200 0 200 400 600
METRES
HORIZONTAL SCALE 1:5000 (A0)

2 0 1 2
METRES
VERTICAL SCALE 1:75 (A0)

GEODETIC INFORMATION:
DATUM: AUSTRALIAN GEODETIC DATUM 1984
PROJECTION: AUSTRALIAN MAP GRID UTM ZONE 54

DRAWING No.	REFERENCE DRAWINGS	REV.	REVISIONS	DATE
00MN-D-28-6504-03	PIPELINE ANODE – OPTION 2 BRACELET ANODE ON 2" PIPELINE	0	ISSUED FOR USE	5.07.03
00MN-D-28-6504-02	PIPELINE ANODE DETAILS BRACELET ANODE ON 10" PRODUCTION LINE	G	ISSUED FOR APPROVAL	11.06.03
00MN-D-28-6509	MINERVA 4 TIE-IN SPOOL G.A.	F	ISSUED FOR BHPB APPROVAL	10.05.03
00MN-D-28-6510	MINERVA 3 TIE-IN SPOOL G.A.	E	ISSUED FOR APPROVAL	03.04.03
00MN-D-28-6502-03	PIPELINE ALIGNMENT SHEET 3 OF 4	D	RE-ISSUED FOR BHPB COMMENTS	11.03.03
00MN-D-28-6502-02	PIPELINE ALIGNMENT SHEET 2 OF 4	C	ISSUED FOR BHPB COMMENTS	17.03.03
00MN-D-28-6502-01	PIPELINE ALIGNMENT SHEET 1 OF 4	B	ISSUED FOR SAIPEM COMMENTS	19.1.02
00MN-D-28-6501	FIELD LAYOUT	A	ISSUED FOR IDR	24.1.02

[redacted]

DRAWN BY: KF
DATE:
SCALE: NOT TO SCALE

bhpbilliton
BHP Billiton Petroleum Pty Ltd
Minerva Field Development Project (MDP)

DRAWING No.: 00MN-D-28-6502-04 REV.: 0

A (1) Reviewed & Approved. Manufacture may proceed
B (2) Reviewed & Approved as noted. Revise & resubmit. Manufacture may proceed subject to BHPB comments.
C (3) Reviewed. Revise and resubmit. Manufacture may not proceed
D (4) Reviewed. Incorporate any comments. Resubmit if revised. Approval not required
INFO (5) Review not required. For Information Only

Approval does not relieve the Contractor of its obligation under the Contract. BHPB reserves its rights to withdraw its approval of documents which are found to be contrary to the Contractor's obligations and the Contractor shall have no entitlement under the Contract in respect of such withdrawal.

[redacted] 5/8/03

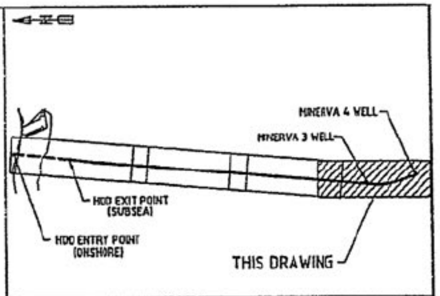
TITLE: MINERVA GAS FIELD DEVELOPMENT
ROUTE ALIGNMENT
SHEET 4 OF 4

CONSULTANT: INTEC ENGINEERING

CLIENT: bhpbilliton | Saipem

CAD FILE NAME: MDP-P-XN-1602.04
DRAWING NO.: MDP-P-XN-1602.04 REV.: 0

1110



KEY PLAN

NOTES

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3. CARBON STEEL LINEPIPE SPECIFICATION IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-S-28-6550.
4. FOR ANODE DETAILS REFER ANODE DRAWINGS 00MN-D-28-6504-02 AND 00MN-D-28-6405-03.
5. COILED PIPE SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6519.
6. FIELD JOINT CORROSION COATING SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6556.
7. BRACELET ANODE EVERY JOINT FOR 4 JOINTS SHALL BE INSTALLED IMMEDIATELY UPSTREAM OF M3 TEE AND IMMEDIATELY DOWNSTREAM OF M4 TEE (ON DUPLEX PIPE SECTION) TO PROVIDE CP COVERAGE OF THE TIE-IN SPOOLS. JOINT LENGTHS ARE 12.172m.
8. ALLOWABLE SPAN LENGTHS FOR BUNDLE ARE BASED ON ALLOWABLE LENGTHS FOR 10" PRODUCTION LINE IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-R-28-6539.
9. ALL DESIGN AND HYDROTEST PRESSURES, REFER TO DOCUMENT: FLOWLINE/ GLYCOL LINE WALL THICKNESS ANALYSIS REPORT, 00MN-R-28-6516
10. SPACER BLOCK TYPES ARE DEFINED IN DRAWING 00MN-D22-5401.
11. THE ANODES ON THE CHEMICAL INJECTION AND CROSS-OVER SPOOLS SHALL BE PLACED AT 30m AND 60m ALONG THE SPOOL FROM THE TEE LOCATION. THIS TOTALS 8 ANODES FOR THE 2" SPOOLS.
12. INSULATION LAYER TO CONSIST OF DOUBLE WRAP OF 1.65mm THICK PVC COLD APPLIED TAPE WITH BITUMEN ADHESIVE. THE INSULATION LAYER SHALL EXTEND TO THE CONCRETE COATING ON EACH SIDE OF THE JOINT.

LEGEND

MINERVA FLOWLINE BUNDLE

DRAWING MATCHLINE

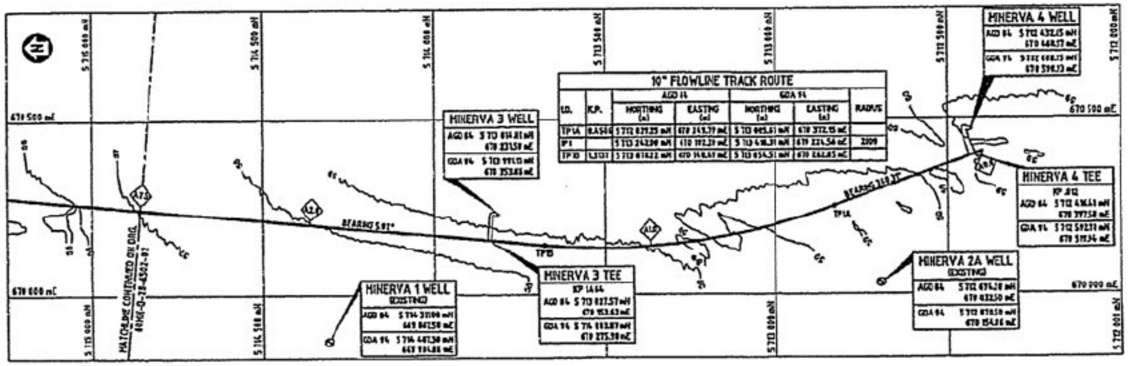
KILOMETRE POST MARKS IN KILOMETRES

BATHYMETRY REDUCED TO LOWEST ASTRONOMICAL TIDE (LAT)

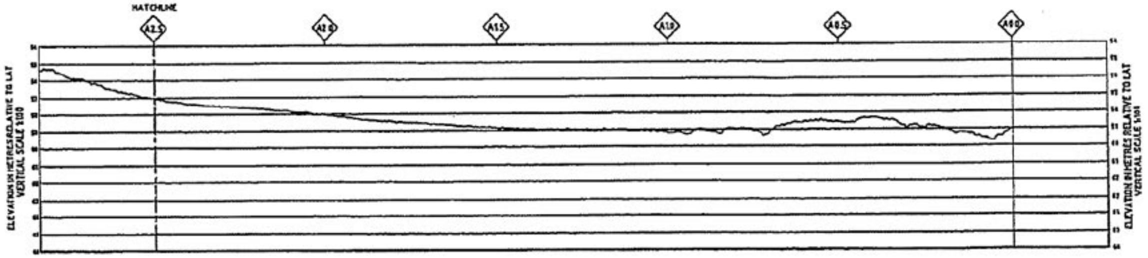
METRES
HORIZONTAL SCALE 1:5000 (A0)

METRES
VERTICAL SCALE 1:100 (A0)

GEODETIC INFORMATION:
DATUM: AUSTRALIAN GEODETIC DATUM 1984
PROJECTION: AUSTRALIAN MAP GRID UTM ZONE 54



SEABED BATHYMETRY PLAN



SEABED PROFILE ALONG ROUTE

	KILOMETRE POINT (KP)	42.5 — 42.0 — 41.5	41.5 — 41.0 — 40.5 — 40.0
	SOIL NATURE	MEDIUM DENSE SAND	
PRODUCTION FLOWLINE	LINEPIPE PROPERTIES	273.5 OD x 15.9mm WT - API5L X60 - NOTE 3	273.1 OD x 12.7mm WT - API5L LC65 2205 - NOTE 2
	EXTERNAL CORROSION COATING	3 LAYER POLYPROPYLENE - 2.5mm THICK - 900kg/m³ DENSITY	
	CONCRETE COATING DETAILS	40mm THICK - 3040kg/m³ DENSITY	
	FIELD JOINT COATING	HEAT SHRINK SLEEVE CORROSION COAT - NOTE 6	COLD APPLIED TAPE INSULATION - NOTE 12
	ANODE TYPE AND SPACING (NOTE 4)	TYPE B BRACELET ANODE EVERY 2 JOINTS	TYPE A BRACELET ANODE EVERY 2 JOINTS - NOTE 7
CHEMICAL INJECTION LINE (2" CFP)	LINEPIPE PROPERTIES	COILED PIPE 60.3mm OD x 4.8mm WT - API5L CP X52C - NOTE 5	
	EXTERNAL COATING	3 LAYER POLYETHYLENE - 1.0mm THICK - 900kg/m³ DENSITY	
	FIELD JOINT	HEAT SHRINK SLEEVE CORROSION COAT - NOTE 6	
	ANODE TYPE AND SPACING (NOTE 4)	BRACELET ANODE EVERY 170m	
UMBILICAL	UMBILICAL SECTION	SUBSEA UMBILICAL	M3 TO M4
	UMBILICAL OD/ OPERATING WEIGHT	153.0mm OD/ 12 kg/m	119.0mm OD/ 6.5 kg/m
BUNDLE	BUNDLE SPACER BLOCK TYPE/ SPACING	TYPE B/ 6.1m SPACING - NOTE 10	TYPE A/ 6.1m SPACING - NOTE 10
	MIN. BUNDLE SUBMERGED WEIGHT/ SG OPERATION	147.8 kg/m/ 1.97	121.6 kg/m/ 2.03
	ALLOWABLE FREESPAN LENGTH (NOTE 8) - INSTALLATION	38.4m	38.1m
	- HYDROTEST	25.9m	25.2m
	- OPERATION	20.2m	17.7m

BUNDLE DATA

bhpbilliton
BHP Billiton Petroleum Pty Ltd
Minerva Field Development Project (MDP)

X 1) Reviewed & Approved. Manufacture may proceed
2) Reviewed & Approved as noted. Review & resubmit. Manufacture may proceed subject to BHPB comments.
3) Reviewed. Review and resubmit. Manufacture may not proceed.
4) Reviewed. Incorporate any comments. Resubmit if revised. Approval not required
5) Review not required. For Information Only
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For [redacted] Date: 5/8/03

DRAWING NO. 00MN-D-28-6502.01 REVISION 0

DRAWING No.	REFERENCE DRAWINGS	REV.	REVISIONS	DATE
00MN-D-28-6504-03	PIPELINE ANODE - OPTION 2 BRACELET ANODE ON 2" PIPELINE	0	ISSUED FOR USE	15.07.03
00MN-D-28-6504-02	PIPELINE ANODE DETAILS BRACELET ANODE ON 10" PRODUCTION LINE	G	ISSUED FOR APPROVAL	11.06.03
00MN-D-28-6509	MINERVA 4 TIE-IN SPOOL G.A.	F	ISSUED FOR BHPB APPROVAL	01.05.03
00MN-D-28-6508	MINERVA 3 TIE-IN SPOOL G.A.	E	ISSUED FOR APPROVAL	02.04.03
00MN-D-28-6502-04	PIPELINE ALIGNMENT SHEET 4 OF 4	D	RE-ISSUED FOR BHPB COMMENTS	11.02.03
00MN-D-28-6502-03	PIPELINE ALIGNMENT SHEET 3 OF 4	C	ISSUED FOR BHPB COMMENTS	07.01.03
00MN-D-28-6502-02	PIPELINE ALIGNMENT SHEET 2 OF 4	B	ISSUED FOR SAIPEM COMMENTS	21.07.02
00MN-D-28-6501	FIELD LAYOUT	A	ISSUED FOR IDR	24.7.02

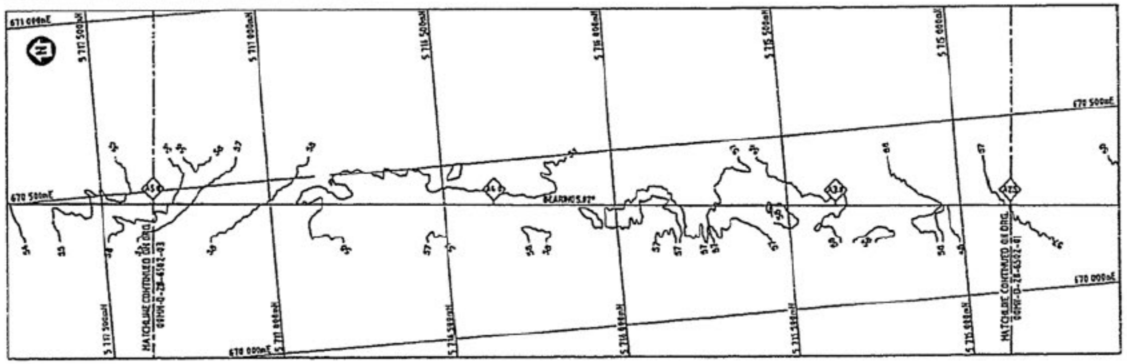
[redacted]

DRAWN BY: | DATE: | SCALE: AS SHOWN | CHKD: | APPD:

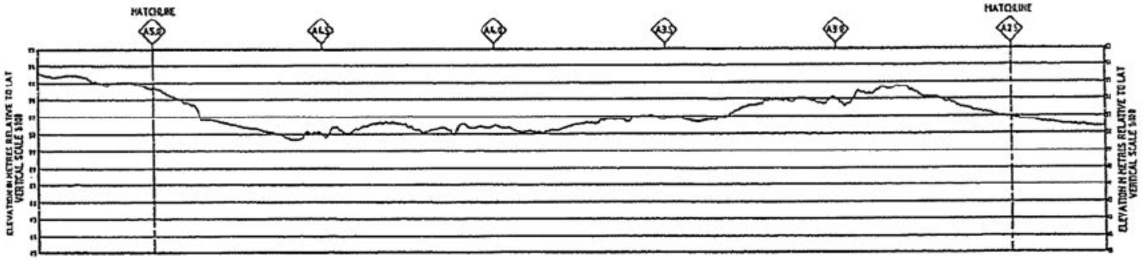
TITLE
MINERVA GAS FIELD DEVELOPMENT
ROUTE ALIGNMENT
SHEET 1 OF 4

CONSULTANT: INTEC ENGINEERING
CLIENT: bhpbilliton
Saipem
CAD FILE NAME: MDP-P-XN-1602.01
DRAWING NO. MDP-P-XN-1602.01
REV. NO. 0

2110



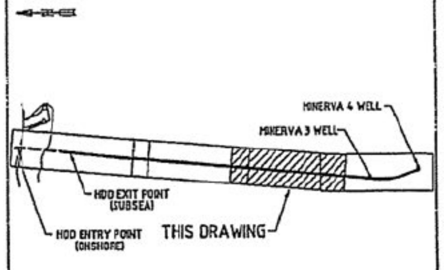
SEABED BATHYMETRY PLAN



SEABED PROFILE ALONG ROUTE

	KILOMETRE POINT (KP)	A5.0	A4.5	A4.0	A3.5	A3.0	A2.5
	SOIL NATURE	MEDIUM DENSE SAND					
PRODUCTION FLOWLINE	LINEPIPE PROPERTIES	219.5 OD x 15.9mm WT – API 5L X60 – NOTE 3					
	EXTERNAL CORROSION COATING	ASPHALT ENAMEL – 5mm THICK – 1300kg/m³ DENSITY			3 LAYER POLYPROPYLENE – 2.5mm THICK – 900kg/m³ DENSITY		
	CONCRETE COATING DETAILS	40mm THICK – 3040kg/m³ DENSITY					
	FIELD JOINT COATING	HEAT SHRINK SLEEVE CORROSION COAT – NOTE 6		COLD APPLIED TAPE INSULATION – NOTE 10			
	ANODE TYPE AND SPACING (NOTE 4)	TYPE C BRACELET ANODE EVERY 3 JOINTS			TYPE B BRACELET ANODE EVERY 3 JOINTS		
CHEMICAL INJECTION LINE (2 OFF)	LINEPIPE PROPERTIES	COILED PIPE 60.3mm OD x 4.8mm WT – API 5LCP X52C – NOTE 5					
	EXTERNAL COATING	3 LAYER POLYETHYLENE – 1.80mm THICK – 900kg/m³ DENSITY					
	FIELD JOINT	HEAT SHRINK SLEEVE CORROSION COATING – NOTE 6					
	ANODE TYPE AND SPACING (NOTE 4)	BRACELET ANODE EVERY 170m					
UMBILICAL	UMBILICAL SECTION	SUBSEA UMBILICAL					
	UMBILICAL OD/ OPERATING WEIGHT	163.0mm OD/ 9.2kg/m					
BUNDLE	BUNDLE SPACER BLOCK TYPE/ SPACING	TYPE C/ 6.1m SPACING – NOTE 9			TYPE B/ 6.1m SPACING – NOTE 9		
	MIN. BUNDLE SUBMERGED WEIGHT/ SG OPERATION	150.6kg/m/ 1.57			147.0kg/m/ 1.57		
	ALLOWABLE FREESPAN LENGTH (NOTE 7) – INSTALLATION	38.6m					
	– HYDROTEST	25.9m					
	– OPERATION	21.3m			20.2m		

BUNDLE DATA



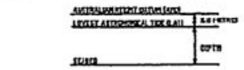
KEY PLAN

NOTES

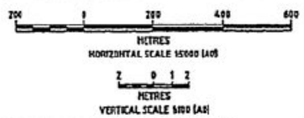
1. ALL SEABED AND SOIL DATA IS TAKEN FROM DOCUMENT NUMBER 00MN-M-28-6481 PRE-ENGINEERING SURVEY REPORT SEPTEMBER 2002.
2. DUPLEX LINEPIPE SPECIFICATION IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-S-28-6564.
3. CARBON STEEL LINEPIPE SPECIFICATION IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-S-28-6550.
4. FOR ANODE DETAILS REFER ANODE DRAWINGS 00MN-D-28-6504-02 AND 00MN-D-28-6405-03.
5. COILED PIPE SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6519.
6. FIELD JOINT CORROSION COATING SPECIFICATION IN ACCORDANCE WITH 00MN-S-28-6556.
7. ALLOWABLE SPAN LENGTHS FOR BUNDLE ARE BASED ON ALLOWABLE LENGTHS FOR 10" PRODUCTION LINE IN ACCORDANCE WITH DOCUMENT NUMBER 00MN-R-28-6539.
8. ALL DESIGN AND HYDROTEST PRESSURES, REFER TO DOCUMENT: FLOWLINE/ GLYCOL LINE WALL THICKNESS ANALYSIS REPORT, 00MN-R-28-6516
9. SPACER BLOCK TYPES ARE DEFINED IN DRAWING 00MN-D22-5401.
10. INSULATION LAYER TO CONSIST OF DOUBLE WRAP OF 1.65mm THICK PVC COLD APPLIED TAPE WITH BITUMEN ADHESIVE. THE INSULATION LAYER SHALL EXTEND TO THE CONCRETE COATING ON EACH SIDE OF THE JOINT.

LEGEND

MINERVA FLOWLINE BUNDLE
DRAWING MATCHLINE
KILOMETRE POST MARKS IN KILOMETRES



BATHYMETRY REDUCED TO LOWEST ASTRONOMICAL TIDE (LAT).



GEODETIC INFORMATION:
DATUM: AUSTRALIAN GEODETIC DATUM 1984
PROJECTION: AUSTRALIAN MAP GRID UTM ZONE 54

bhpbilliton
BHP Billiton Petroleum Pty Ltd
Minerva Field Development Project (MDP)

DRAWING NO. 00MN-D-28-6502.02 | REVISION 0

CONTRACTOR'S DOCUMENT NO.:
CONTRACT NO: [illegible]

RA (✓1) Reviewed & Approved. Manufacture may proceed
RN ☐ 2) Reviewed & Approved as noted. Revise & resubmit. Manufacture may proceed subject to BHPB comments.
RR ☐ 3) Reviewed. Revise and resubmit. Manufacture may not proceed
R ☐ 4) Reviewed. Incorporate any comments. Resubmit if revised. Approval not required
RNR ☐ 5) Review not required. For Information Only
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[redacted] Date 5/8/03

DRAWING No.	REFERENCE DRAWINGS
00MN-D-28-6504-03	PIPELINE ANODE – OPTION 2 BRACELET ANODE ON 2" PIPELINE
00MN-D-28-6504-02	PIPELINE ANODE DETAILS BRACELET ANODE ON 10" PRODUCTION LINE
00MN-D-28-6519	MINERVA 4 TIE-IN SPOOL G.A.
00MN-D-28-6510	MINERVA 3 TIE-IN SPOOL G.A.
00MN-D-28-6502-04	PIPELINE ALIGNMENT SHEET 4 OF 4
00MN-D-28-6502-03	PIPELINE ALIGNMENT SHEET 3 OF 4
00MN-D-28-6502-01	PIPELINE ALIGNMENT SHEET 1 OF 4
00MN-D-28-6501	FIELD LAYOUT

REV.	REVISIONS	DATE	DRAWN	DRAFTING SUPV.	CONSULTANT CHKD.	CONSULTANT APPD.	CLIENT CHKD.	CLIENT APPD.
H	ISSUED FOR USE	15.01.03	[redacted]					
G	ISSUED FOR APPROVAL	[illegible]						
F	ISSUED FOR BHPB APPROVAL	[illegible]						
E	ISSUED FOR APPROVAL	[illegible]						
D	RE-ISSUED FOR BHPB COMMENTS	[illegible]						
C	ISSUED FOR BHPB COMMENTS	[illegible]						
B	ISSUED FOR SAIPEM COMMENTS	[illegible]						
A	ISSUED FOR IDR	[illegible]						

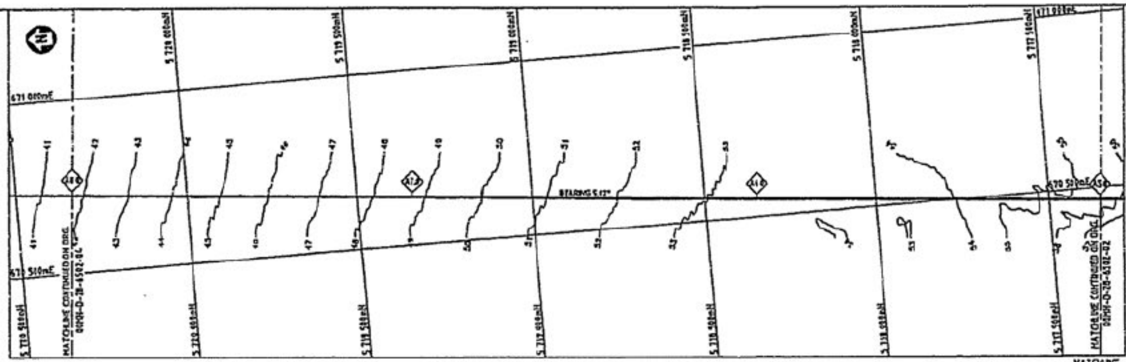
DRAWN BY: [illegible]
DATE: [illegible]
SCALE: REFER LEGEND
CHKD:
APPD:
CONSULT. CLIENT

TITLE
MINERVA GAS FIELD DEVELOPMENT
ROUTE ALIGNMENT
SHEET 2 OF 4

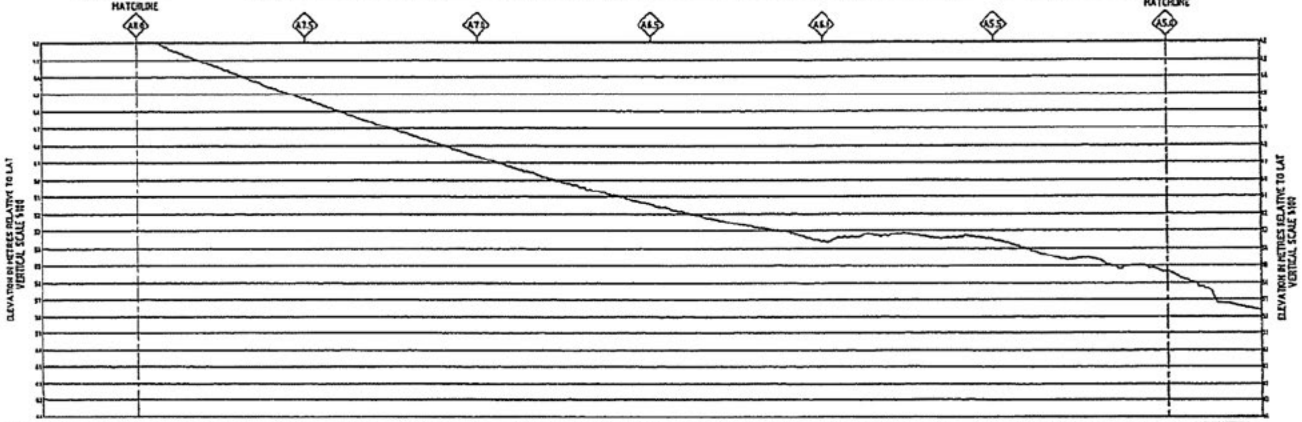
CONSULTANT
INTEC ENGINEERING
CLIENT
bhpbilliton
Eni Saipem
CAD FILE NAME MDP-P-XN-1602.02
DRAWING NO. MDP-P-XN-1602.02
REV. 0

3/10

SEABED BATHYMETRY PLAN

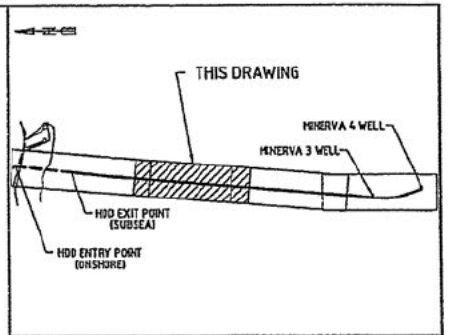


SEABED PROFILE ALONG ROUTE



KILOMETRE POINT (KP)	A8.0 – A5.417	A5.417 – A5.0
SOIL NATURE	MEDIUM DENSE SAND	
PRODUCTION FLOWLINE — LINEPIPE PROPERTIES	273.1 OD x 12.7mm WT – API 5L X60 – NOTE 3	219.5 OD x 15.9mm WT API 5L X60 NOTE 3
EXTERNAL CORROSION COATING	ASPHALT ENAMEL – 5mm THICK – 1300kg/m³ DENSITY	
CONCRETE COATING DETAILS	40mm THICK – 3040kg/m³ DENSITY	
FIELD JOINT COATING	HEAT SHRINK SLEEVE CORROSION COAT – NOTE 6 COLD APPLIED TAPE INSULATION – NOTE 10	
ANODE TYPE AND SPACING (NOTE 4)	TYPE D BRACELET ANODE EVERY 5 JOINTS	TYPE C BRACELET ANODE EVERY 3 JOINTS
CHEMICAL INJECTION LINE (2 OFF) — LINEPIPE PROPERTIES	COILED PIPE 60.3mm OD x 4.8mm WT – API 5LCP X52C – NOTE 5	
EXTERNAL COATING	3 LAYER POLYETHYLENE – 1.80mm THICK – 900kg/m³ DENSITY	
FIELD JOINT	HEAT SHRINK SLEEVE CORROSION COAT – NOTE 6	
ANODE TYPE AND SPACING (NOTE 4)	BRACELET ANODE EVERY 120m	
UMBILICAL — UMBILICAL SECTION	SUBSEA UMBILICAL	
UMBILICAL OD/ OPERATING WEIGHT	163.0mm OD/ 13kg/m	
BUNDLE — BUNDLE SPACER BLOCK TYPE/ SPACING	TYPE D/ 6.1m SPACING – NOTE 9	TYPE C/ 6.1m SPACING
MIN. BUNDLE SUBMERGED WEIGHT – SG OPERATION	132.5kg/m/ 1.88	131.4kg/m/ 1.97
ALLOWABLE FREESPAN LENGTH (NOTE 7) – INSTALLATION	38.6m	38.4m
– HYDROTEST	24.6m	25.9m
– OPERATION	18.9m	21.3m

BUNDLE DATA



KEY PLAN

NOTES

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LEGEND

MINERVA FLOWLINE BUNDLE

DRAWING MATCHLINE

KILOMETRE POST MARKS IN KILOMETRES

AUSTRALIAN HEIGHT DATUM (AHD)
LOWEST ASTRONOMICAL TIDE (LAT)
SEABED
DEPTH

BATHYMETRY REDUCED TO LOWEST ASTRONOMICAL TIDE (LAT).

100 0 200 400 600
METRES
HORIZONTAL SCALE 1:5000 (A0)

2 0 1 2
METRES
VERTICAL SCALE 1:100 (A0)

GEODETIC INFORMATION:
DATUM: AUSTRALIAN GEODETIC DATUM 1966
PROJECTION: AUSTRALIAN MAP GRID UTM ZONE 54

bhpbilliton
BHP Billiton Petroleum Pty Ltd
Minerva Field Development Project (MDP)

DRAWING NO: 00MN-D-28-6502.03 REVISION: 0
CONTRACTOR: McConnell Dowell/Saipem JV
CONTRACT NO:

A: ☒ 1) Reviewed & Approved. Manufacture may proceed
M: ☐ 2) Reviewed & Approved as noted. Revise & resubmit. Manufacture may proceed subject to BHPB comments.
R: ☐ 3) Reviewed. Revise and resubmit. Manufacture may not proceed
M: ☐ 4) Reviewed. Incorporate any comments. Resubmit if revised. Approval not required
RNR ☐ 5) Review not required. For Information Only

Approval does not relieve the Contractor of its obligation under the Contract. BHPB reserves its rights to withdraw its approval of documents which are found to be contrary to the Contractor's obligations and the Contractor shall have no entitlement under the Contract in respect of such withdrawal.

For [redacted] Type
SIG [redacted] DATE 5/5/03

DRAWING No.	REFERENCE DRAWINGS
00MN-D-28-6514-03	PIPELINE ANODE – OPTION 2 BRACELET ANODE ON 2" PIPELINE
00MN-D-28-6514-02	PIPELINE ANODE DETAILS BRACELET ANODE ON 10" PRODUCTION LINE
00MN-D-28-6509	MINERVA 4 TIE-IN SPOOL G.A.
00MN-D-28-6508	MINERVA 3 TIE-IN SPOOL G.A.
00MN-D-28-6502-04	PIPELINE ALIGNMENT SHEET 4 OF 4
00MN-D-28-6502-02	PIPELINE ALIGNMENT SHEET 2 OF 4
00MN-D-28-6502-01	PIPELINE ALIGNMENT SHEET 1 OF 4
00MN-D-28-6501	FIELD LAYOUT

REV.	REVISIONS	DATE
0	ISSUED FOR USE	15.07.03
G	ISSUED FOR APPROVAL	11.06.03
F	ISSUED FOR BHPB APPROVAL	01.05.03
E	ISSUED FOR APPROVAL	01.04.03
D	RE-ISSUED FOR BHPB COMMENTS	11.02.03
C	ISSUED FOR BHPB COMMENTS	07.01.03
B	ISSUED FOR SAIPEM COMMENTS	27.12.02
A	ISSUED FOR IDR	21.12.02

[redacted]

DRAWN BY: | DATE: | SCALE: AS SHOWN | CHKD: | APPD:

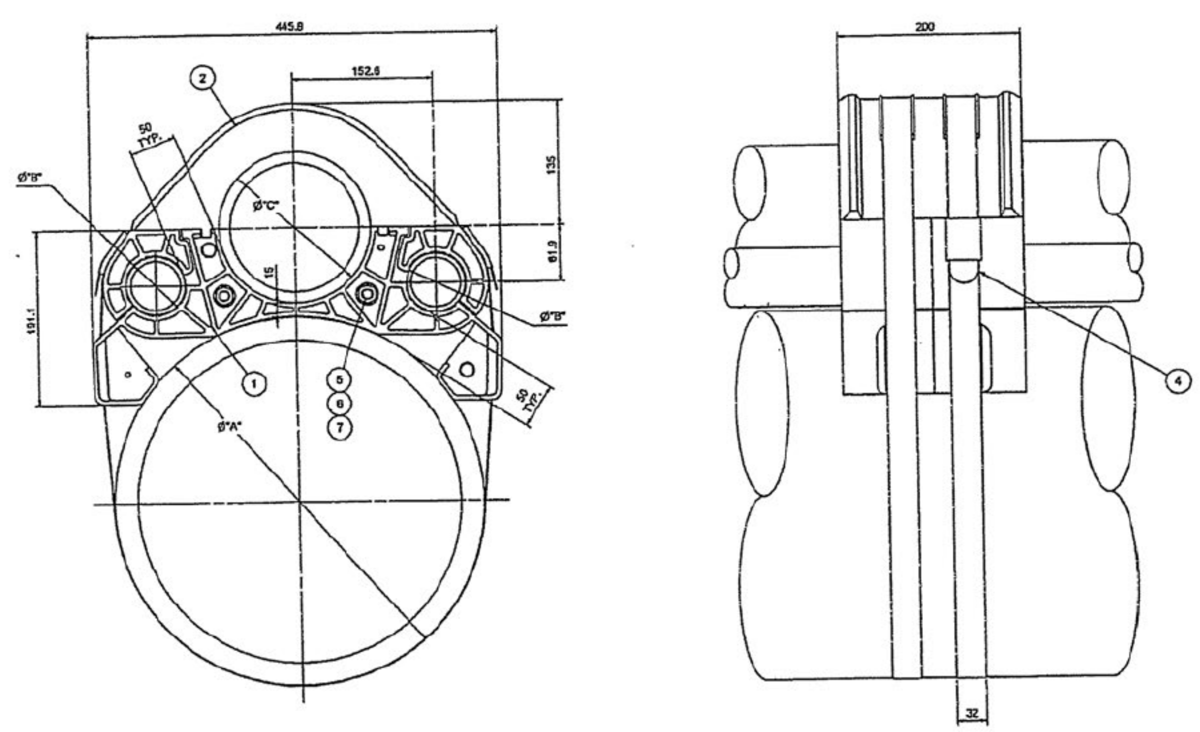
TITLE: MINERVA GAS FIELD DEVELOPMENT
ROUTE ALIGNMENT
SHEET 3 OF 4

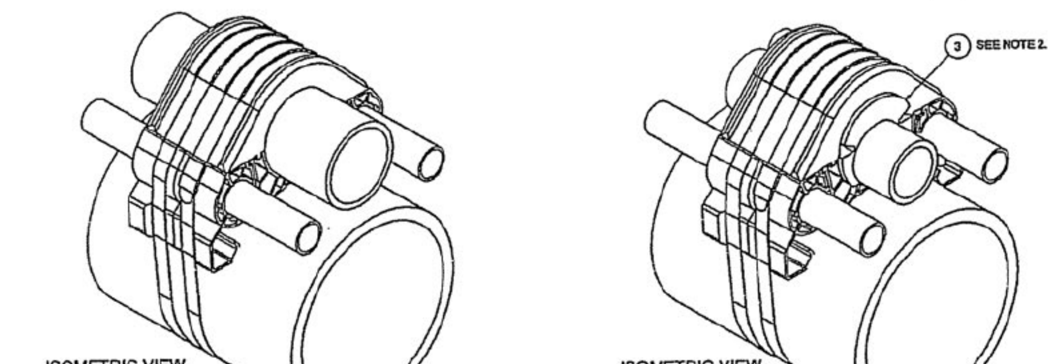
CONSULTANT: INTEC ENGINEERING
CLIENT: bhpbilliton Eni Saipem
CAD FILE NAME: HDP-P-XN-1602.03
DRAWING NO.: HDP-P-XN-1602.03 REV. NO: 0

4110

5/10

DRAWING No. C 421472 ISSUE 01





ISOMETRIC VIEW
(SCALE 1:5)
SHOWING TYPICAL CONFIGURATION OF TYPES "B", "C", "D" & "E" ASSEMBLIES

ISOMETRIC VIEW
(SCALE 1:5)
SHOWING CONFIGURATION OF TYPE "A" ASSEMBLY

ITEM	QTY	DESCRIPTION	MATERIAL
1	2	BODY MOULDING DETAIL	SEE DRAWING No. C421473.
2	1	CAP MOULDING DETAIL	SEE DRAWING No. C421474.
3	1	INSERT MOULDING DETAIL (SEE NOTE 2)	SEE DRAWING No. C421476.
4	2	BANDING DETAILS	SEE DRAWING No. B421475.
5	2	M12 x 38 HEX HEAD SETSCREW DIMS TO BS EN ISO 4017	CARBON STEEL TO BS EN ISO 898-1 Gr. 8.8 'XYLAN' COATED.
6	2	M12 HEX NUT (STYLE 1) DIMS TO BS EN ISO 4032	CARBON STEEL TO BS EN 20898-2 Gr. 8 'XYLAN' COATED.
7	4	M12 PLAIN WASHER DIMS TO BS 4320 (Form A)	CARBON STEEL 'XYLAN COATED'.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. THE INSERT MOULDING IS ONLY USED ON "TYPE A" ASSEMBLIES - SEE ISOMETRIC VIEWS.
3. TYPE E CONFIGURATION DEPICTED HERE.

TYPE	DIA "A"	DIA "B"	DIA "C"
A	358	64.3	119
B	365	64.3	163
C	370	64.3	163
D	383	64.3	163
E	403	64.3	163

4. NOMINAL WEIGHT IN AIR : 3.79 kg.
5. NOMINAL WEIGHT IN SEA WATER : 0.47 kg.

REV.	REVISIONS	DATE	DRAWN	DRAFTING SUPV.	CHKD. SAIPEM	APPD. SAIPEM	CHKD. CLIENT	APPD. CLIENT

Eni Saipem McCONNELL DOWELL

DOCUMENT No. MDP-S-XA-2207 REVISION A

bhpbilliton
BHP Billiton Petroleum Pty Ltd
Minerva Field Development Project (MDP)

DRAWING No. 00MN-D22-5I00 REVISION A

RA 1) Reviewed & Approved. Manufacture may proceed
RN 2) Reviewed & Approved as noted. Revise & resubmit. Manufacture may proceed subject to BHPB comments.
RR 3) Reviewed. Revise and resubmit. Manufacture may not proceed
RI 4) Reviewed. Incorporate any comments. Resubmit if revised. Approval not required
RNR 5) Review not required. For information Only

Approval does not relieve the Contractor of its obligation under the Contract. BHPB reserves its rights to withdraw its approval of documents which are found to be contrary to the Contractor's obligations and the Contractor shall have no entitlement under the Contract in respect of such withdrawal.

For [redacted] DATE 23/10/03

REFERENCE DRAWINGS:

BODY MOULDING DETAIL	- C421473.
CAP MOULDING DETAIL	- C421474.
INSERT MOULDING DETAIL	- C421476.
BANDING DETAIL	- C421475.

No.	DATE	REVISION	DRAWN	CHK'D	APPR'D
01	08/08/03	FIRST ISSUE.			

CRP GROUP LIMITED
STANLEY WAY, STANLEY, SKELMERSDALE, LANCASHIRE, WN8 8EA, ENGLAND.
U.K. TELEPHONE : 01695 712000
U.K. FACSIMILE : 01695 712111

CLIENT SAIPEM (PORTUGAL)

PROJECT BHP BILLITON MINERVA

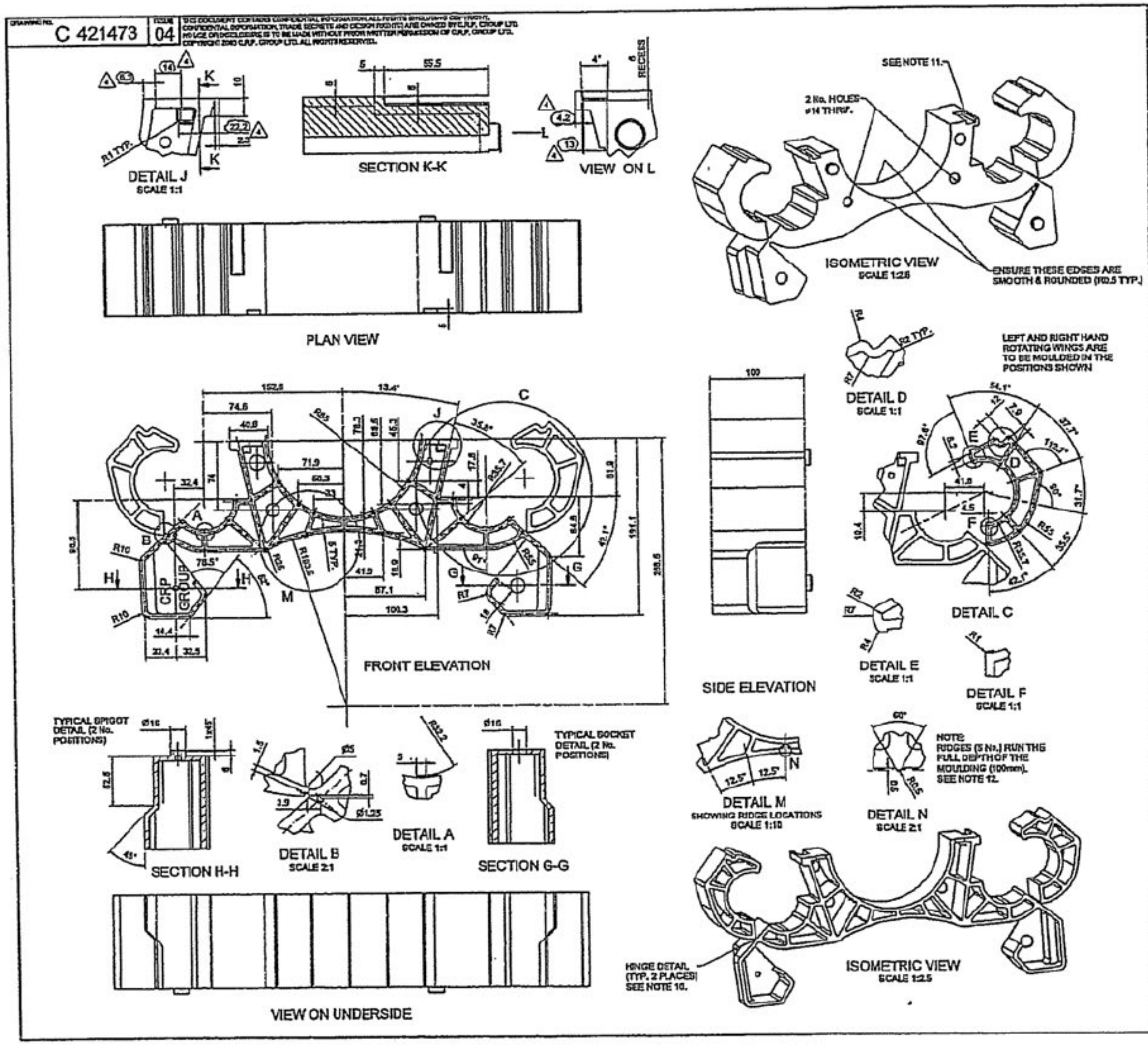
TITLE ADVANCED PIGGY BACK SYSTEM GENERAL ARRANGEMENT

SCALE 1:2.5 | DRAWN BY CAF | SHEET SIZE A1 | PROJECTION

PROJECT No. WO2365 | DRAWING No. C421472 | ISSUE 01

CAD GENERATED DRAWING, DO NOT ALTER MANUALLY

6/10



NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. MATERIAL : POLYPROPYLENE - COLOUR: NATURAL.
3. ALL WEB SECTION THICKNESSES ARE TO BE 6mm AT THE ROOT REDUCING TO A MINIMUM OF 4mm OVER A WEB LENGTH OF 100mm. THICKNESS WILL BE PRO-RATA FOR SHORTER WEBS. ALL WEB INTERNAL RADII ARE TO BE OF MINIMUM SIZE.
4. NOMINAL WEIGHT IN AIR : 0.53 kg.
5. NOMINAL BUOYANCY IN SEA WATER : 0.2 kg.
6. GENERAL TOLERANCE ± 0.5mm.
7. ALL MATING PARTS TO BE A HEAVY INTERFERENCE FIT.
8. "CRP GROUP" IS TO BE MOULDED INTO THE BLOCK IN THE POSITION SHOWN USING 7mm HIGH CHARACTERS.
9. ALL RIB ANGLES ARE SYMMETRICAL ABOUT THE CLAMP CENTRELINE.
10. THE HINGE DETAIL IS TO BE SPECIFIED BY THE TOOL MAKER.
11. BASE OF CHANNELS ON TOP SURFACE ARE TO BE AS HORIZONTAL AS POSSIBLE. I.e. MINIMUM DRAFT ANGLES.
12. ALL RIBS ON SURFACE OF LARGE RADIUS ARE TO BE AS HORIZONTAL AS POSSIBLE. I.e. MINIMUM DRAFT ANGLES.

REV.	REVISIONS	DATE	DRAWN	SUPERV.	CHKD. SAIPEM	APPD. SAIPEM	CHKD. CLIENT	APPD. CLIENT

Eni Saipem — McCONNELL DOWELL

MDP-S-XD-2208

bhpbilliton — BHP Billiton Petroleum Pty Ltd — Minerva Field Development Project (MDP)

08MN-D22-5401

[redacted] 23/10/03

REFERENCE DRAWINGS:

GENERAL ARRANGEMENT - C421472.
CAP MOULDING DETAIL - C421474.
BANDING DETAIL - C421475.

No.	DATE	REVISION	DRAWN	CHKD	APPRD
04	13/08/03	VARIOUS DIMENSIONS REVISED	[redacted]		
03	29/07/03	CLIENT TITLE BLOCK ADDED.			
02	11/07/03	HINGE DETAIL & 2 DIMS ADDED.			
01	07/07/03	FIRST ISSUE.			

CRP GROUP LIMITED
STANLEY WAY, STANLEY, SKELMERSDALE, LANCASHIRE, WN8 8EA, ENGLAND.

CLIENT SAIPEM (PORTUGAL)
PROJECT BHP BILLITON MINERVA
TITLE ADVANCED PIGGY BACK SYSTEM BODY MOULDING DETAIL

SCALE 1:5 | DRAWN BY CAF | SHEET SIZE A1 | PROJECTION
PROJECT No. WO2365 | DRAWING No. C421473 | ISSUE 04

APPENDIX D

WEL Minerva Subsea Infrastructure Decommissioning
Seven Sisters – Saddle Loss Mitigation Brainstorming

May 07 2025

SOW to Complete Camp I - after May 5 2025

- Pipe Bundle left: Kp 2.895 to Kp 7.332; total length 4437m
- [redacted]
- [redacted]

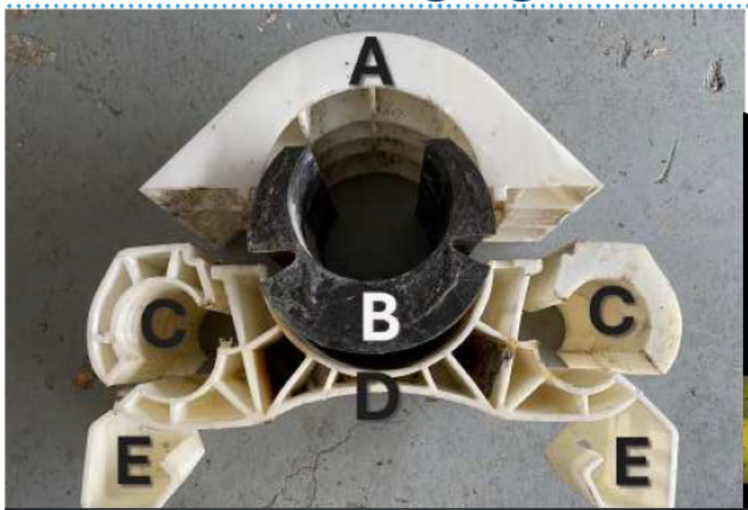
[redacted]

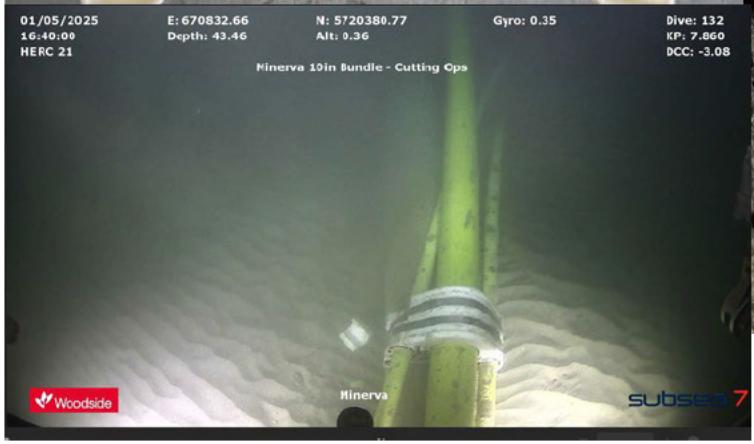
SOW Planned Camp II - from Nov 2025

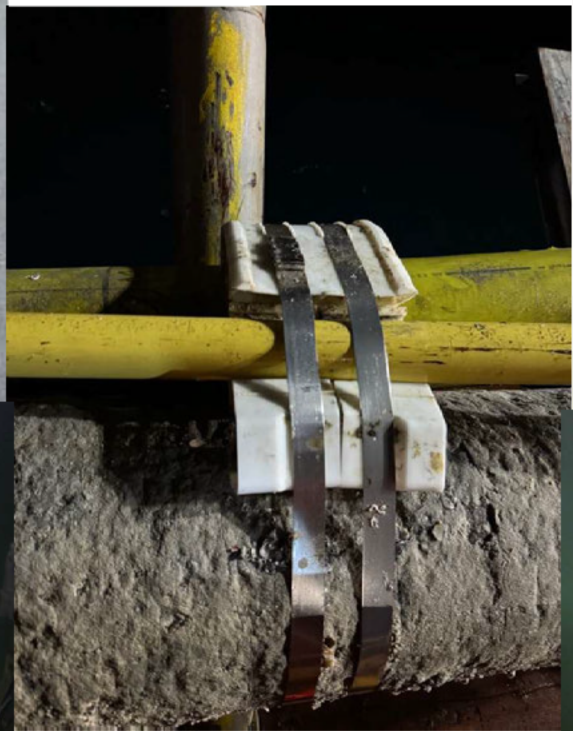
- Pipe Bundle left: Kp 8.914 to Kp 9.542; total length 628m, [redacted],
- Pipe Bundle left: KP 9.542 to Kp 9.970; total length 428m, [redacted],
- [redacted]
- [redacted]

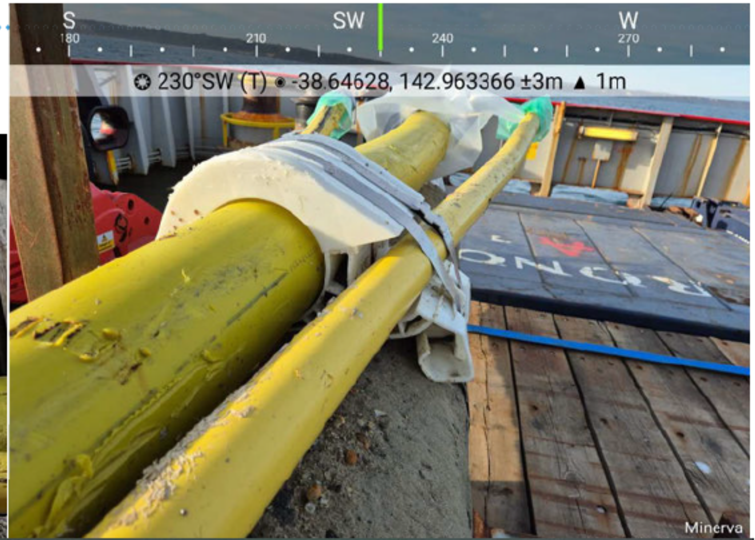
[redacted]

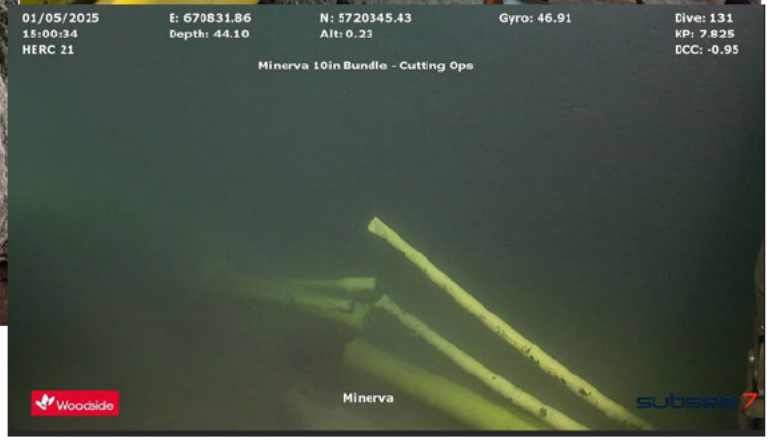
Saddles Dislodging Issues









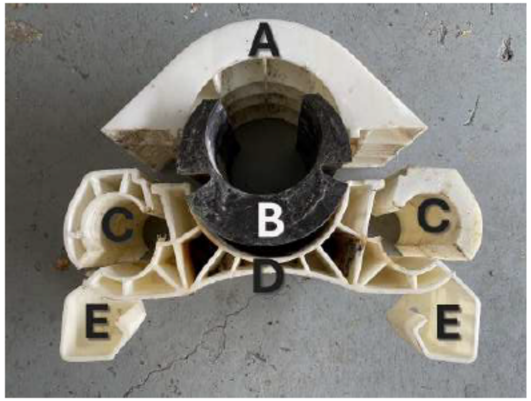


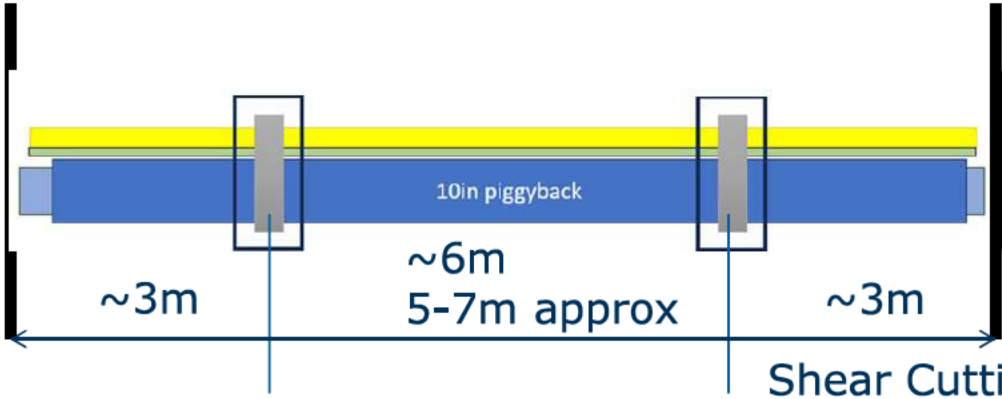
Saddle Dislodging Issues

Reason for the Saddle Dislodging/Broken

- *Residual energy in the 2in line and shear cutter pull apart*
- *2in line is easer to deform and flexible*
- *Design of the Saddle:*

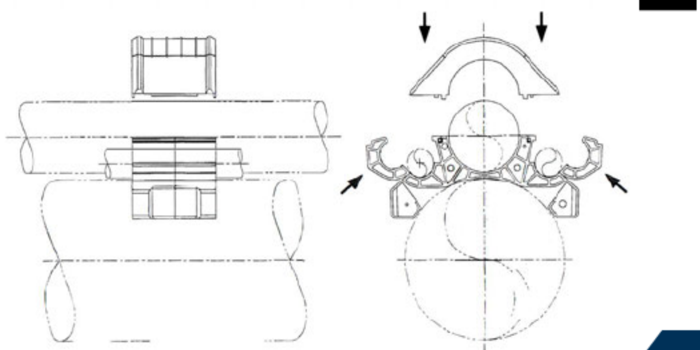
  7 parts, Part C most risk. Inconel strapping loss low risk.





Shear Cutting Location

[redacted]



Deburial of Pipe Bundles-Risk of lose the piggyback saddle

From KP 8.8 to 9.6, pipe bundle is 100% buried

- [redacted]

subsea 7

Saddle Dislodging Issues-Mitigation Method 1

[redacted]

Saddle Dislodging Issues-Mitigation Method 2

[redacted]

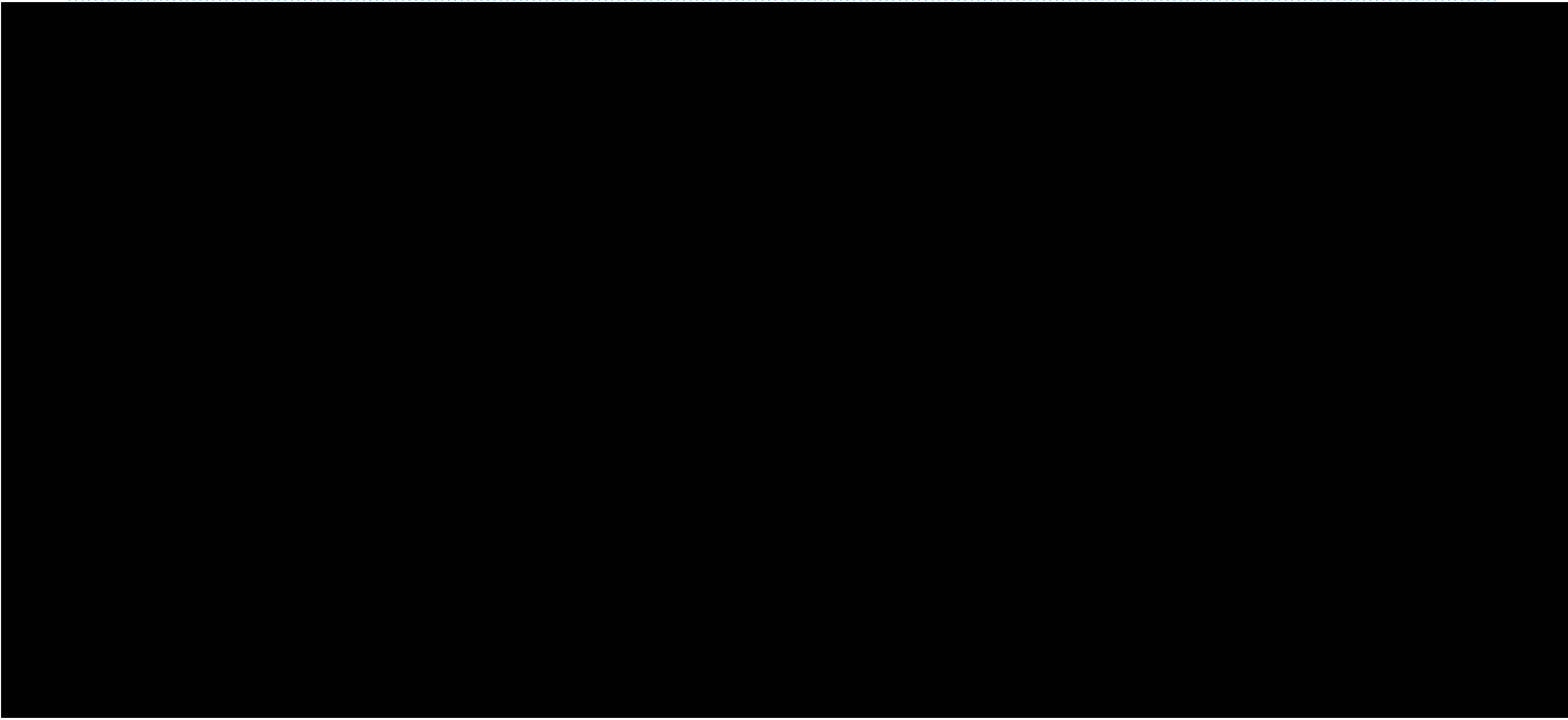
Saddle Dislodging Issues-Mitigation Method 3

[redacted]

Saddle Dislodging Issues-Other Mitigation Methods

[redacted]

Idea’s from the vessel



THANK YOU

subsea 7