

Client

Wintershall Noordzee BV

Project

D12-B to D15-FA-1 Pipeline

Document

Route selection report

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
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Revision History

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Revision Status

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Revision Control Sheet

Rev. No.	Date	Section	Summary of changes



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1. Introduction

1.1. General

Wintershall is planning to install a satellite platform D12-B in Block D12-A in the Dutch Sector of the North Sea. Export of the gas will be via a 10" pipeline to the D15-FA-1 platform. Platform D12-B will be operated by Wintershall and platform D15-FA-1 is operated by Neptune.

Additionally a future import pipeline (10") is foreseen at D12-B.

For the new location Wintershall will take over topside E18-A operated by Wintershall, and will reuse this topside for the new location on the North Sea. The existing E18-A topside will be removed from the jacket, and it will be installed on the new D12-B jacket.

The platform will normally be unmanned.

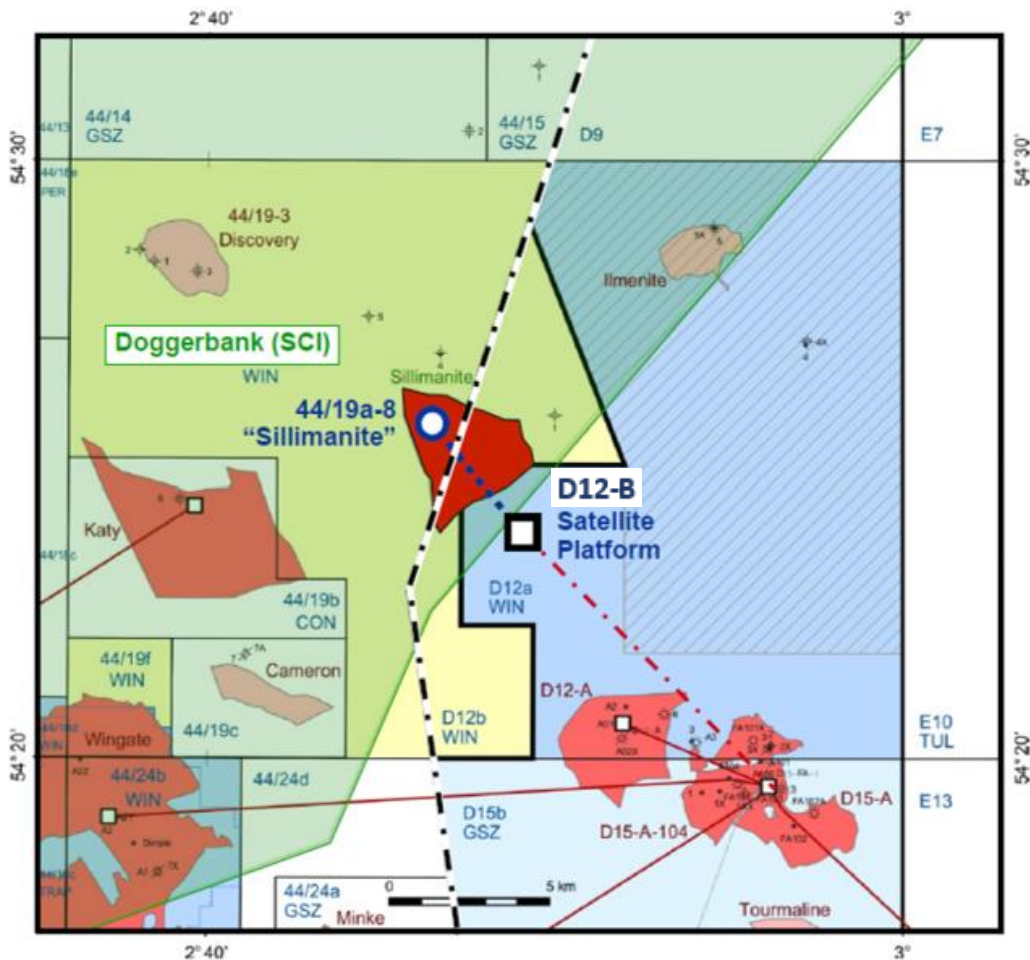


Figure 1-1 Sillimanite field licences & outline



1.2. Document Scope of Work

The scope of this document includes the route selection process to select the optimal pipeline route, which is safe, economical and complies with applicable codes and standards.

Note: the installation contractor will perform a route survey immediately prior to pipelay. Subject to actual findings (sand waves, ripples, mega ripples) a rerouting may be required

1.3. Purpose Document

The objective of this route selection study is to present the optimum pipeline route from the D12-B platform to the D15-FA-1 platform. The major aspects that are involved in the selection of the pipeline route are orientation, seabed features, future developments and constructability of the pipeline.

It is noted that the umbilical is not part of the Enersea design scope, but is assumed to run parallel to the pipeline at a distance of 25m North of the pipeline. J-tubes are located at respectively the D12-B and D15-FA platform to accommodate platform entry.

The following aspects have been considered in the pipeline route selection study:

1. Identification of seabed features such as sand dunes, mega ripples, and risk of their impact towards the selected pipeline route,
2. Selection of the shortest pipeline route,
3. Minimizing pipeline and cable crossings,
4. Optimizing the extend of pre-sweeping,
5. Constructability aspects such as platform approach, start-up and lay down, spool installation, tie-ins, pre-sweep and trenching limitations such as lateral slopes,
6. Fulfilling pipeline route requirements in accordance with COMPANY Specifications, codes and standards,
7. Minimum radius of curvature calculations for pipeline natural bends, based on installation conditions.

1.4. System of Units

All dimensions and calculations shall be documented using the International System of Units (SI) unless noted otherwise.

1.5. Abbreviations

LAT = Lowest Astronomical Tide
MSL = Mean Sea Water Level
KP = Kilometer Post
N = North
TP = Tangent Point
IP = Intersection Point

1.6. Holds

None

2. Summary

The pipeline originates at the D12-B platform and terminates at the D15-FA-1 platform.

The pipeline route is selected on the basis of the following criteria:

1. Shortest route possible within the given constraints;
2. Immunizing seabed intervention requirements;
3. Avoidance of restricted areas ;
4. Adapt a route radius curvature greater or equal to the radius requirements (2000 m)
5. Minimizing pipeline and cable crossings
6. Location of Start-up and lay-down target boxes such that pipeline expansion can be absorbed and construction is feasible.

The route layout is shown in Figure 2-1. Reference is made to route drawing “D12B-67031002-PL-HX4180-GLOBAL-001_Field layout drawing”.

The seabed profile is flat and has a smooth slope from -28.6m (D12-B) to -40.0m (D15-FA-1). In this area pre-sweeping is not required as is shown in the pipeline detailed design report, ref. [1].

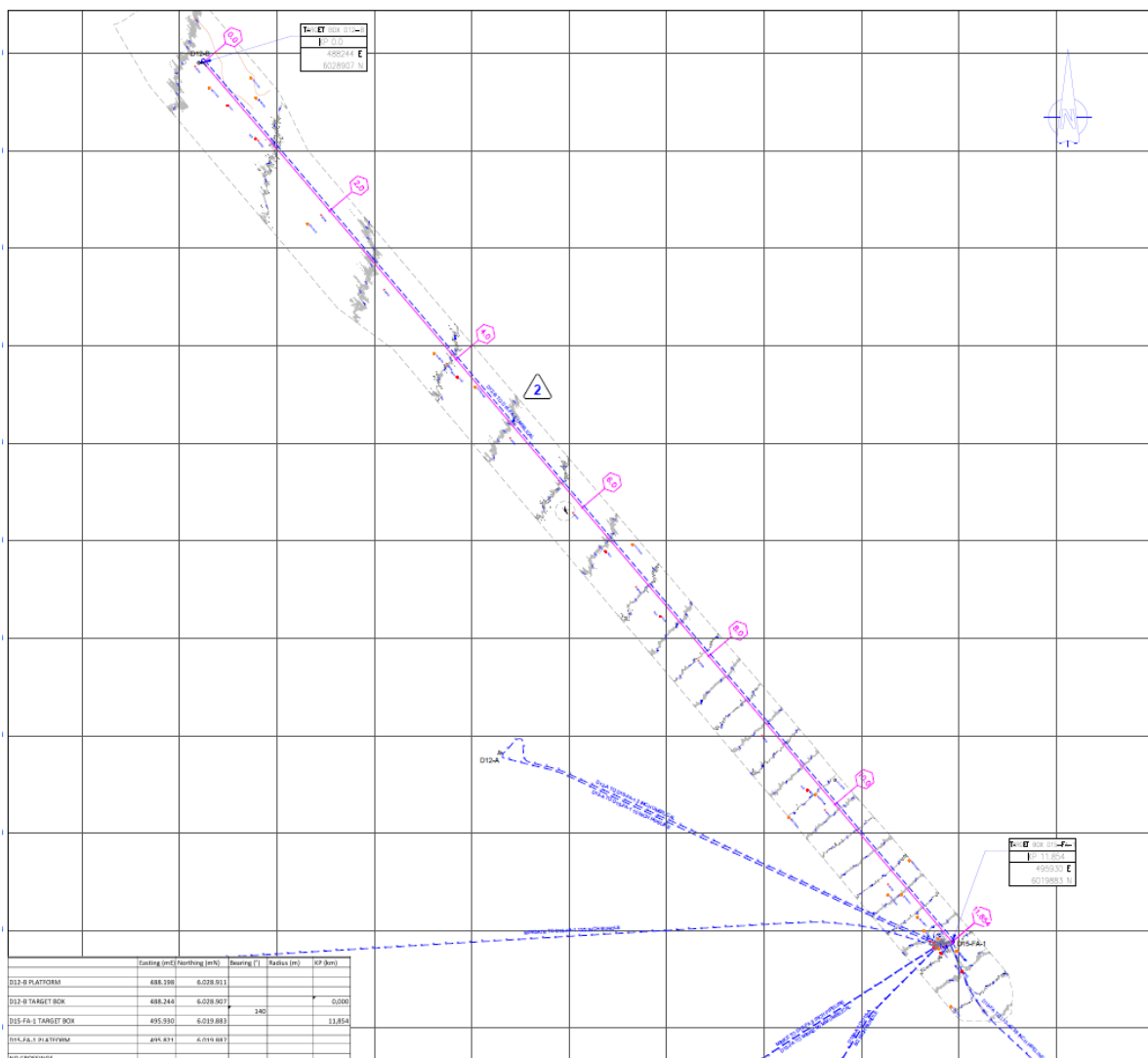


Figure 2-1 – Pipeline Route (see also appendix A)

3. Reference Documents

The regulations, codes, guidelines and specifications to be used as a basis for the detailed design are outlined under the following.

3.1. Regulations, Codes, Standards and Guidelines

- i NEN3656. "Eisen voor stalen buisleidingsystemen op zee." December 2015.

3.2. Company Engineering Standards and Specifications

The following Company specifications are applicable for the detail design.

- A. -

3.3. Project Reference Documents

The following project related documents and specifications are used for the detailed design:

- [1] Enersea report D12B-67031002-PL-LA1206-GLOBAL-001 Rev.01 - "Pipeline Detailed Design Report"
- [2] Enersea report D12B-67031002-PL-AA0709-GLOBAL-001 Rev.02 - "Risk assessment and dropped object analysis"
- [3] Fugro report GH210-R1 Vol. 3 Wintershall Noordzee B.V. - Sillimanite D12-B to D12-A and to D15-FA – Route Survey Results, Dated 10 to 14 April 2017
- [4] Fugro report GH210_D15_AL Alignment Charts Rev. 01 dated 30 May 2017
- [5] Enersea report D12B-67031002-PL-HX4180-GLOBAL-001 Rev02 - Field layout drawing
- [6] Enersea report D12B-67031002-PL-AA7704-GLOBAL-001 Rev02 - "Basis of Design"
- [7] Fugro report GH210-R3, issue 1 "Geotechnical Report Investigation Data, Sillimanite Pipeline Routes, Dutch Sector, North Sea" May 2017

4. Pipeline Route Data

4.1. General

As required by Reference [i], the pipeline shall be buried along the entire route. The targeted minimum cover height is 0.8 m on the top of the pipeline relative to the undisturbed natural seabed. A risk assessment study (ref. [2]) and upheaval buckling analysis (ref. [1]) are to confirm whether this cover height is sufficient.

ITEM	VALUE
Original location	D12-B platform
Tie-in location	D15-FA-1 platform
Approx. new pipeline length	11.8 KM
Water depth range	28.6 – 40.0m LAT
Minimum route bend radius	2000m

Table 4-1 General Pipeline Overview:

4.2. Coordinate System

The parameters of the geodetic system to be used for horizontal positions are taken from ref. [3] and listed in Table 4-2.

ITEM	VALUE
Datum	European Datum 1950 (ED50)
Projection	ED50 / UTM zone 31 N
Ellipsoid name	International 1924
Semi major axis	6 378 388 m
Inverse flattening	297.000
Central Meridian	03°00'00' E
Latitude of Origin	00°00'00' N
False Northing	0 mN
False Easting	500 000 mE
Scale Factor	0.9996

Table 4-2 Geodetic parameters

The vertical position is given relative to the Lowest Astronomical Tide (LAT).

4.3. Coordinates of Pipeline Routes and Key Facilities

The positions of the pipeline, tie-in locations and crossings are given in Table 4-3 (ref. [6]).

Location Point	Northing (m)	Easting (m)	Bearing (°)	Radius (m)	KPI (km)
Platforms					
D12-B Platform (well E)	6.028.911	488.198			
D15-FA-1	6.019.887	495.821			
Pipeline					
D12-B Target Box	6.028.907	488.244			0,000
			140		
D15-FA-1 Target Box	6.019.883	495.930			11,854

Table 4-3 Coordinates of Pipeline Route A and Key Facilities

4.4. Bathymetry

The water depths recorded during survey along the proposed D12-B to D15-FA route ranges between 28.6 m LAT and 40.9 m LAT with the seabed gently deepening to the south east. Localised variations in water depths occur due to scouring of up to 1.0 m depth around the D15-FA platform location.

The water depths at the platform tie-ins are listed in the Table below; data has been taken from Reference 6.

Location	Water Depth (m) [LAT]
D12-B Platform	-28.6
D15-FA-1 Platform	-40.0

Table 4-4 Water Depths at Platforms and Crossings

The seabed profile along the pipeline route is taken from Reference 6 and is presented in Figure 4-1.

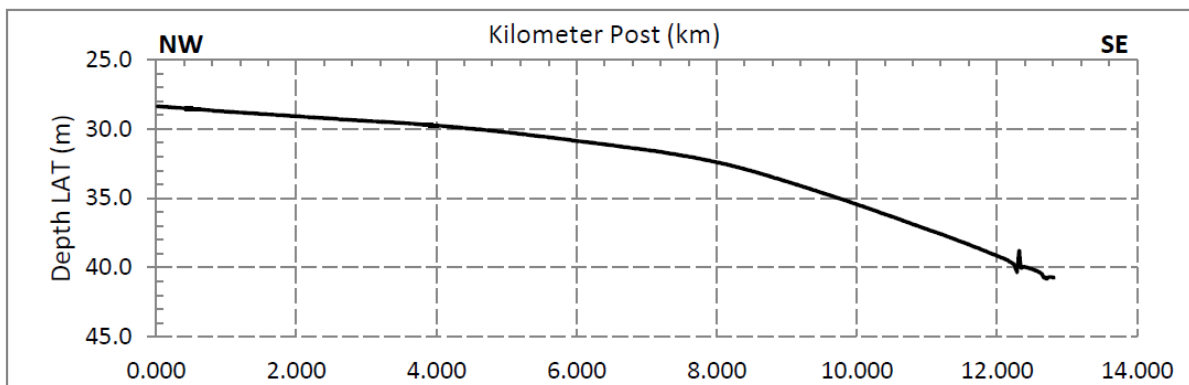


Figure 4-1 Seabed profile along pipeline route from D12-B to D15-FA-1 (D12-B @KP 1.000)

4.5. Survey Route

4.5.1. Magnetometer Contacts

According to database information eight existing infrastructure features are located in the pipeline survey corridor.

The following existing pipelines and umbilicals connect to the D15-FA-1 Platform from the west:

- D12-A to D15-FA 13 inch umbilical;
- D12-A to D15-FA-1 10 inch pipeline;
- Wingate to D15-FA-1 12/2 inch bundle;
- Minke to D15-FA 8 inch pipeline;
- D15-FA to Minke 3inch umbilical;
- D18a-A to D15-A 8 inch pipeline;
- D18a-A to D15-A 2 inch umbilical.

One pipeline approaches the platform from the east and lies exposed towards south-east fo the platform:

- D15-FA to L10-A 36 inch pipeline.

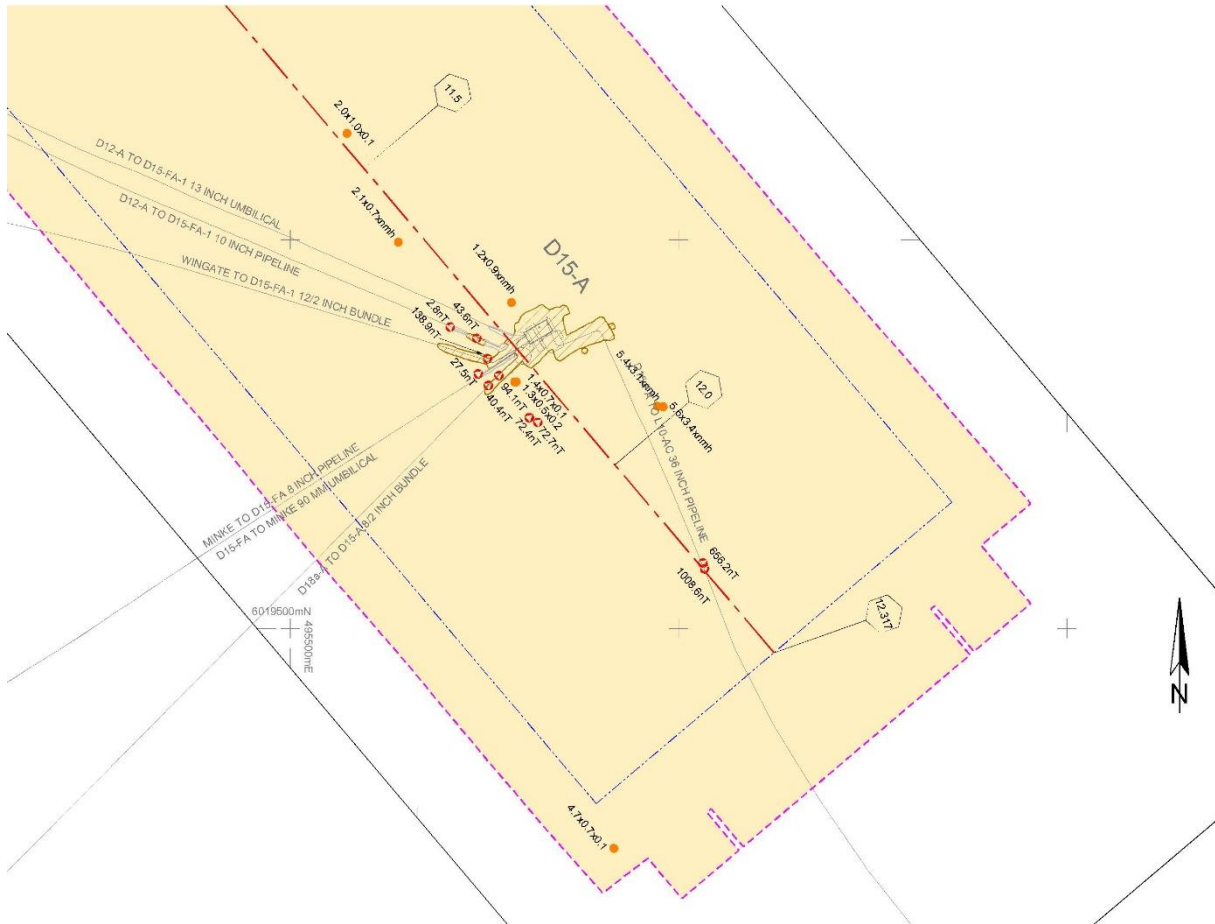


Figure 4-2 – Magnetometer Contacts showing route crossing with existing infra structure

4.5.2. Geophysical Data

Twenty (22) side scan sonar contacts were observed within the route survey corridor. These contacts included one (1) ship wreck, eighteen (18) debris items, two (2) wet-stored mattresses and one (1) depression. Side scan sonar data can be found in Reference [3]. Any major objects are to be passed at a distance of at least 100 m.

4.5.3. Geotechnical Data

The sidescan sonar records show a featureless seafloor with a low to medium reflectivity, interpreted as a continuous cover of fine to medium SAND, and is consistent with the CPT results from the geotechnical campaign. No sedimentary structures indicating sediment transports were observed, apart from scouring around the D15-FA platform. reference [3].



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5. Pipeline Route Alignment Sheets

Based on the information and considerations in the previous sections and the results of the detailed calculations, the alignment sheets have been prepared and shown in Appendix A.4.



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Appendix Drawings

A-1 Approach at D12-B - D12B-67031002-PL-MH2343-GLOBAL-005

A-2 Approach at D15-FA - D12B-67031002-PL-MH2343-GLOBAL-001

A-3 Field lay out - D12B-67031002-PL-HX4180-GLOBAL-001

A-4 Alignment sheets 1 thru 5 - D12B-67031002-PL-LA2105-GLOBAL-001 thru 005



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Attachment A-1: Approach at D12-B

D12B-67031002-PL-MH2343-GLOBAL-005

(1 page)



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Attachment A-2: Approach at D15-FA

D12B-67031002-PL-MH2343-GLOBAL-001

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Attachment A-3: Field Lay out

D12B-67031002-PL-HX4180-GLOBAL-001

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Attachment A-4: Alignment Sheets

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