

Environmental Impact Assessment Report

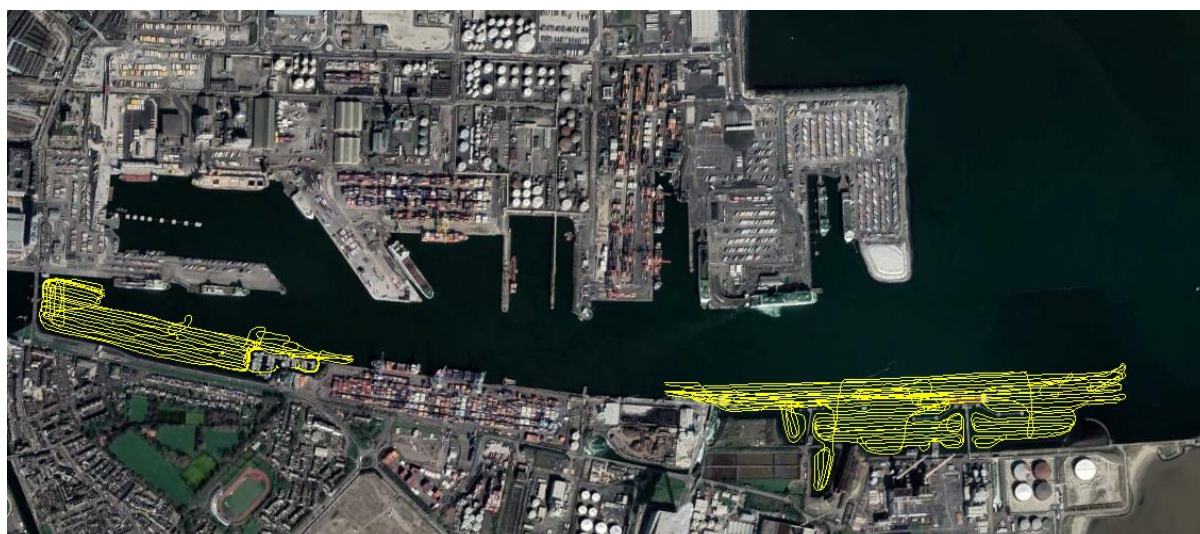
Appendix 16.2

Volume 3 Part 8



Dublin Port 3FM Archaeo-geophysical survey report

October & November 2022



NOTES

Survey type	Multibeam Echosounder, Marine Magnetometer, Sidescan Sonar and Sub-bottom Profiler.
Survey date	26 th of October and the 16 th and 17 th of November, 2022
Project	Dublin Port 3FM archaeo-geophysics
Revision	Rev 0
Report date	11/01/2022
Location	Dublin Port, Ireland
Projection	ITM and Geographic-WGS84

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1. Introduction

Hydromaster conducted an Archaeo-geophysical survey (acoustic and magnetic) in Dublin Port in connection with the proposed developments relating to the 3FM Project. Directions were given by the Archaeological Diving Company Ltd (ADCO) regarding the method of survey to cover the 4 required survey zones.

The survey zones cover the areas in the port which have not previously been investigated for potential archaeology. The survey was to detect and map features on the seabed and highlight those most likely to be archaeology or requiring further investigation/diver inspection (all features remain included in the primary list).

The survey was completed on 26th of October and 16th and 17th of November 2022. The survey presented some access difficulties relating shipping traffic and moored vessels/barges. Further challenges relating to access and data come from difficulty in manoeuvring around the quay and marina structures with towed sensors and the effect of ferrous structures on magnetometer data.

2. Executive summary

Data quality was good in general with abundant features recorded. Penetration was poor with the shallow seismic system, due, most likely, to gas from organic matter in the silt. sidescan data was very detailed in the shallow with positive id on objects such as fisherman's anchor, moorings and rope.

No targets were identified as archaeology.



3. Survey methodology

The survey was carried out at 10 m interval line spacing to ensure a full seabed coverage. The multibeam echosounder (MBES), the marine magnetometer, the sidescan sonar (SSS) and the sub-bottom profiler (SBP) surveys were conducted simultaneously at slow speed to ensure optimum quality data.

3.1 Survey areas

The survey areas include 4 zones:

- Zone 1: Poolbeg mooring area (red polygon – figure 1)
- Zone 2: Poolbeg marina (magenta polygon - figure 1)
- Zone 3: Poolbeg power station and berth 48 area (yellow polygon - figure 1)
- Zone 4: Pigeon house harbour (blue polygon – figure 1)



Figure 1: survey zones in Dublin Port

The survey vessel tracklines are shown in figure 2 below.



Figure 2: Survey vessel tracklines



3.2 Survey equipment

- MULTIBEAM ECHOSOUNDER

A high resolution multibeam echosounder (Reson Seabat T51) was operated at 800kHz to ensure optimum resolution. The specifications of the multibeam echosounder are the following:

Frequency: 800kHz
Number of beams: 1024
Resolution: & 0.25° @800kHz.
Ping rate: Up to 50pings/s
Range resolution: 6mm

- MARINE MAGNETOMETER

A marine magnetometer (Geometrics G-882) was used for the magnetic survey. The G-882 marine magnetometer was towed 7 m behind the vessel and 7.85 m behind the position reference point. The specifications of the magnetometer are the following:

Operating Range: 20,000 to 100,000nT
Max Sample Rate: 20Hz
Noise: <0.004nT/Hz RMS

- SIDESCAN SONAR (SSS)

A high frequency (1000kHz) sidescan sonar was used during survey operations. The Sidescan sonar was vessel mounted for the duration of the survey due to shallow water depths. The specifications of the sonar are the following:

Frequency: 1000 kHz
Swathe coverage: 70m (35m on each channel)
Acoustic beam widths: 0.3°

- SUB-BOTTOM PROFILER (SBP)

The seismic data were collected with INNOMAR SES-2000 parametric sub-bottom profiler. It operates at high (10kHz) and low (5kHz) secondary and 100kHz primary frequencies and is suitable for shallow water depths. The specifications of the profiler are the following:

Water depth range: 0.5-500m
Sediment Penetration: up to 50m
Range/Layer Resolution: <1cm/up to 5cm
Transmit beam width (-3dB): Approx. ±2°/footprint <7% of water depth
Primary Frequencies: 100 kHz (frequency band 85 – 115 kHz)
Secondary Frequencies: 4, 5, 6, 8, 10, 12, 15 kHz



4. Survey results

4.1 Survey results – Zone 1 & Zone 2

4.1.1 Bathymetry

Water depths in Zone 1 range from drying 2.8 m to 7.0 m chart datum and from 3.0 m to 9.5 m chart datum in Zone 2, with the seabed gently sloping away from the quayside. See figure 3. *Detailed bathymetric chart in Appendix 1.*



Figure 3: Bathymetry for Zones 1 & 2

Figure 4 shows the shaded bathymetric data for Zone 1 and 2.

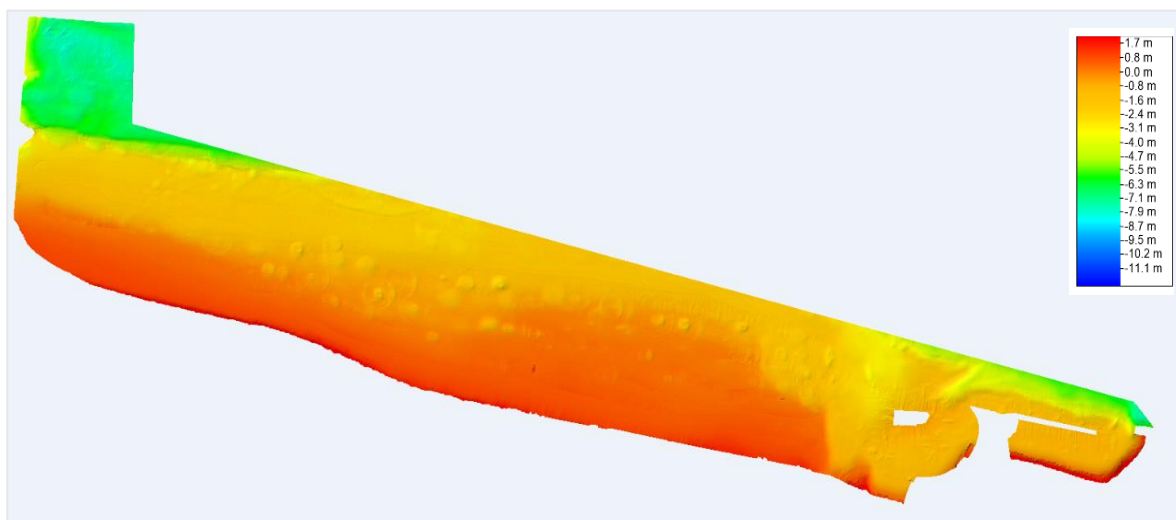


Figure 4: Shaded bathymetric data



Figure 5 shows example of the multibeam data for Zone 1 and 2, corresponding to a sunken boat (left) and to an anchor block (right).

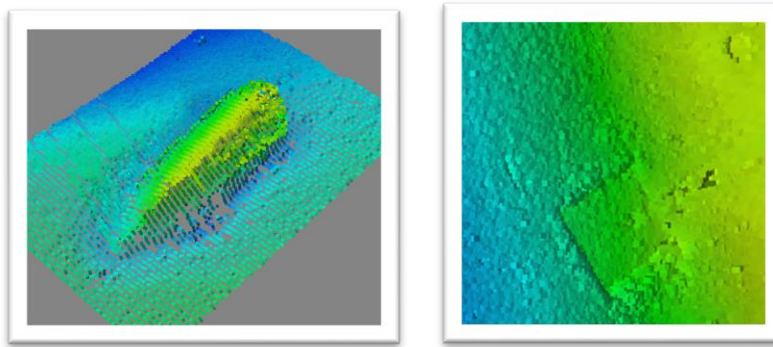


Figure 5: MBES data from Zone 1 (left showing a wreck) and for Zone 2 (right showing an anchor block)

4.1.2 Side scan sonar

In total, 155 contacts were identified in the side-scan sonar data in Zone 1, and 12 contacts in Zone 2. See figure 6 and table 1. *Detailed chart in Appendix 1.*

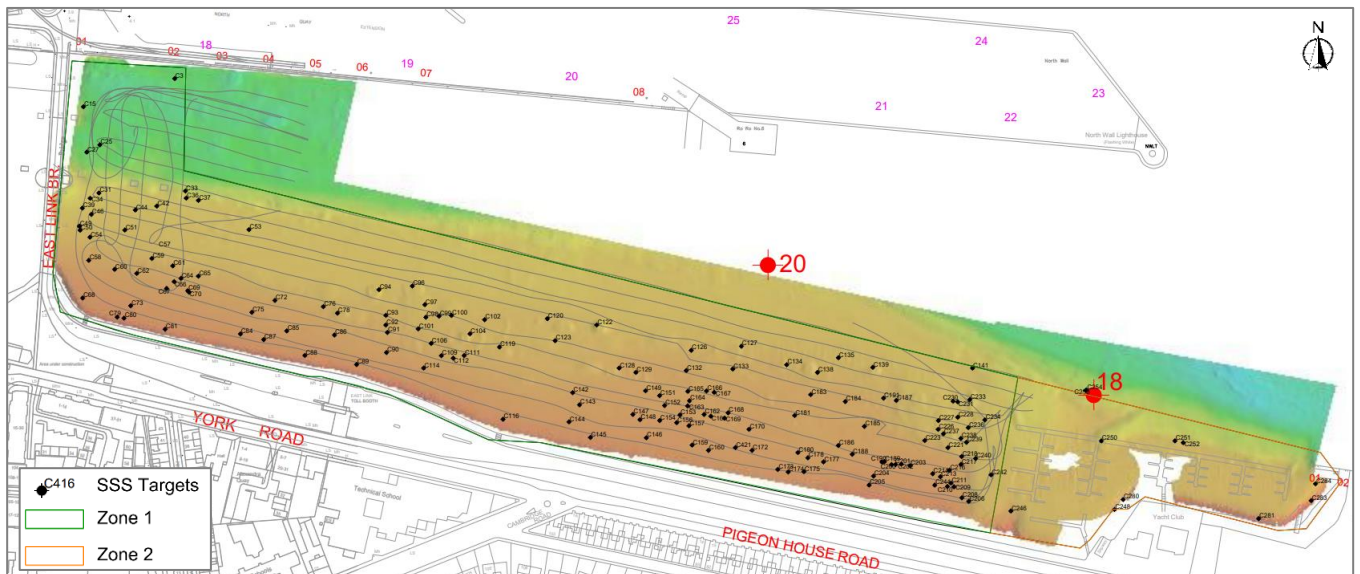


Figure 6: SSS contacts in Zone 1 & 2



167 sonar contacts have been listed on table 1.

Table 1: Sidescan sonar contact list for Zone 1 and 2.

Target ID	Easting (m)*	Northing (m)*	Height (m)	Length (m)	Width (m)	Description
C3	718106.0	734368.1	0.1	1.8	0.6	Boulder
C15	718045.7	734349.5	0.0	1.0	1.1	Tyres
C25	718056.6	734324.3	0.4	0.5	0.5	Boulder
C27	718047.9	734319.5	0.3	0.7	0.5	Boulder
C31	718055.9	734292.6	0.3	0.4	0.5	Boulder
C33	718113.1	734293.9	0.3	1.1	0.3	Boulder
C34	718050.1	734289.1	0.2	0.6	0.4	Boulder
C36	718113.6	734289.2	0.4	1.8	1.0	Boulder
C37	718121.7	734287.7	0.0	0.0	0.0	Dredge mark
C39	718045.0	734282.6	0.4	0.6	0.2	Boulder
C42	718094.2	734283.9	0.0	0.0	0.0	Boulder
C44	718080.0	734281.3	0.0	9.4	0.6	Dredge mark
C46	718051.0	734278.4	0.4	0.6	0.6	Boulder
C49	718043.0	734270.7	0.2	1.0	0.2	Boulder
C50	718043.5	734268.0	0.1	0.8	0.2	Boulder
C51	718073.1	734268.1	0.1	3.4	2.3	Block
C53	718155.1	734268.4	0.0	0.0	1.0	Dredge mark
C54	718050.0	734263.4	0.1	2.0	1.1	Block
C57	718095.1	734256.7	0.0	1.0	1.5	NI** debris
C58	718049.2	734248.1	0.0	2.8	0.2	Chain or rope
C59	718091.0	734249.4	0.0	8.8	8.0	Mooring with chain
C60	718066.3	734242.2	0.0	3.2	3.6	Mooring with chain
C61	718104.8	734244.5	0.0	0.7	0.2	NI debris
C62	718081.0	734239.5	1.0	4.6	0.1	Chain or rope
C64	718110.2	734236.2	0.0	0.6	0.5	NI debris
C65	718121.6	734237.7	0.0	0.0	0.7	Dredge mark
C66	718105.7	734234.1	0.1	3.2	0.3	Chain or rope
C67	718100.7	734229.6	0.0	2.3	1.4	NI debris
C68	718045.2	734223.3	0.0	1.6	0.5	NI debris
C69	718114.6	734228.0	0.0	7.7	0.7	Chain or rope
C70	718115.5	734227.1	0.0	6.9	0.2	Mooring with chain
C72	718172.2	734221.7	0.0	2.0	0.8	Dredge mark
C73	718076.9	734218.1	0.0	0.4	0.2	Boulder field
C75	718157.0	734213.8	0.4	0.7	0.8	Boulder
C76	718204.2	734217.6	0.1	3.9	0.5	NI debris or marking
C78	718213.6	734213.3	0.0	7.4	5.7	Mooring
C79	718068.0	734210.7	0.0	1.1	1.0	Tyre
C80	718072.5	734209.9	0.2	0.8	0.4	Boulder
C81	718099.7	734202.7	0.3	1.0	0.7	Boulder
C84	718149.5	734199.5	0.1	0.6	0.3	Boulder



C85	718180.1	734201.5	0.0	1.0	0.0	NI debris
C86	718211.6	734198.8	0.2	2.8	0.2	Chain or rope
C87	718164.8	734195.8	0.1	0.9	0.3	Boulder field
C88	718192.1	734185.4	0.1	1.5	0.4	Boulder
C89	718226.2	734179.3	0.2	1.1	0.8	Boulder field
C90	718246.0	734187.3	0.2	1.0	0.2	Boulder
C91	718246.6	734200.5	0.0	18.9	0.0	Long linear contact
C92	718245.5	734205.4	0.0	6.4	0.1	Chain or rope
C93	718245.6	734211.8	0.0	5.0	3.3	Mooring
C94	718241.0	734228.8	0.0	8.4	6.4	Mooring
C96	718263.0	734231.2	1.0	7.0	0.2	Chain or rope
C97	718271.3	734218.9	0.1	1.2	0.7	Boulder
C98	718272.0	734210.6	0.0	1.6	0.8	NI debris
C99	718280.7	734211.3	0.0	0.9	0.8	NI debris
C100	718288.9	734211.8	0.1	1.7	0.2	Boulder
C101	718266.9	734202.9	0.0	0.0	0.0	Dredge mark
C102	718310.8	734208.9	1.6	5.0	0.3	Chain or rope
C104	718301.1	734199.6	0.0	6.0	4.9	Mooring
C106	718275.5	734193.3	0.0	0.0	1.2	Dredge mark
C109	718282.2	734185.2	0.1	5.8	0.1	Chain or rope
C111	718297.3	734185.3	0.0	4.2	3.2	Mooring
C112	718290.1	734183.6	0.0	5.8	0.2	Chain or rope
C114	718270.6	734177.0	0.1	1.4	1.2	Tyre
C116	718323.0	734143.2	0.2	1.2	1.0	Boulder field
C119	718320.6	734190.9	0.0	5.5	3.7	Mooring
C120	718352.3	734209.6	2.2	6.9	0.2	Chain or rope
C122	718384.9	734205.5	0.0	7.4	7.0	Mooring
C123	718357.4	734195.1	1.1	7.9	0.1	Chain or rope
C126	718447.3	734188.7	0.0	3.9	0.5	Chain or rope
C127	718480.5	734191.4	0.0	0.0	0.0	Chain
C128	718399.7	734177.0	0.1	2.4	0.2	Mooring with chain
C129	718410.8	734174.1	0.0	9.6	7.5	Mooring
C132	718444.1	734175.4	0.1	1.5	0.6	NI debris
C133	718474.8	734176.4	0.0	1.2	0.7	NI debris
C134	718510.4	734179.2	0.0	7.1	6.2	Mooring
C135	718544.6	734183.8	1.6	2.9	0.4	Chain or rope
C138	718530.8	734174.1	0.0	3.1	0.1	Chain or rope
C139	718567.3	734177.5	1.2	0.0	0.0	NI debris
C141	718633.3	734177.0	0.1	0.8	0.4	Boulder
C142	718369.0	734160.8	0.0	2.1	0.0	NI debris
C143	718373.5	734152.7	0.0	11.7	10.3	Mooring
C144	718366.6	734141.5	0.1	0.8	0.8	Boulder
C145	718380.8	734131.2	0.1	1.3	1.0	Tyre
C146	718417.7	734131.0	0.3	1.1	0.5	Boulder



C147	718408.8	734146.4	0.1	1.2	1.2	Wreck
C148	718413.5	734143.0	0.1	1.3	1.2	Tyre
C149	718417.2	734162.0	0.0	8.0	7.1	Mooring
C151	718426.4	734158.8	0.0	6.8	0.1	Chain or rope
C152	718429.7	734152.3	0.1	2.0	0.5	NI debris
C153	718439.9	734146.1	0.0	1.3	0.8	NI debris
C154	718426.5	734142.4	0.1	0.8	0.6	Concrete block
C156	718437.7	734141.0	0.0	0.0	0.0	NI debris
C157	718445.8	734138.9	0.0	1.4	1.0	NI debris
C159	718447.9	734126.2	0.2	1.7	1.2	Tyre
C160	718458.7	734122.7	0.3	1.1	0.5	Boulder
C161	718460.3	734145.2	0.0	4.8	0.2	Chain or rope
C162	718455.8	734146.4	0.0	1.2	1.1	NI debris
C163	718445.0	734152.0	0.0	1.3	1.1	NI debris
C164	718446.2	734155.4	0.1	1.4	0.8	Boulder
C165	718445.1	734161.7	0.0	2.5	1.3	Debris
C166	718457.4	734161.9	0.0	1.1	1.0	NI debris
C167	718462.5	734161.0	0.0	1.3	1.1	NI debris
C168	718471.7	734147.5	0.1	5.9	0.2	Chain or rope
C169	718469.4	734143.9	0.1	6.3	0.2	Chain or rope
C170	718485.5	734136.6	0.0	4.3	0.3	Anchor
C172	718487.5	734122.7	0.0	1.1	1.0	NI debris
C173	718504.6	734110.1	0.4	1.0	0.6	Boulder
C174	718511.4	734108.5	0.1	0.9	0.6	Boulder
C175	718521.8	734108.6	0.3	1.0	1.1	Tyre
C177	718534.8	734115.1	0.1	0.5	0.3	Boulder
C178	718524.4	734117.8	0.1	0.5	0.2	Boulder and mooring
C180	718517.9	734121.3	0.1	0.9	0.8	Tyre
C181	718515.7	734145.7	0.0	0.0	0.0	Debris
C183	718526.3	734159.5	0.0	0.0	0.0	Chain or rope
C184	718549.2	734154.9	0.7	2.0	0.1	Chain or rope
C185	718561.8	734138.5	0.1	0.7	0.3	Boulder
C186	718544.6	734125.9	0.1	0.6	0.5	Boulder
C187	718582.9	734155.6	0.0	1.4	0.5	NI debris
C188	718553.8	734120.1	0.1	0.7	0.7	Boulder
C189	718575.0	734115.2	0.1	0.8	0.7	NI debris
C190	718573.4	734115.0	0.1	0.5	0.4	Boulder
C191	718574.5	734157.2	0.8	5.0	0.1	Mooring with chain
C200	718579.7	734113.3	0.1	10.2	0.1	Chain or rope
C201	718582.4	734113.4	0.9	0.8	0.7	Mooring
C202	718586.2	734113.6	0.1	5.0	0.2	Chain or rope
C203	718591.9	734112.6	0.1	4.2	0.2	Chain or rope
C204	718567.8	734105.7	0.4	1.1	0.4	Boulder
C205	718564.9	734099.8	0.2	0.9	0.3	Boulder



C206	718630.7	734089.0	0.1	1.2	0.3	Boulder
C208	718626.2	734091.4	0.1	0.6	0.2	Boulder
C209	718621.0	734098.6	0.0	2.3	1.0	NI debris
C210	718616.7	734098.9	0.0	1.7	2.2	Mooring or block
C211	718619.0	734101.1	0.1	5.6	0.2	Linear contact
C213	718612.0	734105.3	0.2	1.2	0.2	Boulder
C214	718607.0	734107.3	0.0	10.5	10.4	Mooring block
C216	718618.0	734109.6	0.0	5.2	0.3	Chain or rope
C217	718625.6	734113.4	0.0	0.8	1.2	NI debris
C218	718626.1	734118.6	0.1	20.2	0.3	Long linear contact
C221	718617.0	734124.5	0.0	0.0	0.0	Chain or rope
C223	718601.7	734129.2	0.5	4.3	1.6	Wreck
C226	718610.5	734136.6	0.0	0.0	0.0	Chain or rope
C227	718610.7	734142.4	0.0	0.9	0.8	NI debris
C228	718623.5	734144.6	0.0	0.0	0.0	Chain or rope
C230	718620.4	734155.2	0.2	21.4	0.2	Chain or rope
C231	718623.4	734154.7	0.2	19.6	1.0	Chain or rope
C233	718631.5	734156.2	0.1	4.8	0.2	Chain or rope
C234	718641.4	734142.8	0.2	7.3	0.2	Chain or rope
C236	718630.5	734137.7	0.2	5.3	0.3	Chain or rope
C237	718614.0	734133.6	0.1	2.8	0.2	Chain or rope
C238	718625.6	734130.6	0.0	0.9	0.6	NI debris
C239	718629.3	734128.0	0.0	3.1	0.4	NI debris
C240	718635.3	734117.3	0.0	0.0	0.0	Chain or rope
C242	718645.5	734106.5	0.0	14.0	0.0	Chain or rope
C244	718608.3	734099.8	0.0	0.0	0.0	NI debris
C246	718658.6	734082.6	0.2	1.0	0.0	Boulder field
C248	718727.1	734083.7	0.1	2.2	0.9	Boulder field
C250	718718.4	734128.9	0.1	3.3	0.2	NI debris
C251	718767.0	734129.0	0.2	0.7	0.6	Boulder
C252	718772.5	734127.8	0.2	0.5	0.5	Boulder
C253	718708.0	734162.3	0.0	6.5	0.0	NI debris
C254	718708.6	734162.5	0.0	6.4	0.2	Chain or rope
C258	718828.3	734164.1	0.1	0.3	0.3	Boulders and cobbles
C280	718732.8	734090.2	0.0	0.0	0.0	Tyre
C281	718822.3	734077.7	0.5	2.2	0.8	Boulders
C283	718857.1	734089.5	0.3	1.3	0.7	NI debris
C284	718859.9	734100.6	0.1	0.5	0.2	Boulder field

*Coordinates in Irish Transverse Mercator (ITM)

** NI: Not Identified



Pictures of the sonar contacts are in Appendix 2. Figure 7 below is showing a few of the identified contacts.

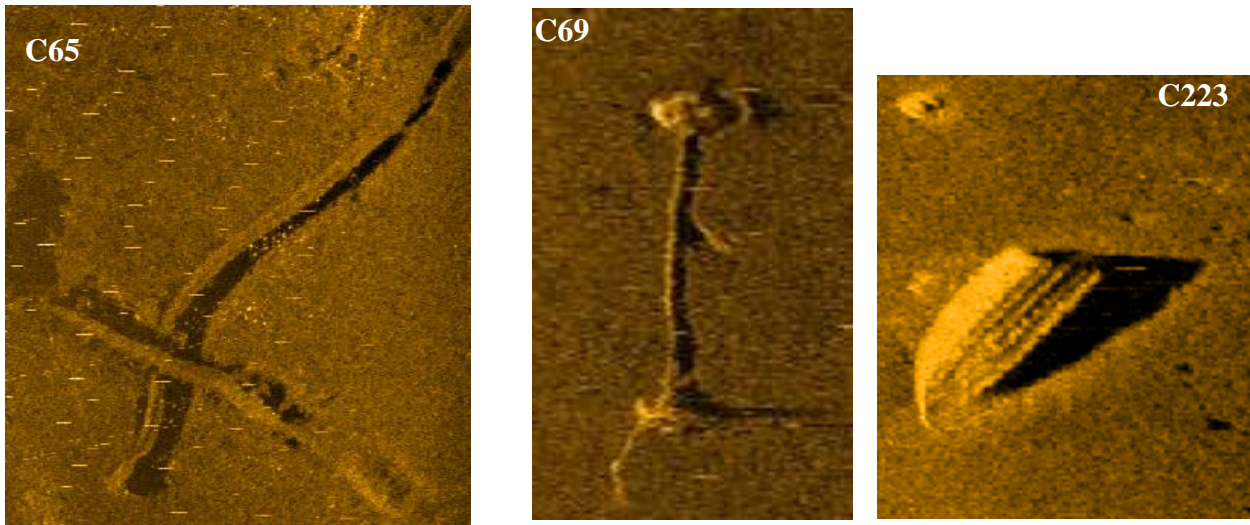


Figure 7: Pictures of sonar contacts C65 (Dredging marks), C69 (Mooring with a chain), and C223 (Wreck).



4.1.3 Marine magnetometer

In total, 38 magnetometer anomalies were identified in Zone 1, see figure 8 and table 2. Details in Appendix.

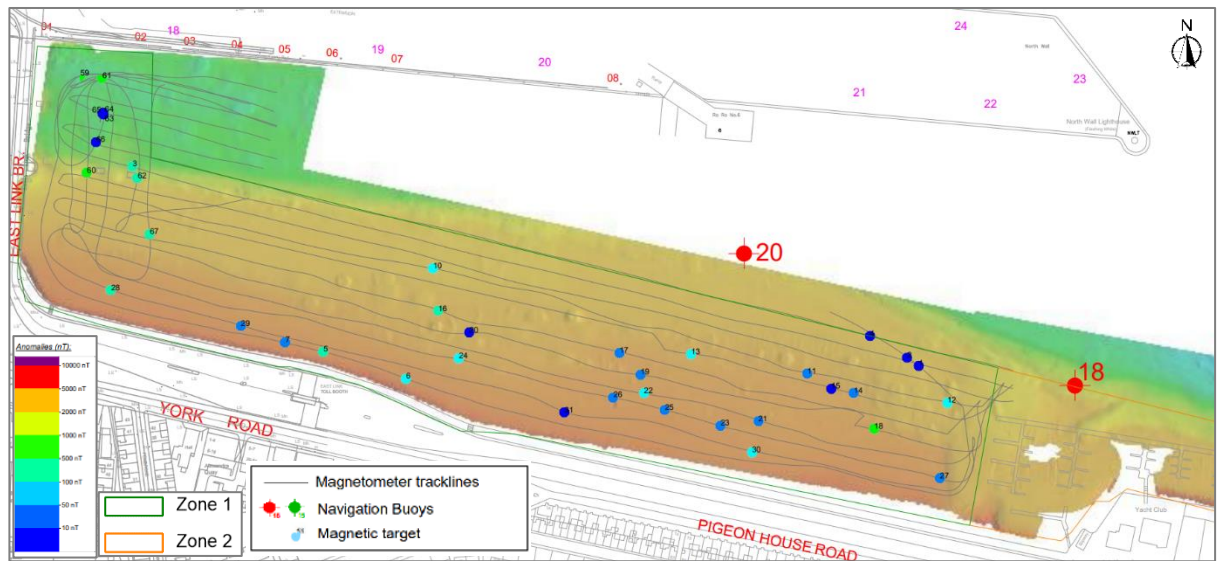


Figure 8: Magnetic anomalies in Zone 1.

Zone 2 was not suitable for towed magnetometers due to obstacles such as Pontoon, anchors and vessels, see figure 9.

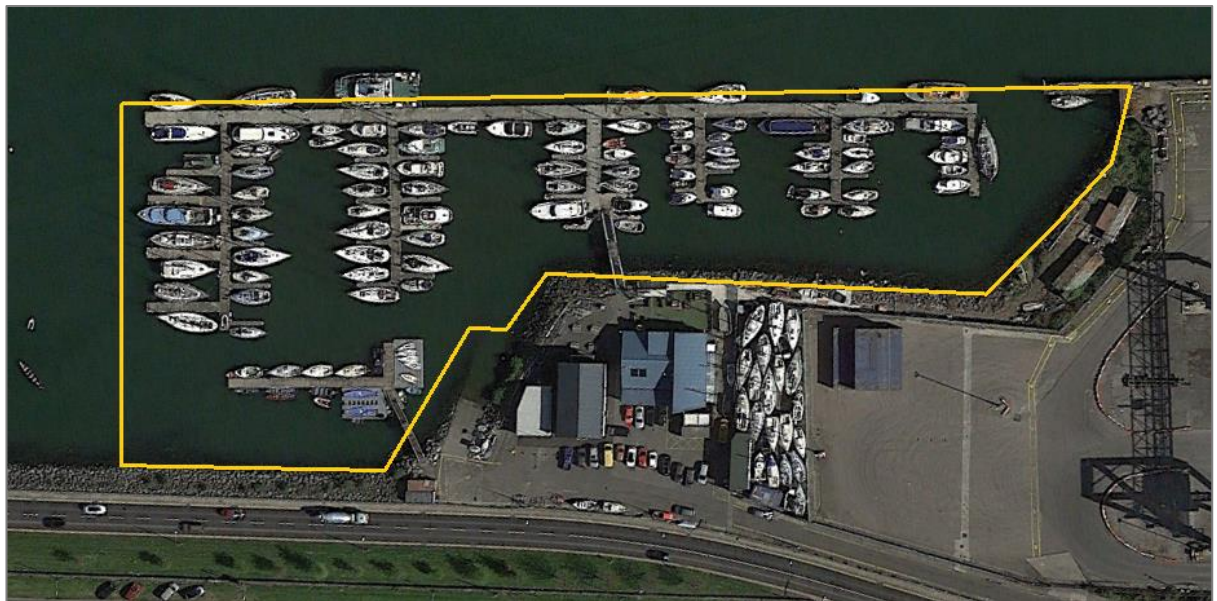


Figure 9: Zone 2 (Orange polygon) is located at Poolbeg Marina (satellite imagery).



Table 2 is listing the 38 magnetic anomalies identified in Zone 1.

Table 2: Magnetic anomalies list for Zone 1.

Target ID	Zone	Easting (m)*	Northing (m)*	Amplitude (nT)**
1	Zone 1	718611.6	734171.7	10
2	Zone 1	718604.3	734177.5	14
3	Zone 1	718100.4	734301.3	202
4	Zone 1	718580.0	734191.3	36
5	Zone 1	718224.2	734181.2	370
6	Zone 1	718278.2	734163.4	150
7	Zone 1	718199.8	734187.0	87
10	Zone 1	718295.5	734235.2	172
11	Zone 1	718539.2	734167.4	85
12	Zone 1	718630.3	734148.4	182
13	Zone 1	718463.6	734179.9	130
14	Zone 1	718569.4	734153.7	66
15	Zone 1	718555.1	734157.6	33
16	Zone 1	718299.3	734208.1	317
17	Zone 1	718417.1	734180.9	94
18	Zone 1	718583.0	734130.7	824
19	Zone 1	718430.9	734166.0	75
20	Zone 1	718319.4	734193.3	44
21	Zone 1	718507.6	734136.4	92
22	Zone 1	718433.1	734153.7	101
23	Zone 1	718482.9	734132.9	82
24	Zone 1	718312.3	734176.6	137
25	Zone 1	718446.4	734143.4	77
26	Zone 1	718412.8	734151.5	68
27	Zone 1	718625.3	734098.6	52
28	Zone 1	718085.9	734221.5	249
29	Zone 1	718170.6	734198.1	70
30	Zone 1	718503.4	734116.4	131
31	Zone 1	718381.2	734142.2	43
59	Zone 1	718066.2	734360.7	841
60	Zone 1	718070.6	734297.6	591
61	Zone 1	718080.6	734359.0	744



62	Zone 1	718103.6	734294.2	262
63	Zone 1	718081.5	734335.5	45
64	Zone 1	718081.3	734336.5	17
65	Zone 1	718080.7	734336.0	11
66	Zone 1	718076.6	734317.5	10
67	Zone 1	718111.4	734257.5	215

*Coordinates in Geographic WGS84 and Irish Transverse Mercator (ITM)

** Amplitude of the target in Nanotesla (nT)

Figure 10 presents the magnetic anomalies of 824 nT recorded for target 18. The vertical axis corresponds to the magnetic Amplitude in nT.

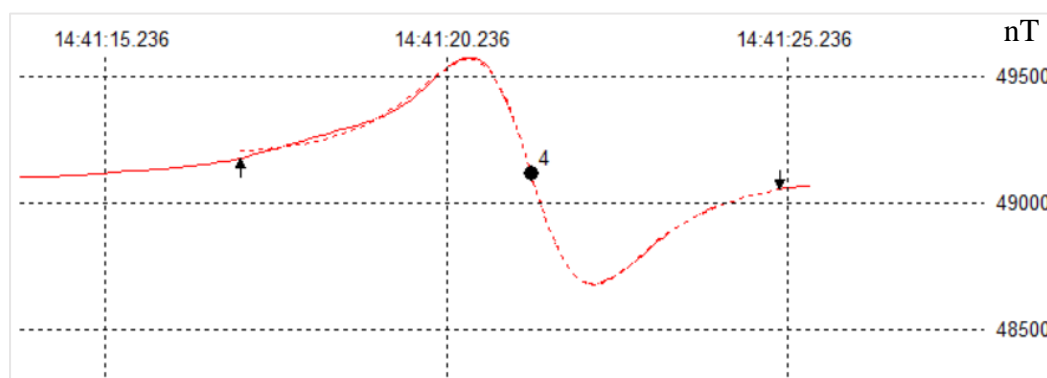


Figure 10: Target 18 magnetic anomalies recorded. Horizontal axis is the time, vertical axis is the magnetic amplitude in nT



4.1.4 Sub-bottom profiler results for Zone 1 and 2.

▪ **Zone 1**

The seabed is at a depth of about 10 m in the western part of zone 1, and shallows to 4-6 m in an eastward direction. There is very little acoustic penetration beyond the seabed. This lack of penetration has been interpreted as being the result of a sediment layer with high Organic matter content, at, or just below the surface. This layer is about 0.3- 0.5 m in thickness in most Zones. Organic matter causes air bubble to be present in the sediment and these bubbles are impenetrable to sound. This results in acoustic blanking rendering any seismic Units below such a layer invisible (Figure 11).

Penetration occurs to a depth of about 1.5 m below the seabed (bsd) in the western Zone part of zone 1. This might be due to reduced Organic matter content in the surface layer (Figure 12).

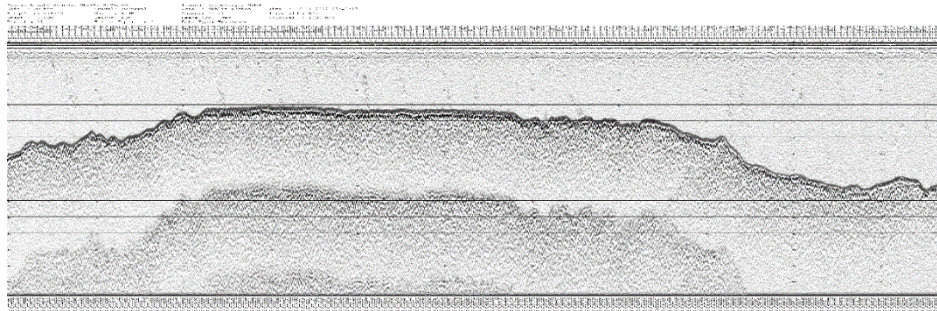


Figure 11: Example seismic profile from zone 1 showing a sediment layer immediately below the surface.

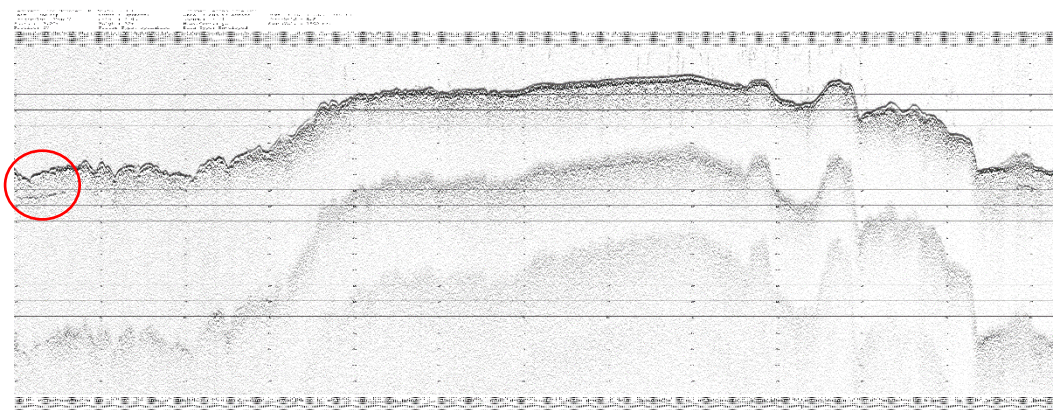


Figure 12: Example seismic profile from zone 1 showing a sediment layer immediately below the surface and penetration on of about 1.5 m in on the right (red circle) (west).

▪ **Zone 2**

The seabed in zone 2 is between 5 and 12 m in depth and there is very little acoustic penetration beyond the seabed. This lack of penetration has been interpreted as being the result of a sediment layer with high organic matter content, at, or just below the surface. This layer is about 0.3 – 0.5 m in thickness. Organic matter causes air bubble to be present in the sediment and these bubbles are impenetrable to sound. This results in acoustic blanking rendering any seismic units below such a layer invisible (Figure 13).



Penetration occurs to a depth of about 1.5 m bsd in the easternmost part of zone 2. Reduced penetration might be due to gas from organic matter content at the surface which is common in silt areas (Figure 14).

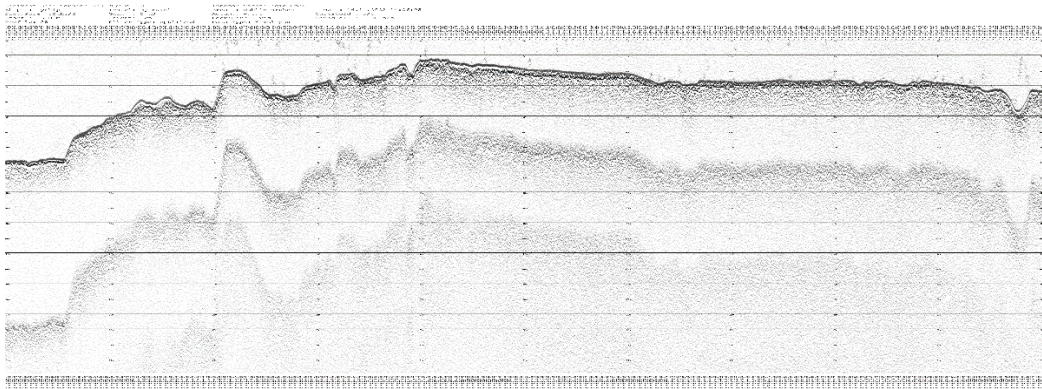


Figure 13: Example seismic profile from zone 2 showing a sediment layer immediately below the surface.

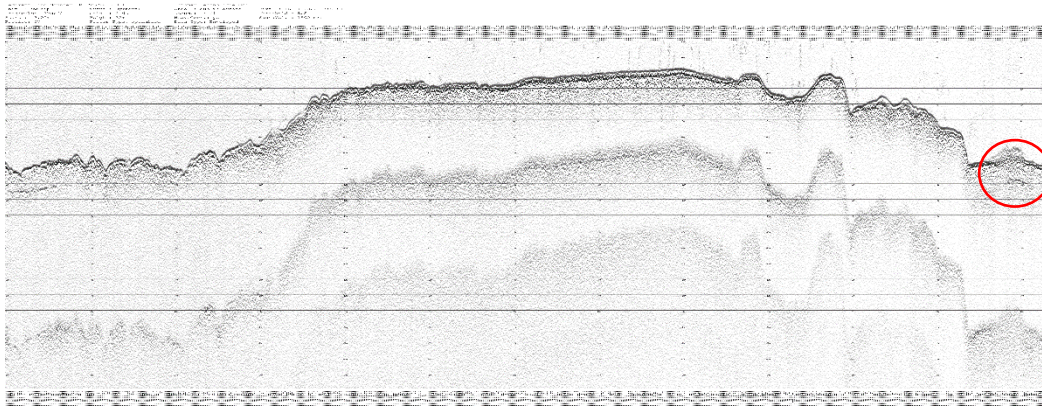


Figure 14: Example seismic profile from zone 2 showing a sediment layer immediately below the surface and penetration on of about 1.5 m on the left (red circle) (east).



4.2 Survey results - Zone 3 & 4

4.2.1 Bathymetry

Water depths in Zone 3 range from drying 2.8 m to 11.3 m chart datum with the seabed gently sloping away from the quayside in general and a deeper zone is present where dredging has occurred within the berth pocket 48, as shown in figure 15.

For Zone 4, water depths vary from 2.2 m to 0.6 m chart datum with the seabed sloping away from the quayside and a small, deeper pool at the entrance of the Zone, as shown in figure 15.

Detailed bathymetric chart in Appendix 1.

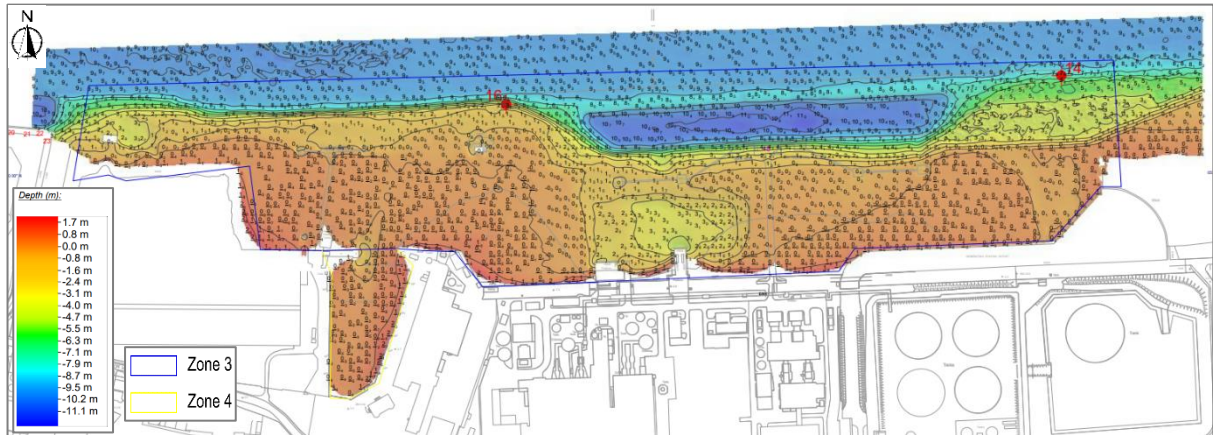


Figure 15: Bathymetry for zones 3 & 4

Figure 16 shows the shaded bathymetric data for Zone 3 and 4.

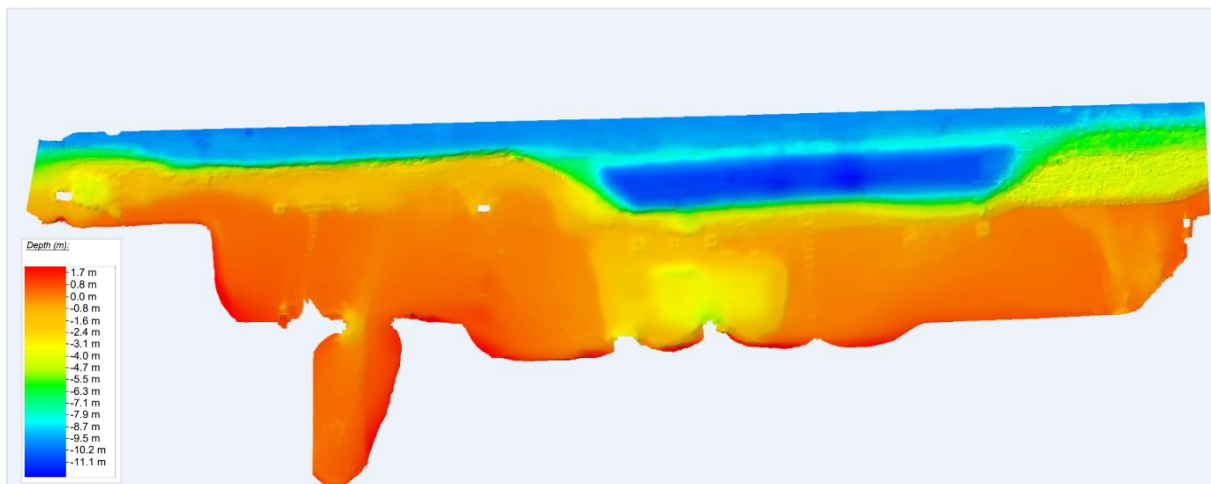


Figure 16: Shaded bathymetry of Zone 3 and 4.



Figure 17 shows example of the multibeam data for Zone 3 and 4, corresponding to three long debris lying down over the seabed (left) and to a broken pontoon in pigeon house harbour (right).

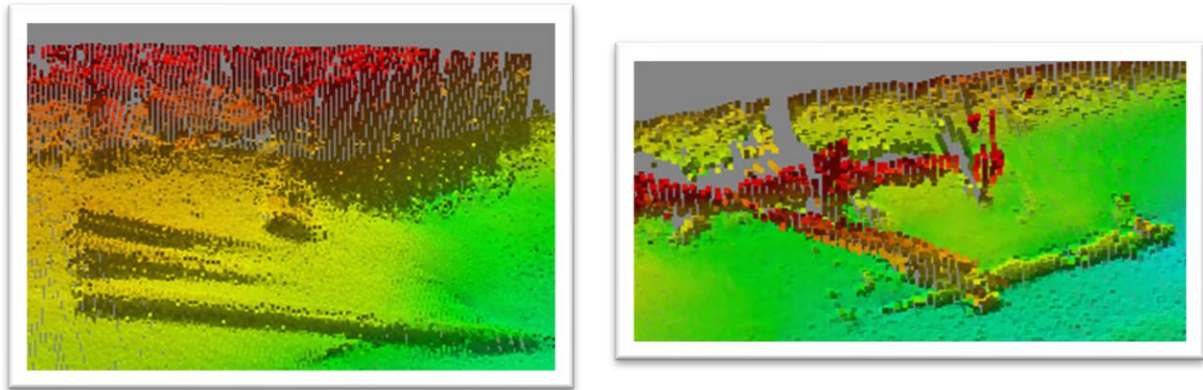


Figure 17: MBES data from Zone 3 (left long debris) and from Zone 4 (broken pontoon)

4.2.2 Side scan sonar

In total, 69 sidescan sonar contacts have been identified in Zone 3, and 5 sonar contacts in Zone 4, as shown in figure 18. Detailed chart in Appendix 1, Pictures of those targets are in Appendix 2.

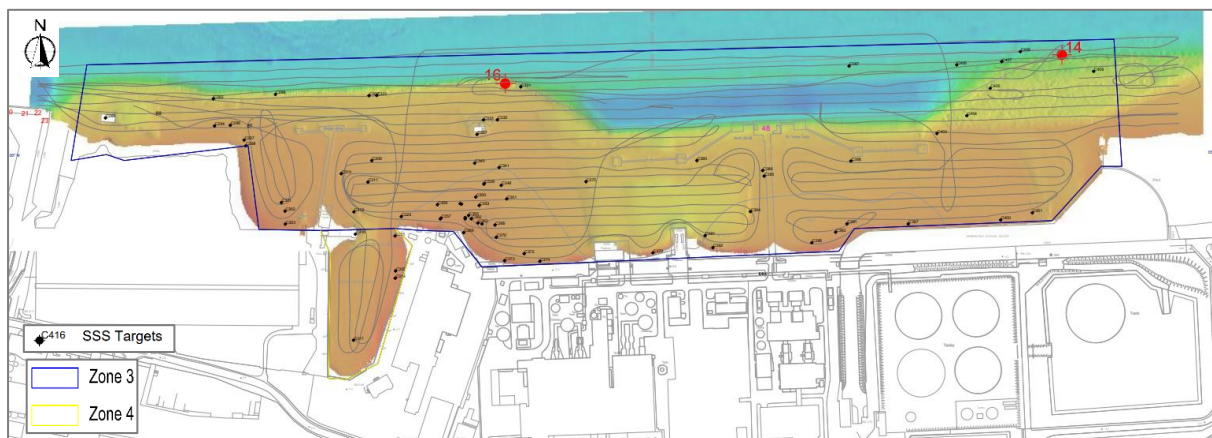


Figure 18: SSS contacts in Zone 3 & 4.



74 Sonar contacts have been listed in Table 3.

Table 3: Sidescan sonar contact list for Zone 3 and 4.

Target ID	Easting*(m)	Northing*(m)	Height (m)	Length (m)	Width (m)	Description
C289	720056.1	733964.5	0.0	3.1	0.5	Boulder
C292	720168.3	733984.5	0.0	0.0	0.0	NI debris
C294	720169.5	733956.3	0.6	2.2	1.6	Block
C296	720185.9	733957.0	0.8	1.7	0.4	NI debris
C297	720200.2	733941.6	0.0	0.0	0.0	Boulder field
C298	720201.7	733935.6	0.2	1.8	1.3	Buried Tyre
C299	720232.8	733989.0	0.0	0.0	0.0	Sand feature
C301	720239.0	733877.0	0.2	0.9	1.2	Boulder
C302	720242.7	733868.0	0.4	0.5	0.3	Boulder
C303	720243.0	733854.7	0.2	0.7	0.3	Boulder field
C307	720330.0	733987.6	0.0	2.1	0.2	NI debris
C309	720332.9	733920.4	0.5	0.7	0.4	Boulder
C310	720301.1	733906.8	0.0	2.2	4.2	NI debris
C311	720328.9	733898.2	0.1	8.2	0.5	NI debris
C312	720314.3	733867.3	0.4	1.0	1.0	Block
C316	720315.9	733844.2	0.4	1.1	0.4	Boulders
C317	720313.9	733734.4	0.0	0.0	0.0	Sand feature
C319	720357.2	733798.6	0.1	1.3	0.2	NI debris
C320	720357.6	733806.1	0.0	2.5	0.1	NI debris
C321	720357.1	733842.4	0.3	1.0	1.2	Tyre
C322	720363.5	733862.4	0.1	1.0	0.9	Tyre
C323	720338.0	733987.9	0.0	0.0	0.0	NI debris
C324	720426.2	733875.4	0.6	0.9	0.6	Boulder
C325	720404.2	733860.0	0.2	1.0	0.9	Tyre
C326	720429.9	733861.4	0.1	4.2	0.2	NI debris
C328	720449.8	733896.7	0.0	1.3	2.2	Boulders
C331	720487.8	733996.8	0.3	5.0	2.0	NI debris
C332	720463.4	733962.7	0.4	0.7	0.6	Boulder
C333	720448.9	733962.5	0.2	0.8	0.3	Boulder
C337	720442.3	733947.6	0.0	2.1	0.2	NI debris
C340	720439.8	733917.7	0.2	1.8	1.3	Block
C341	720465.2	733913.3	0.1	1.9	1.8	Tyre
C345	720449.4	733896.1	0.3	1.5	0.3	Boulders
C348	720467.5	733894.8	0.1	0.9	0.9	Tyre
C350	720441.0	733882.7	0.0	1.9	0.2	Debris
C351	720473.1	733880.7	0.1	0.8	0.7	Tyre
C352	720424.7	733875.8	0.5	0.8	0.5	Boulders
C353	720444.6	733873.9	0.2	4.5	0.1	Long NI debris
C355	720433.5	733863.6	0.1	2.7	0.1	Long NI debris
C356	720401.1	733874.7	0.2	0.9	0.5	Boulder



C357	720404.8	733860.7	0.2	0.8	0.6	Boulder
C359	720430.0	733860.1	0.1	1.3	0.6	NI debris
C360	720436.3	733860.1	0.1	2.9	0.4	NI debris
C362	720443.2	733855.8	0.2	1.0	1.0	Tyre
C366	720428.4	733845.7	0.2	1.0	0.2	Boulder
C368	720461.0	733853.7	0.2	1.8	0.3	Boulder
C369	720447.4	733854.9	0.6	0.7	0.6	Boulder
C370	720462.3	733841.0	0.1	0.7	0.9	Boulder
C372	720491.3	733824.0	0.1	0.9	0.8	Tyre
C373	720470.9	733816.7	0.1	1.7	0.9	Block with rope
C374	720507.6	733816.2	0.2	1.2	0.9	Tyre
C375	720555.5	733898.6	0.1	0.7	0.6	Boulder
C379	720625.1	733824.9	0.6	1.3	0.8	Boulders
C380	720670.8	733920.5	0.0	1.0	0.8	NI debris
C381	720679.4	733842.7	0.3	9.8	0.4	Long NI debris
C382	720687.5	733830.2	0.3	1.4	0.8	Boulders
C384	720726.4	733867.6	0.3	3.6	1.1	Boulder
C385	720740.7	733904.3	0.0	6.2	2.0	NI debris
C386	720739.1	733910.1	0.0	2.7	0.2	Debris
C387	720828.9	734018.3	0.4	0.8	0.3	Boulder
C388	720830.9	733920.0	0.2	1.5	1.5	NI debris
C391	720826.8	733854.9	0.0	0.5	0.2	Tyre
C392	720815.0	733846.3	0.1	2.9	0.1	Long NI debris
C396	720790.2	733835.4	0.1	0.9	0.7	Boulder
C397	720890.4	733854.9	0.1	2.1	0.2	NI debris
C400	720986.5	733858.9	0.1	1.8	0.1	Chain or rope
C401	721019.5	733866.3	0.1	1.0	0.3	Boulder
C403	720920.2	733948.5	0.1	0.6	0.2	Boulders and cobbles
C404	720951.3	733966.9	0.0	1.5	0.5	Boulder
C405	720975.6	733995.3	0.0	0.0	0.0	Sand feature
C406	720940.8	734019.5	0.0	1.9	1.2	Sand feature
C407	720987.6	734023.0	0.0	5.0	0.2	NI debris
C408	721007.0	734033.3	1.5	1.0	0.4	Boulder
C409	721083.2	734012.9	0.0	3.3	1.3	NI debris

*Coordinates in Irish Transverse Mercator (ITM)

** NI: Not Identified

Pictures of the sonar contacts are in Appendix 2. Figure 19 below is showing a few of the identified contacts.

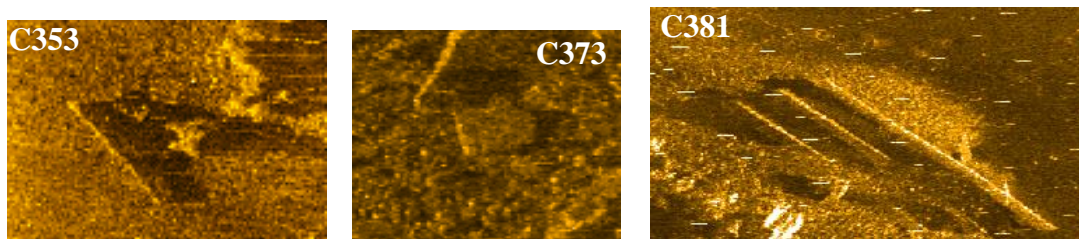


Figure 19: Picture of sonar contacts C353 (Long NI debris), C373 (Anchor block with rope), and C381 (3 long NI debris).



4.2.3 Marine Magnetometer

In total, 43 magnetometer anomalies have been identified in Zone 3, and 2 anomalies in Zone 4, as shown in figure 20. *Details in Appendix.*

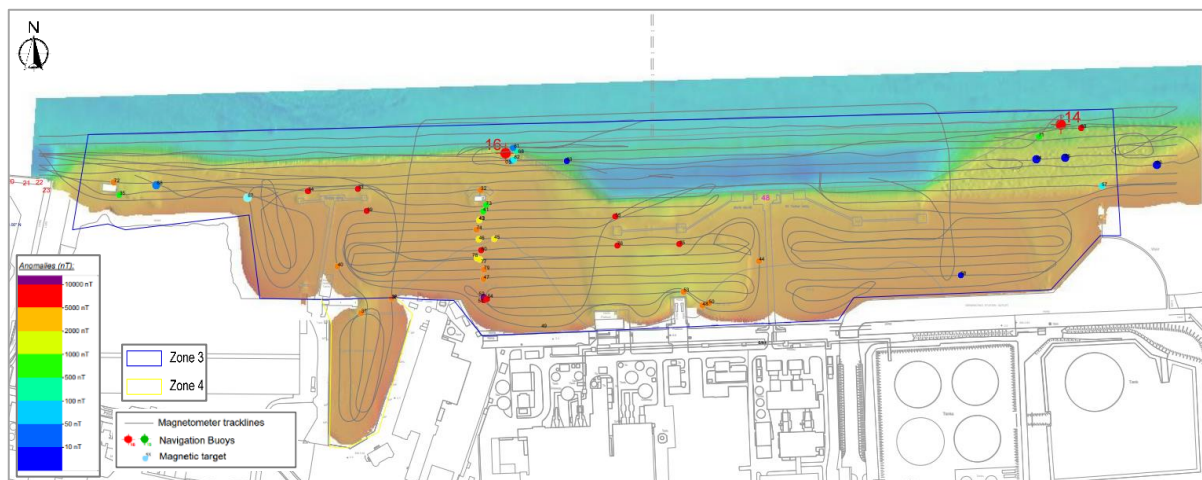


Figure 20: Magnetic anomalies in Zone 3 and 4.

Table 4 is listing the 45 magnetic anomalies identified in Zone 3 and 4.

Table 4: Magnetic anomalies list for Zone 3 and 4.

Target ID	Zone	Easting (m)*	Northing (m)*	Amplitude (nT)**
32	Zone 3	720445.7	733962.2	3422
33	Zone 3	720318.2	733963.6	6600
34	Zone 3	720266.1	733961.0	9122
35	Zone 3	720069.8	733956.9	900
37	Zone 4	720320.9	733834.6	3384
38	Zone 4	720352.9	733849.0	4906
39	Zone 3	720327.1	733940.1	7466
40	Zone 3	720296.7	733882.8	3651
41	Zone 3	720448.4	733940.2	749
42	Zone 3	720444.2	733930.3	1577
44	Zone 3	720735.9	733888.4	4660
45	Zone 3	720459.6	733911.6	1531
46	Zone 3	720444.1	733910.8	1520
47	Zone 3	720448.7	733870.1	2467
48	Zone 3	720676.9	733841.9	3811
49	Zone 3	720508.7	733819.4	369
50	Zone 3	720683.6	733844.6	2877
51	Zone 3	720448.9	733847.2	6711
52	Zone 3	720448.9	733850.6	11157
53	Zone 3	720657.1	733856.3	2174



54	Zone 3	720451.8	733848.5	8921
55	Zone 3	720586.1	733933.9	5519
57	Zone 3	721093.0	733965.9	185
58	Zone 3	720945.8	733873.0	41
68	Zone 3	720482.8	734002.3	216
69	Zone 3	721070.8	734026.6	6067
70	Zone 3	720478.7	733992.4	88
71	Zone 3	721027.0	734017.2	945
72	Zone 3	720063.7	733970.2	2133
73	Zone 3	720451.3	733946.2	807
74	Zone 3	720441.4	733920.9	2371
75	Zone 3	720652.7	733905.9	5160
76	Zone 3	720588.0	733904.3	6810
77	Zone 3	720445.1	733889.8	1087
78	Zone 3	720441.8	733890.9	1096
79	Zone 3	720449.2	733879.3	3146
80	Zone 3	720446.2	733899.3	6525
81	Zone 3	720479.4	734005.9	94
82	Zone 3	720480.0	733993.3	155
83	Zone 3	720535.2	733992.1	6
84	Zone 3	721024.2	733993.9	6
85	Zone 3	721054.2	733995.5	8
86	Zone 3	721149.5	733988.6	6
87	Zone 3	720203.1	733954.4	179
88	Zone 3	720108.4	733967.7	81

*Coordinates in Irish Transverse Mercator (ITM)

Figure 21 presents the magnetic anomalies of 3811 nT recorded for target 48 (Zone 3) on the left, and of 4906 nT recorded for target 38 (zone 4) on the right. The vertical axis corresponds to the magnetic Amplitude in nT.

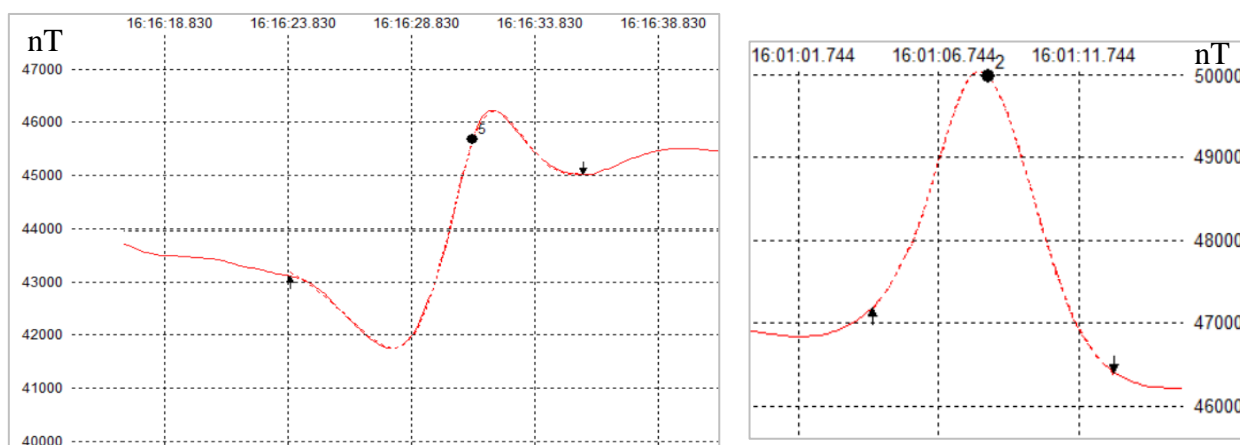


Figure 21: Magnetic anomaly 48 on the left, and magnetic anomaly 38 on the right.. Horizontal axis is the time, vertical axis is the magnetic amplitude in nT



4.2.4 Sub-bottom profiler results for Zone 3 and 4.

▪ **Zone 3**

The seabed in zone 3 is between 3 and 15 m in depth. The western part of the survey Zone is similar to zones 1 & 2, with a thin sediment layer visible at the surface. This layer is about 0.3 – 0.5 m in thickness in most Zones and it is likely to be composed of sediment with high Organic matter content. organic matter causes air bubble to be present in the sediment and these bubbles are impenetrable to sound. This results in acoustic blanking, rendering any seismic units below such a layer invisible (Figure 23). This layer is also visible in the channel however it is much thinner, with a thickness of approximately 0.1 m.

Figure 22 shows the thickness of the first seabed layer.

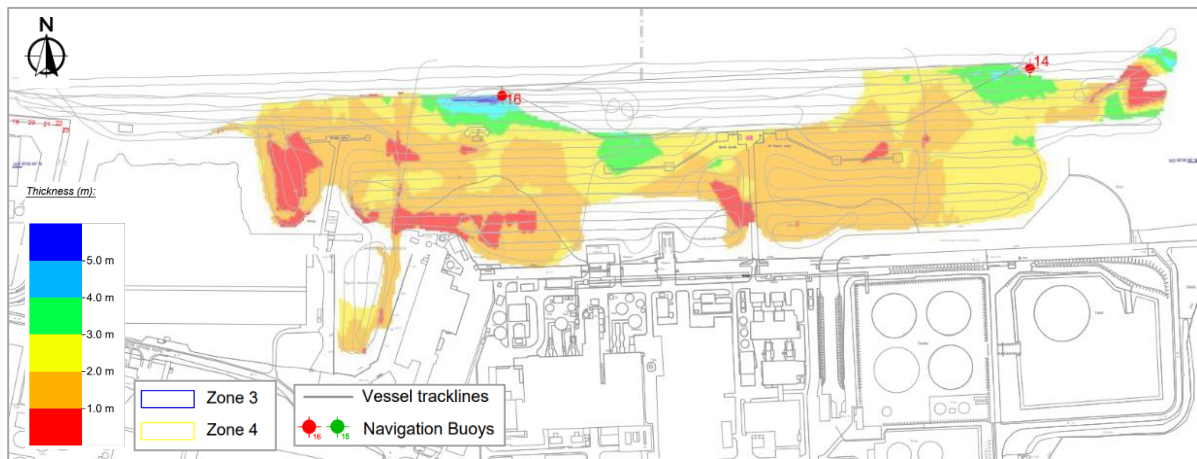


Figure 22: Isopach for zones 3 & 4

Towards the east of the survey Zone, it is possible to see a layer at a depth of approximately 2 – 3 m bsl. This layer is similar in character to the shallow layers visible in zones 1, 2 & and the western part of zone 3. It is interpreted to be comprised largely of organic rich sediment, resulting in the blanking of any subsequent layers.

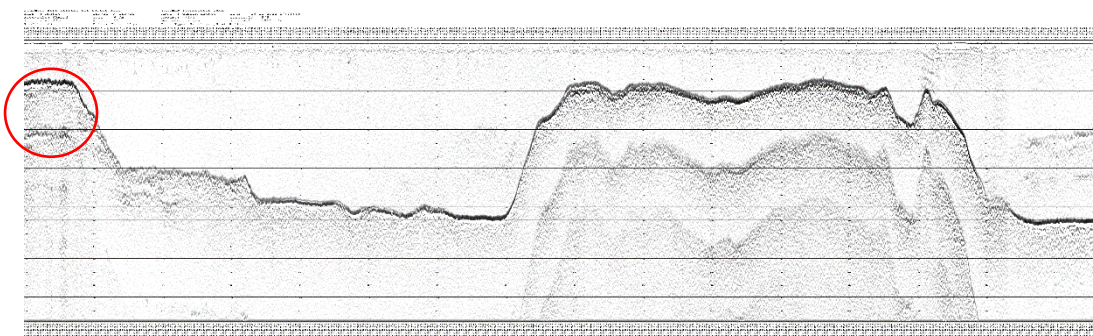


Figure 23: Example seismic profile from zone 3 showing a sediment layer immediately below the surface and deeper layer on the right (red circle) (east)



Zone 4

The seabed in zone 4 is 3-5 m in depth with a layer of what is thought to be organic rich sediment about 0.5-1 m in thickness immediately below the surface. Any subsequent layers were not visible due to the acoustic impenetrability (Figure 24).

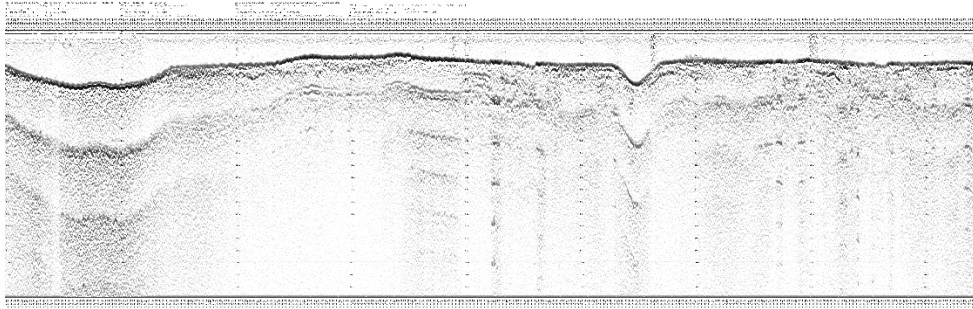


Figure 24: Example seismic profile from zone 4 showing a sediment layer immediately below the surface.



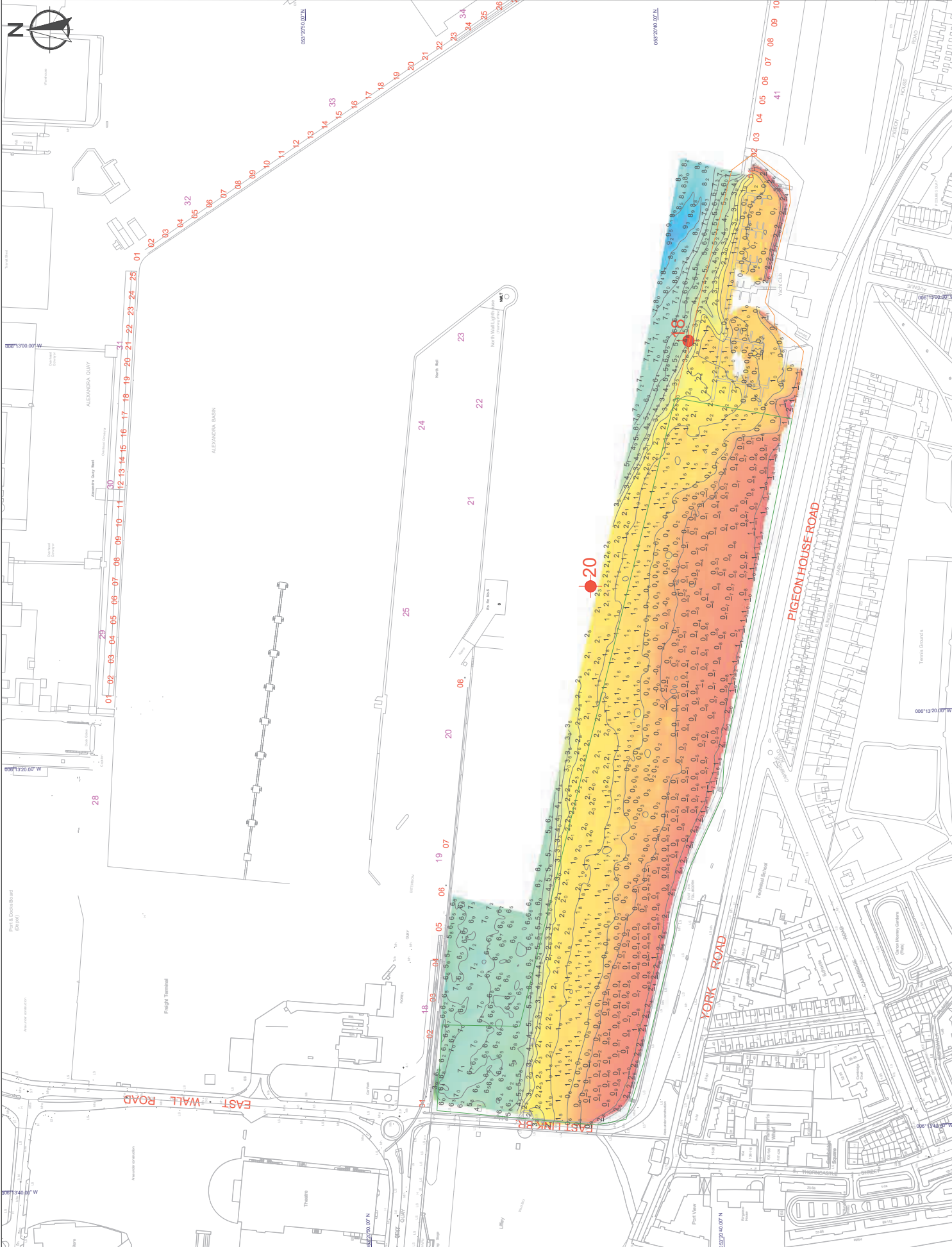
Appendix

Appendix 1: Charts

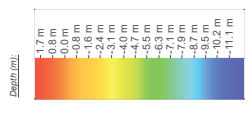
- Bathymetric charts:
 - 2211_Dublin_Zones1&2_Bathymetric_ChartA1.Pdf
 - 2211_Dublin_Zones3&4_Bathymetric_ChartA1.pdf
- Sidescan contact location
 - 2211_Dublin_Zones1&2_SSS_Targets_ChartA1.pdf
 - 2211_Dublin_Zones3&4_SSS_Targets_ChartA1.pdf
- Magnetometer anomalies location
 - 2211_Dublin_Zone1_Magnetometer_Anomalies_ChartA1.pdf
 - 2211_Dublin_Zones3&4_Magnetometer_Anomalies_ChartA1.pdf
- SBP thickness
 - 2211_Dublin_Zones3&4_SBP_Isopach_ChartA1.pdf

Appendix 2: Sonar contact pictures

- 2211_Dublin_Sidescan_contacts_Pictures.pdf



LEGEND



- Contours
- Soundings
- Navigation Buoys
- Zone 1
- Zone 2
- Zone 3
- Zone 4

Scale



GENERAL NOTES

Soundings: Navigation Depths - Shad Blue
 Means below datum
 Contours: 1 meter interval
 Datum: Chart Datum (CD) Mean -2.51 m
 Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey Method: Multibeam echosounder
 Survey Date: 16th, 17th & 28th November 2022

Drawing revision

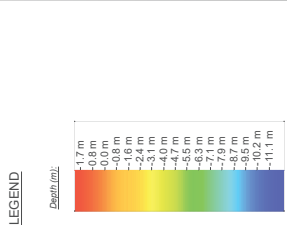
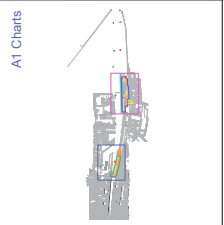
Date	Rev	Description	Drawn By
29/11/2022	0	Issue	TD



Client: Dublin Port Company
 Project: Dublin Port Archo Geophysical Project
 Drawing Title: Bathymetry Zones 1 & 2 - November 2022
 Issue: 2011_DP_Archo_001
 Scale: A1 @ 1:1000
 Drawing Date: 29/11/2022
 Drawing ID

Dublin Port - Archeo geophysical - Bathymetry Zones 3 & 4 - November 2022

KEY PLAN



GENERAL NOTES

Soundings: Navigation Depth - Shal Blue
Mean Low Datum
1 meter interval

Contours: Chart Datum (OD Mean - 2.51 m)
Geographic - WGS84

Projection: Dublin Port
Map Projection: UTM
Survey Location: 53° 07' 50.00" N, 10° 07' 52.00" W
Survey Method: GNSS
Survey Date: 18th, 19th, 20th, 21st, 22nd, 23rd November 2022

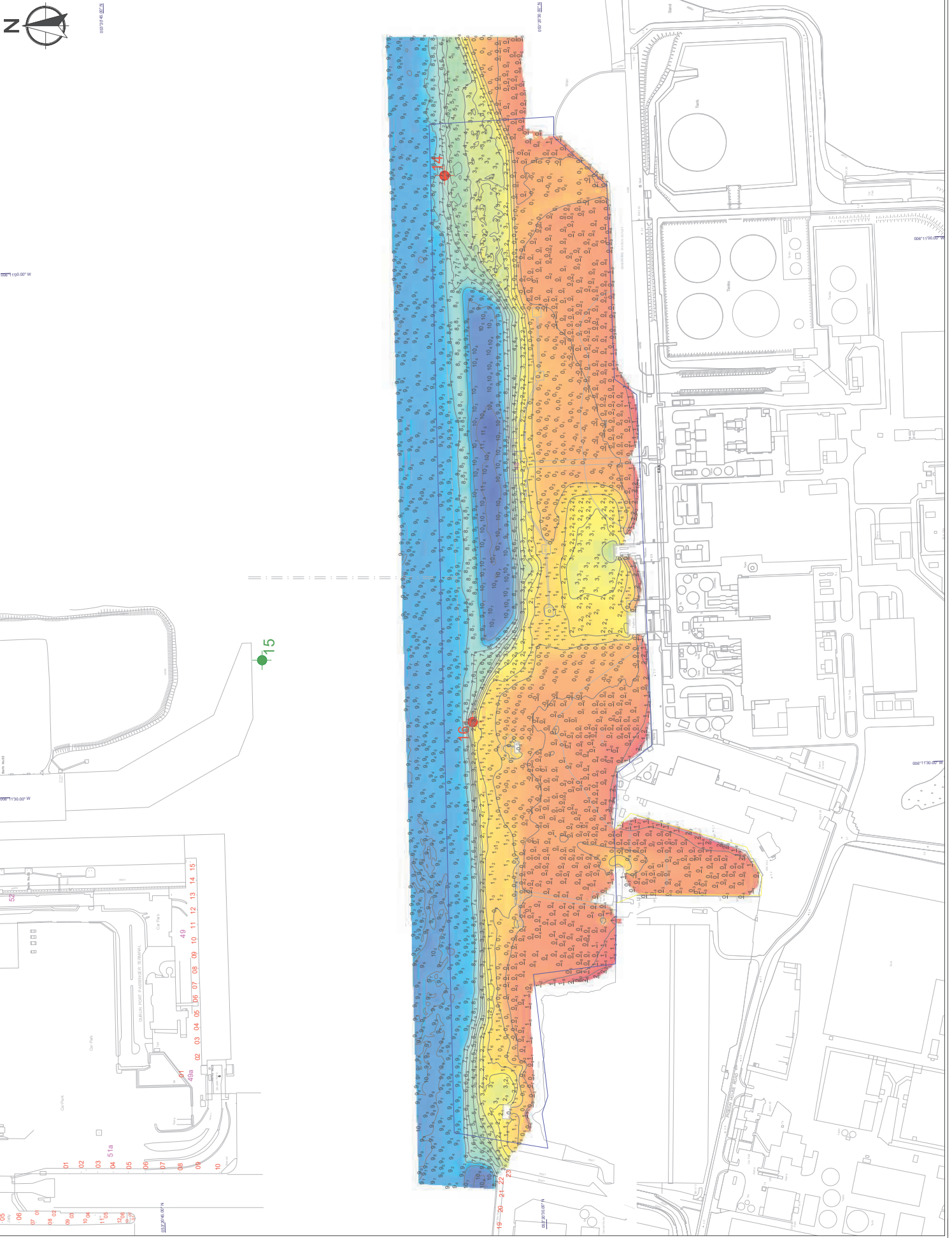
Drawing revision

Date	Rev.	Description	Drawn By
23/11/2022	0	Issue	TD

HYDROMASTER LTD
 11 Maple Court, Dublin Road
 Shankill, Co. Galway
 T: 013 9390100
 E: info@hydromaster.ie
 W: www.hydromaster.ie

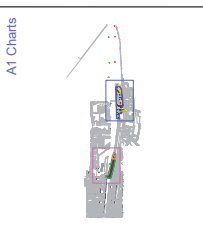
**COMHLACHT CHIALFORT
 ATHA CLAIH
 DUBLIN PORT COMPANY**

Drawing Information
 Client: Dublin Port Company
 Project: Dublin Port Archeology Project
 Drawing Title: Bathymetry Zones 3 & 4 - November 2022
 Issue: 2022_01_DP_Archeo_001
 Scale: A1 (8/11000)
 Drawing No.: 24/11/2022
 Drawing: TD



Dublin Port - Archeo Geophysical - Side Scan Sonar targets position Zones 1 & 2 - November 2022

KEY PLAN



LEGEND



- Vessel tracklines
- Navigation Buoys
- SSS Targets
- Zone 1
- Zone 2
- Zone 3
- Zone 4

Scale



GENERAL NOTES

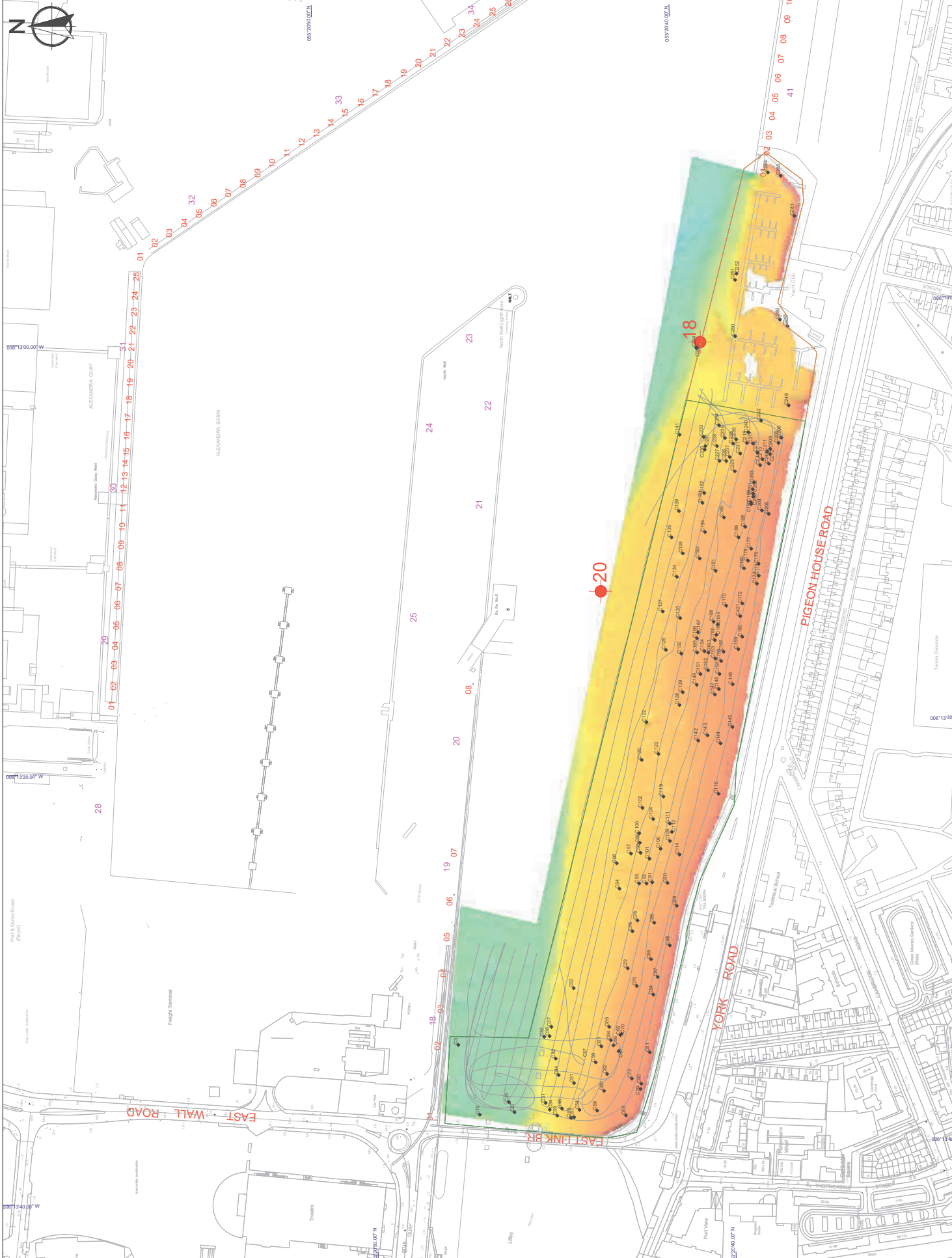
Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey method: Side Scan Sonar
 Survey Date: 16th, 17th & 25th November 2022

Drawing revision

Date	Rev	Description	Drawn By
09/01/2023	0	Issue	TD

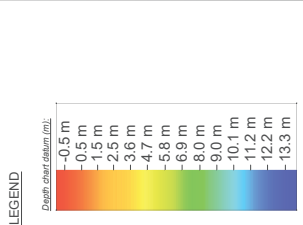
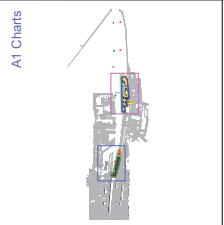


Client: Dublin Port Company
 Project: Dublin Port Archeology Project
 Drawing Title: Side Scan Sonar position Zones 1 & 2
 Date: 20th Nov 2022
 Scale: A1 @ 1:1000
 Drawing: TD



Dublin Port - Archeo Geophysical - Side Scan Sonar targets position zones 3 & 4 - November 2022

KEY PLAN



GENERAL NOTES

Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey Method: Side Scan Sonar
 Survey Date: 16th, 17th & 25th November 2022

Drawing revision

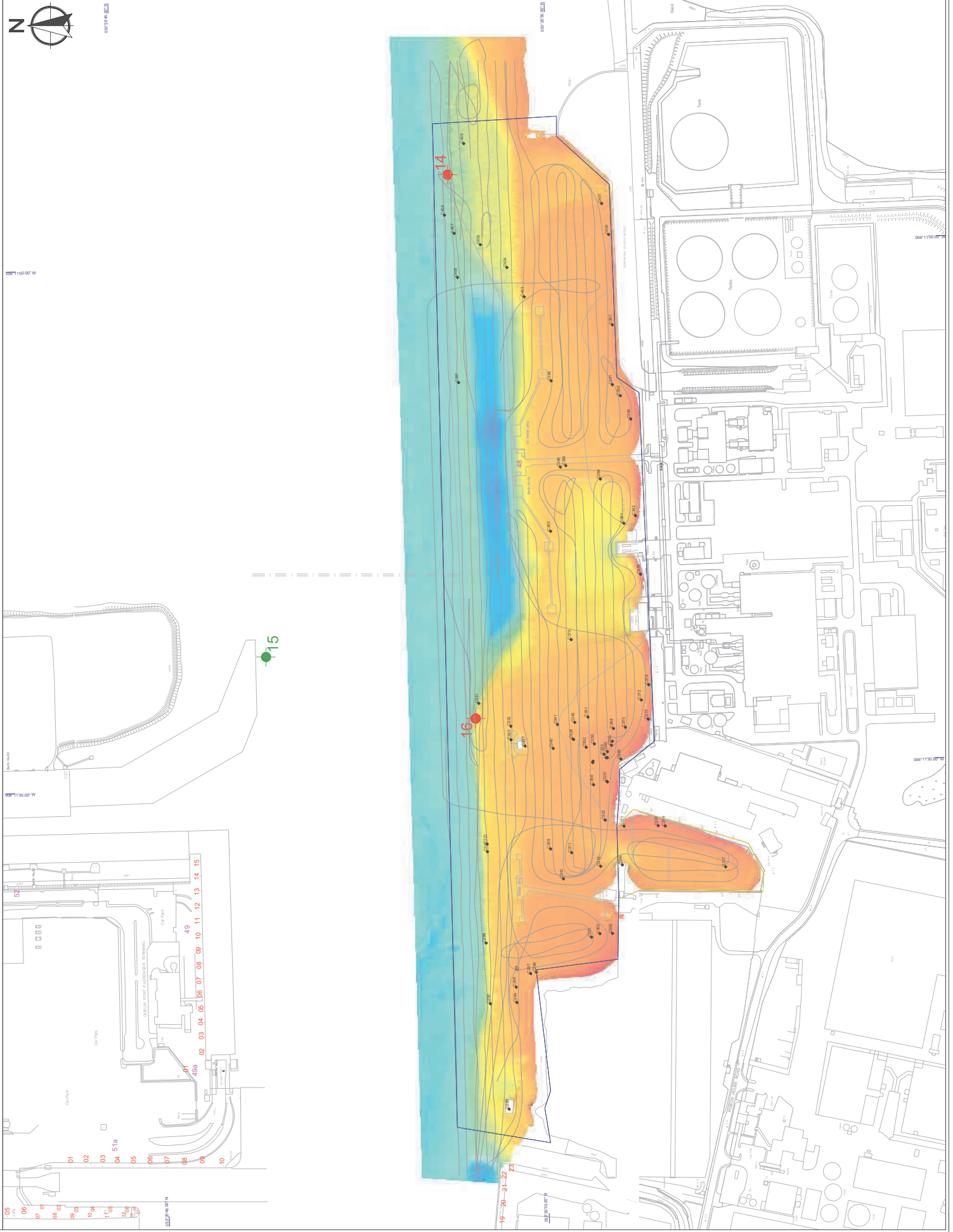
Date	Rev	Description	Drawn By
09/01/2023	0	Issue	TD

HYDROMASTER LTD
 1 Mackey Court, Dublin Road
 Dunmore, Co. Galway
 T: 093 8609049
 E: info@hydromaster.ie
 www.hydromaster.ie

**COMHLACHT CHIALFORT
 ATHA CLIAITH
 DUBLIN PORT COMPANY**

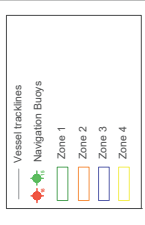
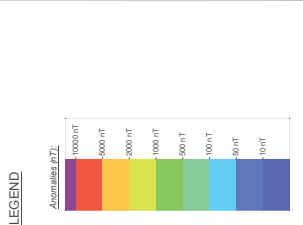
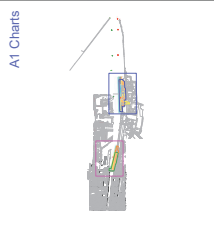
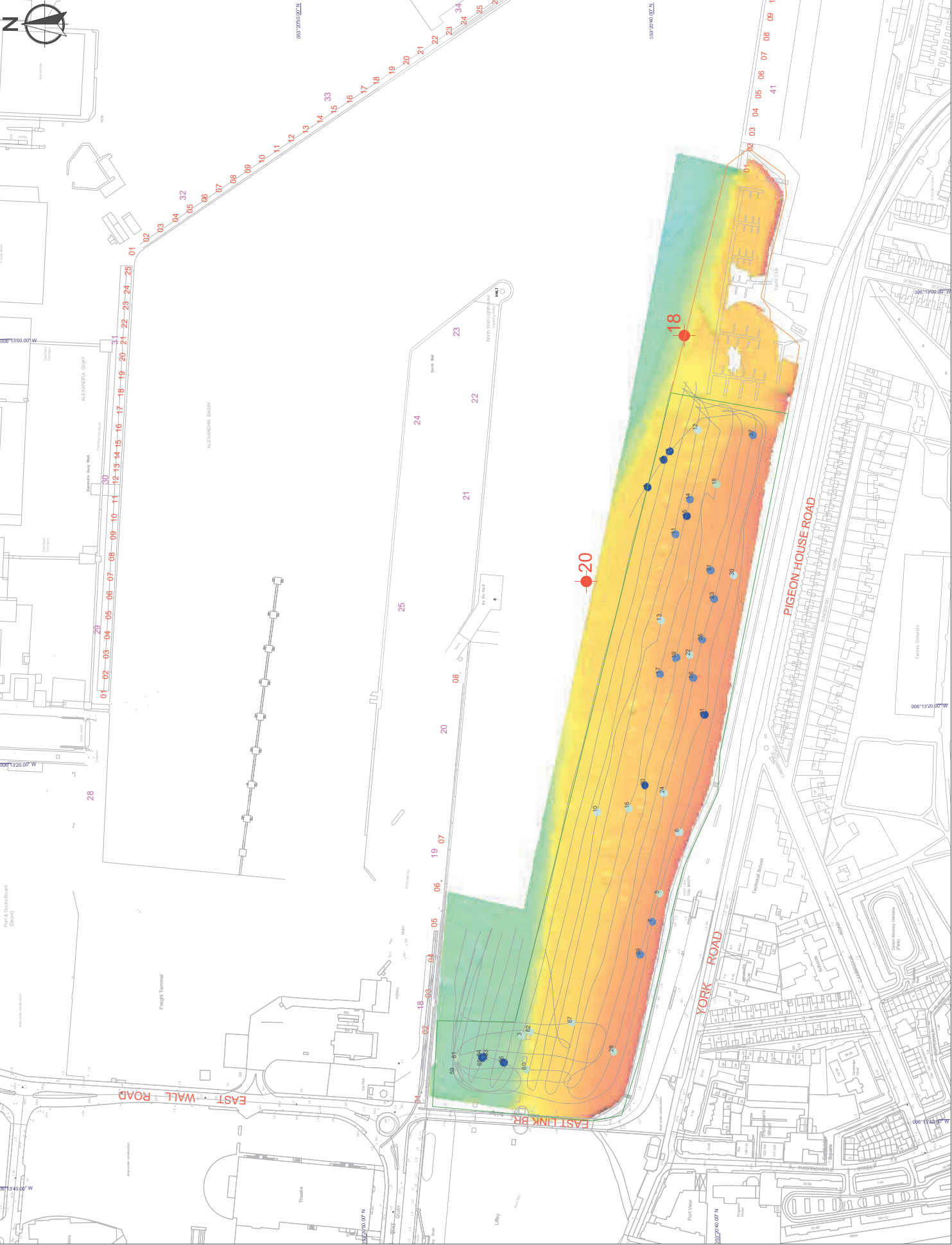
Drawing Information

Client: Dublin Port Company
 Project: Dublin Port Archeology Project
 Drawing Title: Side Scan Sonar Targets Zones 3 & 4
 Issue: 2023_01_09_Archeo_001
 Scale: A1 @ 1:1000
 Drawing No: 00/01/2023
 Drawing: TD



Dublin Port - Archeo Geophysical - Magnetic anomalies Zones 1 & 2 - November 2022

KEY PLAN



GENERAL NOTES

Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey Method: Minis Magnetometer
 Survey Date: 16th, 17th & 26th November 2022

Drawing revision

Date	Rev	Description	Drawn By
29/11/2022	0	Issue	TD

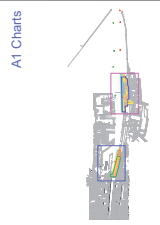


COMHLAHT CHALAFORT
ATHA CLIAITH
DUBLIN PORT COMPANY

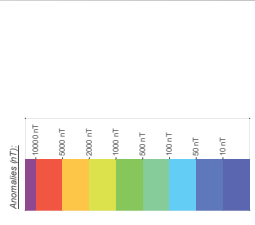
Drawing Information
 Client: Dublin Port Company
 Project: Dublin Port Archeology Project
 Drawing Title: Magnetic anomalies Zones 1 & 2
 Date: 29/11/2022
 Scale: A1 @ 1:1000
 Drawing No: 2011_DP_Archeo_001
 Drawing Date: 29/11/2022
 Drawing: TD

Dublin Port - Archeo Geophysical - Magnetic anomalies Zones 3 & 4 - November 2022

KEY PLAN



LEGEND



- Vessel Tracklines
- Navigation Buoy
- Zone 1
- Zone 2
- Zone 3
- Zone 4

GENERAL NOTES

Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey Method: Minis Magnetometer
 Survey Date: 16th, 17th & 26th November 2022

Drawing revision

DATE	REV	DESCRIPTION	DRAWN BY
28/11/2022	0	Issue	TD



Drawing Information

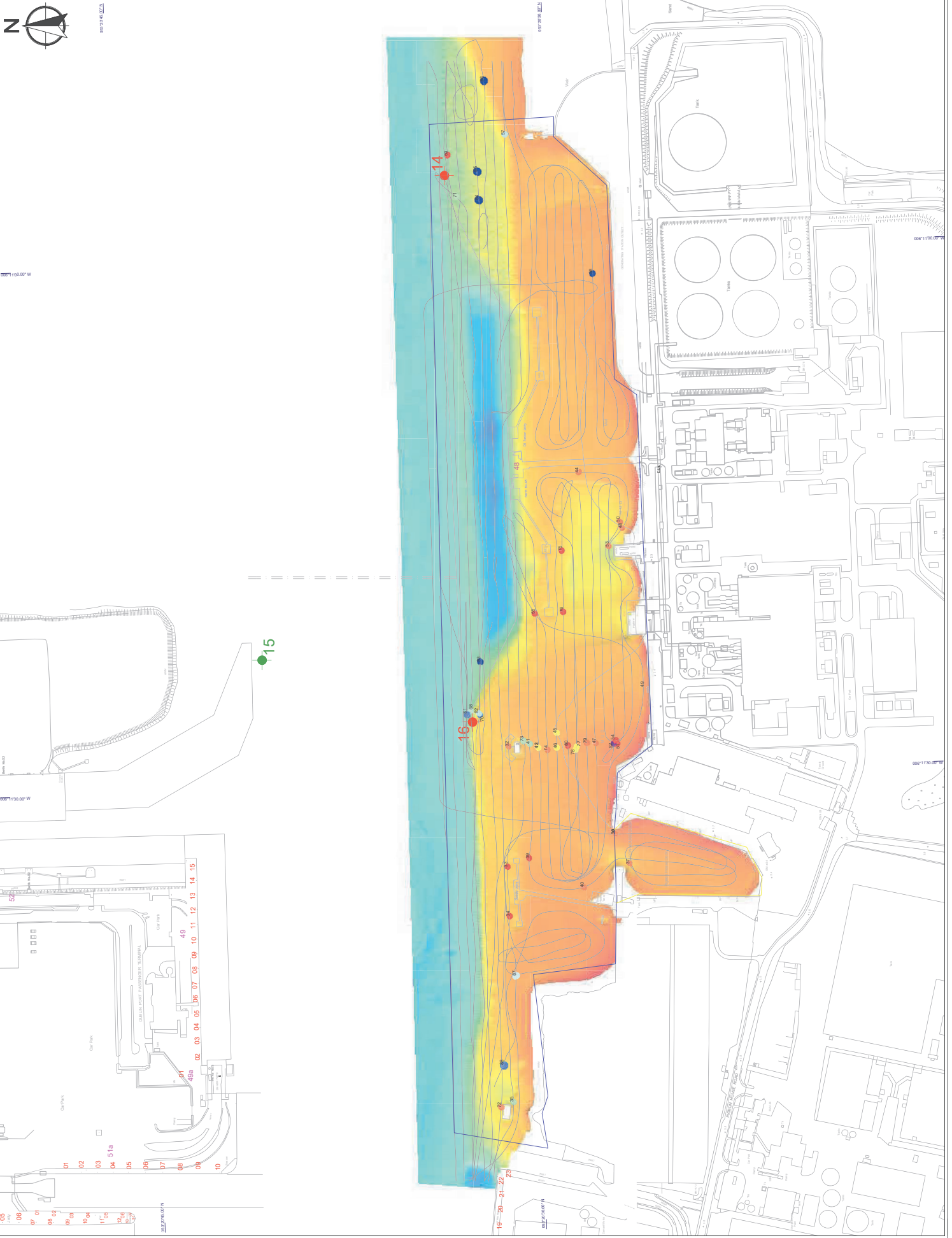
Client: Dublin Port Company

Project: Dublin Port Archeology Project

Drawing Title: Magnetic anomalies Zones 3 & 4 -

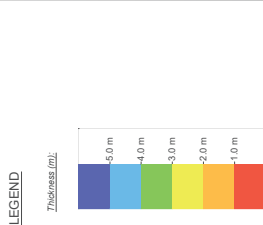
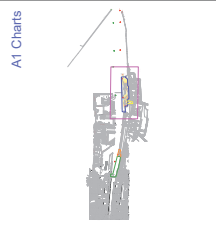
Scale: A1 (8) 1:1000

Drawn By: TD



Dublin Port - Archeo Geophysical - Isopach Zones 3 & 4 - November 2022

KEY PLAN



Vessel tracklines
 Navigation Buoys
 Zone 1
 Zone 2
 Zone 3
 Zone 4

Scale
 0 18.0 72.0
 144.0 m

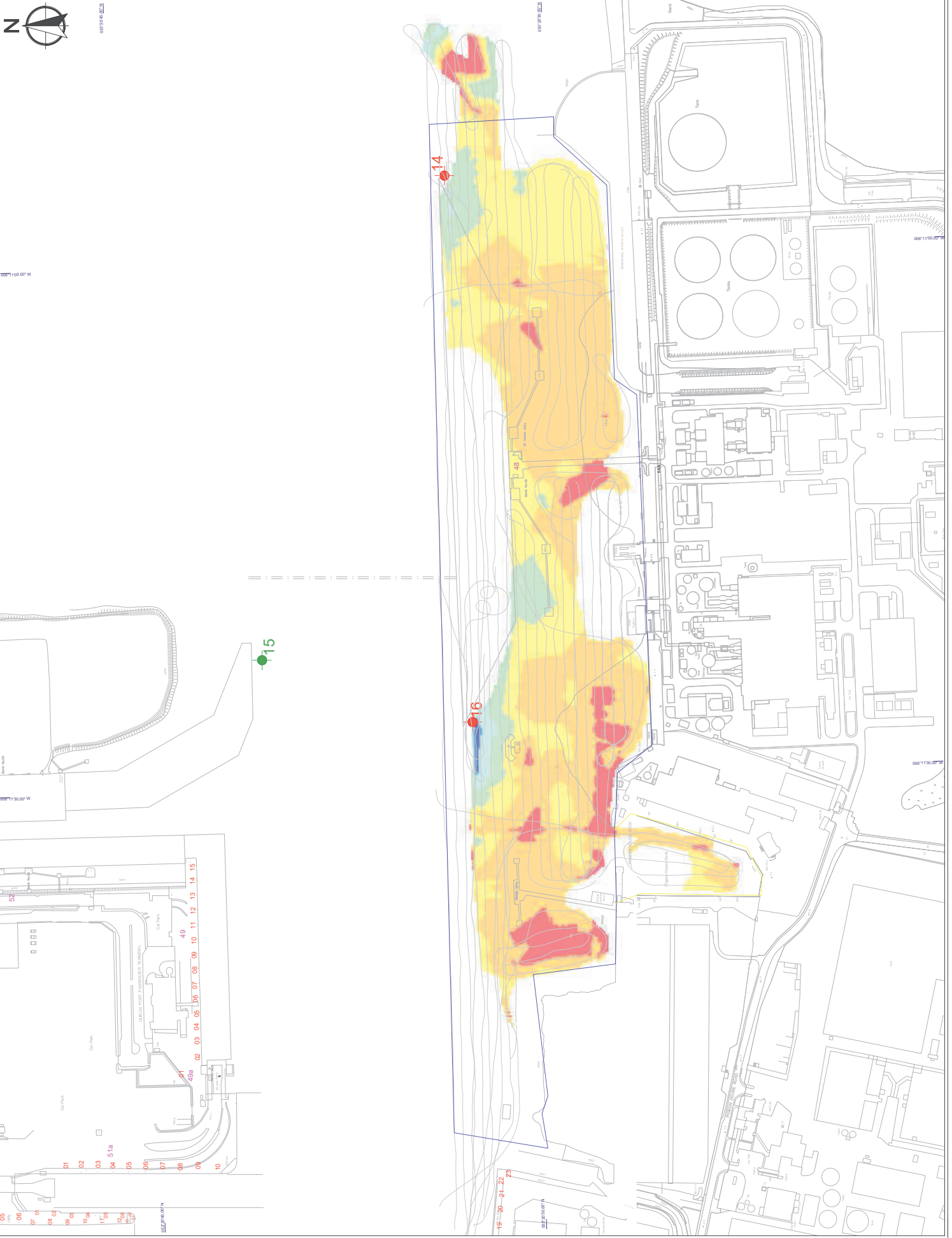
GENERAL NOTES
 Projection: Geographic - WGS84
 Survey Location: Dublin Port
 Survey Date: 16th, 17th & 26th November 2022

Drawing revision:

DATE	REV	DESCRIPTION	DRAWN BY
20/11/2022	0	Issue	TD



Drawing Information
 Client: Dublin Port Company
 Project: Dublin Port Archeology Project
 Drawing Title: Isopach Zones 3 & 4 - November 2022
 Date: 20/11/2022
 Scale: A1 (8) 1:1000
 Drawing No: 20/11/2022



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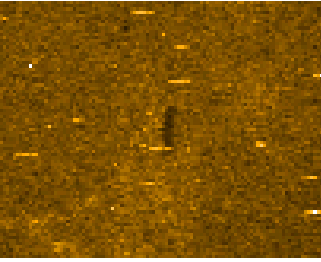
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16

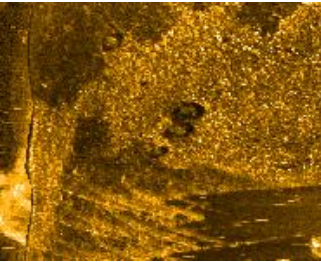
14

Appendix 2 - 2211_Dublin_Sidescan_contacts_Pictures

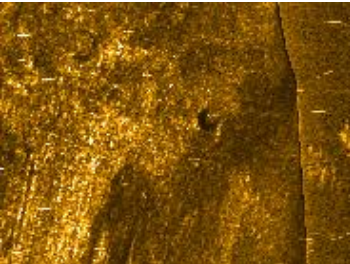
- Target 3: Boulder



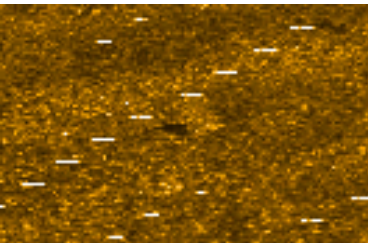
- Target 15: Tyres



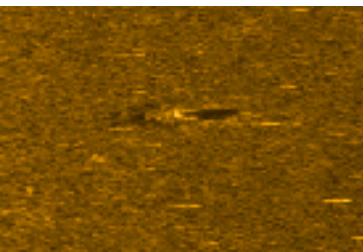
- Target 25: Boulder



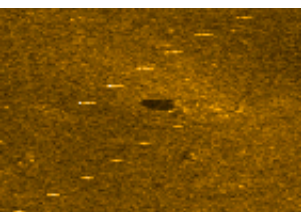
- Target 27: Boulder



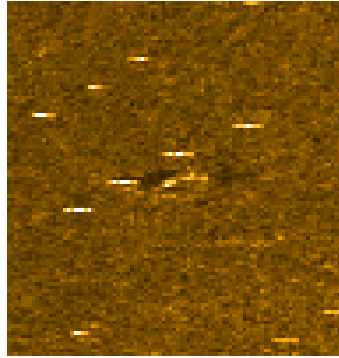
- Target 31: Boulder



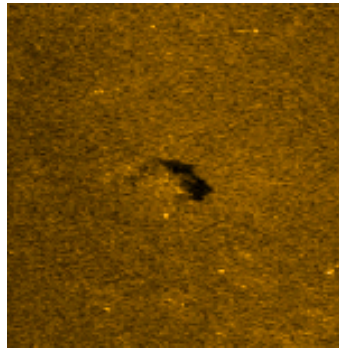
- Target 33: Boulder



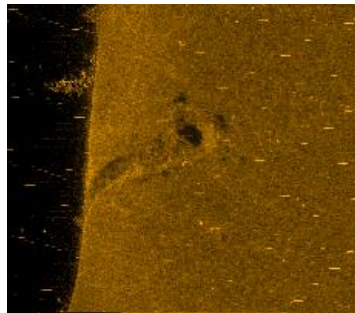
- Target 34: Boulder



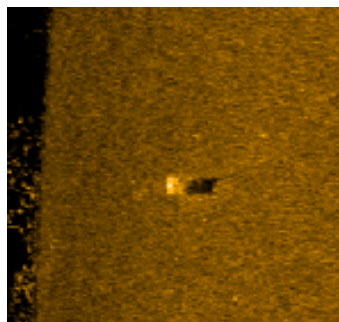
- Target 36: Boulder



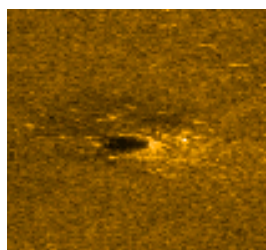
- Target 37: Dredge mark



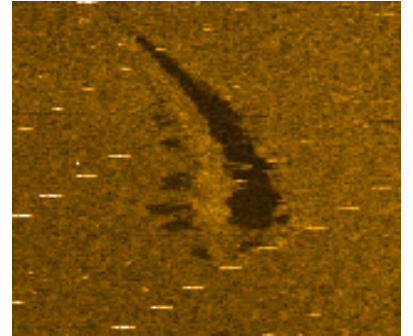
- Target 39: Boulder



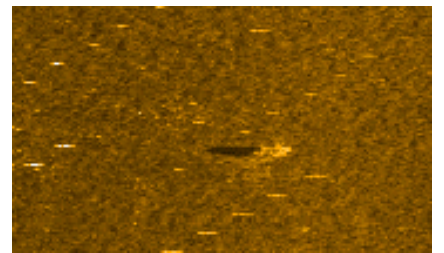
- Target 42: NI debris



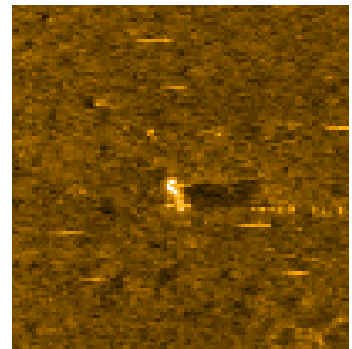
- Target 44: Dredge mark



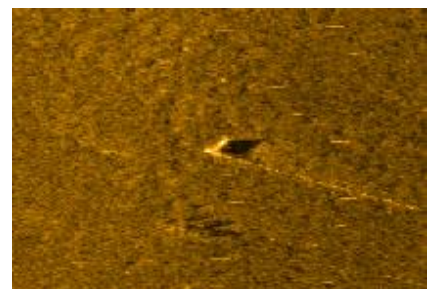
- Target 46: Boulder



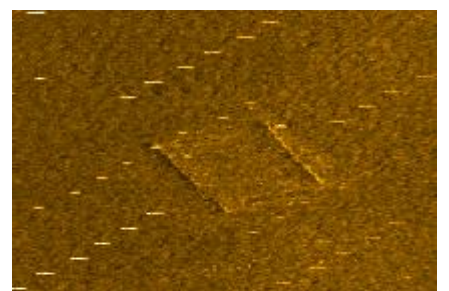
- Target 49: Boulder



- Target 50: Boulder

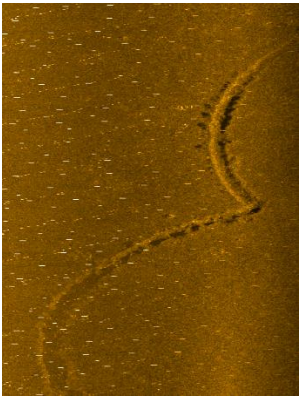


- Target 51: Block

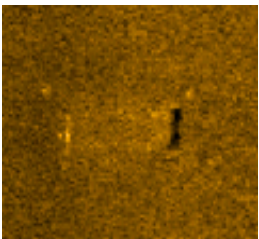


Appendix 2 - 2211_Dublin_Sidescan_contacts_Pictures

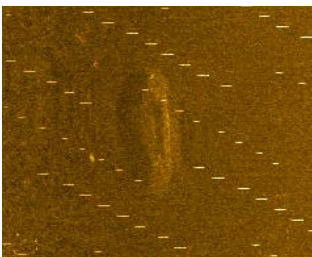
- Target 53: Dredge mark



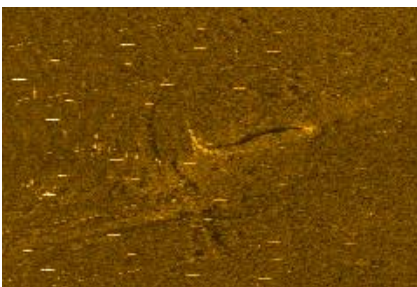
- Target 54: Block



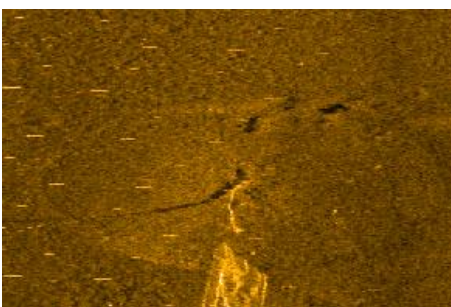
- Target 57: NI debris



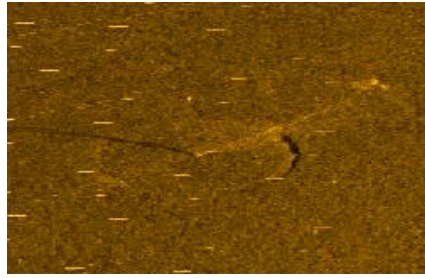
- Target 58: Rope or chain



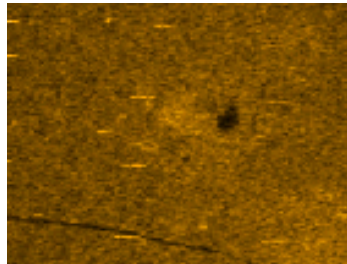
- Target 59: Mooring with chain



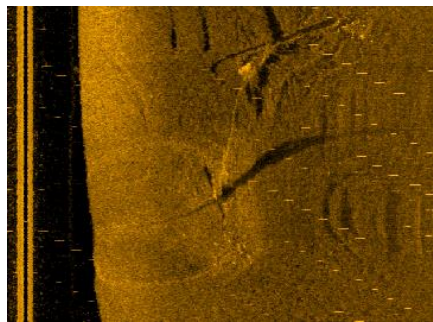
- Target 60: Mooring with chain



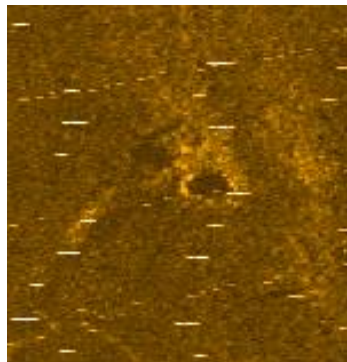
- Target 61: NI debris



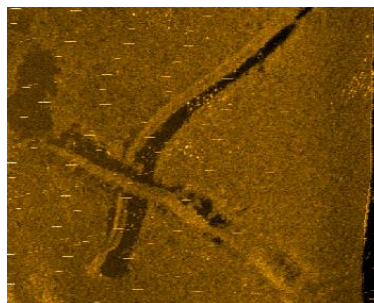
- Target 62: Mooring



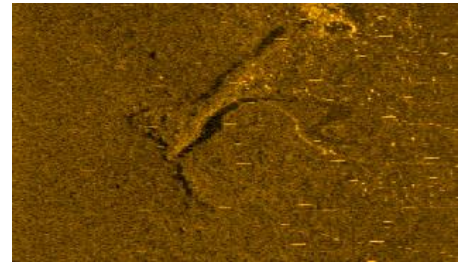
- Target 64: NI debris



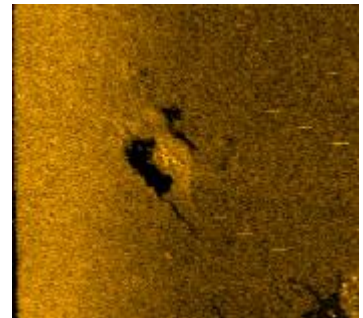
- Target 65: Dredge mark



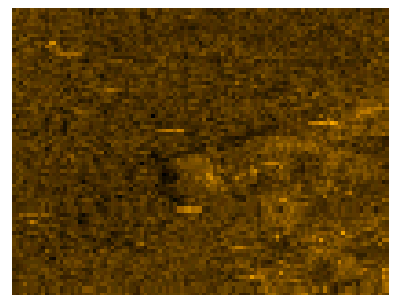
- Target 66: Rope or chain



- Target 67: NI debris



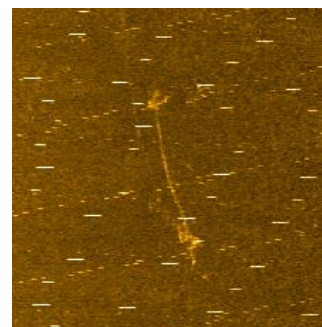
- Target 68: NI debris



- Target 69: Mooring with chain

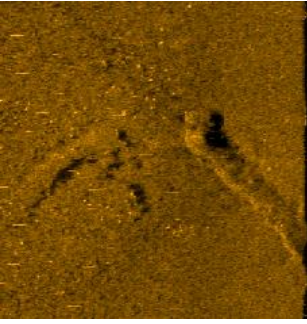


- Target 70: Rope or chain

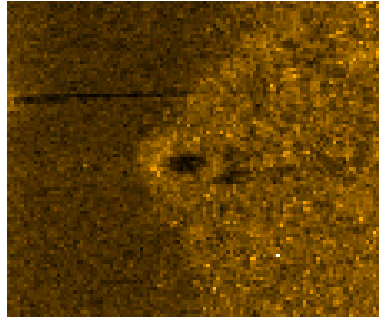


Appendix 2 - 2211_Dublin_Sidescan_contacts_Pictures

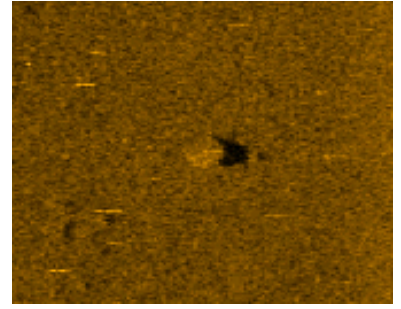
- Target 72: Dredge mark



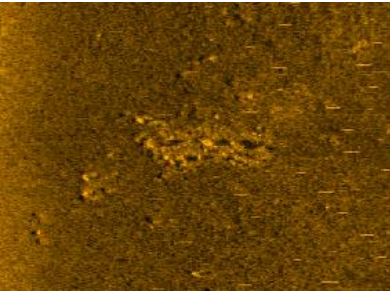
- Target 79: Tyre



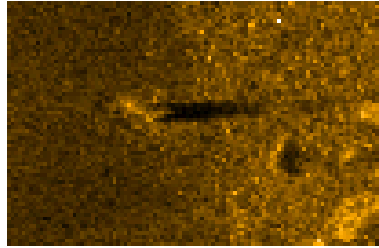
- Target 85: NI debris



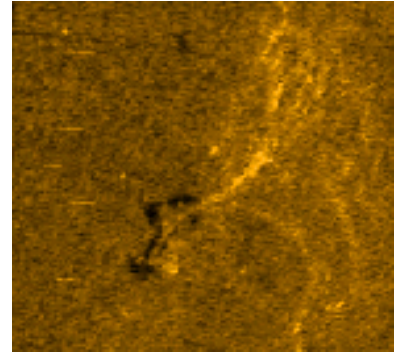
- Target 73: Boulder



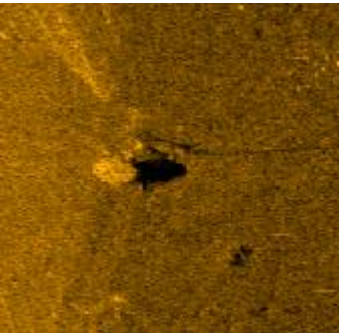
- Target 80: Boulder



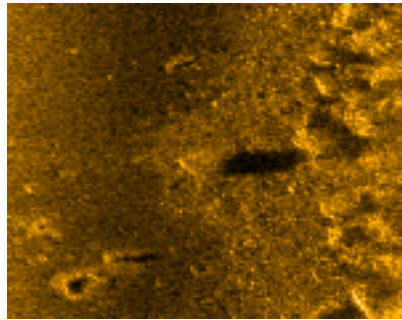
- Target 86: Chain or rope



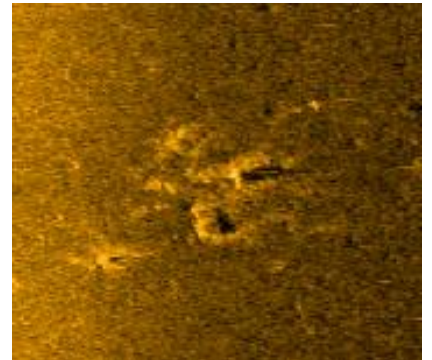
- Target 75: Boulder



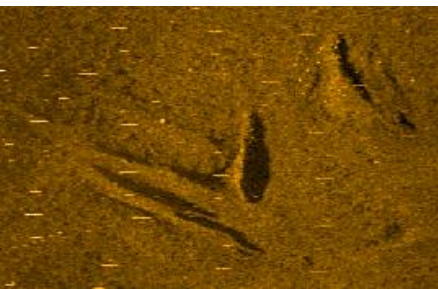
- Target 81: Boulder



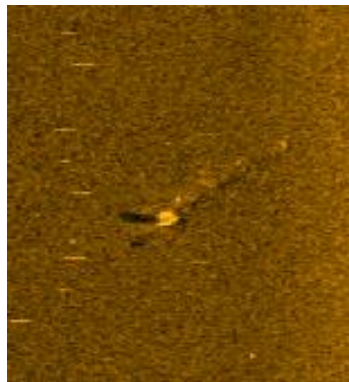
- Target 87: Boulder field



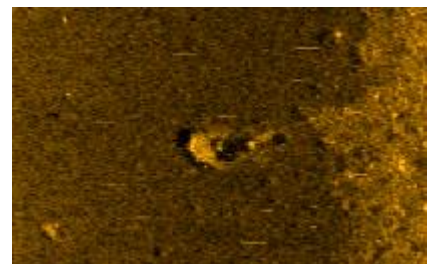
- Target 76: NI debris



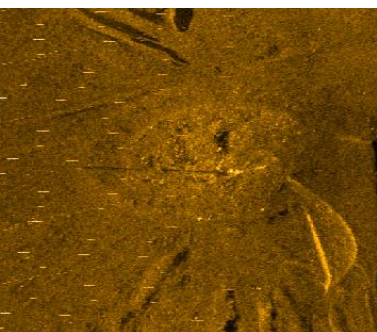
- Target 82: Boulder



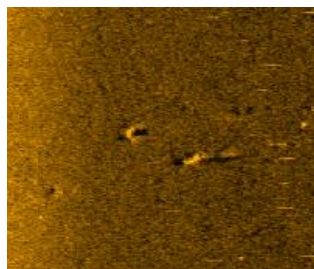
- Target 88: Boulder



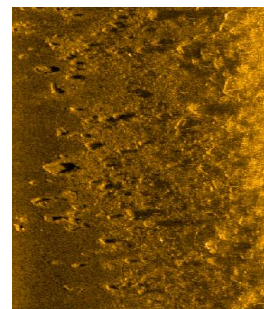
- Target 78: Mooring



- Target 84: Boulder

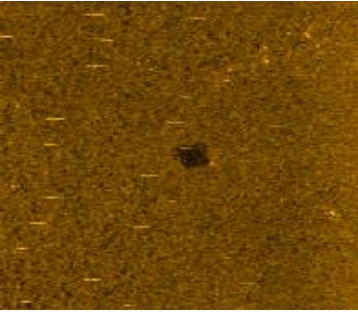


- Target 89: Boulder field

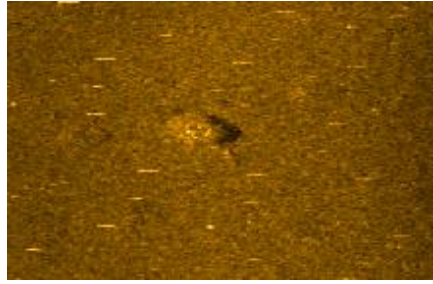


Appendix 2 - 2211_Dublin_Sidescan_contacts_Pictures

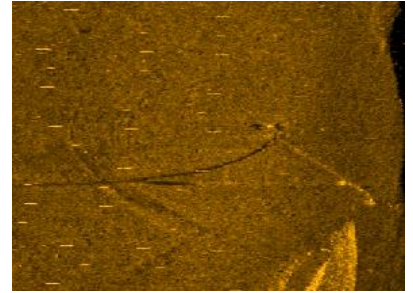
- Target 90: Boulder



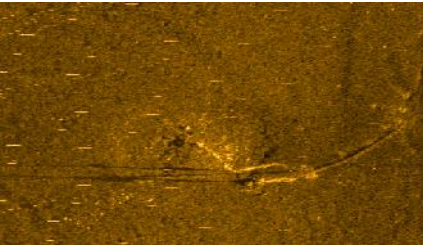
- Target 97: NI debris



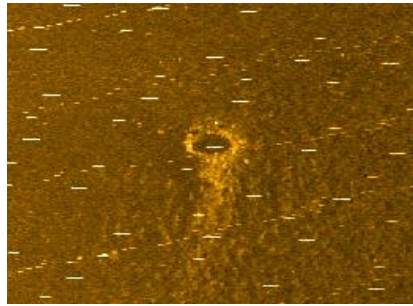
- Target 102: Chain or rope



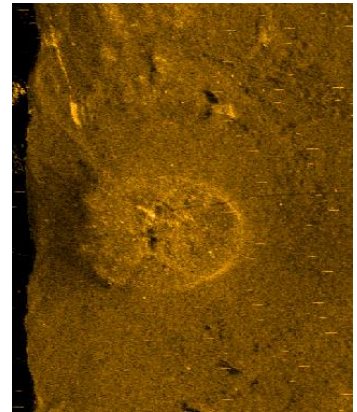
- Target 92: Chain or rope



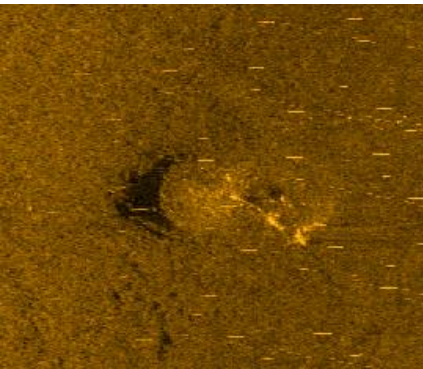
- Target 98: NI debris



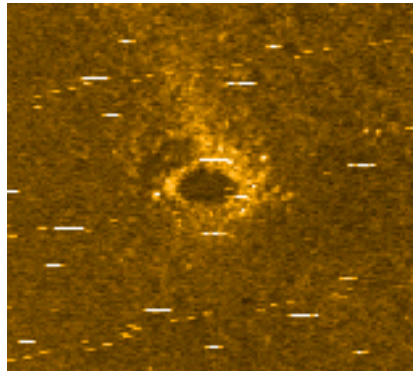
- Target 104: Mooring



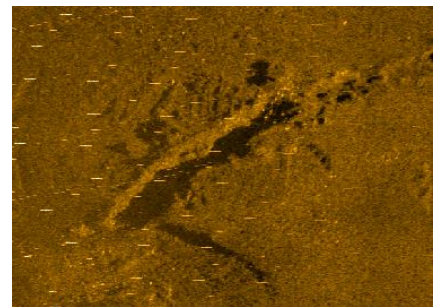
- Target 93: Mooring



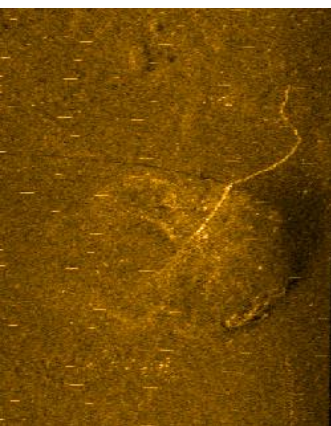
- Target 99: NI debris



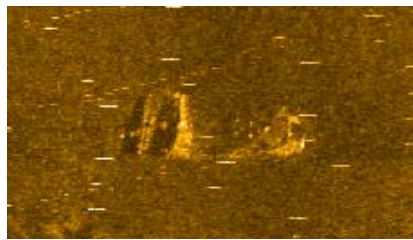
- Target 106: Dredge mark



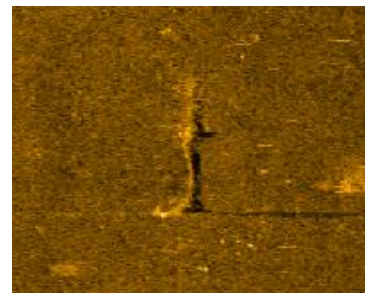
- Target 94: Mooring



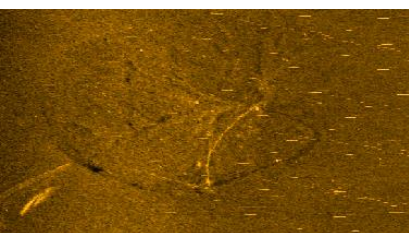
- Target 100: Boulder



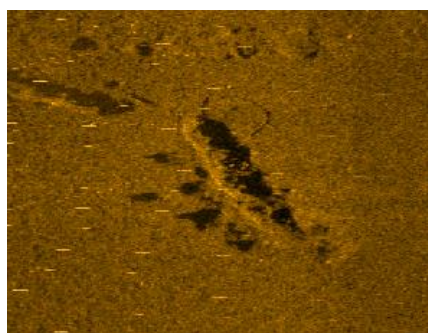
- Target 109: Chain or rope



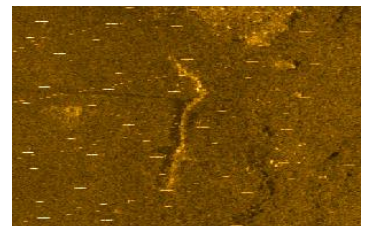
- Target 96: Chain or rope



- Target 101: Dredging mark

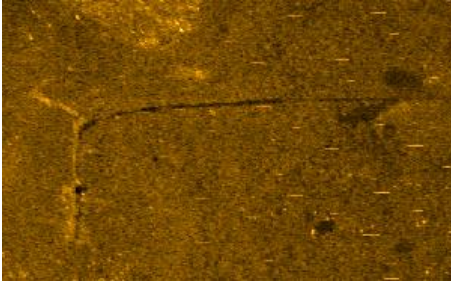


- Target 111: Chain or rope

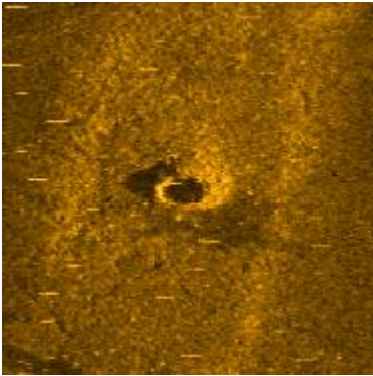


Appendix 2 - 2211_Dublin_Sidescan_contacts_Pictures

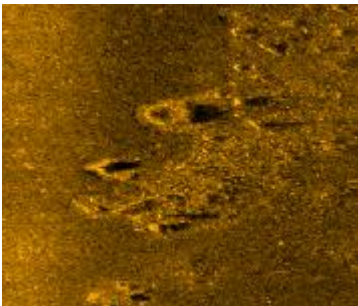
- Target 112: Rope or chain



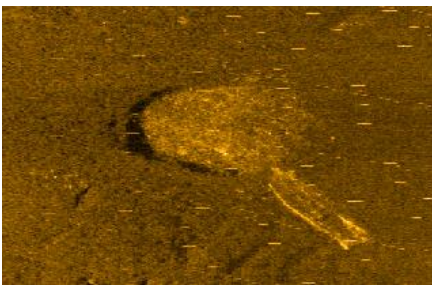
- Target 114: Tyre



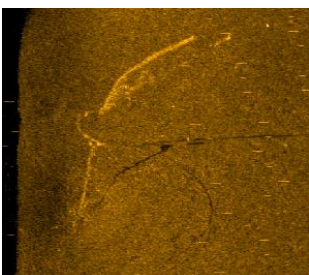
- Target 116: Boulder field



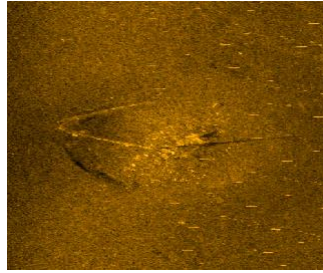
- Target 119: Mooring



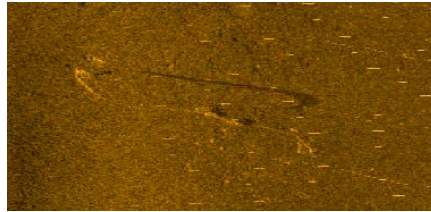
- Target 120: Chain or rope



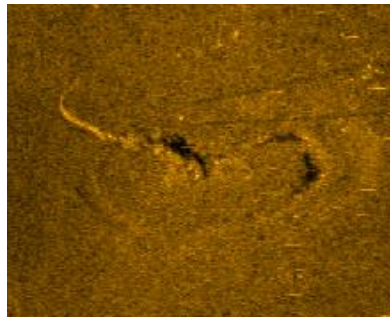
- Target 122: Mooring



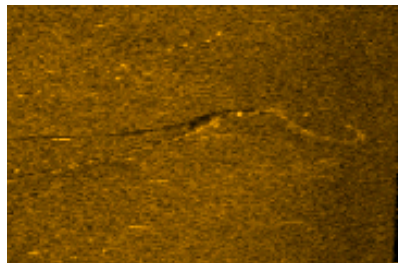
- Target 123: Chain or rope



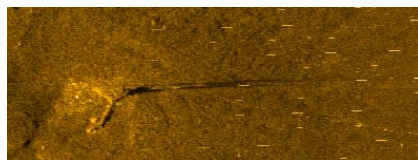
- Target 126: Mooring



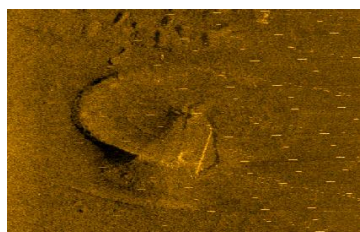
- Target 127: Chain



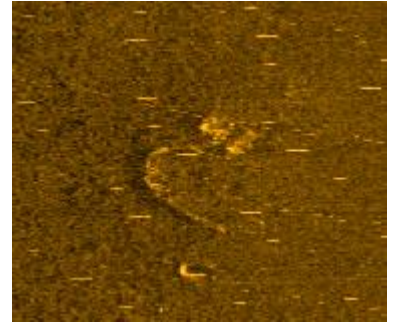
- Target 128: Mooring with chain



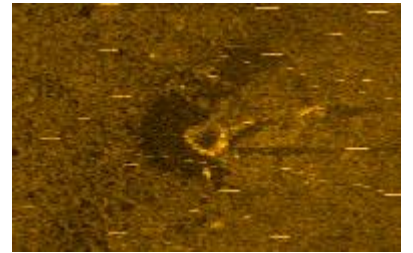
- Target 129: Mooring



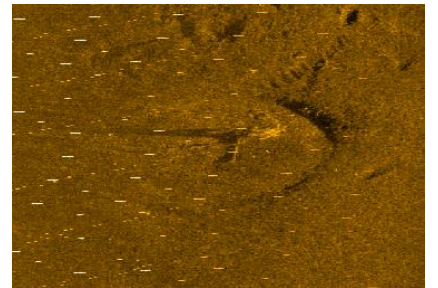
- Target 132: NI debris



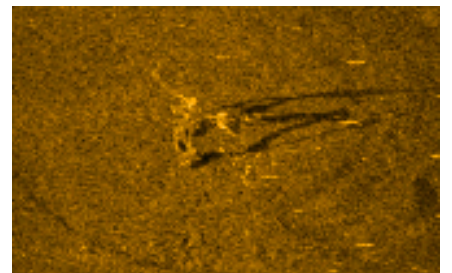
- Target 133: NI debris



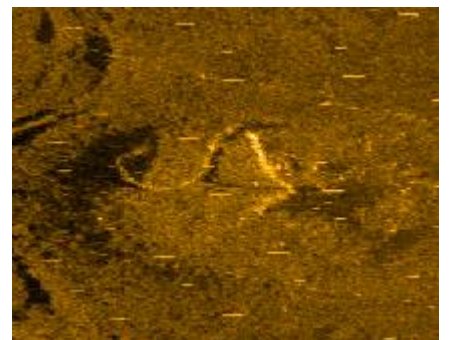
- Target 134: Mooring



- Target 135: Chain or rope

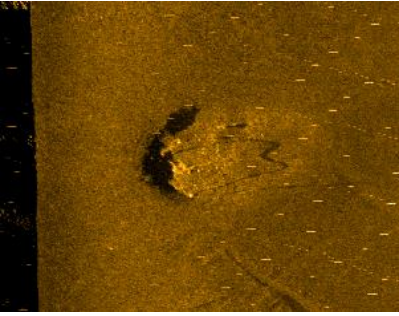


- Target 138: Chain or rope

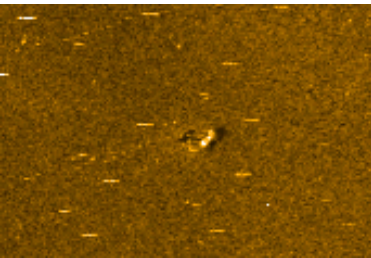


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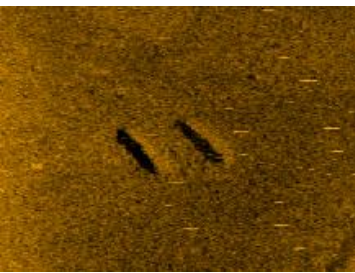
- Target 139: NI Debris



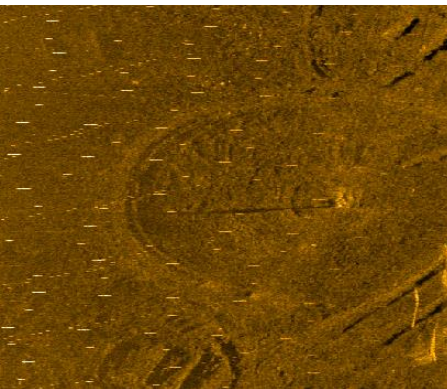
- Target 141: Boulder



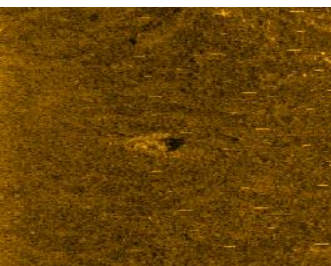
- Target 142: Marking



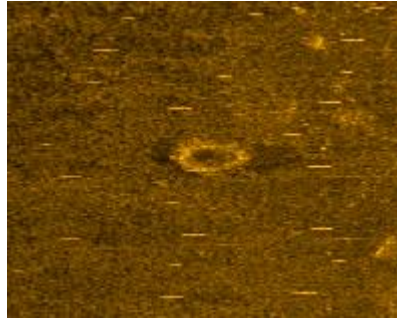
- Target 143: Mooring



- Target 144: Boulder



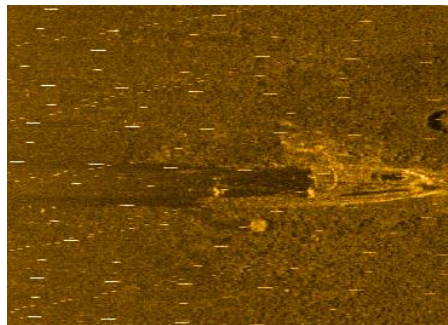
- Target 145: Tyre



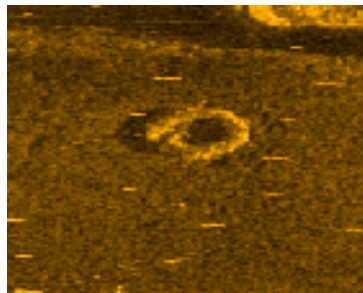
- Target 146: Boulder



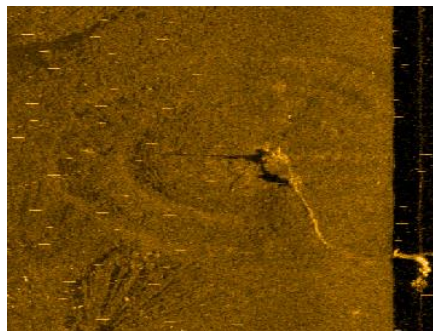
- Target 147: Wreck



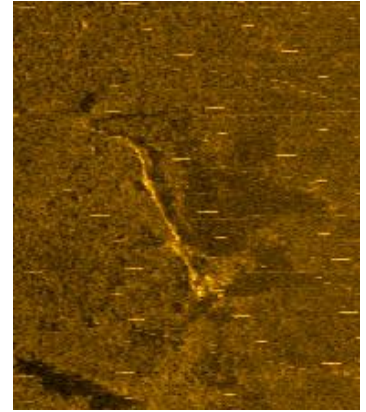
- Target 148: Tyre



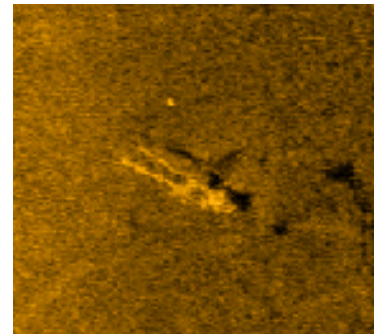
- Target 149: Mooring



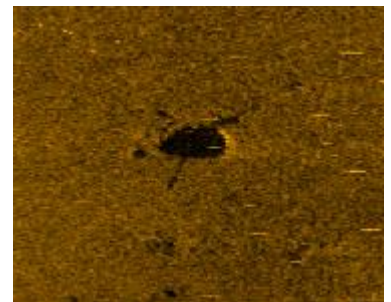
- Target 151: Chain or rope



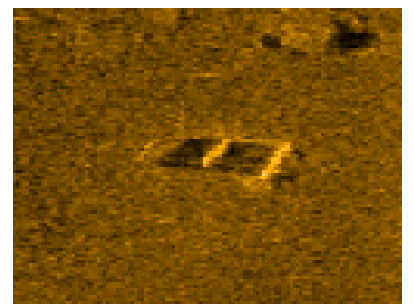
- Target 152: NI debris



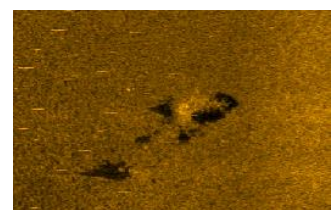
- Target 153: NI debris



- Target 154: Block

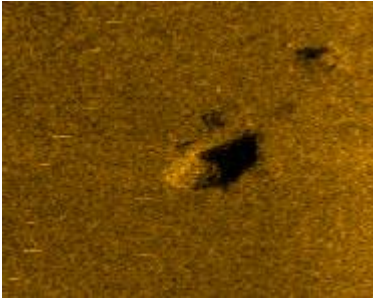


- Target 156: NI debris

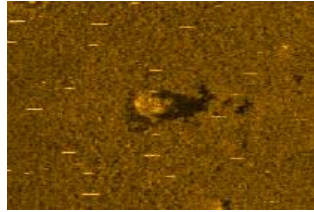


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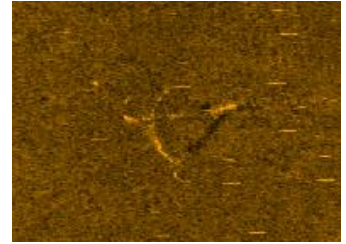
- Target 157: NI debris



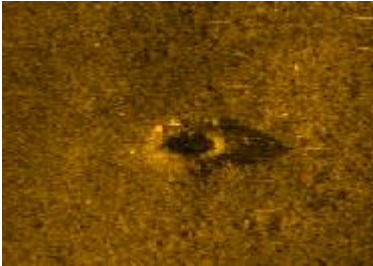
- Target 164: Boulder



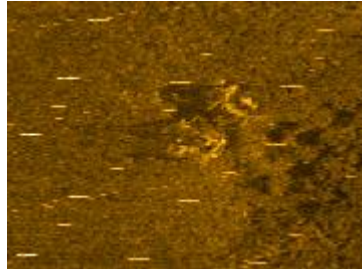
- Target 170: Anchor



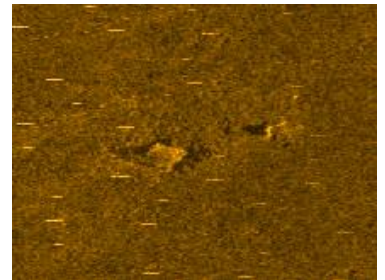
- Target 159: Tyre



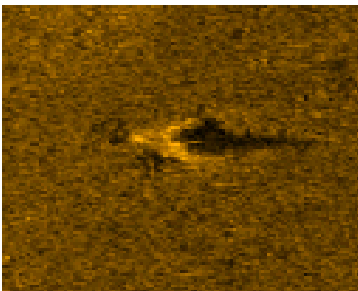
- Target 165: NI Debris



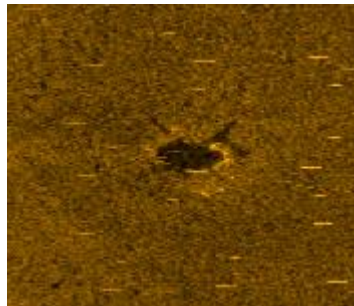
- Target 172: NI



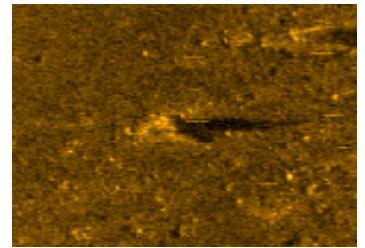
- Target 160: Boulder



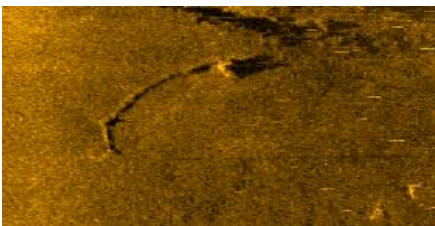
- Target 166: NI debris



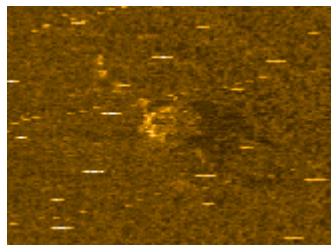
- Target 173: Boulder



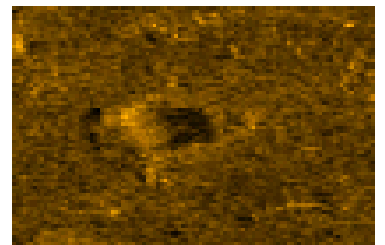
- Target 161: NI Debris



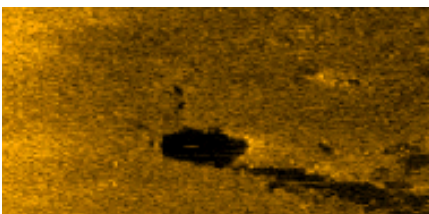
- Target 167: NI



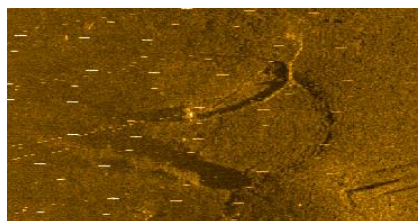
- Target 174: Boulder



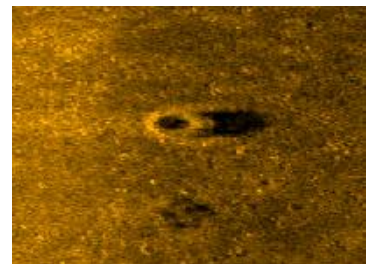
- Target 162: NI debris



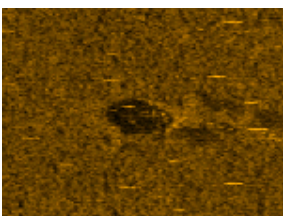
- Target 168: Chain or rope



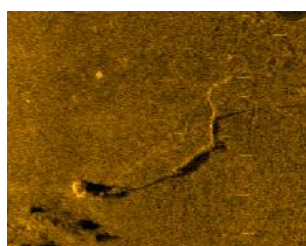
- Target 175: Tyre



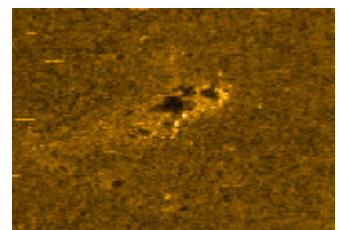
- Target 163: NI debris



- Target 169: Chain or rope

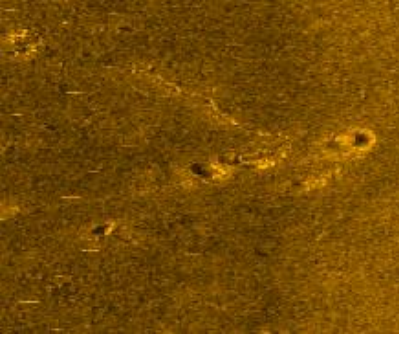


- Target 177: Boulder

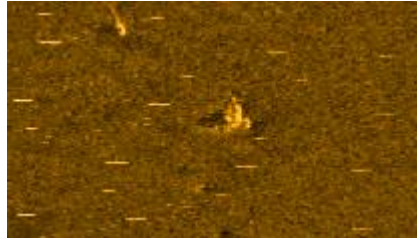


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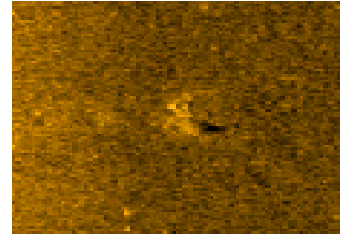
- Target 178: Boulder and mooring



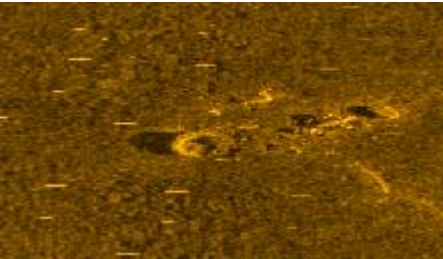
- Target 185: Boulder



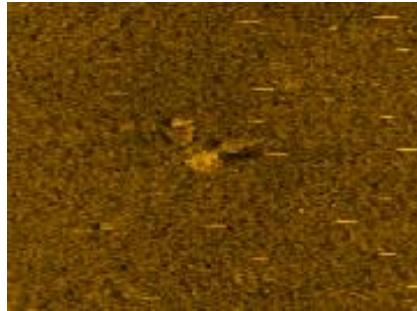
- Target 190: Boulder



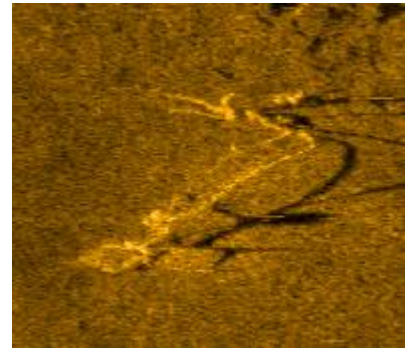
- Target 180: Boulder



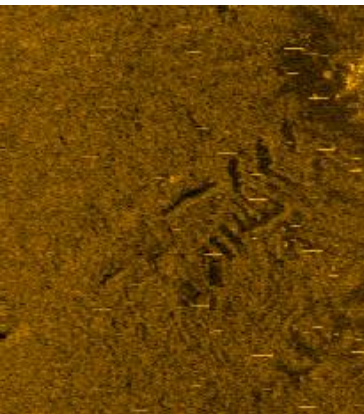
- Target 186: Boulder



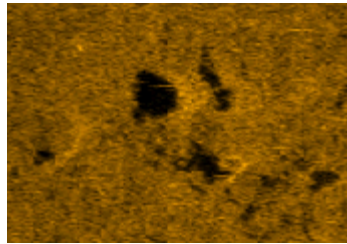
- Target 191: Mooring with chain



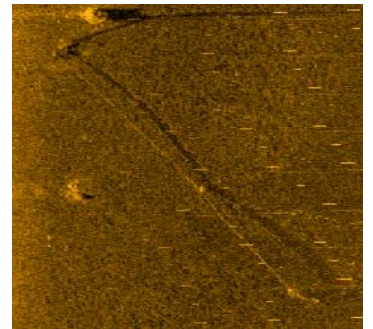
- Target 181: NI Debris



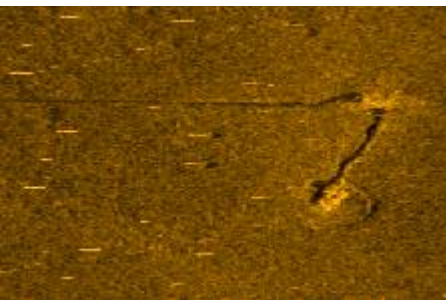
- Target 187: NI debris



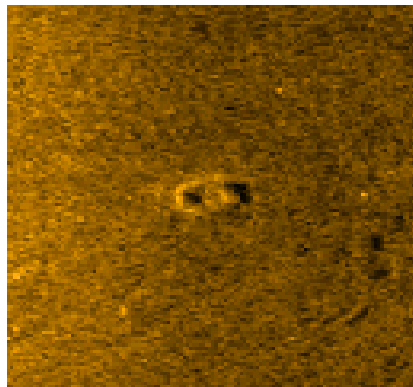
- Target 200: Chain or rope



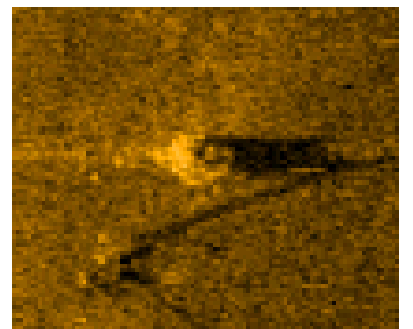
- Target 183: Chain or rope



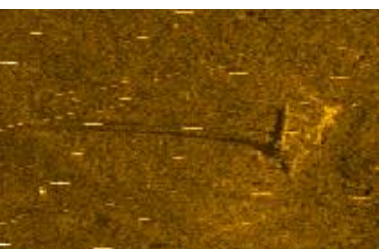
- Target 188: Boulder



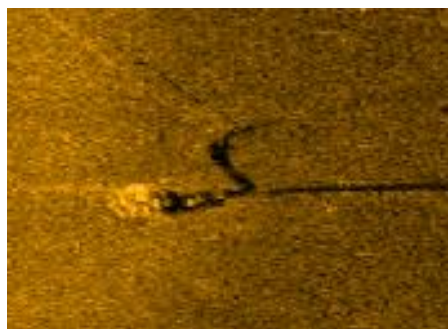
- Target 201: Boulder



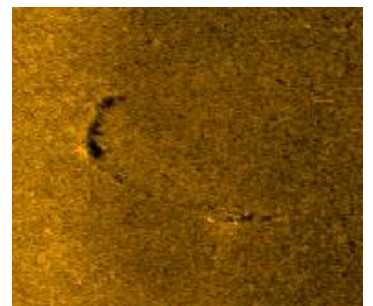
- Target 184: NI Debris



- Target 189: NI debris

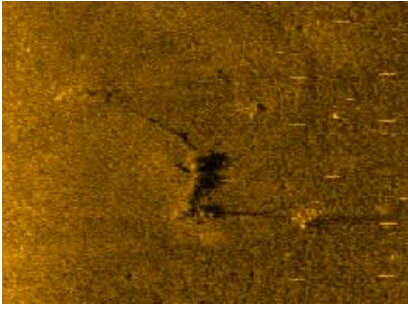


- Target 202: Chain or rope

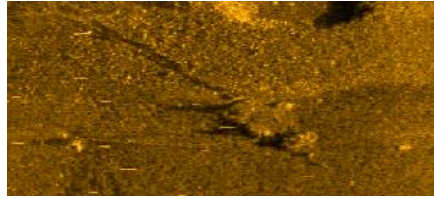


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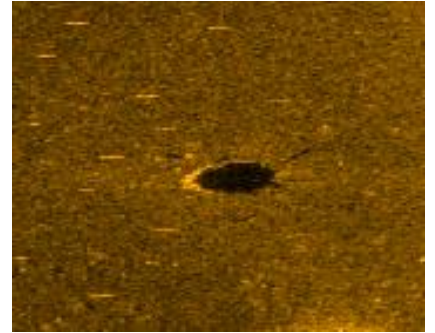
- Target 203: Chain or rope



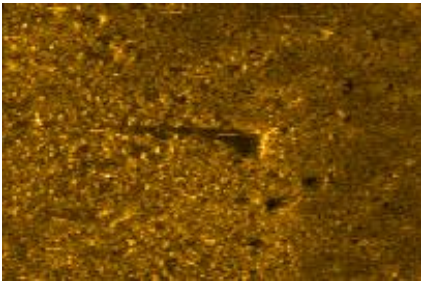
- Target 209: NI debris



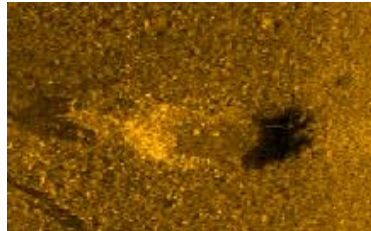
- Target 217: NI debris



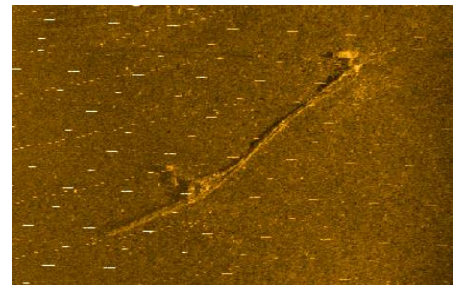
- Target 204: Boulder



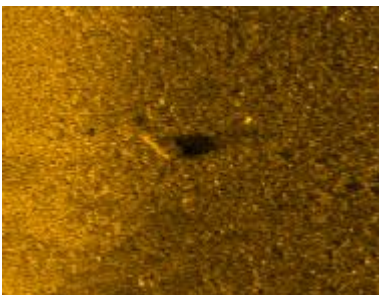
- Target 210: Mooring



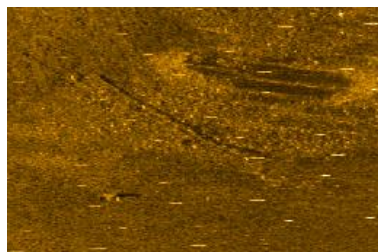
- Target 218: Linear NI debris



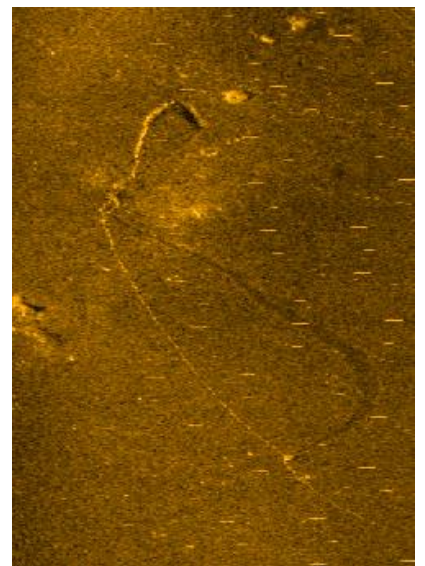
- Target 205: Boulder



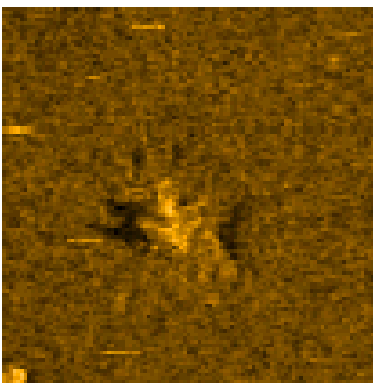
- Target 211: Linear NI debris



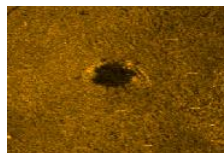
- Target 221: Chain or rope



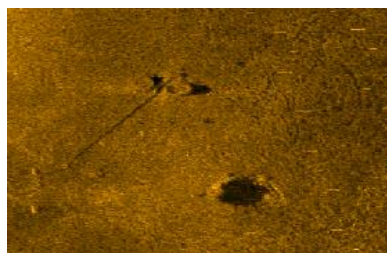
- Target 206: Boulder



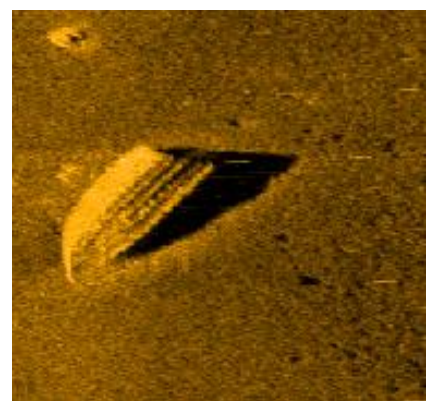
- Target 213: Boulder



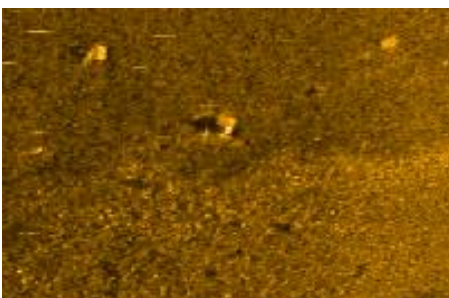
- Target 214: Mooring



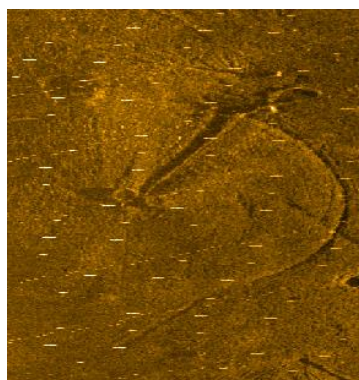
- Target 223: Wreck



- Target 208: Boulder

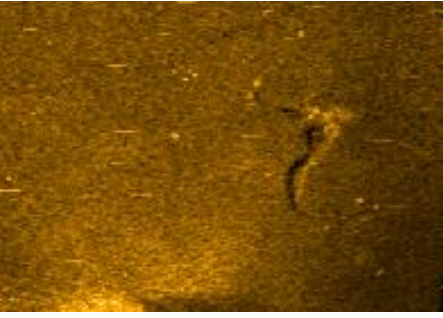


- Target 216: Chain or rope

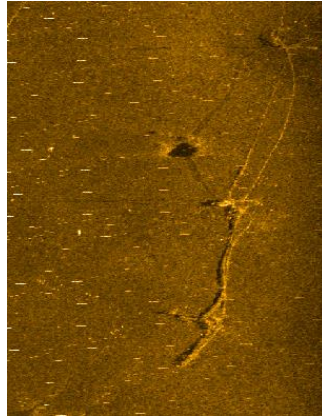


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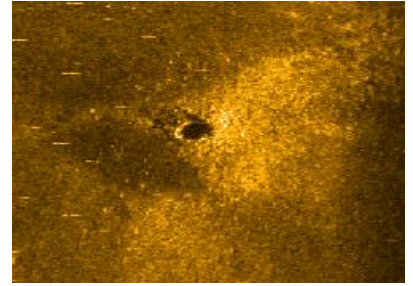
- Target 226: NI Debris



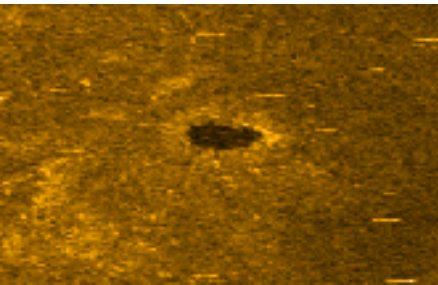
- Target 231: Chain or rope



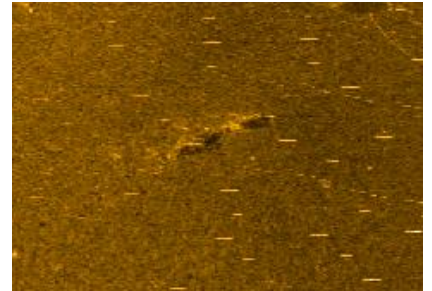
- Target 238: NI debris



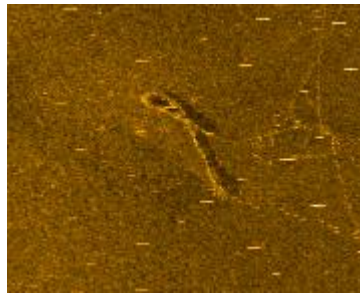
- Target 227: NI debris



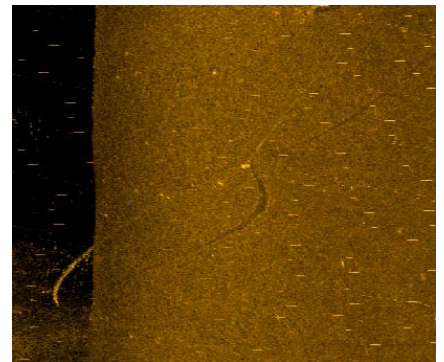
- Target 239: Debris



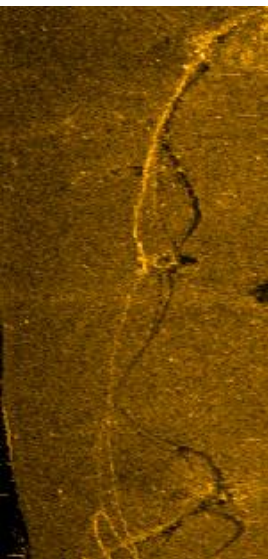
- Target 233: Rope



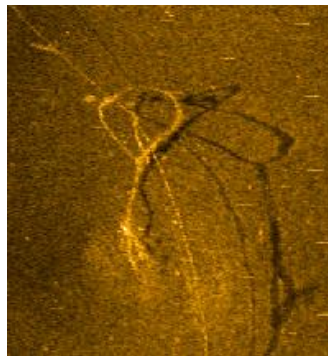
- Target 240: Rope



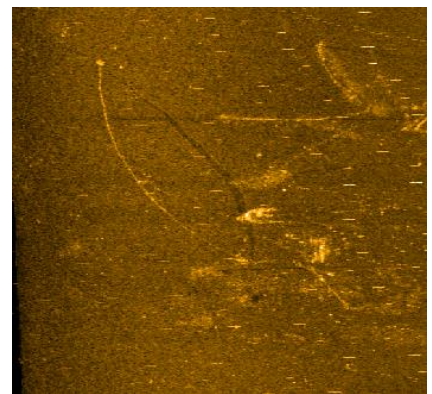
- Target 228: Chain or rope



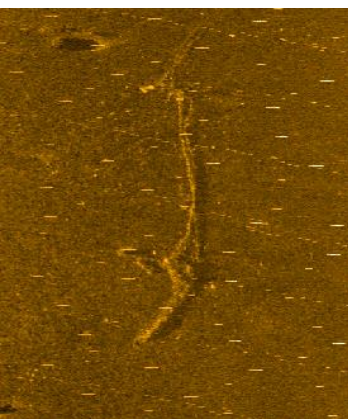
- Target 234: Rope



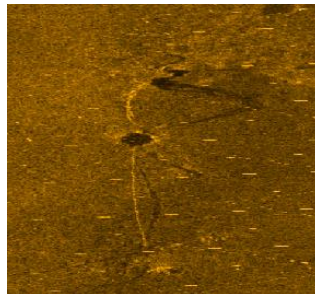
- Target 242: Rope



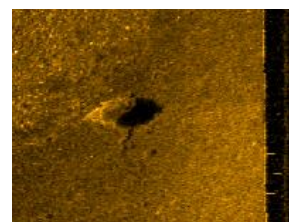
- Target 230: Chain or rope



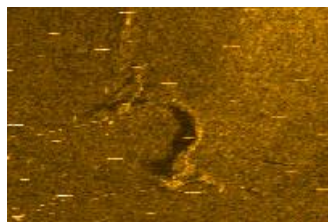
- Target 236: Chain or rope



- Target 244: NI debris

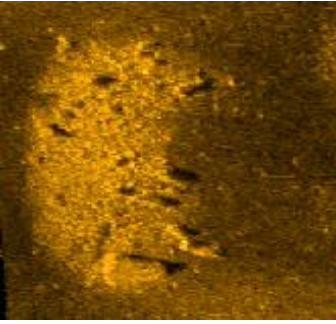


- Target 237: NI Debris

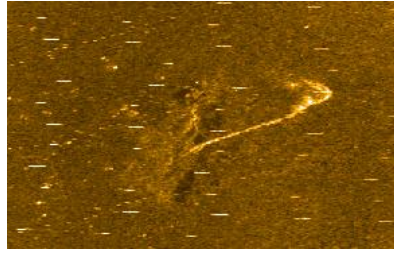


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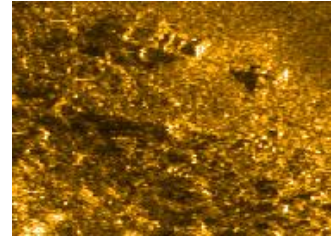
- Target 246: Boulder



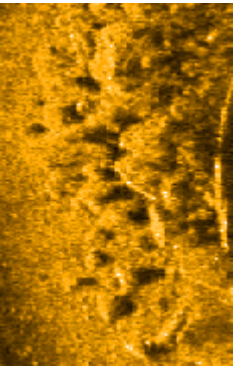
- Target 254: Chain or rope



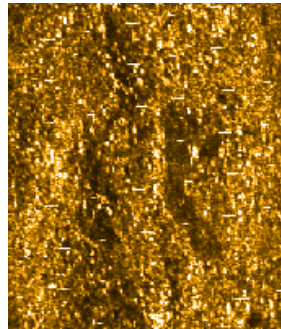
- Target 284: Boulder field



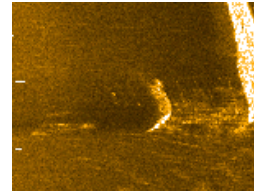
- Target 248: Boulder field



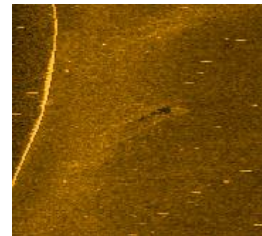
- Target 258: Boulders and cobbles



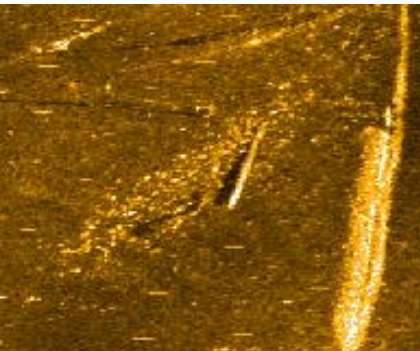
- Target 289: Boulder



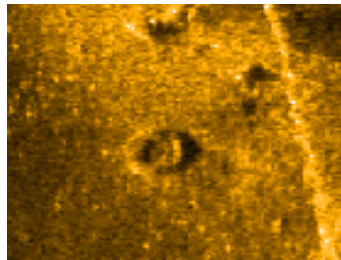
- Target 292: NI debris



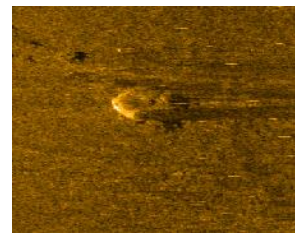
- Target 250: NI Debris



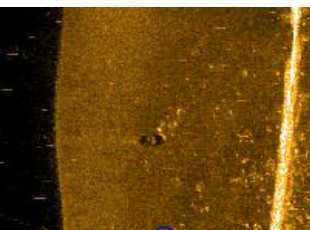
- Target 280: Tyre



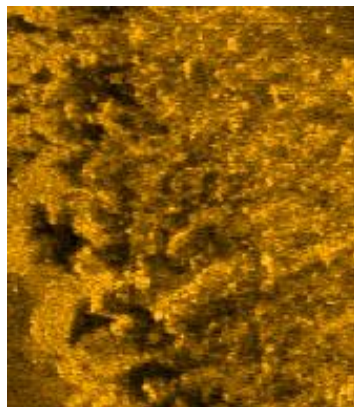
- Target 294: Block



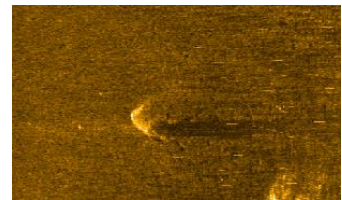
- Target 251: Boulder



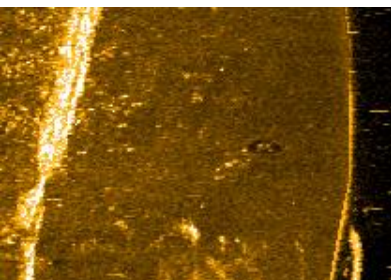
- Target 281: Boulder fields



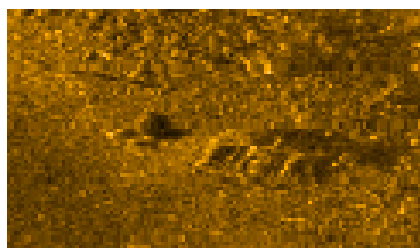
- Target 296: NI debris



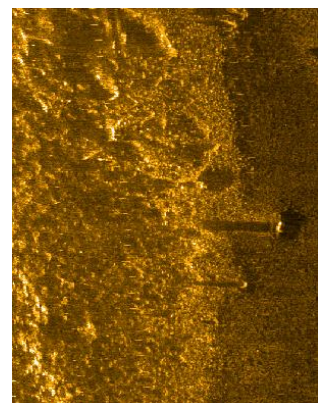
- Target 252: Boulder



- Target 283: NI Debris

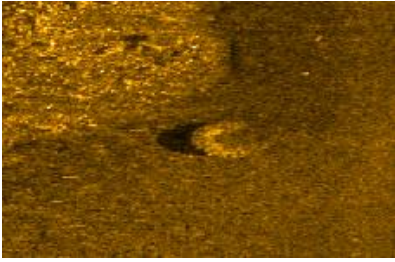


- Target 297: Boulder field



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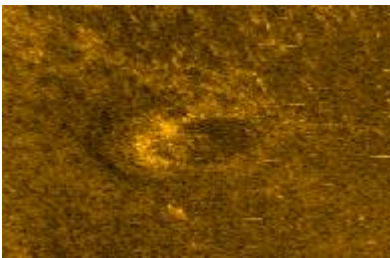
- Target 298: Buried tyre



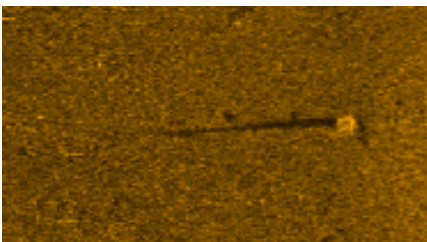
- Target 299: sand feature



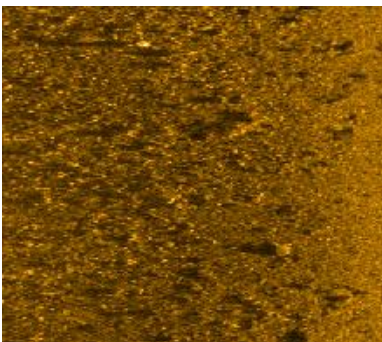
- Target 301: Boulder



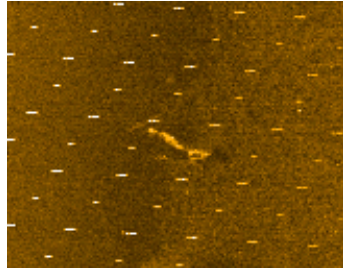
- Target 302: Boulder



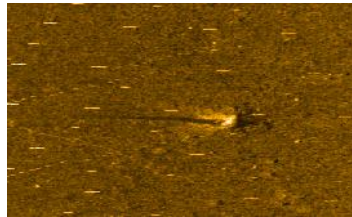
- Target 303: Boulder field



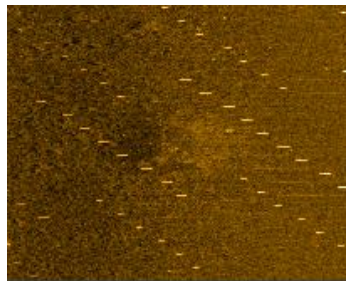
- Target 307: NI Debris



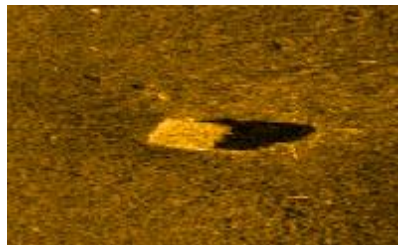
- Target 309: Boulder



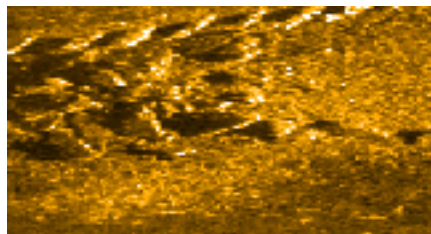
- Target 311: NI debris



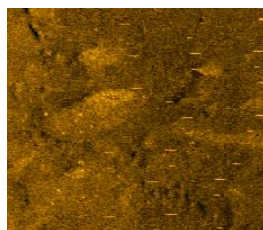
- Target 312: Block



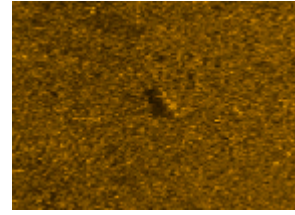
- Target 316: Boulder



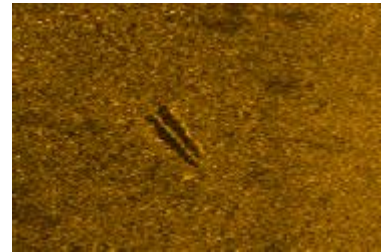
- Target 317: Sand feature



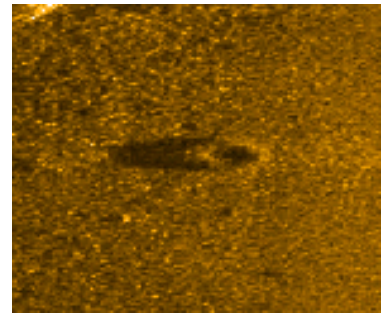
- Target 319: NI Debris



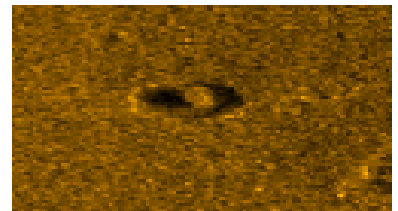
- Target 320: NI Debris



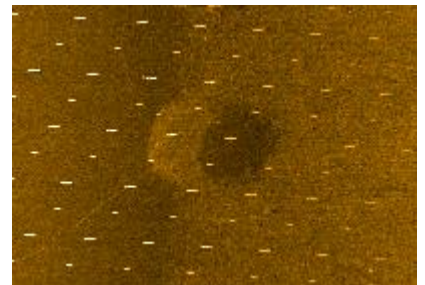
- Target 321: Tyre



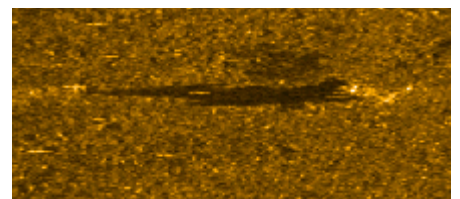
- Target 322: Tyre



- Target 323: NI debris

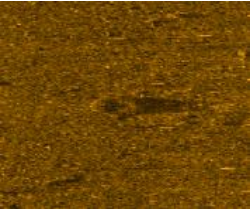


- Target 324: Boulder

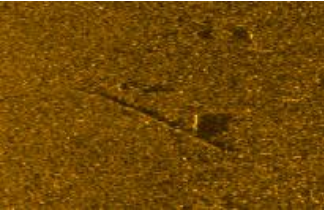


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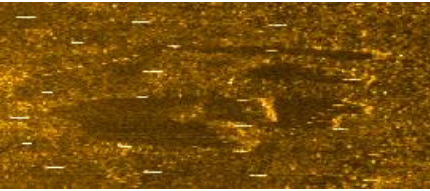
- Target 325: Tyre



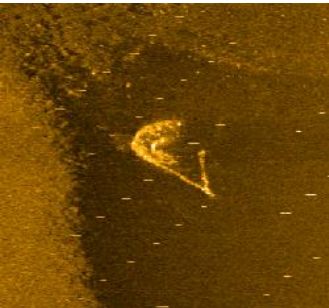
- Target 326: NI Debris



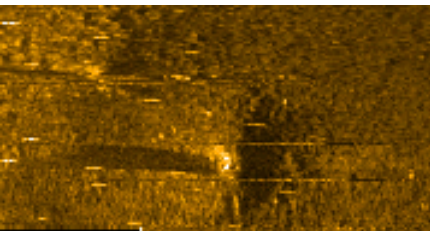
- Target 328: Boulder



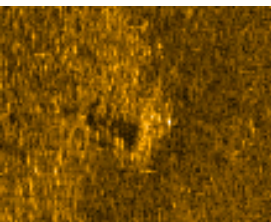
- Target 331: NI debris



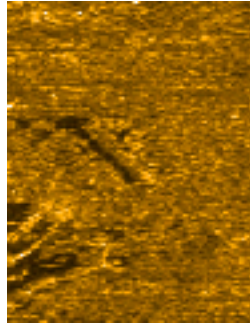
- Target 332: Boulder



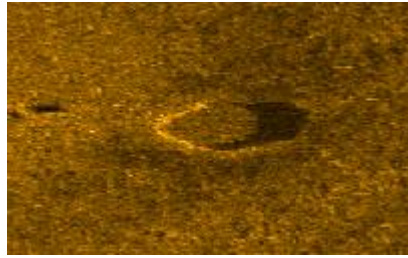
- Target 333: Boulder



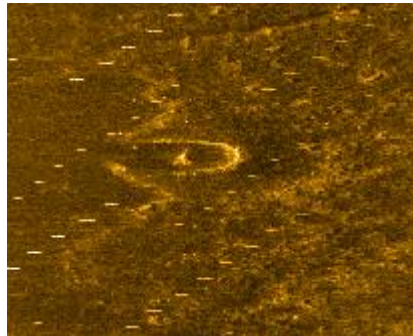
- Target 337: NI Debris



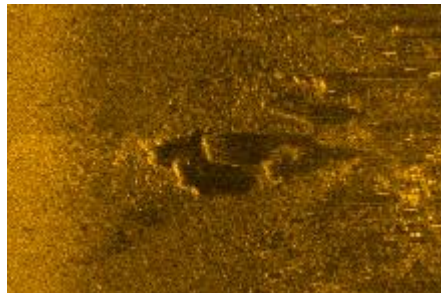
- Target 340: Block



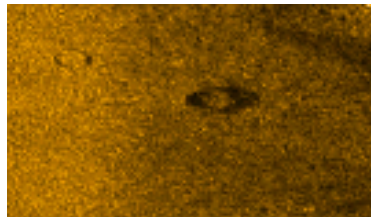
- Target 341: Tyre



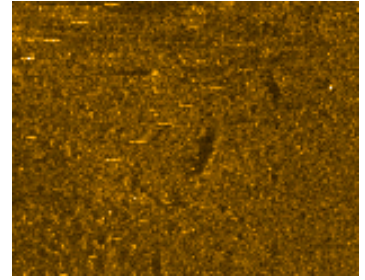
- Target 345: Boulder



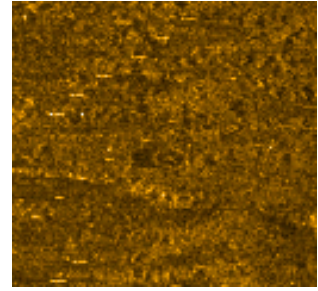
- Target 348: Tyre



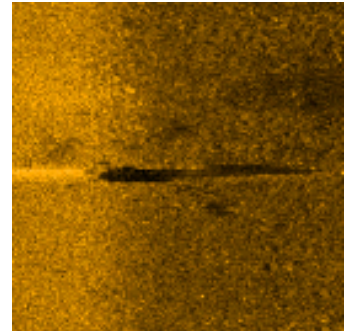
- Target 350: NI Debris



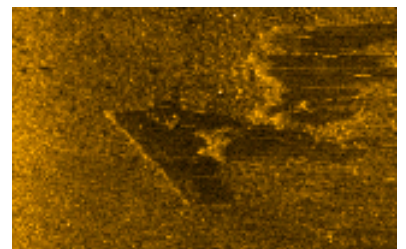
- Target 351: Tyre



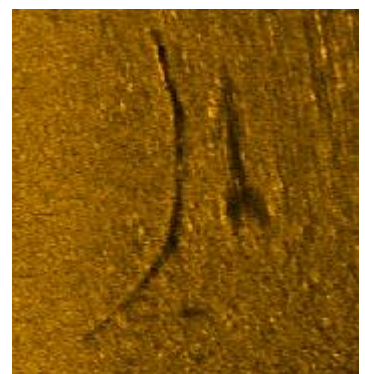
- Target 352: Boulders



- Target 353: Long NI Debris

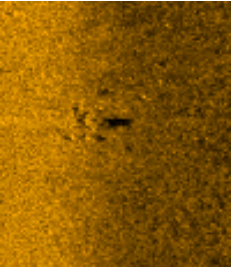


- Target 355: Long NI debris

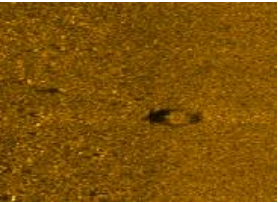


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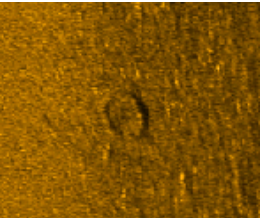
- Target 356: Boulder



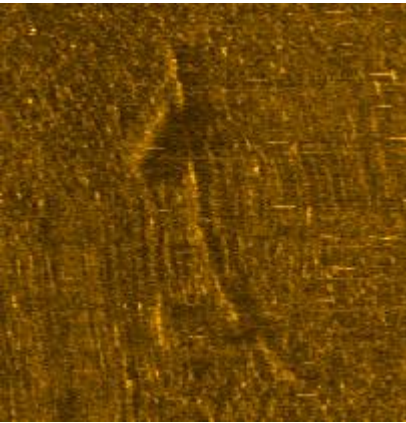
- Target 357: Boulder



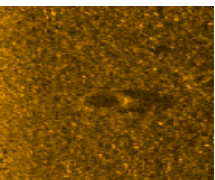
- Target 359: Tyre or wheel



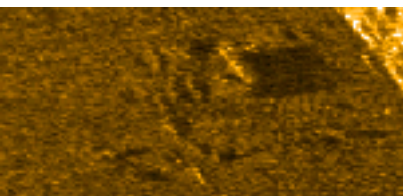
- Target 360: NI Debris



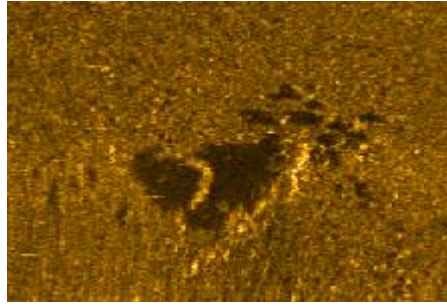
- Target 362: Tyre



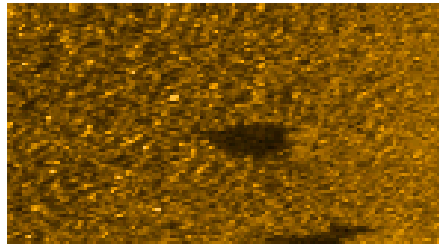
- Target 366: Boulder



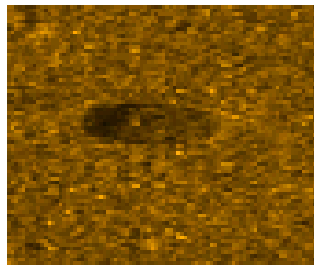
- Target 368: Boulder



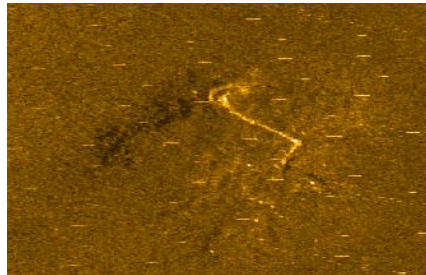
- Target 369: Boulder



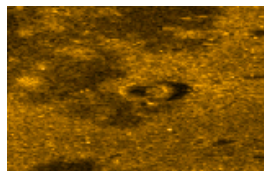
- Target 370: Boulder



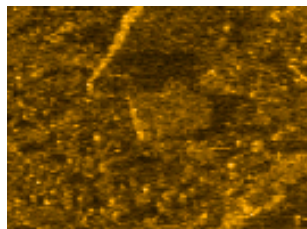
- Target 371: Chain or rope



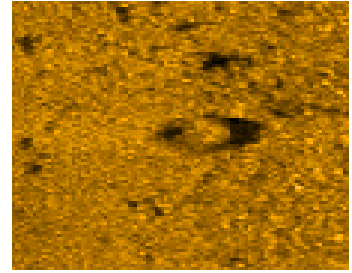
- Target 372: Tyre



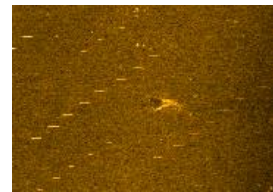
- Target 373: Block with rope



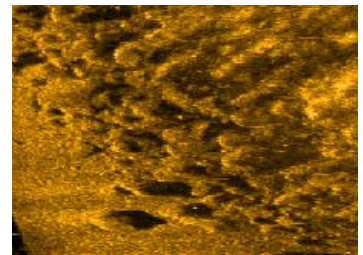
- Target 374: Tyre



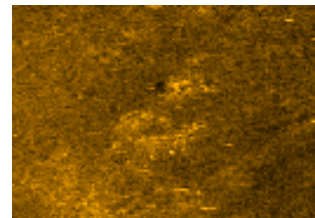
- Target 375: Boulder



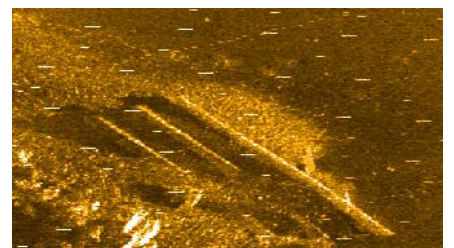
- Target 379: boulder field



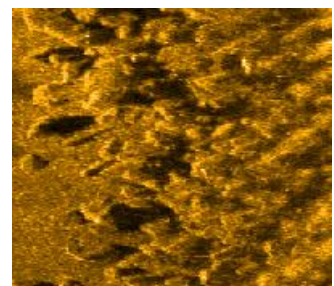
- Target 380: NI debris



- Target 381: Long NI debris

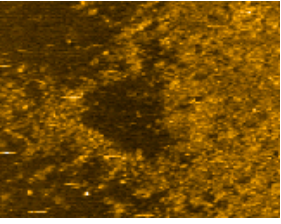


- Target 382: boulder field

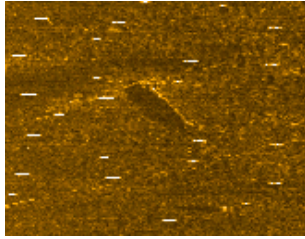


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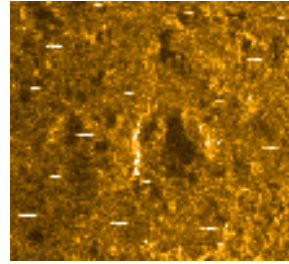
- Target 384: Boulder



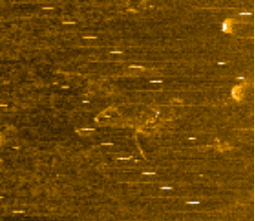
- Target 392: NI Debris



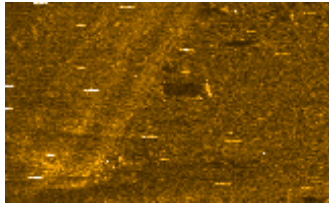
- Target 404: Boulder



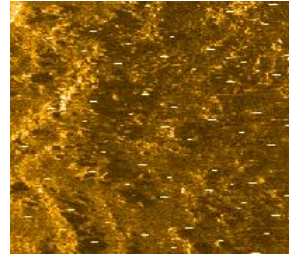
- Target 385: NI debris



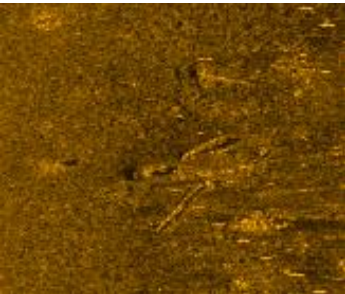
- Target 396: Boulder



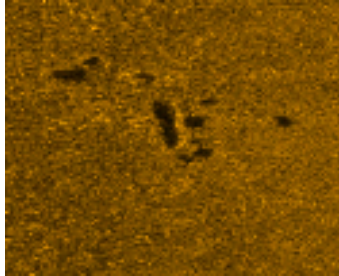
- Target 405: Sand feature



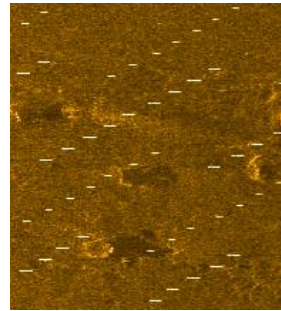
- Target 386: NI Debris



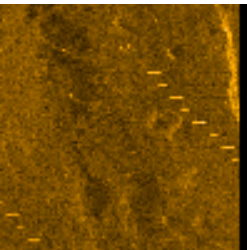
- Target 397: NI Debris



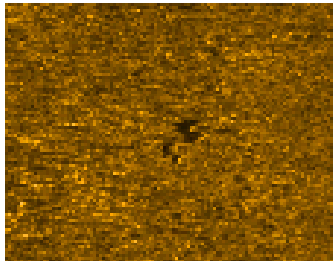
- Target 406: Sand feature or NI debris



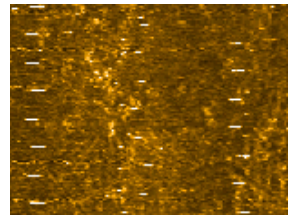
- Target 387: Boulder



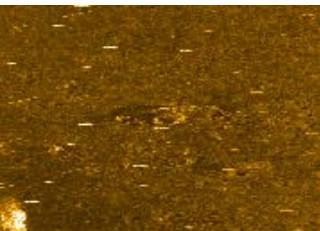
- Target 400: NI Debris



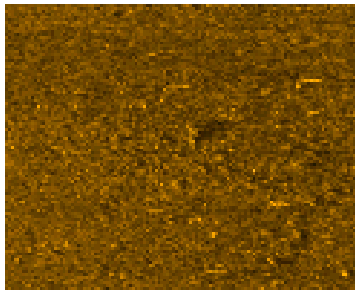
- Target 407: NI Debris



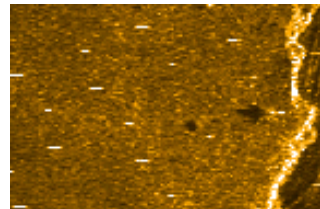
- Target 388: NI debris



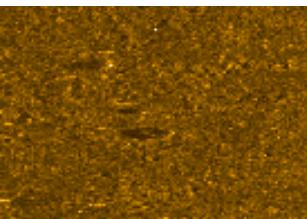
- Target 401: Boulder



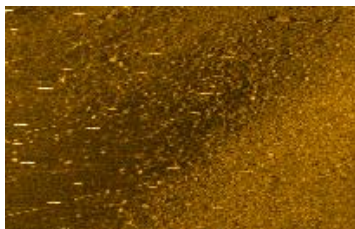
- Target 408: Boulder



- Target 391: Tyre



- Target 403: Boulder and cobble field



- Target 409: NI debris

