

| Date / year | Event | Source | Page |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------|
| 11/12 June 1943 | Crash. A Lancaster of 12 Squadron crashed in the North Sea just west of IJmuiden. | SGLO | T2423 |
| 21/22 June 1943 | Crash. A Wellington of 300 Squadron crashed in the North Sea 65 km west of IJmuiden. | SGLO | T2517 |
| 25/26 June 1943 | Crash. A Lancaster bomber of 101 Squadron crashed in the North Sea 1 km west of Wijk aan Zee. | SGLO | T2597 |
| 25 July 1943 | Crash. A Spitfire of 611 Squadron crashed in the North Sea 15 km west of Wijk aan Zee. | SGLO | T2697 |
| 28 July 1943 | Crash. A B-17 of 96BG/338BS crashed in the North Sea near IJmuiden. | SGLO | T2723 |
| 1 September 1943, 19/20 September 1943 | Een fraaie Duitse opname van het wrak van het hospitaalschip 'Strassburg' (ex 'Baloeron' van de Rotterdamsche Lloyd) genomen op 19 okt. 1943, nadat het schip op 1 september 1943, op weg van Rotterdam naar Hamburg, op de Noordzee tussen IJmuiden en Wijk aan Zee op een mijn was gelopen. | MUN 2 | 209 |
| | De Baloeran werd later door de Duitsers gevorderd, tot hospitaalschip ingericht en op 20 juli 1941 onder de naam Strassburg als zodanig in dienst gesteld. Op weg van Rotterdam naar Hamburg zou de Baloeran later, op 1 september 1943, even benoorden IJmuiden op een mijn lopen. Het schip werd op het strand gezet, doch Britse vliegtuigen en motortorpedoboten vernietigden het in de nacht van 19 op 20 september 1943. | BEZ 1 | 176 |
| | Coastal Command: 1 Hampden voerde om 22.20 uur twee mijl ten westen van IJmuiden met een torpedo een aanval uit op een stilliggend passagiersschip. | ZWA 2 | 82 |
| 19 October 1943 | Crash. A Beaufighter of 236 Squadron crashed in the North Sea 2.5 km west of IJmuiden. | SGLO | T2992 |
| | Coastal Command: 27 Beaufighters (zes bewapend met 60 ponds raketten en eenentwintig met enkel boordwapens) geëscorteerd door drie squadrons Spitfires vielen om 11.20 bij IJmuiden een aanval uit op het passagiersschip Strassburg. Er werd gezien dat een salvo raketten het schip raakte. Verder vele treffers met boordwapens. Ook schepen in de buurt werden aangevallen en beschadigd. 1 Beaufighter van No. 236 Squadron keerde niet terug. | ZWA 2 | 106-107 |
| November 1943 | In november 1943 moesten de medewerkers van Van den Tak helpen met het leggen van elektrische grondmijnen voor diverse havens langs de Nederlandse kust. Voor dat werk werden ook vaartuigen van de bergingsfirma gebruikt. De mijnbsperring voor IJmuiden lag 75 à 100 meter voor de piermonding. De ontstekingskabels van die mijnen liepen door de nauwe ruimte tussen de voorsteven van de COEN en de kop van de Zuidpier. | BUR | 46 |
| 7 January 1944 | Crash. A P-47 Thunderbolt crashed in the North Sea 7 km west of IJmuiden. | SGLO | T3293 |
| 12/13 February 1944 | Coastal Command: 1 Beaufighter viel om 1.55 uur 7 mijl ten noorden van IJmuiden een aanval uit op een schip dat werd geëscorteerd door 15 kleinere schepen. Een torpedo werd afgeworpen waarna er dikke rookwolken werden gezien. | ZWA 2 | 154 |
| 24 February 1944 | Crash. A P-47 Thunderbolt of 361FG/376FS crashed in the North Sea of IJmuiden. | SGLO | T3475 |
| 26 March 1944 | Op zondag 26 maart 1944 deden niet minder dan 390 bommenwerpers, geëscorteerd en ondersteund door 200 jagers, een zeer zware aanval op de havens van IJmuiden. 'russen 13.30 en 14.45 uur werden die middag meer dan 600 (On bommen van grote hoogte afgeworpen. De aanvallers meldden dat de aanval begunstigd werd door helder weer en goed zicht. Volgens een Duits rapport lag het hoofddoel van de aanval op de havens en de S-bunker. Twee S-bot, een torpedobootjager en 4 <i>Hafenschutzboten</i> werden tot zinken gebracht. Bovendien werd een gedeelte van de vishal verwoest en een koelhuis zwaar beschadigd. Telefoonverbindingen werden verbroken en verscheidene gebouwen in het havengebied werden vernield. | BUR | 83 |

| Date / year | Event | Source | Page | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|---------|----|---------|---|-----|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-------|-------|-------|---|--|---|--|--|--|--|--|--|--|--|--|--|--|--|-------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|-------|--------|---|---|----|--|--|--|--|--|--|--|--|--|--|--|---|-------|-----------|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|----------|---------|---|---|---|--|--|---|--|--|--|--|--|--|--|--|--|-------|------------|--------|-----|---|--|--|--|--|--|--|--|--|--|--|--|--|---|-------|--------|---------|--|---|--|--|--|---|--|--|---|--|--|--|--|--|--|-------|--------|--------|--|--|--|--|---|--|--|--|--|--|--|--|--|--|--|------|-------|--------|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|------|------------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|-------|--------|----------|---|---|---|----|---|---|---|--|--|---|--|--|--|---|---|-------|-------|--------|---|---|---|--|--|--|--|--|--|--|--|--|--|--|--|-------|------------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|-------|--------|---------|---|--|--|--|--|--|--|---|--|--|--|--|--|--|--|-------|--------|-------|--|---|--|--|--|--|---|--|--|--|--|--|--|--|--|------|--------|---------|--|---|--|---|---|--|--|--|--|--|--|--|--|--|--|------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|-----------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|-----------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--------|--------|---|--|---|--|---|--|--|--|--|--|--|--|--|--|--|------|-----------|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|---|--|------|--------|--------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|------|-------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--------|--------|--|---|---|---|--|--|--|--|--|--|--|--|--|--|--|------|-------|--------|--|---|---|----|--|--|--|--|--|--|--|--|--|--|--|------|-----------|---------|--|---|--|---|--|--|---|---|---|--|--|--|--|--|--|------|--------|----------|---|--|---|---|---|---|---|--|--|---|--|--|--|--|--|------|-------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|------------|-------|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--------|---------|---|---|---|---|--|--|---|--|---|--|--|--|--|--|--|------|----------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--------|--------|--|---|---|---|---|--|--|--|--|--|--|--|--|--|--|------|------------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|--------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|------------|-------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------|-------|--------|---|---|--|--|--|--|--|--|--|--|--|--|--|--|---|------|------------|-------|--|--|---|--|--|--|--|--|--|--|--|--|--|--|--|----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|------------------|------------------------------------------------------------------------------------------------------------------------|-------|-----|---------------|---------------------------------------------------------------------------------------|------|-------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|----------------|--------------------------------------------|-------|-----|----------------|------------------------------------------------------------|-------|-----|----------------|------------------------------------------------------------|-------|-----|----------------|-----------------------------------------------------------|-------|-----|--------------------|--------------------------------------------------------------|-------|-----|
| | AEAF: 390 bommenwerpers, 344 B-26's 18 Bostons met escorte en ondersteuning van dertien squadrons Spitfires en drie squadrons Mustangs werden uitgestuurd voor een aanval op de haven van IJmuiden. Tussen 13.30 en 13.35 werden 108 1000-ponder en 61 500-ponder brisantbommen afgeworpen. Tussen 14.08 en 14.47 werden 1332 1000-ponder brisantbommen afgeworpen. Het zwaartepunt van de aanvallen was de haven en de S-bootbunker. Twee S-bot, een torpedobootjager en vier Hafenschutsboten zijn gezonken. | ZWA 2 | 183-185 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| April 1944 | <p>Bezetting Festung IJmuiden:</p> <table border="1"> <caption>14-4-1944</caption> <thead> <tr> <th>Einh.</th> <th>Abteilung</th> <th>Besatz</th> <th>60</th> <th>150/200</th> <th>2</th> <th>3,7</th> <th>4</th> <th>6,8</th> <th>10,5</th> <th>15</th> <th>17</th> <th>4,7</th> <th>3,7</th> <th>5</th> <th>7,5</th> <th>3,7</th> <th>7,5</th> </tr> </thead> <tbody> <tr><td>611 H</td><td>2./32</td><td>0.2.7</td><td>2</td><td></td><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>611 L</td><td>FluWa</td><td>0.1.4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>621 H</td><td>2./32</td><td>0.5.10</td><td>2</td><td>1</td><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>621 H</td><td>1.F.S.Kp.</td><td>0.0.14</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>631 M</td><td>Stab 201</td><td>6.17.84</td><td>2</td><td>6</td><td>3</td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>631 M</td><td>Fu.M.G st.</td><td>0.9.51</td><td>1-2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>641 M</td><td>5./816</td><td>1.17.98</td><td></td><td>3</td><td></td><td></td><td></td><td>2</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>641 M</td><td>8./816</td><td>0.1.12</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>65 H</td><td>2./32</td><td>0.3.10</td><td>1</td><td>1</td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>65 H</td><td>1.F.St.Kp.</td><td>0.0.4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>5</td><td></td></tr> <tr><td>661 M</td><td>2./201</td><td>2.27.110</td><td>7</td><td>1</td><td>2</td><td>12</td><td>1</td><td>1</td><td>2</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td>1</td><td>1</td></tr> <tr><td>661 H</td><td>2./32</td><td>0.1.12</td><td>1</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>661 H</td><td>2.F.St.Kp.</td><td>0.0.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>671 M</td><td>Ugruko</td><td>5.33.81</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>681 M</td><td>6./816</td><td>0.0.7</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>69 M</td><td>6./816</td><td>0.14.18</td><td></td><td>1</td><td></td><td>1</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>71 H</td><td>2./32</td><td>0.1.3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>71 H</td><td>1.F.S.Kp.</td><td>0.0.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>72 H</td><td>2./32</td><td>0.1.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>72 H</td><td>1.F.S.Kp.</td><td>0.0.4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>73 M</td><td>3./201</td><td>1.7.64</td><td>6</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>73 H</td><td>1.F.S.Kp.</td><td>0.2.28</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>6</td><td></td></tr> <tr><td>73 M</td><td>6./816</td><td>0.2.11</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>73 M</td><td>Hako</td><td>0.1.3</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>78 M</td><td>M.S.S.</td><td>0.2.14</td><td></td><td>1</td><td>2</td><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>79 H</td><td>2./32</td><td>0.3.14</td><td></td><td>1</td><td>2</td><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>80 M</td><td>5.-6./816</td><td>1.18.98</td><td></td><td>5</td><td></td><td>5</td><td></td><td></td><td>1</td><td>1</td><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>81 M</td><td>4./201</td><td>1.21.131</td><td>9</td><td></td><td>2</td><td>3</td><td>1</td><td>1</td><td>2</td><td></td><td></td><td>4</td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>81 H</td><td>2./32</td><td>0.0.2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>81 H</td><td>4.Lw.Jg.R.</td><td>0.1.0</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>82 M</td><td>4./816</td><td>2.17.98</td><td>3</td><td>3</td><td>1</td><td>4</td><td></td><td></td><td>2</td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>83 L</td><td>FluWa 23</td><td>0.1.7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>84 H</td><td>4./816</td><td>0.4.20</td><td></td><td>2</td><td>1</td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>84 L</td><td>7.A.Rgt.16</td><td>0.1.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>84 M</td><td>4./201</td><td>0.1.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>84 H</td><td>1.F.St.Kp.</td><td>0.0.6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>85 H</td><td>3./32</td><td>0.3.15</td><td>2</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td>85 H</td><td>1.F.St.Kp.</td><td>0.0.8</td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td colspan="18">= bodenständig</td></tr> <tr><td colspan="18">(KG 16. Lw F.D. april 1944)</td></tr> <tr> <td colspan="18">Bunker inventarislijst: zie pag. 151-158.</td></tr> <tr> <td>10/11 April 1944</td><td>Coastal Command: 1 Wellington heeft 16 E/R-boten aangevallen met drie 500-ponders MC. Een bom heeft een schip geraakt.</td><td>ZWA 2</td><td>193</td></tr> <tr> <td>18 April 1944</td><td>Crash. A P-38 Lightning of 20FG/55FS crashed in the North Sea 35 km west of IJmuiden.</td><td>SGLO</td><td>T3600</td></tr> <tr> <td>22/23 April 1944</td><td>Coastal Command: 1 Wellington viel om 1.14 uur 30 mijl ten westen van IJmuiden een aantal E-botan aan. Hierbij werden acht 100-pounds anti-duikbootbommen afgeworpen die dwars over het doel vielen.</td><td>ZWA 2</td><td>203</td></tr> <tr> <td>15/16 May 1944</td><td>Coastal Command: 1 Avenger voerde om 3.52 uur op 8 mijl ten noorden van IJmuiden een aanval uit op een klein vrachtschip uit waarbij vier 250-ponders GP werden afgeworpen. Na de aanval hing er een kolom rook boven het schip.</td><td>ZWA 2</td><td>214</td></tr> <tr> <td>24/25 May 1944</td><td>Coastal Command: 1 Avenger voerde bij IJmuiden een aanval uit op vier mijnenvegers, waarbij twee 500-ponders en 250-ponder GP af werden geworpen.</td><td>ZWA 2</td><td>223</td></tr> <tr> <td>26/27 May 1944</td><td>3 Stirlings legden 15 mijnen bij IJmuiden.</td><td>ZWA 2</td><td>224</td></tr> <tr> <td>27/28 May 1944</td><td>Bomber Command: 3 Stirlings legden 15 mijnen bij IJmuiden.</td><td>ZWA 2</td><td>224</td></tr> <tr> <td>28/29 May 1944</td><td>Bomber Command: 1 Stirling legde vijf mijnen bij IJmuiden.</td><td>ZWA 2</td><td>225</td></tr> <tr> <td>29/30 May 1944</td><td>Bomber Command: 1 Halifax legde vier mijnen bij IJmuiden.</td><td>ZWA 2</td><td>225</td></tr> <tr> <td>31 May/1 June 1944</td><td>Bomber Command: 2 Halifaxes legden vier mijnen bij IJmuiden.</td><td>ZWA 2</td><td>227</td></tr> </tbody> </table> | Einh. | Abteilung | Besatz | 60 | 150/200 | 2 | 3,7 | 4 | 6,8 | 10,5 | 15 | 17 | 4,7 | 3,7 | 5 | 7,5 | 3,7 | 7,5 | 611 H | 2./32 | 0.2.7 | 2 | | 6 | | | | | | | | | | | | | 611 L | FluWa | 0.1.4 | | | | | | | | | | | | | | | | 621 H | 2./32 | 0.5.10 | 2 | 1 | 10 | | | | | | | | | | | | 1 | 621 H | 1.F.S.Kp. | 0.0.14 | | | | | | | | | | | | | | | | 631 M | Stab 201 | 6.17.84 | 2 | 6 | 3 | | | 1 | | | | | | | | | | 631 M | Fu.M.G st. | 0.9.51 | 1-2 | 1 | | | | | | | | | | | | | 1 | 641 M | 5./816 | 1.17.98 | | 3 | | | | 2 | | | 4 | | | | | | | 641 M | 8./816 | 0.1.12 | | | | | 1 | | | | | | | | | | | 65 H | 2./32 | 0.3.10 | 1 | 1 | 5 | | | | | | | | | | | | | 65 H | 1.F.St.Kp. | 0.0.4 | | | | | | | | | | | | | | 5 | | 661 M | 2./201 | 2.27.110 | 7 | 1 | 2 | 12 | 1 | 1 | 2 | | | 4 | | | | 1 | 1 | 661 H | 2./32 | 0.1.12 | 1 | 1 | 1 | | | | | | | | | | | | | 661 H | 2.F.St.Kp. | 0.0.5 | | | | | | | | | | | | | | | 1 | 671 M | Ugruko | 5.33.81 | 3 | | | | | | | 4 | | | | | | | | 681 M | 6./816 | 0.0.7 | | 1 | | | | | 1 | | | | | | | | | 69 M | 6./816 | 0.14.18 | | 1 | | 1 | 3 | | | | | | | | | | | 71 H | 2./32 | 0.1.3 | | | | | | | | | | | | | | | | 71 H | 1.F.S.Kp. | 0.0.5 | | | | | | | | | | | | | | | 1 | 72 H | 2./32 | 0.1.5 | | | | | | | | | | | | | | | | 72 H | 1.F.S.Kp. | 0.0.4 | | | | | | | | | | | | | | | | 73 M | 3./201 | 1.7.64 | 6 | | 1 | | 1 | | | | | | | | | | | 73 H | 1.F.S.Kp. | 0.2.28 | | | | | | | | | | | | | | 6 | | 73 M | 6./816 | 0.2.11 | | | | | | | | | | | | | | | | 73 M | Hako | 0.1.3 | 1 | | | | | | | | | | | | | | | 78 M | M.S.S. | 0.2.14 | | 1 | 2 | 5 | | | | | | | | | | | | 79 H | 2./32 | 0.3.14 | | 1 | 2 | 10 | | | | | | | | | | | | 80 M | 5.-6./816 | 1.18.98 | | 5 | | 5 | | | 1 | 1 | 4 | | | | | | | 81 M | 4./201 | 1.21.131 | 9 | | 2 | 3 | 1 | 1 | 2 | | | 4 | | | | | | 81 H | 2./32 | 0.0.2 | | | | | | | | | | | | | | | | 81 H | 4.Lw.Jg.R. | 0.1.0 | 1 | | | | | | | | | | | | | | | 82 M | 4./816 | 2.17.98 | 3 | 3 | 1 | 4 | | | 2 | | 3 | | | | | | | 83 L | FluWa 23 | 0.1.7 | | | | | | | | | | | | | | | | 84 H | 4./816 | 0.4.20 | | 2 | 1 | 1 | 1 | | | | | | | | | | | 84 L | 7.A.Rgt.16 | 0.1.5 | | | | | | | | | | | | | | | | 84 M | 4./201 | 0.1.5 | | | | | | | | | | | | | | | | 84 H | 1.F.St.Kp. | 0.0.6 | | | | | | | | | | | | | | | | 85 H | 3./32 | 0.3.15 | 2 | 1 | | | | | | | | | | | | | 1 | 85 H | 1.F.St.Kp. | 0.0.8 | | | 1 | | | | | | | | | | | | | = bodenständig | | | | | | | | | | | | | | | | | | (KG 16. Lw F.D. april 1944) | | | | | | | | | | | | | | | | | | Bunker inventarislijst: zie pag. 151-158. | | | | | | | | | | | | | | | | | | 10/11 April 1944 | Coastal Command: 1 Wellington heeft 16 E/R-boten aangevallen met drie 500-ponders MC. Een bom heeft een schip geraakt. | ZWA 2 | 193 | 18 April 1944 | Crash. A P-38 Lightning of 20FG/55FS crashed in the North Sea 35 km west of IJmuiden. | SGLO | T3600 | 22/23 April 1944 | Coastal Command: 1 Wellington viel om 1.14 uur 30 mijl ten westen van IJmuiden een aantal E-botan aan. Hierbij werden acht 100-pounds anti-duikbootbommen afgeworpen die dwars over het doel vielen. | ZWA 2 | 203 | 15/16 May 1944 | Coastal Command: 1 Avenger voerde om 3.52 uur op 8 mijl ten noorden van IJmuiden een aanval uit op een klein vrachtschip uit waarbij vier 250-ponders GP werden afgeworpen. Na de aanval hing er een kolom rook boven het schip. | ZWA 2 | 214 | 24/25 May 1944 | Coastal Command: 1 Avenger voerde bij IJmuiden een aanval uit op vier mijnenvegers, waarbij twee 500-ponders en 250-ponder GP af werden geworpen. | ZWA 2 | 223 | 26/27 May 1944 | 3 Stirlings legden 15 mijnen bij IJmuiden. | ZWA 2 | 224 | 27/28 May 1944 | Bomber Command: 3 Stirlings legden 15 mijnen bij IJmuiden. | ZWA 2 | 224 | 28/29 May 1944 | Bomber Command: 1 Stirling legde vijf mijnen bij IJmuiden. | ZWA 2 | 225 | 29/30 May 1944 | Bomber Command: 1 Halifax legde vier mijnen bij IJmuiden. | ZWA 2 | 225 | 31 May/1 June 1944 | Bomber Command: 2 Halifaxes legden vier mijnen bij IJmuiden. | ZWA 2 | 227 |
| Einh. | Abteilung | Besatz | 60 | 150/200 | 2 | 3,7 | 4 | 6,8 | 10,5 | 15 | 17 | 4,7 | 3,7 | 5 | 7,5 | 3,7 | 7,5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 611 H | 2./32 | 0.2.7 | 2 | | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 611 L | FluWa | 0.1.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 621 H | 2./32 | 0.5.10 | 2 | 1 | 10 | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 621 H | 1.F.S.Kp. | 0.0.14 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 631 M | Stab 201 | 6.17.84 | 2 | 6 | 3 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 631 M | Fu.M.G st. | 0.9.51 | 1-2 | 1 | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 641 M | 5./816 | 1.17.98 | | 3 | | | | 2 | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 641 M | 8./816 | 0.1.12 | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 H | 2./32 | 0.3.10 | 1 | 1 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 65 H | 1.F.St.Kp. | 0.0.4 | | | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 661 M | 2./201 | 2.27.110 | 7 | 1 | 2 | 12 | 1 | 1 | 2 | | | 4 | | | | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 661 H | 2./32 | 0.1.12 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 661 H | 2.F.St.Kp. | 0.0.5 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 671 M | Ugruko | 5.33.81 | 3 | | | | | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 681 M | 6./816 | 0.0.7 | | 1 | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 69 M | 6./816 | 0.14.18 | | 1 | | 1 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 H | 2./32 | 0.1.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 71 H | 1.F.S.Kp. | 0.0.5 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 72 H | 2./32 | 0.1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 72 H | 1.F.S.Kp. | 0.0.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 73 M | 3./201 | 1.7.64 | 6 | | 1 | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 73 H | 1.F.S.Kp. | 0.2.28 | | | | | | | | | | | | | | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 73 M | 6./816 | 0.2.11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 73 M | Hako | 0.1.3 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 78 M | M.S.S. | 0.2.14 | | 1 | 2 | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 79 H | 2./32 | 0.3.14 | | 1 | 2 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 80 M | 5.-6./816 | 1.18.98 | | 5 | | 5 | | | 1 | 1 | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 81 M | 4./201 | 1.21.131 | 9 | | 2 | 3 | 1 | 1 | 2 | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 81 H | 2./32 | 0.0.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 81 H | 4.Lw.Jg.R. | 0.1.0 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 82 M | 4./816 | 2.17.98 | 3 | 3 | 1 | 4 | | | 2 | | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 83 L | FluWa 23 | 0.1.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 84 H | 4./816 | 0.4.20 | | 2 | 1 | 1 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 84 L | 7.A.Rgt.16 | 0.1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 84 M | 4./201 | 0.1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 84 H | 1.F.St.Kp. | 0.0.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85 H | 3./32 | 0.3.15 | 2 | 1 | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 85 H | 1.F.St.Kp. | 0.0.8 | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| = bodenständig | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (KG 16. Lw F.D. april 1944) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bunker inventarislijst: zie pag. 151-158. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10/11 April 1944 | Coastal Command: 1 Wellington heeft 16 E/R-boten aangevallen met drie 500-ponders MC. Een bom heeft een schip geraakt. | ZWA 2 | 193 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 April 1944 | Crash. A P-38 Lightning of 20FG/55FS crashed in the North Sea 35 km west of IJmuiden. | SGLO | T3600 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22/23 April 1944 | Coastal Command: 1 Wellington viel om 1.14 uur 30 mijl ten westen van IJmuiden een aantal E-botan aan. Hierbij werden acht 100-pounds anti-duikbootbommen afgeworpen die dwars over het doel vielen. | ZWA 2 | 203 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15/16 May 1944 | Coastal Command: 1 Avenger voerde om 3.52 uur op 8 mijl ten noorden van IJmuiden een aanval uit op een klein vrachtschip uit waarbij vier 250-ponders GP werden afgeworpen. Na de aanval hing er een kolom rook boven het schip. | ZWA 2 | 214 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24/25 May 1944 | Coastal Command: 1 Avenger voerde bij IJmuiden een aanval uit op vier mijnenvegers, waarbij twee 500-ponders en 250-ponder GP af werden geworpen. | ZWA 2 | 223 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26/27 May 1944 | 3 Stirlings legden 15 mijnen bij IJmuiden. | ZWA 2 | 224 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27/28 May 1944 | Bomber Command: 3 Stirlings legden 15 mijnen bij IJmuiden. | ZWA 2 | 224 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28/29 May 1944 | Bomber Command: 1 Stirling legde vijf mijnen bij IJmuiden. | ZWA 2 | 225 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29/30 May 1944 | Bomber Command: 1 Halifax legde vier mijnen bij IJmuiden. | ZWA 2 | 225 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 May/1 June 1944 | Bomber Command: 2 Halifaxes legden vier mijnen bij IJmuiden. | ZWA 2 | 227 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Table 22: Overview of events, German occupation to D-Day.

June (D-Day) – May 1945 (liberation)

One June 6th an allied invasion force landed in Normandy, rapidly advancing to Germany. German forces desperately attacked the allied convoys transporting vital resources for the advancing armies, forcing the British navy to aggressively patrol the shipping lanes. This situation continued until the capitulation of the German military in May 1945.

| Date / year | Event | Source | Page |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| 1/2 June 1944 | Coastal Command: 1 Avenger voerde om 3.05 uur 10 mijl NW van IJmuiden een aanval op twee schepen. Twee 500- en 250-pond GP bommen werden afgeworpen. Treffers niet waargenomen, wel een ontploffing gehoord. | ZWA 2 | 229 |
| 2/3 June 1944 | Bomber Command: 4 Halifaxes legden 16 mijnen bij IJmuiden. | ZWA 2 | 229 |
| 2/3 June 1944 | Coastal Command: 2 Avengers voerden tussen 1.15 en 1.33 uur 10 mijl NW van IJmuiden aanvallen uit op 2 tot 3 schepen. In totaal werden er drie 500-ponders en drie 250-ponders GP afgeworpen. Een treffer geclaimd. | ZWA 2 | 229 |
| 3/4 June 1944 | Bomber Command: 6 Halifaxes legden 24 mijnen mij IJmuiden. | ZWA 2 | 230 |
| 4/5 June 1944 | Bomber Command: 1 Halifax legde 4 mijnen bij IJmuiden. | ZWA 2 | 230 |
| 9/10 June 1944 | Zo raakten in de nacht van 9 op 10 juni 1944 zes motortorpedoboten van het 58 ^e Engelse MTB flottielje – gestationeerd in Great Yarmouth – tussen IJmuiden en Egmond aan Zee in gevecht met het escorte van een Duits konvooi dat op weg was naar Rotterdam. Een Engelse bron meldt dat de MTB's, zonder ontdekt te worden, het konvooi tot 500 m konden naderen. Op die afstand vuurden boten met succes hun torpedo's af. Volgens Engelse gegevens werden drie Duitse voorpostenboten bij dit treffen tot zinken gebracht. (De Duitsers bevestigen het verlies van twee van hun schepen nl. de V 1314 en van de V 2021. Inmiddels hadden de overige escorteschepen hun mijnenveegtuig laten slippen en het vuur geopend op de aanvallers. Daarbij werd één van de MTB's zo zwaar getroffen dat het scheepje zonk. Eén bemanningslid werd gedood, de overigen konden door de Engelsen worden gered.) | BUR | 88 |
| 15/16 June 1944 | Bomber Command: 1 Stirling legde zes mijnen bij IJmuiden. | ZWA 2 | 239 |
| 30 June/1 July 1944 | Bomber Command: 2 Strilings legde 12 mijnen bij IJmuiden. | ZWA 2 | 247 |
| 4/5 July 1944 | Een maand later in de nacht van 4 op 5 juli was er opnieuw een treffen tussen Duitse eenheden en Engelse MTB's, nu voor de pieren van IJmuiden. Britse MTB's – van het 58 ^e MTB-flottielje – vielen die nacht een Duits konvooi aan en raakten daarbij niet alleen in gevecht met de escorterende Duitse schepen maar ook met Duitse E-boten die te hulp waren gesneld. Duitse militairen melden dat in de vroege ochtend gevechtscontact was tussen eigen escortevoertuigen en Engelse S-boten ten westen van IJmuiden. Een eigen schip gezonken. Eén beschadigde vijandelijke S-boot de haven binnengesleept en daar gezonken. Nog een S-boot beschadigd. | BUR | 89 |
| 6/7 July 1944 | Bomber Command: 1 Stirling legde zes mijnen bij IJmuiden. | ZWA 2 | 251 |
| 17 July 1944 | AEAF: 12 Spitfires uitgestuurd om de Hoogovens aan te vallen. Uiteindelijk bij IJmuiden een aanval uitgevoerd op een uitlopend schip. Resultaten niet waargenomen. | ZWA 2 | 255 |
| August 1944 | By August 1944, the Germans had been forced to cease sending convoys by day along the Dutch coast. The toll taken by the Allied air forces had become too heavy. The only possible tactic was to sail the convoys by night, in short hops from port to port, sheltering in heavily defended harbours during the long daylight hours. In response, Coastal Command tried to attack the convoys at night, employing the <i>Torbeaus</i> of the Strike Wings. These squadrons were joined by two bomb-carrying squadrons based at Bircham Newton in Norfolk, the Wellingtons of 524 Squadron and the Avengers of 855 (Fleet Air Arm) Squadron. During moonlit nights these aircraft would roam along the Dutch coast on patrols called Rovers, taking off singly at set intervals and seeking 'targets of | NES | 181 |

| Date / year | Event | Source | Page |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| | 'opportunity'. On dark nights, they would sometimes adopt more involved tactics, known as Operation Gilbeys. These were combined bombing and torpedo attacks, and the method had been worked out as early as January 1944, based on experiments carried out by the Torbeaus of 254 Squadron at North Coates. | | |
| 24 August 1944 | Een volgende verwoestende aanval werd op 24 augustus 1944 door 22 zware viermotorige bommenwerpers (Lancasters) uitgevoerd. Bij die aanval die slechts drie minuten duurde – van 14.26 tot 14.29 uur – werden 119 ton bommen afgeworpen. Acht vliegtuigen wierpen 4.3 ton explosieven – waaronder acht bommen van 12.000 pond – op de Schnellbootbunker aan de Haringhaven. De foto's, die tijdens de aanval werden genomen, toonden één voltreffer op de bunker en vijf <i>near misses</i> , drie aan de landzijde en twee aan de zeezijde van de betonnen kolos. De veertien andere bommenwerpers wierpen 76 ton explosieven op de ligplaatsen van de Duitse Schnellboten in de Visserij- en Haringhaven. De Duitsers meldden in hun rapporten de volgende schade: De 'oude' S-Bootbunker, de Visserij haven en het spoorstation werden zwaar beschadigd. Bovendien werd opnieuw een gedeelte van de vishallen vernield, een viertal pakhuizen in de nabijheid ondergingen hetzelfde lot. In de havens werd een Voorpostenboot, een Hafenschutzboot, een artilleriedrager en een kleine havenranger tot zinken gebracht. Het was voor het eerst dat de Engelsen een doel in Nederland met de zgn. 'Tallboys', aanvielen. | BUR | 83-85 |
| | Bomber Command: 22 Lancasters vielen de E-bootbunkers en aanlegplaatsen bij IJmuiden aan. Hierbij is in totaal 119 ton brisantbommen afgeworpen. Hieronder waren acht 12.000-ponders). Vele bommen op zowel het land als in het water. | ZWA 2 | 279 |
| 13/14 September 1944 | Coastal Command: 1 Wellington voerde om 1.18 uur 14 mijl ZW van IJmuiden een aanval uit op een aantal schepen. Drie 500-ponders MC werden afgeworpen, waarna drie explosies te zien waren. | ZWA 2 | 314 |
| 15 September 1944 | Crash. A Spitfire of 229 Squadron crashed in the North Sea 48 km west of IJmuiden. | SGLO | T4025 |
| 15 December 1944 | Op 15 december 1944 volgde nogmaals een aanval van zeventien Lancasters op de Schnellbootbunkers in IJmuiden. Tussen 15.03 en 15.10 uur (binnen acht minuten) werden 70 ton explosieven afgeworpen. De aanval werd uitgevoerd door de befaamde Dambusters, No 617 Squadron van de Royal Air Force, die opnieuw 'Tallboys' afwierpen. Na die aanvallen bleken de geallieerden de door hen gestelde doelen te hebben bereikt, want de grote S-bunker en de havens waren onbruikbaar gemaakt. Hoewel er nog een paar aanvallen volgden op de mini-onderzeeboten die in de laatste maanden van de oorlog vanuit IJmuiden opereerden, werden er door de geallieerde luchtmachten geen grote operaties meer tegen doelen in het IJmondgebied uitgevoerd. | BUR | 85 |
| | Bomber Command: 13 Lancasters vielen E/R-bootbunkers bij IJmuiden aan. Hierbij werd 70 ton brisantbommen (13 12.000 ponders) afgeworpen. | ZWA 2 | 477 |
| 18/19 December 1944 | Coastal Command: 1 Wellington viel om 19.45 uur op 19 mijl WZW van IJmuiden drie E-botnen aan. Zes 250-ponders werden afgeworpen, maar geen resultaten waargenomen. | ZWA 2 | 482 |
| 23/24 December 1944 | Coastal Command: 4 Wellingtons voerden tussen 19.35 en 5.43 aanvallen uit op schepen bij IJmuiden. Twee vliegtuigen claimden een treffer. | ZWA 2 | 485 |
| 24/25 December 1944 | Coastal Command: 1 Wellington viel om 20.20 uur op 5 mijl ten westen van IJmuiden met zes 250-ponders twee schepen aan. Een brand werd geconstateerd. | ZWA 2 | 486 |
| December 1944-early 1945 | Vanaf begin 1945 fungeerde IJmuiden, behalve als thuishaven voor de gevreesde 'Schnellboote', tevens als uitvalsbasis voor een van de laatste 'geheime wapens' van de Duitse marine: De tweemansonderzeeboot 'Seehund'. Op 27, 28 en 29 december 1944 waren al vaartuigen van een kleiner type, bestemd voor één man (de 'Molch'), per speciale oplegger aangevoerd, mogelijk om voor trainingsdoeleinden te worden gebruikt. Nadat in het Noordzeekanaal ten oosten | ROL | 36 |

| Date / year | Event | Source | Page |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| | van de Zuiderlijn een geslaagde proefvaart was gemaakt, arriveerden in IJmuiden nog uitsluitend de grotere boten, hoofdzakelijk per spoor. | | |
| 6/7 January 1945 | Coastal Command: 4 Wellingtons vielen tussen 19.46 en 1.05 uur individuele aanvallen uit op vijandelijke schepen en radarcontacten tussen IJmuiden en het Lichtschip Maas. Geen resultaten waargenomen. | ZWA 2 | 513 |
| 14/15 January 1945 | Coastal Command: 1 Wellington viel om 21.50 uur ten ZW van IJmuiden zeven radarcontacten aan. Er werden zes 250-ponders afgeworpen. Hierna nog maar zes radarcontacten gezien. | ZWA 2 | 517 |
| 15/16 January 1945 | Coastal Command: 1 Wellington viel om 22.28 uur op 15 mijl WNW van IJmuiden twee radarcontacten aan en wierp 12 250-ponders MC af. Beide radarcontacten waren verdwenen. | ZWA 2 | 518 |
| 3 February 1945 | Bomber Command: 17 Lancasters van No. 9 Squadron vielen tussen 16.07 en 16.11 uur miniduikboot- en E-bootbunkers aan. Hierbij zijn er 17 12.000-ponders D.P met ontstekingen met een half uur vertraging afgeworpen. Resultaten niet waargenomen. | ZWA 2 | 534 |
| 8 February 1945 | Bomber Command: 15 Lancasters van No. 617 Squadron vielen E-bootbunkers in IJmuiden aan. Hierbij werden 15 12.000-ponders DP afgeworpen. Waarschijnlijk voltreffers. | ZWA 2 | 541 |
| 8/9 February 1945 | Coastal Command: 1 Wellington viel tussen 19.48 en 21.20 uur op 8 mijl ZW van IJmuiden een radarcontact aan waarbij zes 250-ponders werden afgeworpen. Tevens met boordwapens gevuurde. Klein schip geclaimd. | ZWA 2 | 543 |
| 10 February 1945 | 8th Air Force: 9 B-17's vielen E-bootbunkers bij IJmuiden aan. Hierbij werd er 36 ton brisantbom afgeworpen met goed resultaat. | ZWA 2 | 545 |
| 19/20 February 1945 | Coastal Command: 1 Wellington viel om 20.28 uur bij IJmuiden een radarcontact aan met zes 250 ponders. Resultaten niet waargenomen. | ZWA 2 | 553 |
| 12/13 March 1945 | Coastal Command: 1 Wellington viel ter hoogte van IJmuiden een schip aan met zes 250-ponders. Een voltreffer geregistreerd. | ZWA 2 | 582 |
| 14 March 1945 | 8th Air Force: 9 B-17 voerden een aanval uit op IJmuiden waarbij 35 ton aan brisantbommen werd afgeworpen met goede resultaten. Deze bommen waren Disney-bommen. | ZWA 2 | 583 |
| 21 March 1945 | 8th Air Force: 3 B-17 voerden een aanval met Disney-bommen uit op de duikbootbunkers in IJmuiden. Resultaat werd beschreven als redelijk. | ZWA 2 | 592 |
| 24 March 1945 | Fighter Command: Bij IJmuiden werden twee miniduikboten door Spitfires aangevallen, maar geen claims. | ZWA 2 | 605 |
| April 1945 | In de laatste oorlogsweken heeft een drietal 'Seehunde' uit IJmuiden nog enige provianderingsvaarten gemaakt naar de Vesting Duinkerken, waar Duitse troepen - ofschoon maandenlang omsingeld - nog immer standhielden. De boten waren daartoe, in plaats van met torpedo's, uitgerust met bevoorradingcontainers, gevuld met vet en andere voedingsmiddelen. De laatste tocht was een enkele reis. Eind april 1945 was het afgelopen met de sluiptochten. De bemanningsleden bleven geconsigneerd in de nabijheid van hun boten, maar uitvaren was er niet meer bij. Voor de havenmond was een ondoordringbare mijnenversperring gelegd. | ROL | 37 |
| 8/9 April 1945 | Coastal Command: 1 Wellington viel tussen 1.23 en 4.25 uur ter hoogte van IJmuiden een radarcontact aan, maar resultaten werden niet waargenomen. | ZWA 2 | 622 |
| 9/10 April 1945 | Coastal Command: 6 Wellingtons vielen tussen 23.57 en 2.40 uur schepen bij IJmuiden aan. Twee explosies waargenomen. | ZWA 2 | 623 |
| 2/3 May 1945 | Coastal Command: 1 Wellington viel om 23.13 uur op 30 mijl WNW van IJmuiden een miniduikboot aan met zes 250-ponds dieptebommen en boordwapens. De boot verdween en er kon later geen radarcontact meer worden gemaakt. 1 Wellington viel om 1.13 uur op 26 mijl WZW van IJmuiden een miniduikboot aan met vier 250-ponds dieptebommen. Met boordwapens werden treffers geplaatst. | ZWA 2 | 647 |

Table 23: Overview of events D-Day – May 1945.

Post-war period

Immediately after the war, the reconstruction of the Netherlands began. Defensive works, bunkers and remaining UXO were cleaned up. German prisoners of war were used to clear the thousands of minefields.

| Date / year | Event | Source | Page |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|
| After 5 May 1945 | Direct na de bevrijding van West-Nederland werd aangevangen met het vegen van een kanaal vanaf het zuiden langs Hoek van Holland en IJmuiden naar Den Helder. Voor het te vegen kanaal werd het bestaande, door de Duitsers vrijgehouden, kanaal gebruikt. Mijnen werden hierin niet gevonden. Ook de Nieuwe Waterweg tot Rotterdam, de havens van Rotterdam, de haven van IJmuiden, het Noordzeekanaal tot Amsterdam en de reden van Hoek van Holland, IJmuiden en Den Helder werden geveegd. De operaties werden uitgevoerd door Britse en Nederlandse mijnenvegers onder Engels commando. | ROE | 59 |

Table 24: Overview of events Post-war period.

ANNEX 3 DUTCH ARCHIVES

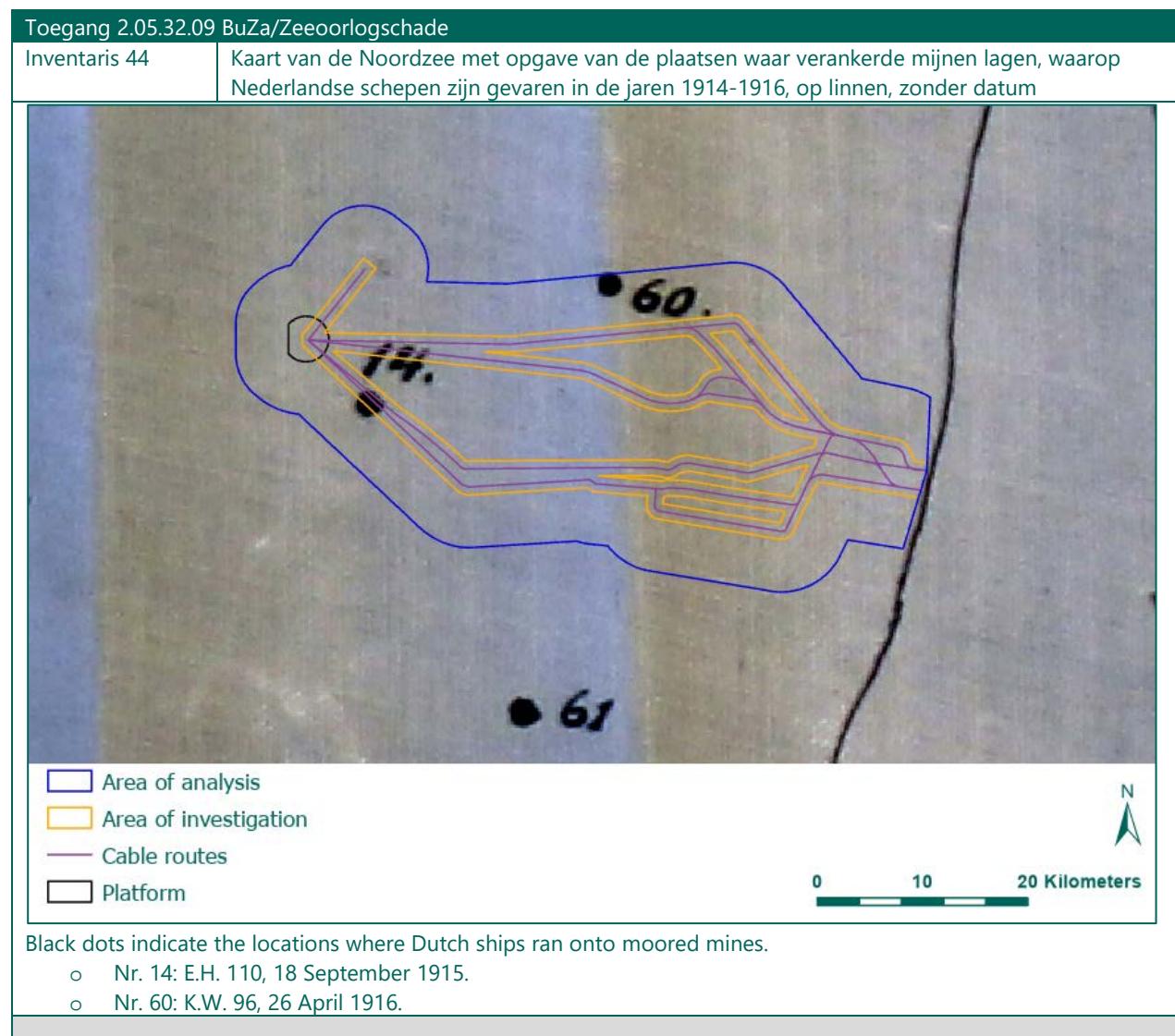
Several Dutch archives have been consulted for this desk top study. These results are shown in this annex.

Nationaal Archief (NA)

The following records have been consulted in the Nationaal Archief (National Archives):

- Toegang 2.05.32.09 BuZa/Zeeoorlogschade [Foreign relations / naval warfare damage]
- Toegang 2.12.18 archief van de Koninklijke Marine: Chef van de Marinestaf te 's-Gravenhage, 1886-1942 [Chief of the Navy staff, 1886-1942]
- Toegang 2.12.19 Marinestaf, 1945-1948 [Navy Staff, 1945-1948]
- Toegang 2.12.27 Marine / Tweede Wereldoorlog, 1940-1945 [Navy during the Second World War]
- Toegang 2.12.56 Marine na 1945 [Navy after the Second World War]
- Toegang 2.13.114 Marinestaf van het Ministerie van Defensie, 1948-1984 [Navy staff of the Ministry of Defence]
- Toegang 2.13.167 Ministerie van Defensie: 2e Geniecommandement Bureau Registratie Verdedigingswerken (Bunkerarchief). [Ministry of Defence: 2nd Engineercommander Defence Works Registration Bureau]

Relevant files from the record groups mentioned above are shown in the following tables:



Toegang 2.12.18 archief van de Koninklijke Marine: Chef van de Marinestaf te 's-Gravenhage, 1886-1942

Inventaris 192 | Stukken betreffende de kustverdediging. 1908-1940

Information on coastal defences, 23 May 1935.

d. Haven van IJMUIDEN.

Batterij I
(bij Wijk aan Zee) 115 km.
3 x 12 L 40 11,5 km.
(indirecte richting)
1 zoeklicht v.90 2500 m.

Het beletten van
het opruimen der
mijnversperringen.

1. Vuur op groote
afstanden.
2. Het medewerken
aan het afslaan
van landingen.

Batterij II.
(bij Wijk aan Zee). 75 km.
115 km.
3 x 12 L 40 11,5 km.
(directe en indi- 2500 m.
recte richting).
1 zoeklicht v.75 2250 m.

Het beletten van
het o.c.f. batterij I.
versperring:
Slijkgat-Bokkegat,
Noord-Pampus.

c.f. batterij I.

Batterij III.
(t/Zuiden Noordzee-
kanaal). 75 km.
3 x 7 L. 40 7,5 km.
(directe richting)
1 zoeklicht v. 60 2000 m.

c.f. batterij I.

1. Het medewerken
aan afslaan van
landingen.
2. Het beletten van
het forceeren van
de haven ingang.

Batterij IV.
t/Zuiden van Noord-
zee-kanaal.
(directe richting). 75 km.
3 x 7 L. 40 7,5 km.
1 zoeklicht v. 60 2000 m.

Het veilig stellen
van visserschepen ver-
sperringen in Hollen-
gaten. c.f. batterij III. c.f. batterij III.

| Richt | Bemaling | Aantal stukken | Waar opgesteld | Max. dracht | Aantal schoten per min. | Projectiel | Aanwezige munitie | Toelichtingen |
|------------------------|----------|----------------|----------------|-------------|-------------------------|------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>I J M U I D E N</u> | | | | | | | | |
| | | | | | | | | <u>z u i d e r f r o n t .</u> |
| Idem | 7 1.40 | 3 | IJmuiden | 7500 | 10 | bg patr.net buis N° 13 en slaggup- je. N° 4 | 750 | tromp. Opgesteld op IJ-krieken met directe richting, ± 800 m v.v.h. van het verdedigingswerk, 2.v.h Hoordsekaanal; in den noest Westelijke duinrand. |
| | 7 1.40 | 3 | Idem | 7500 | 10 | idem | 750 | Als boven; achter ± 400 m Z.v.h verdedigingswerk. Munitie op het fort bij Velsen. |
| | 12 1.40 | 3 | Idem | 11500 | 6 | bg patr. | 375 | Moot nog worden opgesteld op betonbedding ± 2500 m Noord v/h verdedigingswerk; kanonnen en munitie nog niet aanwezig. Aan de opstelling wordt begonnen in 1934. |

Inventaris 275 | Stukken betreffende het onschadelijk maken van mijnen. 1914-1940

Information on mines during World War I:

- o 26 July 1915. 3 miles north of IJmuiden a mine was located and sunk.

Toegang 2.12.19 Marinestaf, 1945-1948

Inventaris 723 | Hoofd Munitiedumping Sectie IX-Naval Disarmament Control Staff (NDCS)
april - december 1946 1946, 1947.

Ammunition was dumped in the North Sea, about 20 miles off IJmuiden.

Toegang 2.12.19 Marinestaf, 1945-1948

Hier zijn gestationeerd :

- de L.C.T.'s 7122 - 7125 - 7031 en 7033;
- het logementschip "Gunner";
- de motorbooten "Valkenisse" en Biggekerke";
- 2 3-tonners en een P.U.

ad A. De L.C.T.'s laden de munitie aan Zijkanaal F. Na geladen te zijn wordt gedumpt op de Noordzee ± 20 mijl uit de kust bij IJmuiden. Indien geladen zijnde en door weergesteldheid niet gedumpt kan worden, krijgen ze ligplaats aan de Noordelijke meerpalen bij de Noorder Sluis. Tevens doen ze om beurten dienst als escorte vaartuig, indien er gedumpt wordt.

Op 20 Maart j.l. werd aan een der steigers aan Zijkanaal F. begonnen de eerste L.C.T. te laden. Op 30 Mei j.l. was de 7de L.C.T. met laden gereed. Daar de verschillende ladingen varieeren tusschen de 200 en 225 ton per L.C.T., mag worden aangenomen, dat per 1 Juni van Zijkanaal F. ± 1500 ton is aangevoerd.

De laadtijd per L.C.T. varieerde van 5 tot 12 dagen, nadat er door de Landmacht werd aangevoerd en voldoend personeel aanwezig was om de munitie dumpklaar te maken en het aantal politieke gevangenen dat zich vrijwillig beschikbaar stelde. Het aantal dagen dat nodig was per L.C.T. om na geladen te zijn, buitenaarts gedumpt te hebben, varieerde van 2 tot 9 dagen, dit i.v.m. al of niet gunstige weergesteldheid om te dumpen.

Aangesien de Marine voor wat betreft voorbereiding en organisatie de Landmacht ver vooruit was, is oorzaak dat de afvoer niet vlugger kon geschieden. Met verwijzing evenwel naar het schrijven van den Chef van den Generale Staf dd. 15 Mei Afd. Uitrusting No. 5637, betreffende dumping in zee van munitie, is te verwachten dat binnenkort op volle capaciteit kan begonnen worden.

Toegang 2.12.27 Marine / Tweede Wereldoorlog, 1940-1945

No relevant files in this series.

Toegang 2.12.56 Marine na 1945

| | |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inventaris 910 | Wijziging begrenzing munitiestortplaats te IJmuiden i.v.m. herhaaldelijk opvissen van explosieven buiten de oorspronkelijke munitiestortplaats. 1968 |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|

Ammunition dump at sea off IJmuiden.

3 April 1968. It appeared that ammunition is encountered outside the dump zone, therefore a larger zone needs to be marked.

| | | |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <p style="text-align: right; margin-top: -10px;">1+2+5dm + bodem</p> | <p>Hierbij heb ik de eer Uwe Excellentie te berichten dat mij, uit het herhaaldelijk opvissen van explosieven buiten de oorspronkelijke munitiestortplaats te IJmuiden, is gebleken dat deze begrenzing hiervan wijziging behoeft. Een nader onderzoek met onderwater detectie-apparatuur heeft deze noodzaak ^{mogelijk} bevestigd. In verband hiermede zijn inmiddels dezerzijds de volgende maatregelen genomen.</p> <p>a. een lichtboei werd gelegd in de positie 52 33 30N 04 03 36 E welke het centrum van de stortplaats markeert, referte "bericht aan Zeevarenden" nr. 2502 van 16 sept. '67.</p> <p>b. De volgende waarschuwing werd eveneens in de vorm van een "Bericht aan Zeevarenden" (nr. 242 (P) van 20 jan. '68), uitgegeven: "Ligging geel-zwarre spitse lichtboei 52 33,5N - 04 03, 6E." In verband met de aanwezigheid van explosieven wordt bodemvisserij, booraktiviteiten en seismische onderzoeken ontraden in het gebied met een straal van drie zeemijlen, waarvan het middelpunt is bovengenoemde lichtboei is.</p> | 68 67. |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|

| | |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------|
| Inventaris 925 | Het vergroten van de veiligheid voor de Nederlandse kust door het verbreden van de door mijnenvegers geveegde vaarroutes., 1948-1949. |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------|

Dump ground 20 miles off IJmuiden.

Voorts is ons bekend, dat zich W.N.W. van IJmuiden op circa 20 mijl uit de kust een "dump ground" van munitie bevindt, waar de Marine geruimen tijd de door de Duitsers achtergelaten munitie in zee heeft geworpen en waarheen een smalle geul is geveegd. Daar deze dump zich ruimschoots in het zogenaamde "witte" gebied bevindt, bestaat de mogelijkheid voor gedemagnetiseerde schepen om vanaf IJmuiden zonder omwegen op een navigatorisch veilige wijze in het ruime sop te komen en van daaruit koers te zetten waarheen men wil. Op deze wijze zou het minder veilige gedeelte van de Kustgeul nabij de Haaksgronden kunnen worden gemeden. Voor schepen van Rotterdam en Vlissingen met de wil om de Noord zou deze oplossing eveneens zijn voordelen hebben.

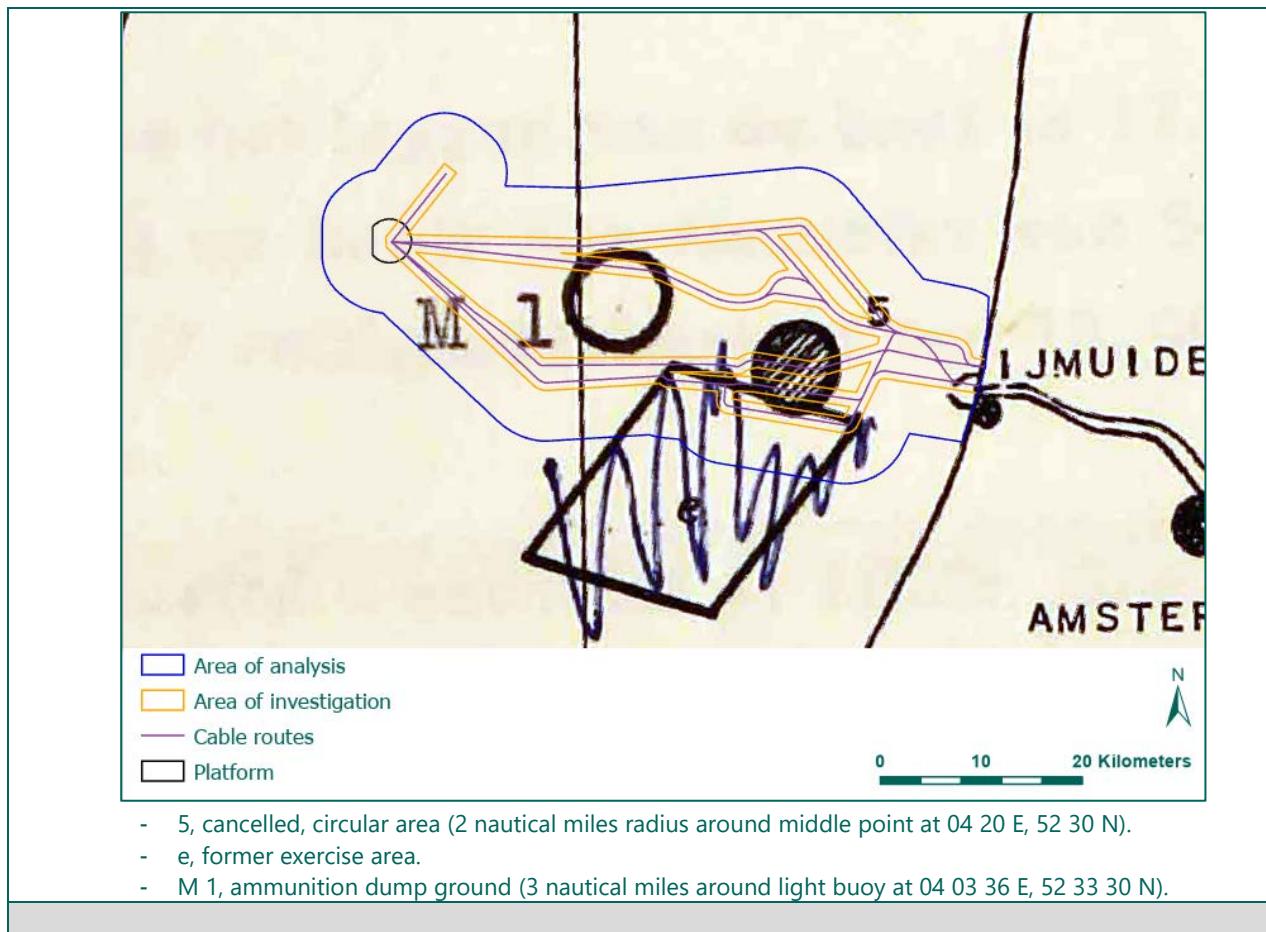
| | |
|----------------|----------------------------------------------------------------------------------------------------|
| Inventaris 955 | Tijdig publiceren van mijnenoefeningen en het aangeven van de oefengebieden. 1957, 1960, 1967-1972 |
|----------------|----------------------------------------------------------------------------------------------------|

Information on (former) mine sweeping exercise areas and ammunition dump zone.

- Mines encountered in fishing nets, April 1967:

| | | | |
|--------|-------------------------------------------|-------------------|---------------------------------------------------------|
| 130467 | <u>Volendam 89</u> Cornelis Johanna | 52-28.1N-04-02E | Duitse invloedsmijn type GC Nr. D 22207 gaaf. |
| 170467 | <u>HD 7 (Zes gebroeders)</u> | 52-26.7N-04-32.3E | kontakteijn WO I verroest. Deksel en lading gaaf. |
| 220467 | <u>Scheveningen 69 (96)</u> (Mercator) | 52-25 N-04-10 E | Duitse invloedsmijn type GC met druk unit. Geheel gaaf. |

- (former) exercise areas for mine sweeping:



Toegang 2.13.114 Marinestaf van het Ministerie van Defensie, 1948-1984

No relevant files in this series.

Toegang 2.13.167 Ministerie van Defensie: 2e Geniecommandement Bureau Registratie Verdedigingswerken (Bunkerarchief)

| | |
|----------------|------------------------------|
| Inventaris 272 | Blokkaarten van werken. 1951 |
|----------------|------------------------------|

Relevant, overview of the defence works of the *Atlantikwall*.

| | |
|----------------|------------------------------|
| Inventaris 275 | Blokkaarten van werken. 1951 |
|----------------|------------------------------|

Relevant, overview of the defence works of the *Atlantikwall*.

| | |
|----------------|-------------------------------------------------------------------|
| Inventaris 322 | Stellingen en complexen in Noord- en Midden Nederland. 1939-1959. |
|----------------|-------------------------------------------------------------------|

Relevant: battery "Zuidzand".

Toegang 2.13.167 Ministerie van Defensie: 2e Geniecommandement Bureau Registratie Verdedigingswerken
(Bunkerarchief)



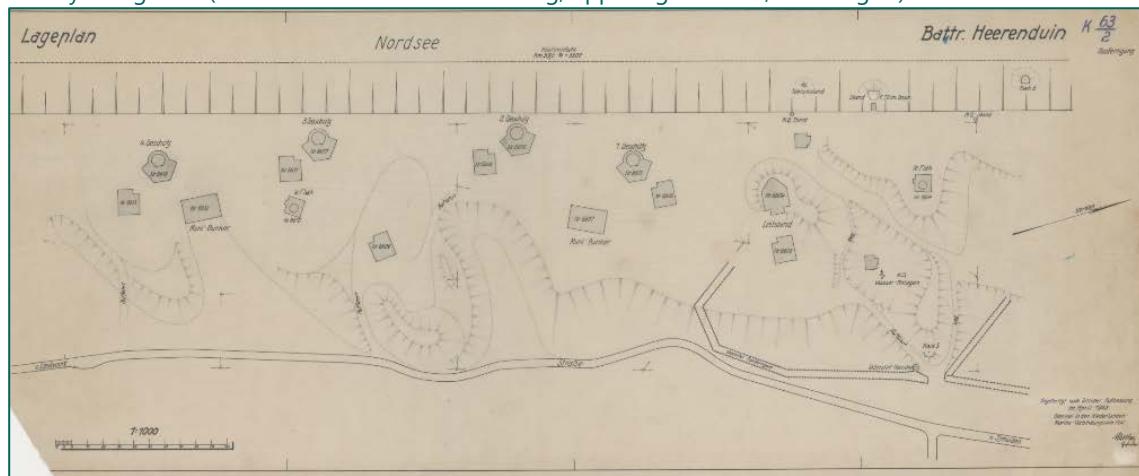
Inventaris 331 Stellingen en complexen in Noord- en Midden Nederland. 1939-1959.

Relevant, defence works and coastal batteries in Velsen.

Inventaris 1044 Tekeningen (Stellungen) van objecten, hindernissen, tankmuren- en grachten. 1941-1945

Relevant:

Battery "Langerak" (notice: the name on the drawing, upper right corner, is not right!).



NIMH

The following records have been consulted in the Nederlands Instituut voor Militaire Historie (Dutch Institute for Military History):

- Collectie 035: Collectie Volkers (kustmijnen) [Collection Volkers (coastal mines)]
- Collectie 492: De strijd op Nederlands grondgebied tijdens de Wereldoorlog II / De Groene Serie [The battle in the Netherlands, World War II / Green series]
- Collectie 575: Bureau Inlichtingen/ Duitse verdedigingswerken. [Bureau of Intelligence/German defence works]

Relevant files from the record groups mentioned above are shown in the following tables:

Collectie 035: Collectie Volkers (kustmijnen)

Map 3 Hoek van Holland & IJmuiden

1 – 16 August 1949:

Gedurende deze periode werden er 16 Khatiemijnen opgeruimd voor het strand te Wijk aan Zee, vanaf kilometerpaal 50 tot aan de Noorderpier te IJmuiden (paal 55).
IJmuiden (paal 55)

Het totaal aantal geruimde mijnen sinds 1 Januari-49 bedraagt 12.

De in deze periode geruimde mijnen behoren tot de K.-8-versperring.

Het aantal visdagen in deze periode bedroeg 5.

Op Dinsdag 9 Augustus werd er begonnen met het vissen naar mijnen ten Noorden van de pier te IJmuiden en wel vanaf KM.-paal 50 tot aan KM.-paal 55 (Noorderpier te IJmuiden).

Ondanks hoge branding en zeegang werd er de gehele week met succes doorgewerkt en tot en met 15 Augustus mijnen vernietigd.

Bijna al deze mijnen bevinden zich nog in een zeer goede staat; geheel compleet met opbouw en stoothoorn. Het betonblok, waarin de lading zit vindt is meerdere malen geconstateerd.

De diepte waarop zich deze mijnen bevinden bedraagt bij Hoog-Water ongeveer 5-6 meter.

16 August – 1 September 1949:

Gedurende deze periode werden er 25 Khatiemijnen opgeruimd, als vol verdeeld over de verschillende versperringen:

van de K 8-versperring 11 mijnen, dus totaal geruimd 27 mijnen.

van de K 8 A-versperring 12 mijnen, dus totaal geruimd 12 mijnen

Op 9 Augustus werden de werkzaamheden begonnen voor het strand te Wijk aan Zee en wel vanaf Kilometerpaal 50 tot KM-paal 55 (Noorderpier te IJM).

Deze periode werd gekenmerkt door zeer mooi weer, zodat de werkzaamheden aldaar reeds op Vrijdag 26 Augustus konden beëindigd worden, nadat er 39 mijnen waren aangevist, door duikers gecontroleerd en vervolgens vernietig waren.

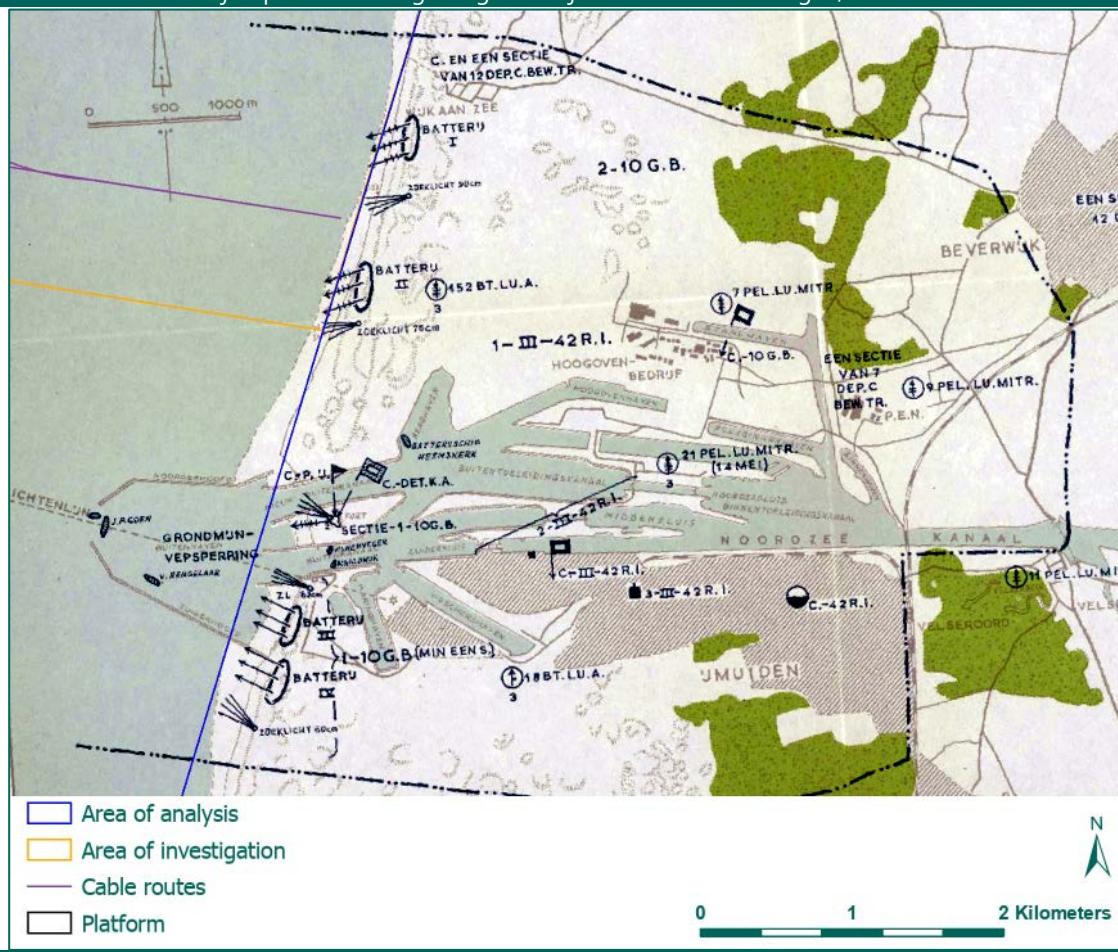
Dit gedeelte van de zee voor de kust vanaf paal 50 tot aan de Noorderpier te IJmuiden kan dus nu vrij verklaart worden van Khatiemijnen, onder het voorbehoud, dat er nog altijd de mogelijkheid bestaat, dat er mijnen onder het zand verborgen zitten, welke bij toename van de diepte weer te voorschijn zouden kunnen komen.

Collectie 492: De strijd op Nederlands grondgebied tijdens de Wereldoorlog II / De Groene Serie

Inventaris 14 | Onderdeel E. De gebeurtenissen op het West- en Noordfront - Vesting Holland

Map showing the Dutch defences in IJmuiden.

Collectie 492: De strijd op Nederlands grondgebied tijdens de Wereldoorlog II / De Groene Serie

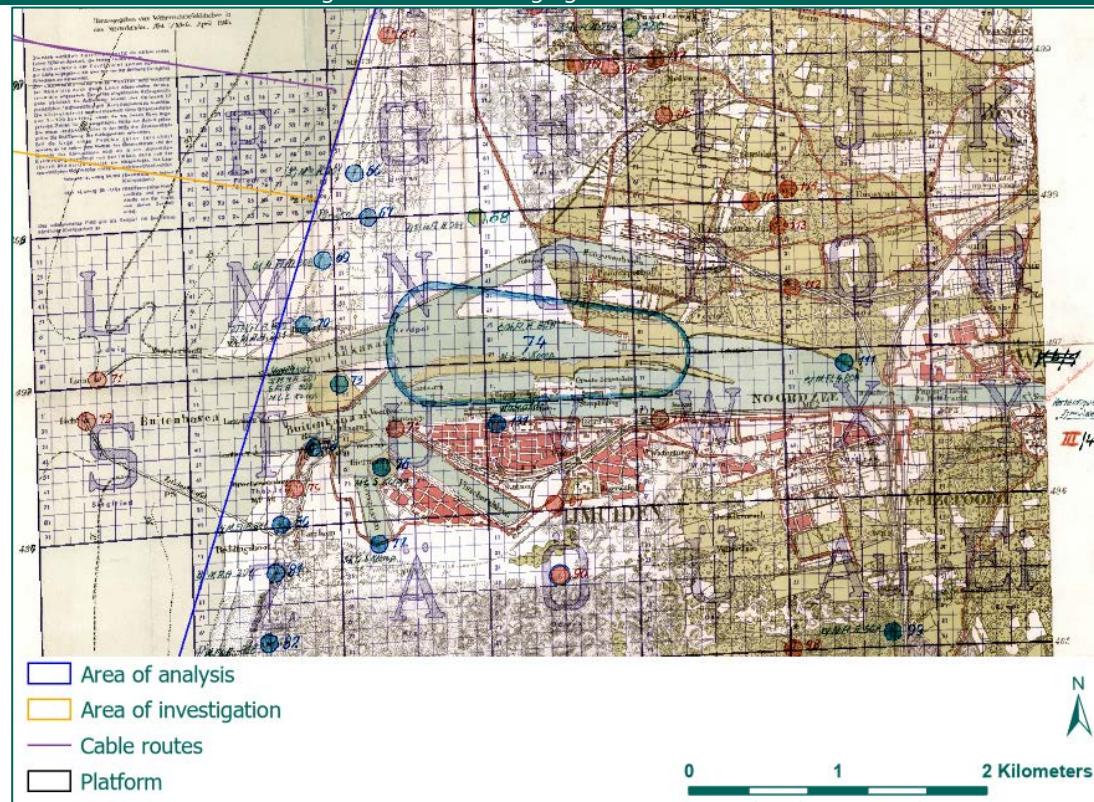


Collectie 575: Bureau Inlichtingen/ Duitse verdedigingswerken

| | |
|---------------|--------------------------------------------------------------------|
| Inventaris 68 | Duitse, Nederlandse en Britse topografische kaarten (1932 - 1945). |
| | Duitse verdedigingskaarten van de Nederlandse kust. |

Relevant, map showing the different defence positions within the *Festung IJmuiden*:

Collectie 575: Bureau Inlichtingen/ Duitse verdedigingswerken



| | |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Inventaris 198 | Bureau Inlichtingen (1941 - 1945) Inlichtingen Binnenlandse Strijdkrachten: Kaarten van Duitse verdedigingswerken (margriet, molen, vlag en kroon series) Kaarten van Duitse verdedigingswerken en objecten afkomstig uit de margriet, molen, vlag en kroon series |
| Relevant information on defence works at IJmuiden. | |
| Inventaris 219 | Bureau Inlichtingen (1941 - 1945) Inlichtingen Binnenlandse Strijdkrachten: Kaarten van Duitse verdedigingswerken (margriet, molen, vlag en kroon series) Kaarten van Duitse verdedigingswerken en objecten afkomstig uit de margriet, molen, vlag en kroon series |
| Relevant information on defence works at IJmuiden. | |
| Inventaris 245 | Bureau Inlichtingen (1941 - 1945) Inlichtingen Binnenlandse Strijdkrachten: Kaarten van Duitse verdedigingswerken (margriet, molen, vlag en kroon series) Kaarten van Duitse verdedigingswerken en objecten afkomstig uit de margriet, molen, vlag en kroon series |
| Relevant information on defence works at IJmuiden. | |
| Inventaris 457 | Bureau Inlichtingen (1941 - 1945) Inlichtingen Binnenlandse Strijdkrachten: Kaarten van Duitse verdedigingswerken (margriet, molen, vlag en kroon series) Kaarten van Duitse verdedigingswerken en objecten afkomstig uit de margriet, molen, vlag en kroon series |
| Relevant information on defence works at IJmuiden. | |

ANNEX 4 INTERNATIONAL ARCHIVES

Several international archives have been consulted in order to gain information on the war related events in the area of investigation. The REASeuro database contains a large quantity of documents from the British, American and German archives. The following international archives yielded relevant documents for this desk top study:

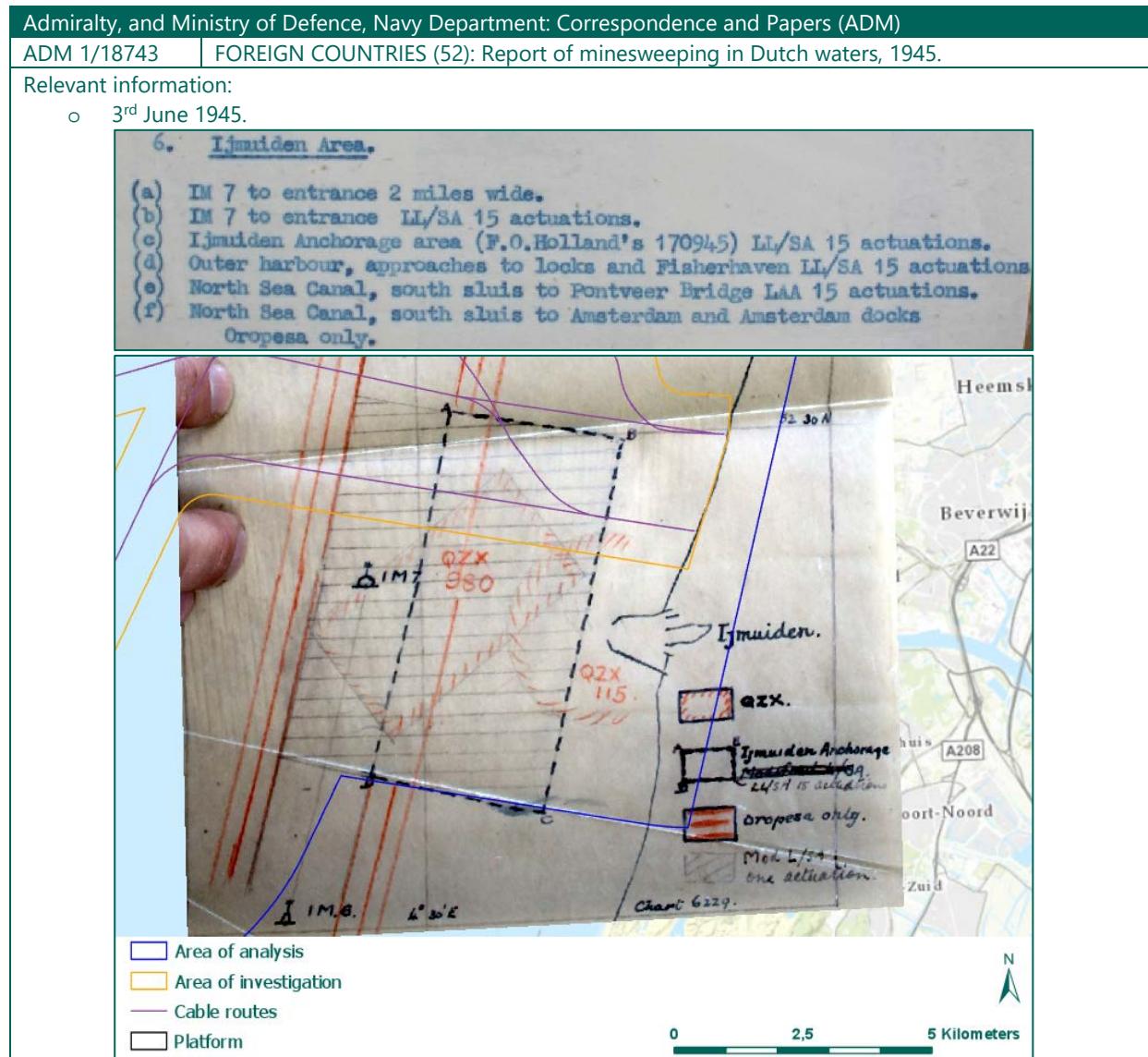
- The National Archives (TNA) in London, UK.
- National Archives and Records Administration (NARA) in College Park (MD), United States.
- Bundesarchiv-Militärarchiv (BaMa) in Freiburg, Germany.

The National Archives

The National Archives (TNA) have been consulted for more information on maritime and aerial warfare in the area of investigation. This annex contains relevant information from TNA. Information regarding maritime and aerial warfare is mentioned consecutively.

Admiralty series

The admiralty series (ADM) have been consulted for information concerning wrecks, naval combat, minefields and air strikes. Consulting these series yielded several files containing relevant information. These files are shown in the tables below.



Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)

ADM 1/18996 Results of British minelaying offensive.

General information about total amount of laid/dropped mines, 3rd September 1939 – 5th May 1945:

MINES LAID IN ENEMY WATERS

| | |
|-----------------------------------|---------------------|
| By Fast Minelayers and Destroyers | 11,100 |
| By M.T.Bs, M.Ls and M.G.Bs | 6,450 |
| By Submarines | 3,000 |
| By Aircraft | 53,100 |
| <u>Total</u> | <u>73,650 Mines</u> |

ADM 1/19745 Post-war mine clearance in European waters: first interim report of International Central Board. With charts, 1946-1947.

Relevant information:

- Appendix III. Merchant Ships and Fishing Vessels of all Nationalities sunk or damaged by mines between 9th May 1945 and 31st March 1946, in European Waters.

| | | | | |
|---------------------------------|---------|-------------|---------|----------------------|
| Norwegian BETTY (2,450 tons) | 12/3/46 | Off Ymuiden | Damaged | Outside swept water. |
|---------------------------------|---------|-------------|---------|----------------------|

- Dangerous areas existing in March 1946.



ADM 199/265 Admiralty: War History Cases and Papers, Second World War. Coastal forces actions: reports. 1944 - 1945

Relevant information:

- 14/15 February 1944. Encounter with enemy E-boats.
- 5/6 March 1944. Gunfire contact with enemy trawler.
- 24/25 March 1944. Gunfire contact with enemy trawlers.
- 29/30 March 1944. Attack on convoy.

ADM 199/266 Admiralty: War History Cases and Papers, Second World War. Coastal forces actions: reports. 1944

Relevant information:

| | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------|----------------|---------------|----------------|---------------|----------------|---------------|----------------|
| Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM) | | | | | | | | | |
| <ul style="list-style-type: none"> ○ 24/25 February 1944. Gunfire contact with enemy boats. ○ 13/14 July 1944. Gunfire contact. | | | | | | | | | |
| ADM 199/536 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces operations: reports. 1942 - 1943 | | | | | | | | |
| Relevant information: | | | | | | | | | |
| <ul style="list-style-type: none"> ○ 19/20 September 1943. Gunfire contact and attack on "Strasbourg" with torpedoes. | | | | | | | | | |
| ADM 199/537 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces operations: reports. 1943 | | | | | | | | |
| Relevant information: | | | | | | | | | |
| <ul style="list-style-type: none"> ○ 17/18 April 1943. Gunfire contact. ○ 28/29 April 1943. Gunfire contact. ○ 22/23 July 1943. Gunfire contact. ○ 23/24 July 1943. Gunfire contact. ○ 18/19 August 1943. Gunfire contact with enemy trawlers. ○ 25 August 1943. Gunfire contact. | | | | | | | | | |
| ADM 199/544 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces operations: reports. 1943 | | | | | | | | |
| Relevant information: | | | | | | | | | |
| <ul style="list-style-type: none"> ○ Operation QU2B, 17 April 1943. Mines laid by coastal forces. | | | | | | | | | |
| <p style="text-align: center;"><u>Completed Q.U. 2 B.</u></p> <p>(a) Area is enclosed by lines joining:-</p> <p>52 deg. 29 mins. 42 secs. N. 04 deg. 31 mins. 24 secs. E. 52 deg. 28 mins. 36 secs. N. 04 deg. 32 mins. 48 secs. E. 52 deg. 26 mins. 54 secs. N. 04 deg. 29 mins. 24 secs. E. 52 deg. 28 mins. 06 secs. N. 04 deg. 28 mins. 00 secs. E.</p> <p>(b) M.L's 100, 106.</p> <p>(c) 17th April, 1943 at 0249.</p> <p>(e) 12 in No. A S Y B.205 (No Sterilizers arming clocks set to arm at 3 days).</p> | | | | | | | | | |
| <ul style="list-style-type: none"> ○ Operation QU11, 29 May 1943. Mines laid by coastal forces. | | | | | | | | | |
| <p style="text-align: center;"><u>Completed Q.U. XI.</u></p> <p>(A) Area is enclosed by lines joining:-</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>52° 35' 00" N</td> <td>04° 28' 30" E.</td> </tr> <tr> <td>52° 35' 00" N</td> <td>04° 31' 30" E.</td> </tr> <tr> <td>52° 32' 00" N</td> <td>04° 31' 30" E.</td> </tr> <tr> <td>52° 32' 00" N</td> <td>04° 28' 30" E.</td> </tr> </table> <p>(B) M.T.B's 234, 223, 232, 244.</p> <p>(C) 29th May, 1943 at 0225.</p> <p>(E) 16 in No. ASY B 205 (No sterilizers, No delays).</p> | | 52° 35' 00" N | 04° 28' 30" E. | 52° 35' 00" N | 04° 31' 30" E. | 52° 32' 00" N | 04° 31' 30" E. | 52° 32' 00" N | 04° 28' 30" E. |
| 52° 35' 00" N | 04° 28' 30" E. | | | | | | | | |
| 52° 35' 00" N | 04° 31' 30" E. | | | | | | | | |
| 52° 32' 00" N | 04° 31' 30" E. | | | | | | | | |
| 52° 32' 00" N | 04° 28' 30" E. | | | | | | | | |
| ADM 199/1168 | Admiralty: War History Cases and Papers, Second World War. Minelaying and minesweeping: reports. 1939-1945 | | | | | | | | |
| Relevant information: | | | | | | | | | |
| <ul style="list-style-type: none"> ○ Operation QU1, 5 November 1942. Mines laid by coastal forces. | | | | | | | | | |

Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)

| | |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A. | Area is enclosed by lines joining:- $52^{\circ} 29' 12''$ N $04^{\circ} 29' 06''$ E. $52^{\circ} 27' 30''$ N $04^{\circ} 29' 06''$ E. $52^{\circ} 27' 30''$ N $04^{\circ} 27' 48''$ E. $52^{\circ} 29' 12''$ N $04^{\circ} 27' 48''$ E. |
| B. | M.L's 110, 105, 110. |
| C. | November 5th at 0115. |
| E. | 18 in number Mines, A Mark I-IV Assembly 77. Steriliser Clocks set 40 days. 6 mines per boat. |

| | |
|--------------|------------------------------------------------------------------------------------------------------------|
| ADM 199/1350 | Admiralty: War History Cases and Papers, Second World War. Minelaying and minesweeping: reports. 1939-1945 |
|--------------|------------------------------------------------------------------------------------------------------------|

Relevant information:

- Operation QU29, 17 April 1944. Mines laid by coastal forces.

| | |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Completed Q.U.29.</u> | |
| (A) | Area is enclosed by lines joining:- $52^{\circ} 29'$ N $04^{\circ} 31'$ E $52^{\circ} 29'$ N $04^{\circ} 32'$ E $52^{\circ} 26'$ N $04^{\circ} 32'$ E $52^{\circ} 26'$ N $04^{\circ} 31'$ E |
| (B) | M.T.Bs 234, 245, 83, 88, 223, 225, 233, 244. |
| (C) | 17th April, 1944 0130. |
| (E) | 32 in number 4 ASY D 413 16 ASY D 407 (all 16 day sterilizers) 12 ASY B 231 (<u>Clocks to arm 8 days, 8 day sterilizers</u>). |

- Operation QU27, 23 April 1944. Mines laid by coastal forces.

| | |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Completed Q.U. 27.</u> | |
| (A) | Area is enclosed by lines joining:- $52^{\circ} 30'$ N $04^{\circ} 26'$ E $52^{\circ} 30'$ N $04^{\circ} 28'$ E $52^{\circ} 26'$ N $04^{\circ} 29'$ E $52^{\circ} 26'$ N $04^{\circ} 26'$ E |
| (B) | M.T.Bs 223, 224, 225, 233, 234, 244, 83, 93, 245, M.Ls 100, 105, 110. |
| (C) | 23rd April, 1944, 0145. |
| (E) | 52 in number 12 ASY K 1011 6 ASY D 411 18 ASY D 413 (all Bobbin Q) 7 Mark XVII 49/50 Mark XVIII L (Clocks to arm 38 days 5 hours) 9 Mark XVII 49/50 Mark XVII Star, all flooder clocks to 16 days. |

| | |
|--------------|----------------------------------------------------------------------------------------------------------------------|
| ADM 199/2414 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces Log. 01 September 1942 - 30 April 1943. |
|--------------|----------------------------------------------------------------------------------------------------------------------|

Relevant information:

- 20/21 February 1943. Gunfire contact. MGB's were fired at by two M-class M/S NW of IJmuiden.
- 28 February 1943. Gunfire contact. MGB 49 was sunk
- 17 April 1943. Gunfire contact.
- 29 April 1943. Gunfire contact.

Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------|
| ADM 199/2415 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces Log. 01 May 1943 - 30 September 1943. |
|--------------|--------------------------------------------------------------------------------------------------------------------|

Relevant information:

- 5 May 1943. Two times short gunfire contact.
- 23 July 1943. Gunfire contact and attack with torpedoes. 1 German ship probably hit with torpedo.
- 25 July 1943. Gunfire contact
- 18/19 August 1943. Attack on convoy with torpedoes.
- 19 September 1943. Attack with torpedoes.

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------|
| ADM 199/2416 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces Log. 01 October 1943 - 30 April 1944. |
|--------------|--------------------------------------------------------------------------------------------------------------------|

Relevant information:

- 14/15 February 1944. Gunfire contact. Probably sunk 1 enemy boat with torpedoes.
- 24/25 February 1944. Gunfire contact.
- 5/6 March 1944. Gunfire contact. One enemy trawler sunk.
- 6/7 March 1944. Battle with guns and torpedoes.
- 24/25 March 1944. Attack off IJmuiden. No casualties or damage.
- 28/29 March 1944. Battle with guns and torpedoes.
- 29/30 March 1944. Battle with guns and torpedoes.

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------|
| ADM 199/2417 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces Log. 01 April 1944 - 31 October 1944. |
|--------------|--------------------------------------------------------------------------------------------------------------------|

Relevant information:

- 13/14 July 1944. Gunfire contact, a trawler sunk (torpedoed).
- 30 September/1 October 1944. Gunfire contact and attack on convoy with torpedoes.
- 8/9 October 1944. Gunfire contact and torpedo attack.

| | |
|--------------|--------------------------------------------------------------------------------------------------------------------|
| ADM 199/2418 | Admiralty: War History Cases and Papers, Second World War. Coastal Forces Log. 01 October 1944 - 31 March 1945. |
|--------------|--------------------------------------------------------------------------------------------------------------------|

Relevant information:

- 15/16 October 1944. Gunfire contact with 4 enemy trawlers.

| | |
|-------------|---------------------------------------------|
| ADM 234/560 | British mining operations 1939-1945: Vol 1. |
|-------------|---------------------------------------------|

Relevant information (see also ADM 234/561):

- Operation 'CBX', 10th May 1940.
236 Mk XIV/XVII mines, at a depth of eight feet (= 2.44 meters).

Rendezvous between the PRINCESS VICTORIA and the destroyers was effected at 0945, off the Humber light-vessel, and the force proceeded south down the swept channel at 16 knots, departure being taken from Smith's Knoll light-vessel at 1537. Passage was made to the laying area in perfect weather conditions, but, when nearing Ymuiden, the destroyer WHITSHEAD was sighted picking up members of her crew blown overboard by air attack, and air raids were in evidence on the mainland both during and after the lay; nevertheless the force suffered no interference and, between 2107 and 2137 on 10th, the PRINCESS VICTORIA laid 236 Mk XIV/XVII units, at a depth of eight feet, along a line extending for 6.06 miles in a direction 280° from position 52°33'N, 04°28.3'E. On completion the force returned to Immingham, arriving at 0930 on 11th May.

- QU operations:
 - 17th April 1944, operation 'QU29', commencing at 0130 hours.
32 A Mk I-IV mines.

Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)

| | |
|--------------------|---------------------|
| Assemblies: | 4 D 413) |
| | 16 D 407) standard |
| | 12 B 231) |

Sterilizers for the D assemblies were set to operate on 3rd May. Those for the B assemblies were set, in error, to operate on the same day as they armed, 8th May.

- 19th April 1944, operation 'QU28', commencing at 0215 hours.

The total was made up of:

18 Mk XVII (49/50)/XVIII at a depth of 23 feet

20 A Mk I-IV - B 231)

8 A Mk I-IV - D 413) standard assemblies

8 A Mk I-IV - D 407)

Arming clocks in the B 231 assemblies were set to operate four days after laying. Sinkers were set to release in three groups of six on 26th, 28th and 30th May. Flooders and sterilizers were set for 16th June 1944. The lay was without incident.

- 23rd April 1944, operation 'QU27', commencing at 0145 hours.

The total of 52 mines was made up of:

9 Mk XVII (49/50)/XVII - at a depth of 23 feet

7 Mk XVII (49/50)/XVIII - at a depth of 22 feet

| | | |
|------------|------------|--------------------|
| 12 A Mk VI | - K 1011) | Special assemblies |
| 6 A Mk VI | - D 411) | |

| | | |
|--------------|---------|---------------------|
| 18 A Mk I-IV | - D 413 | Standard assemblies |
|--------------|---------|---------------------|

Flooders and sterilizers were set to operate on 17th June 1944 and Mk XVIII sinkers to release on 31st May 1944. The lay was without incident.

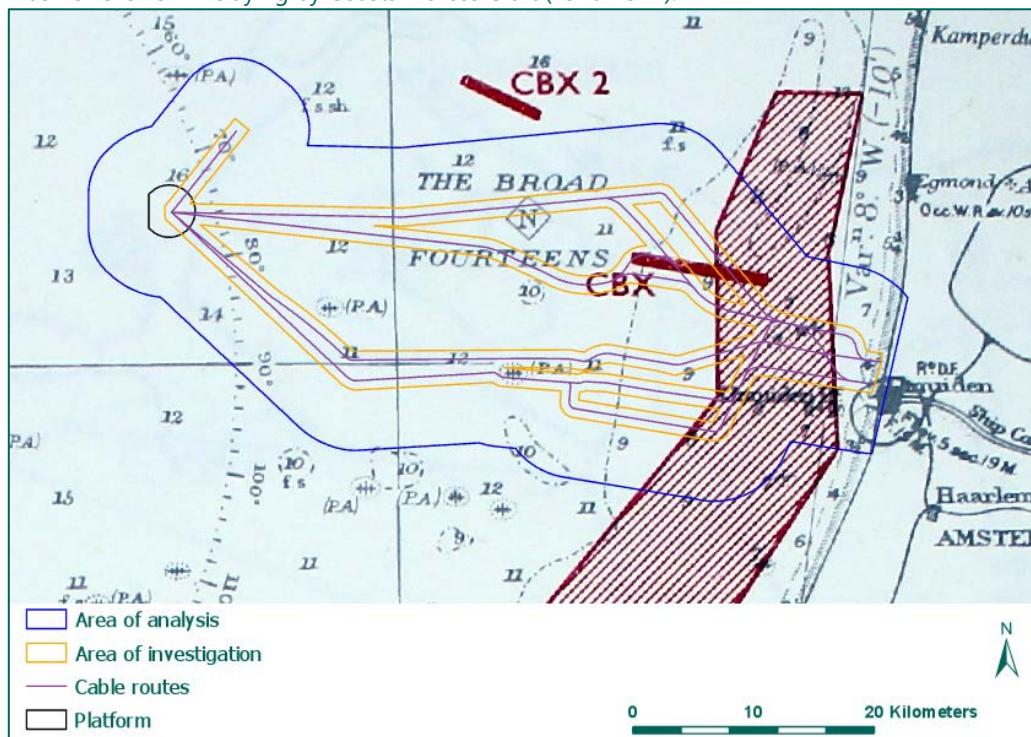
- o Air minelaying off the Dutch coast (see also ADM 234/561).

| | DANISH COAST | ELBE & WESER | GERMAN COAST & FRISIAN IS. | DUTCH WEST COAST | HOOK OF HOLLAND | SCHELDT | ALL AREAS |
|---------|---------------------------------------------|---------------------|--------------------------------------|------------------------|---------------------|---------------------------------|-----------------------|
| | Hawthorn Rosemary | Eglantine Yams | Xeranthemum Zinnia Mussels Nectarine | Limpets Whelks Trefoil | Oysters Iris V | Newts Juniper Iris II Flounders | |
| 1940 | Mines - Casualties - Ratio - | 139 8 1:17 | 127 10 1:13 | 45 10 1:4.5 | 60 7 1:8.5 | 70 5 1:14 | 441 40 1:11 |
| 1941 | Mines 37 Casualties 1 Ratio 1:37 | 116 11 1:10.5 | 268 18 1:15 | - 4 oo | 2 2 1:1 | - - | 423 36 1:11.7 |
| 1942 | Mines 698 Casualties 18 Ratio 1:39 | 133 10 1:13 | 3,921 67 1:58 | 170 4 1:42 | - - - | - - | 4,922 99 1:49.5 |
| 1943 | Mines 156 Casualties 12 Ratio 1:13 | 63 4 1:16 | 6,288 32 1:197 | 372 - oo | - - - | - - | 6,879 48 1:143 |
| 1944 | Mines 1,800 Casualties 53 Ratio 1:134 | 150 11 1:13.6 | 1,468 19 1:77 | 491 8 1:61 | 88 5 1:18 | 252 8 1:31 | 4,249 104 1:41 |
| 1945 | Mines 256 Casualties 1 Ratio 1:296 | 361 14 1:126 | - - - | - 2 oo | - - - | - - | 657 17 1:39 |
| OVERALL | Mines 2,987 Casualties 85 Ratio 1:35 | 962 58 1:16.6 | 12,072 146 1:83 | 1,078 28 1:38.5 | 150 14 1:10.7 | 322 13 1:47 | 17,571 344 1:51 |

Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)

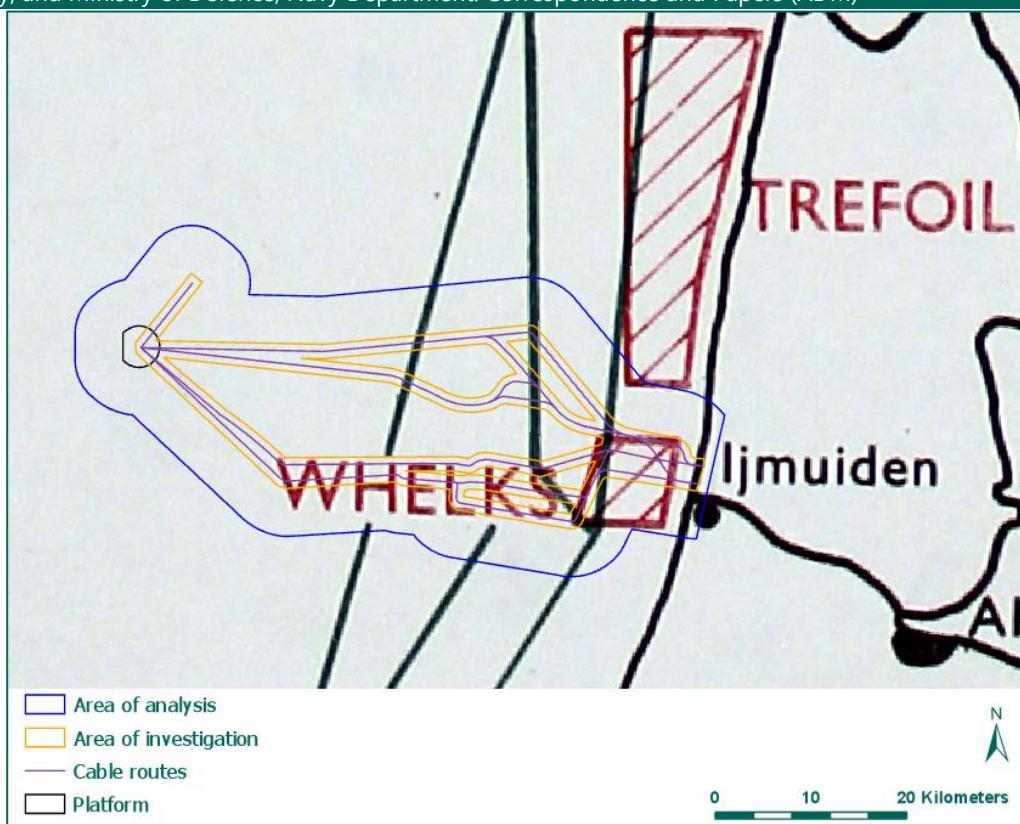
Relevant information:

- Map showing:
British defensive minelaying: Operation 'CBX', 10th May 1940
British offensive minelaying by Coastal Forces Craft (1940-1944).



- Map showing the zones of the air minelaying off the Dutch coast (operation 'Gardening'). the area of analysis has overlap with two Gardening zones: Whelks and Trefoil.

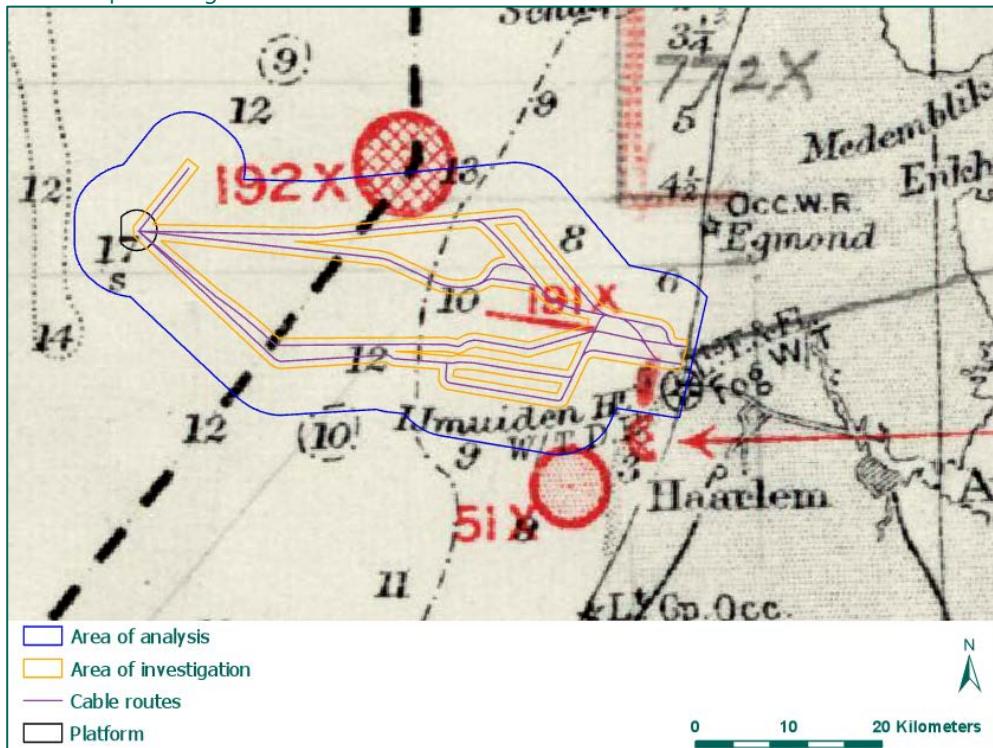
Admiralty, and Ministry of Defence, Navy Department: Correspondence and Papers (ADM)



ADM 239/304 | North Sea: chart 736 showing position of British and German minefields.

Relevant information:

- British map showing German and British minefields:

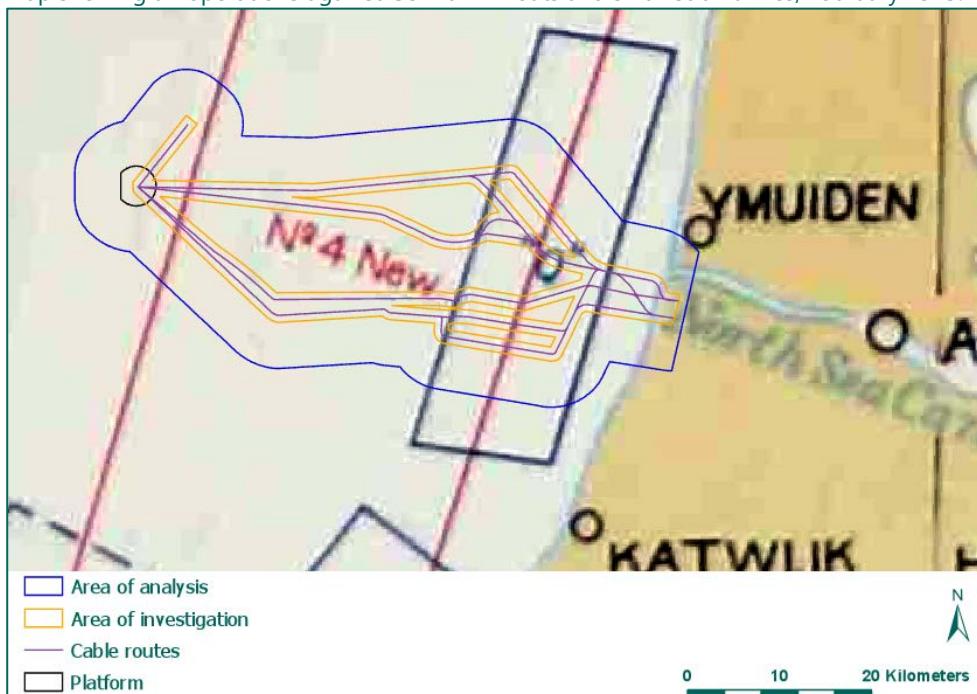


Cabinet and its committees (CAB)

| | |
|-------------|-----------------------------------------------------------------------------------------------------------------|
| CAB 101/324 | Air Offensive Against Enemy Shipping and Bomber Command Minelaying Operations, 1 September 1944 - 5 May 1945 |
|-------------|-----------------------------------------------------------------------------------------------------------------|

Relevant information:

- Map showing air operations against German E-Boats and small submarines, February 1945:


Air Ministry series

The Air Ministry series (AIR) contain information on aerial warfare during the Second World War. The Operations Record Books (ORBs) of units that operated in or near the area of investigation have been consulted:

- Headquarters Coastal Command, 1940-1945 (AIR 24/372 t/m AIR 24/427)
- 16 Group Coastal Command, 1940-1945 (AIR 25/313 t/m AIR 25/374)
- Headquarters Bomber Command, 1940-1945 (AIR 24/217 t/m AIR 24/319)
- Intelligence on USAAF missions (AIR 40)

16 Group Coastal Command patrolled the North Sea, attacking German shipping and conducting rescue operations. ORBs from this unit contain location of air strikes, jettisons, aircraft wreckages and Anti-Aircraft Artillery (AAA). Until halfway through 1942 the locations were noted in Coastal Command cypher which has only partially been decrypted by REASeurop. From 1942 onwards the ORBs mention locations in coordinates, based on decimal degrees. One must take into account that Coastal Command operated during the night as well, severely restraining navigational accuracy. When possible, war related events mentioned in the Coastal Command records have been coupled with records from the German point of view, resulting in more accurate positioning based on multiple sources.

REASeurop digitalized all the relevant latitude/longitude coordinates from Coastal Command ORBs and plotted these coordinates in GIS. This results in a comprehensive database of Coastal Command activity that may have results in the presence of UXO in the area of investigation. Coastal Command activity in and around the area of investigation is shown in Figure 48.

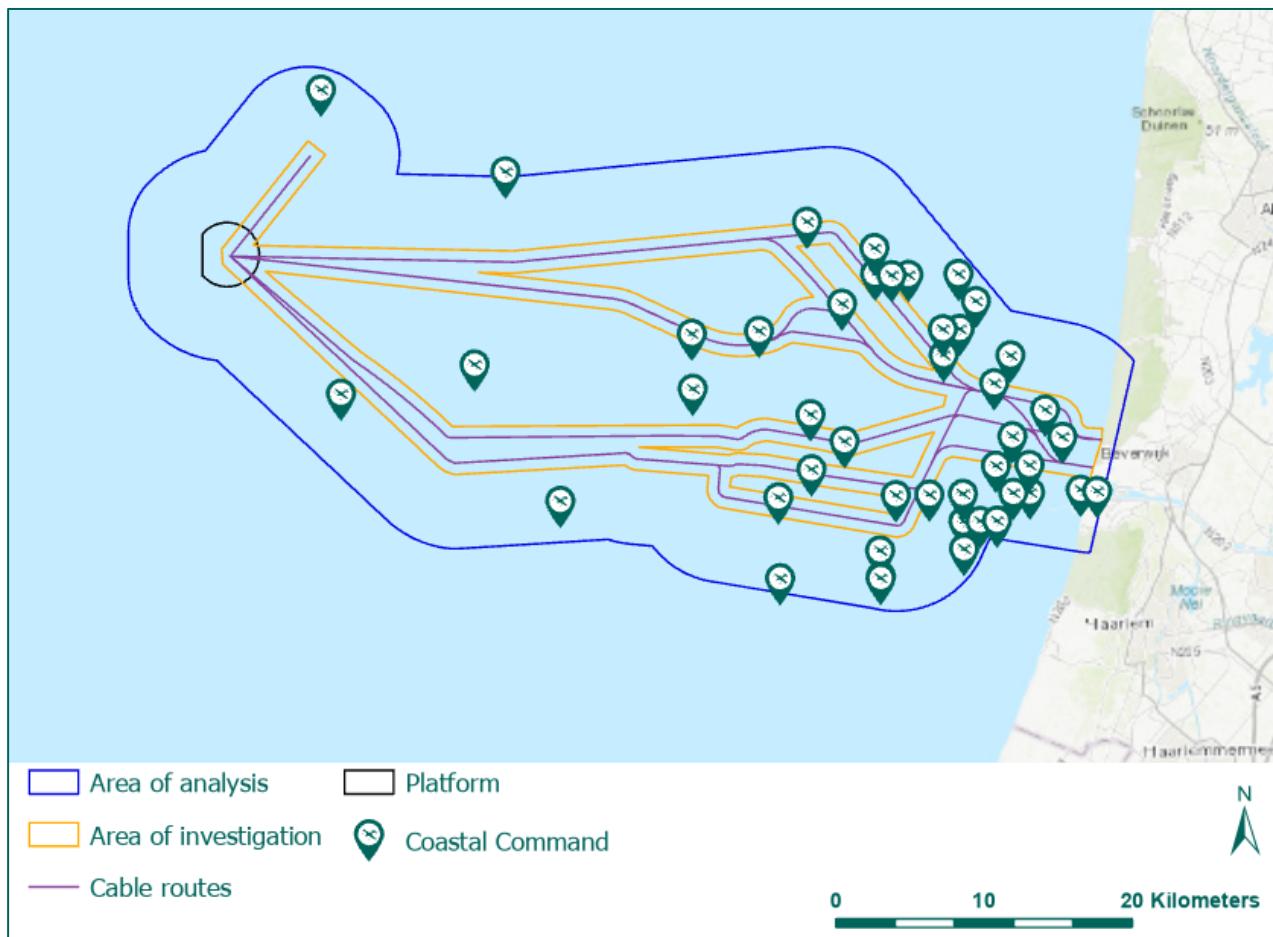


Figure 48: Locations of Coastal Command operations, based on 16 Group logs.

| Date | Event | Sources |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4 May 1942 | Operation 'Strike', enemy convoy, position 52 36N, 04 22E. Burst in the background is result of explosion of shell from land battery. - <i>Attack on convoy and firing of coastal guns. Relevant.</i> | AIR 28/595 |
| 27 November 1942 | Hudson A/320, to attack with bombs the southbound enemy convoy. In position 52 27N, 04 27E a probable escort vessel of approximately 1000 tons was attacked. There was intense inaccurate flak from ships and shore batteries. - <i>Attack on ship, flak from ships and coastal batteries. Relevant.</i> | AIR 25/343 |
| | Hudson A/320, to attack with bombs the southbound enemy convoy. In position 52 33N, 04 30E the aircraft sighted a convoy of 14 merchant vessels and 5 escort vessels. After two unsuccessful attempts the aircraft attacked a merchant vessel of 3,000 to 4,000 tons. Course southerly, speed six knots. Four 250 lbs bombs were dropped from 2,500 ft., 70 ft. spacing. Thirty ft. abaft port beam of vessel (nearest burst). There was little light flak from the convoy, and bursts of heavy flak from the shore batteries. - <i>Attack with bombs on vessel, flak from ships and coastal batteries. Relevant.</i> | AIR 25/343 |
| 18 February 1943 | Hampden G/415, at 2140 in position 52 30 N, 04 23E sighted bomb burst 6-10 miles ahead, also flak followed by one flare. - <i>Bomb burst and flak. Relevant.</i> | AIR 25/346 |
| | Hampden D/415, at 2155 in position 52 34 N, 04 26E a/c sighted 3 M/Vs course southerly, speed 7 knots. Aircraft attacked, but owing to intense | AIR 25/346 |

| Date | Event | Sources |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| | <p>fairly accurate light flak, evasive action was taken and results of bombing were not observed.</p> <ul style="list-style-type: none"> - <i>Attack on ships and flak. Relevant.</i> <p>Hudson L/320. At 2126 in position 52 27N, 04 27E sighted convoy of 18 vessels in two columns, on a southerly course, speed 7 knots. Aircraft attacked an MV of 2,500 tons, vessel third from rear of port column of convoy. Second or third bomb believed to make a direct hit on the stern of MV, the whole of L's crew saw a high column of smoke rising.</p> <ul style="list-style-type: none"> - <i>Attack on convoy. Relevant.</i> | |
| 15 September 1943 | <p>Six Hampdens /415. Torpedoes with 8 ft. contact were to be carried. Two miles west of IJmuiden a large liner was sighted. The liner appeared to be stationary, and down at the bow, and also had list to starboard. After runs of aircraft 'R', 'Y' and 'G', 'G' made a second run. On his second attack or run in, the Captain decided not to release torpedo as he considered the ship, aground in shallow water, having insufficient water for any chance of success.</p> <ul style="list-style-type: none"> - <i>Attack with torpedoes. Relevant.</i> | AIR 25/346 |
| 19 October 1943 | <p>14 Beaufighter's 254 Squadron, 13 Beaufighter's 236 Squadron. Object to attack minesweepers expected to be operating in IJmuiden area. Six Beaufighter's were to be armed with RP and twenty with cannon. At 1111 hours due west of IJmuiden wing sighted and attacked the following targets: M/V Strasbourg, at least one tug, one trawler, one 'M' class minesweeper, and one T.C.L. (probable).</p> <ul style="list-style-type: none"> - <i>Jettison of bombs (live!). Relevant.</i> | AIR 25/353 AIR 24/407 |
| 13 April 1944 | <p>Wellington M/415. Armed with 5 x 500 MC bombs and flares. Object: to attack enemy shipping contacted. Three bombs were jettisoned – live – in position 52 34N, 04 11E.</p> <ul style="list-style-type: none"> - <i>Jettison of bombs (live!). Relevant.</i> | AIR 25/360 |
| 23 April 1944 | <p>A/415. 52 32 N, 03 50E, West of IJmuiden. At 0104 hours attacked with 8 x 100 lbs A/S bombs. It is estimated there were two direct hits. At 0116 hours two fires were observed on boats. At the time of attack the boats were weaving violently. After attack A/C turned away and set course for base.</p> <ul style="list-style-type: none"> - <i>Attack on E-boats. Relevant.</i> | AIR 25/360 |
| 24 May 1944 | <p>Avenger B/848, object is to attack and destroy enemy shipping found in patrol area. A/C to be armed 2 x 500 and 2 x 250 lbs bombs plus 4 flares. At 0218 there was another contact from four vessels 45 degrees to starboard 8 miles away when a/c was in position 5226N, 0422E. A/C climbed, closed, and dropped flares but nothing was seen. A further search with radar was carried out and 2 more flares were dropped at 0226 hours and four minesweepers were seen and attacked with 2x 500 lbs and 1 x 250 lbs bomb. One bomb was a near miss 20 yards on starboard quarter of one of the vessels. One 250 lbs bomb hung up.</p> <ul style="list-style-type: none"> - <i>Attack on vessels, possibly into area of analysis. Relevant.</i> | AIR 25/361 |
| 1 June 1944 | <p>Avenger C/848, to carry out armed recce of enemy C/V route form Den Helder to Dunkirk. A/C to be armed with 2 x 500 lbs and 2 x 250 lbs bombs. At 0305 two ships were seen in position 52 36N, 04 24E, on a southerly course, speed 4 knots possibly armed trawlers. Dive bombed from 3,500 to 1,500 ft. from ahead dropping all bombs in stick. No hits seen but there was</p> | AIR 25/362 |

| Date | Event | Sources |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| | a further explosion 3 seconds after all bombs had burst. There was moderate fairly accurate light flak from the two ships. - <i>Attack on ships and flak. Relevant.</i> | |
| 8 July 1944 | Wellington. At 0251 hours when a/c was in position 52 31N, 0432 E there were two blips ahead and to port 8 miles away and at 0305 hours an attack was made through a break in the cloud on one M/V of 1,500-2,000 tons which was on a course of 225 degrees at 12 knots. The attack was made from 4,000 ft. and 6 x 500 lbs MC bombs (44 nose 0.14 sec delay tail) were used. They were believed to have straddled vessel. Immediately after attack 5 more similar M/V's were seen and 4 E/V's ahead of vessel attacked. - <i>Attack on ships. Relevant.</i> | AIR 25/363 |
| 7 September 1944 | /143. At 0105 hours in position 52 27N, 04 28E about 25 U/I vessels were sighted on a course of 010 degrees at 6 knots. Their position was given to control and another a/c on patrol. Intense light flak was experienced close behind a/c. At 0200 hours these vessels were attacked from 1,200 ft. with 2 x 250 and 2 x 500 lbs bombs but results were not seen owing to evasive action being taken. - <i>According to the speed and direction of the convoy attacked, the attack took probably place within the area of analysis. Relevant.</i> | AIR 25/366 |
| 9 September 1944 | Beaufighter X/143. At 0417 hours in position 52 30N, 0420 E a flare was seen to be dropped by an unidentified a/c and flak was seen below. The other a/c was talking on VHF. At 0420 hours bombs were seen to drop from this A/C and the pilot of "X" saw 3 ships below. A flare was then dropped by "X" and a wake was seen on an easterly course. What appeared to be a small vessel was attacked at 0425 hours from 2-3,000 ft. with 2 x 250 and 2 x 500 lbs, but although 2 bombs were seen to burst their position in relation to the target was unobserved. - <i>Observation of attack on ships and flak, and attack on ship possible in area of analysis. Relevant.</i> | AIR 25/366 |
| 13 September 1944 | /524. [...] obtained radar contact in position 52 28N, 0403E, which was immediately followed by a visual of 4 surface craft, most probably E-boats on a course 130/T at 25 knots. They were in line astern. Sighting report sent to base. At 0056 hours pilot attacked the rear boat. Near miss was claimed bombs seen to explode 50 yards to starboard of the rear vessel. No flak was encountered. Attack report sent to base. At 0110 hours three more explosions were seen in vicinity of the same vessels. - <i>Attack on E-boats. Relevant.</i> | AIR 25/366 |
| | Avenger P/855, armed with 2 x 500 lbs and 2 x 250 lbs bombs. At 2329 hours a/c dropped two flares, one failing to ignite, on radar and saw four M/V's but no E/v's they were on course 190/T at 12 knots and in a loose diamond formation. At 0009 hours in position 52 25N, 04 22E pilot attacked rear M/V. The attacked M/V was seen to be illuminated by flash of bombs, but the actual explosions were not observed. Meagre light accurate flak was experienced. - <i>Attack on ships. Relevant.</i> | AIR 25/366 |
| 23/24 September 1944 | Avenger /855, armed 2 x 250 lbs, 2 x 500 lbs U.S.G.P. bombs and flares 4 x Mk 5. Patrol was flown at height of 3,000 ft. At. 2200 radar contact 4 miles on starboard bow. At 2203 in position 52 35N, 04 28E 6 sources of moderate light flak in line ahead on course 010 degrees, speed 25 knots as estimated from wakes seen after attack. Suggesting E/R boats. At 2204 | AIR 25/366 |

| Date | Event | Sources |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| | attacked second source of flak, with bombs and observed gunfire followed by explosion and sparks seen. - <i>Attack on ships. Relevant.</i> | |
| 4 October 1944 | Avenger A/855. Rover patrol along enemy convoy route from 5 miles south of Hook to north end of Texel. Armed with 2 x 250 lbs and 2 x 500 lbs bombs. At 0048 there were 6 blips and at 0053 in position 5227N, 0428E a convoy composed of 1 large M/V and 6/7 escorts was seen. 3 escorts in a wide via were leading followed by the M/V with the other escorts in loose formation and 3 more escorts further off shore in approximately 52 28N, 04 25E , course 020 degrees 7 knots. The last ship in convoy was TLC type. Sighting report was sent at 0057 and at 0107 target was attacked in a dive from 4,200 to 2,800 ft. from the port beam using moonlight. Bombs fell short. 2 flares were dropped but no results were seen. - <i>Attack on ship, probably in area of investigation. Relevant.</i> | AIR 25/367 |
| 7 October 1944 | Avenger /855. Armed 2 x 500 lbs, 2 x 250 lbs GP bombs, 4 flares Mk 5. At 2310 in position 52 29N 04 18E 6 blips 080 degrees T, 7 miles. At 2345 sighted 6 TTAs and at 2347 a/c attacked with bombs. A large explosions was felt and orange flash seen. A/C was damaged by fair amount of light flak during attack. - <i>Attack on ships possibly in area of analysis. Relevant.</i> | AIR 25/367 |
| 12/13 October 1944 | Wellington /524. To be armed 6 x 500 lbs bombs and maximum flares, and to be fitted with L/R tanks. Off patrol at position 52 36N, 04 27E. 3 bombs were jettisoned live. - <i>Jettison of bombs (live!). Relevant.</i> | AIR 25/367 |
| 2 November 1944 | Wellington B/P/524, A/C to be armed with 6 x 500 lbs bombs and maximum flares. At 0520 in position 52 34N, 04 27E 5 E/Boats were seen on course 120 degrees 30 knots. A level bombing attack from starboard to port was made from 4,000 ft. 2 explosions were seen in the wake of one vessel. There was light accurate flak. - <i>Attack on E-boats and flak. Relevant.</i> | AIR 25/368 |
| 30 November 1944 | Wellington R/524, a/c to be armed 12 x 250 lbs bombs. A/C circled for position and attacked at 2230 in position 52 28N, 04 16E. On first run in – straight and level attack – on starboard quarter of leading vessel of 6 plus in line astern. The first pair of bombs were seen to make a direct hit. A large flash was observed and much debris whilst a/c was attempting second attack. The remainder of vessel then opened out and passed on ahead of vessel attacked. During the run in a visual sighting of 6 plus E-boats was obtained but bombs failed to release and were finally released by using jettison bar. - <i>Attack on vessels with bombs. Relevant.</i> | AIR 25/368 |
| 9 December 1944 | Wellington /524. A/C to be armed 12 x 250 lbs bombs and maximum flares. Further radar contact at 0245 hours, position 52 28N, 04 30E. A/C circled and attacked 6 x 250 lbs bombs 90 ft. spacing. Results not observed. - <i>Attack on ships. Relevant.</i> | AIR 25/369 |
| 12 December 1944 | Wellington J/524. | AIR 25/369 |

| Date | Event | Sources |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| | <p>At 2122 in position 52 38N, 04 18E visual sighting of wake. At 2130 sighted 1 E-boat course 330 speed 25 knots. Attacked with bombs no hits observed. Made another attack at 2215 and at 2225 a third, E/B now slowed to 10 knots. MTB bombs level hits probable. Contact was lost at 2230.</p> <ul style="list-style-type: none"> - <i>Attack on E-boat. Not relevant: original position of E-boat not known.</i> | |
| 15 December 1944 | <p>Wellington /524. To carry out Box Patrol 'D' to locate enemy shipping sighting and attack report required. Aircraft to be armed with 12 x 250 lbs bombs, 8 flares, 3 drop flares, 12 marine markers.</p> <p>Contact was made at 2224 in position 52 37N, 04 22E and at 2228 an attack was made S.E. and radar was used. Nothing was observed as to the results.</p> <ul style="list-style-type: none"> - <i>Attack. Relevant.</i> | AIR 25/369 |
| 24 December 1944 | <p>Wellington /612, a/c to be armed with 6 x 250 lbs bombs, maximum number of flares and to be fitted with long range tanks.</p> <p>At 2005 hours in position 52 30N, 04 20E there were two contacts and at 2020 hours in position 52 28N, 04 25E A/C attacked two stationary contact with 6 x 250 lbs bombs. The first bomb gave brighter burst than the other but no further results were seen.</p> <p>At 2228 hours in position 52 27N, 04 29E very accurate intense light flak was experienced.</p> <ul style="list-style-type: none"> - <i>Attack with bombs, flak. Relevant.</i> | AIR 25/369 |
| 5/6 January 1945 | <p>Wellington R/524. At 2336 hours two radar contacts bearing 081 T 15 miles. Attacked two contacts in position 52 28N, 0423E fairly accurate light flak experienced.</p> <ul style="list-style-type: none"> - <i>Attack on ships. Relevant.</i> | AIR 25/370 |
| 13 January 1945 | <p>Wellington /612. Armed with 6 x 250 lbs MC bombs (44 pistol nose instantaneous, tail .025 seconds delay), 3 white drips and 8 flares. A/C began patrol at 1807 in position 51 54N, 03 44E. At 1830 in position 52 36N, 04 23E ASV became u/s and a/c set course for base. At 1833 2 bombs were jettisoned live.</p> <ul style="list-style-type: none"> - <i>Jettison of bombs (live!). Relevant.</i> | AIR 25/370 |
| 15 January 1945 | <p>Patrol was commenced at 2125 hours in position 52 53N, 0343 E. At 2215 hours two contacts were made in 52 32N, 04 11E and attacked twice. On first occasion 3 minutes later saw two dull red glows through cloud lasting approximately 15 seconds.</p> <ul style="list-style-type: none"> - <i>Attack on E-boats. Relevant.</i> | AIR 25/370 |
| 3 February 1945 | <p>At 0107 hours, in position 52 38N, 04 23E, off patrol having completed 3 circuits. Nothing was sighted. At 0110 in position 52 40N, 0400 E, 12 bombs were jettisoned safe.</p> <ul style="list-style-type: none"> - <i>Jettison of bombs. Relevant.</i> | AIR 25/371 |
| 5 February 1945 | <p>Wellington /612. At 0645 hours in position 52 30N, 04 33E smell of burning which seemed to come from bomb bay, and bombs were jettisoned alive.</p> <ul style="list-style-type: none"> - <i>Jettison of bombs (live!). Relevant.</i> | AIR 25/371 |
| | <p>Wellington /612. Later at 0615 hours the remaining two E-boats were attacked with front and rear guns from 1,000 ft. in position 52 29N, 04 30E. The target vessels were then reported to be taking wild evasive action and firing erratically.</p> <ul style="list-style-type: none"> - <i>Attack on E-boats with guns and flak. Relevant.</i> | AIR 25/371 |

| Date | Event | Sources |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 19 February 1945 | Wellington P/612. Attacked contact at 2028 hours in position 52 28N, 04 31E with 6 x 250 lbs bombs from height of 1,000 ft. - <i>Attack on ships. Relevant.</i> | AIR 25/371 |
| 22/23 February 1945 | Wellington P/612. At 0112 hours A/C attacked in position 52 29N, 04 31E, from 4,000 ft. on radar. One large explosion was seen at base of flak in addition to bomb bursts. - <i>Attack on E-boats. Relevant.</i> | AIR 25/371 |
| 25 February 1945 | Wellington /612. Attacked 5 contacts, in position 52 32N, 04 29E, visually estimated as 5 TTAS, with 6 x 250 lbs bombs from height of 1,000 ft. The rear gunner fired about 400 rounds into flak area, and observed 2 nd pair of bombs bursting right alongside 2 nd ship. Only 4 blips were shown on radar after attack. Intense and very accurate M/F and H/F Rocket fire experienced, which did not appear to decrease after attack with machine gun. - <i>Attack on ship with bombs, flak and rockets. Relevant.</i> | AIR 25/371 |
| 12 March 1945 | Wellington P/612. At 2300 hrs in position 52 35N, 04 20E a/c attacked contacts when on course 180 degrees. Intense accurate flak was encountered estimated to be 40 mm and rocket fire which made a cone just above tail of a/c. One of the contacts was very much larger than anything seen in this area by this crew, all operators agreed on this. 6 x 250 lbs bombs were used from 2,000 ft. and bombs exploded in flak area. After attack there was a blinding green flash seen by pilot and rear gunner after which a reddish orange glow was seen on water for about 10 seconds. Radar screen still showed three contacts. - <i>Attack on ships and flak (3.7 cm and rockets). Relevant.</i> | AIR 25/372 |
| 14 March 1945 | Wellington. On patrol at 1953. In position 52 36N, 04 23E light flak was encountered, a wreck is charted in this position. - <i>Flak and observation of wreck. Relevant.</i> | AIR 25/372 |
| 15 March 1945 | Wellington /612. A/C shadowed and informed control and at 2346 hours in position 52 29N, 04 29E attacked four stationary contacts. There was fairly accurate light and medium flak and some rockets. 6 x 250 lbs were dropped and no visual results were seen but there were only three blips on screen after attack. - <i>Attack on ships, flak, and rockets. Relevant.</i> | AIR 25/372 |
| 17 March 1945 | At 2056 hours in position 52 33N, 03 58E there was a radar contact of one large blip surrounded by a number of smaller blips, there was inaccurate light flak. - <i>Observation on radar. Not relevant.</i> | AIR 25/372 |
| 27/28 March 1945 | Wellington /524. Anti E-boat bomb and flare load. Force contacted visually at 0112 in position 52 26N, 04 27E. Attacked with 6 x 250 lbs bombs 1 M/V and 5 E/V's. No results observed owing to evasive action from fairly accurate light and medium flak. - <i>Attack on ships and flak. Relevant.</i> | AIR 25/372 |
| 3/4 April 1945 | At 2127 hours A/C was in position 52 43N, 03 49E and large explosion was observed inland bearing 122 degrees. This was followed by others throughout patrol, they are thought to be from possible demolitions. - <i>Observation. Not relevant.</i> | AIR 25/373 |

| Date | Event | Sources |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5 April 1945 | Wellington /524, Arming: anti E-boat bomb and flare load. At 0228 hours a/c received a message to investigate U/N in position 52 20N, 04 26E and attack. Aircraft set course for position of target, and at 0252 hours in position 52 25N, 04 16E made a contact of 7 blips bearing 060 T / 11 miles. 'C' sent in a report and attacked along track from astern, at 0325 hours. The attack was made with 6 x 250 lbs bombs, but results were unobserved. No flak was encountered. - <i>Attack on vessels, probably in area of analysis. Relevant.</i> | AIR 25/373 |
| 7/8 April 1945 | Wellington. At 2301 hours a contact was obtained and was confirmed at 2331 hours as 3 U/N stationary in position 52 29N, 04 29E. This was reported and instructions were received to attack and shadow. The attack was made at 0140/8 hours in position 52 30N, 0430E with 6 x 250 lbs bombs from 3,500 feet. - <i>Attack on ships with bombs. Relevant.</i> | AIR 25/373 |
| 8/9 April 1945 | Wellington /524. Arming: anti E-boat bomb and flare load. At 0028 attacked 7 radar contacts in position 52 28N, 04 34E, no results observed, and no flak. - <i>Attack on ships with bombs. Relevant.</i> | AIR 25/373 |
| 10 April 1945 | Wellington /524. All A/C to be armed anti E-boat bomb and flare load. At 0007 hours a/c attacked contacts in position 52 33N, 04 26E there was heavy and light inaccurate flak. No results were observed but bombs burst in flak area and contacts spread out after attack. - <i>Attack on ships and flak. Relevant.</i> | AIR 25/373 |
| | Wellington /524. At 0016 hours this a/c picked up contact in position 52 35N, 04 30E this was reported to control and a/c was ordered to attack and return to base. At 0118 hours a/c attacked 3 U/I contacts in position 52 30N, 04 30E. Intense fairly accurate medium flak was encountered. Bombs were seen to burst in centre of flak. - <i>Attack on ships and flak. Relevant.</i> | AIR 25/373 |
| 12 April 1945 | At 2345 hours in position 52 34N, 04 15E there were three to four contacts bearing 074 degrees at 10 miles. Control was informed at 0022 hours a/c attacked these contacts by radar but no results were observed. At 0029 hours a/c dropped flares in position but nothing was seen. - <i>Attack. Relevant.</i> | AIR 25/373 |
| 24 April 1945 | Wellington /612. At 0237 hours in position 52 25N, 04 22E aircraft attacked with 2 x 250 lbs bombs, but results were unobserved, owing to evasive action taken. It was discovered that 4 bombs had hung up when aircraft landed. During attack light flak was encountered. - <i>Attack and flak. Relevant.</i> | AIR 25/373 |

Table 25: Coastal Command operations, based on 16 Group ORBs.

Bomber Command, Coastal Command's famous land-based counterpart, was also active against German shipping during the first years of the war. Besides intentional bombing, Bomber Command aircraft also jettisoned bombs when in trouble. The jettisons preferably took place over sea, since this dramatically reduced the chance of collateral damage. Bomber Command coordinates have been digitalized and imported in GIS as well. Coordinates in and around the area of investigation are shown in Figure 49.

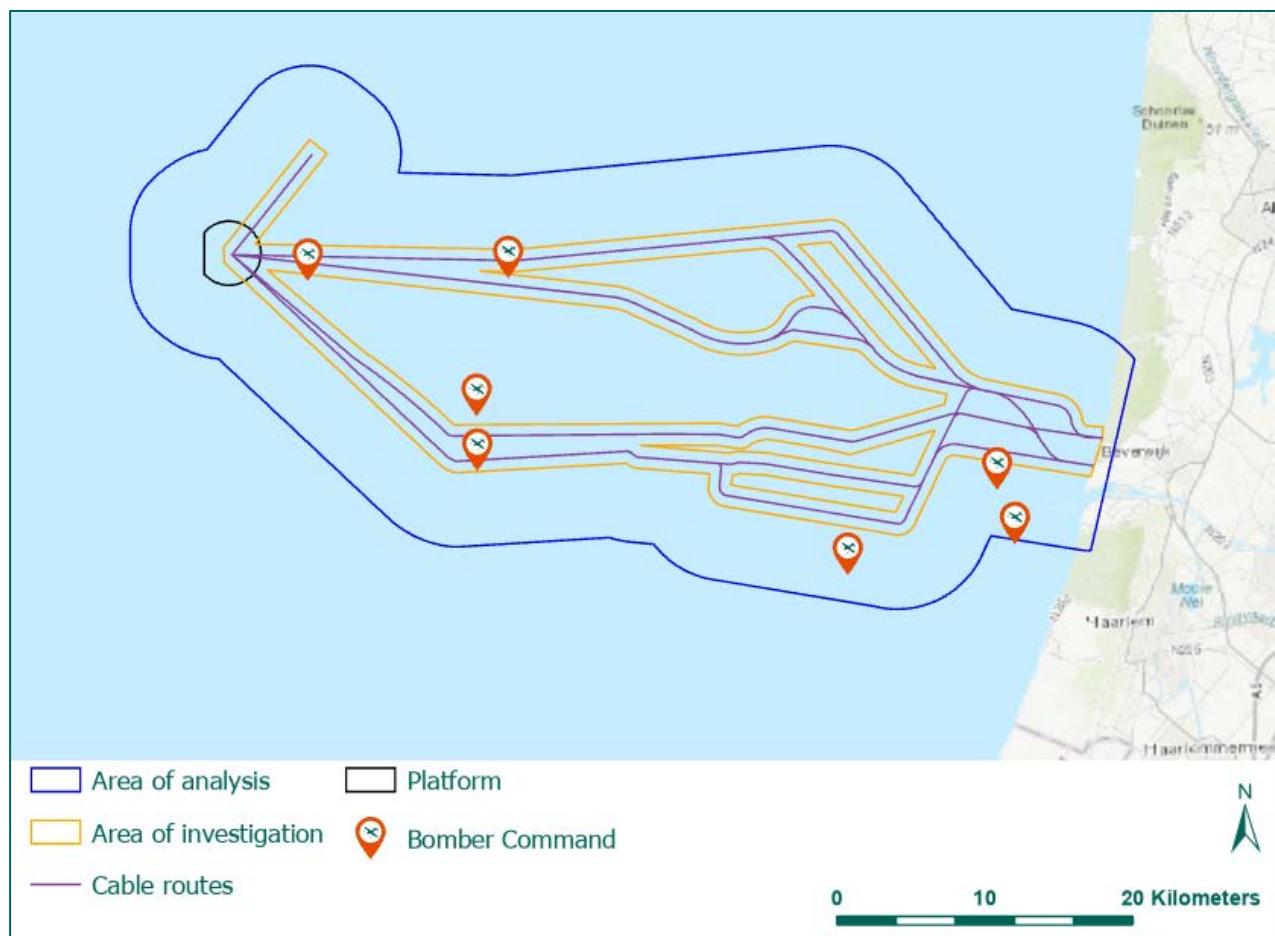


Figure 49: Locations of Bomber Command operations, based on Bomber Command HQ logs.

| Date | Event | Sources |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 20/21 March 1941 | 1 Blenheim (2 Group), 4 x 250 lbs. Convoy 52 26N, 04 20E, 15-20 ships various sizes stationary. Near misses. - <i>Attack on convoy. Relevant.</i> | AIR 24/229 |
| 23 May 1941 | 2 Blenheim's (2 Group). 8 x 250 lbs SAP. 2 M/V's 6,-8,000 tons at 52 27N, 04 30E, proceeding southwards. Results unobserved owing to intense light flak from vessels, but considerable smoke seen issuing from one of the vessels amidships after bombing. - <i>Attack on convoy. Relevant.</i> | AIR 24/231 |
| 12 July 1941 | 1 Blenheim (2 Group). 4 x 250 SAP. 100 ft. sailing vessel (believed reporting vessel) 52 32N, 03 58E. Bombs overshot by 5-10 yards. Vessel also machine gunned. - <i>Attack on ship. Relevant.</i> | AIR 24/233 |
| 18 August 1941 | 12 Blenheim's (2 Group). 24 x 500 lbs SAP, 48 x 25 lbs incendiary. Two 300 ton trawlers 3 miles apart. 52 49N, 04 26E. Both ships hit and sunk. - <i>Attack on ships, possible wrecks. Relevant.</i> | AIR 24/234 |
| 20/21 October 1941 | 8 Blenheim's (2 Group), 16 x 500 lbs SAP. 52 29N, 04 29E, Convoy of 7 or 8 MV's and 4 Flak ships. | AIR 24/236 |

| Date | Event | Sources |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| | <p>2 a/c attacked 2,000 ton M.V - Results unobserved, ship also M/Gunned.</p> <p>1 a/c attacked 2,000 ton tanker-Results Unobserved</p> <p>1 a/c attacked 2/4,000 ton M.V. Smoke seen coming from vessel.</p> <p>1 a/c attacked 4,000 ton M.V. -Results unobserved the ship also M/Gunned.</p> <p>1 a/c attacked 1,000 vessel - Smoke seen rising from vessel which was also M/Gunned.</p> <p>2 a/c of 82 Sqdn. MISSING. Believed to have attacked. 1 a/c shot down by Me.109. The other believed by flak.</p> <p>- <i>Attack on convoy. Relevant.</i></p> | |
| 13 February 1942 | <p>3 Blenheim's (2 Group). 6 x 500 lbs SAP, 12 x 40 lbs. Large warship in convoy, 52 37N, 04 00E. One bomb seen to fall just short or possible hit on warship. Otherwise results unobserved.</p> <p>- <i>Attack on warship. Relevant.</i></p> <p>2 Wellingtons (4 Group), 16 x 500 lbs SAP. Large warship 52 30N, 03 58E. Ship clearly identified, but results unobserved owing to cloud.</p> <p>- <i>Attack on warship. Relevant.</i></p> | AIR 24/240 AIR 24/240 |

Table 26: Bomber Command operations, based on Bomber Command Headquarter ORBs.

The North Sea theatre of war saw also action of fighter planes of Fighter Command and 2nd Tactical Air Force (2TAF). Fighter Command patrolled the sea in order to intercept German planes heading for Britain and escorted bombers. From 1944 onward Fighter Command was involved in the war against the German V1 and V2 weapons. 2TAF mainly supported the ground forces by carrying out attacks on tactical ground targets, but also enemy shipping near the shores was attacked. Locations coming forward out of Fighter Command's and 2TAF's ORBs are showed in Figure 50.

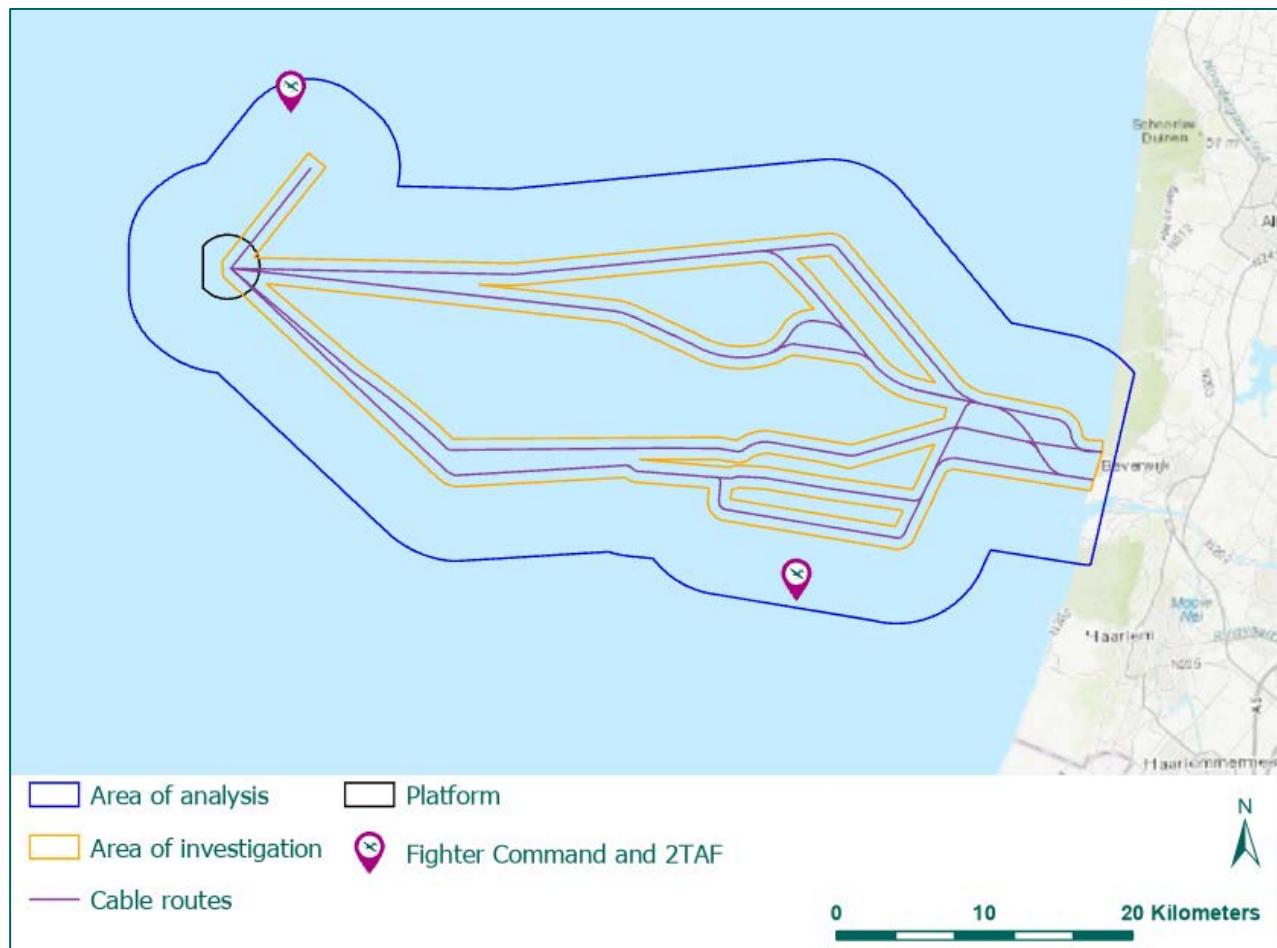


Figure 50: Locations of Fighter Command and 2TAF operations, based on logs.

| Date | Event | Sources |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 6/7 April 1945 | 2 Swordfishes, 119 Squadron/157 Group. Anti-shipping patrols off the Dutch coast. An orange light in the sky was again seen at Y.4802 from 2153 to 2237 hours. 6 – 8 E/R boats were sighted at 2332 hours at C.9880 but were not attacked due to unfavourable weather and faulty radar. - No attacks in area of analysis. Not relevant. | AIR 37/718 |
| 12 April 1945 | Not relevant, no targets at sea attacked by 2TAF. | AIR 37/718 |

Table 27: Fighter Command and 2TAF operations, based on ORBs.

Remark on jettisons and flight paths

Related to the air war are jettisons of bombs and the numerous flight paths of incoming and outgoing bombers above the North Sea. During bombing raids, allied bombers followed certain routes towards their target and backwards to base. In case of emergency or to avoid landing with the bomb load, the bombs were often released above the North Sea. The figure underneath is a document from The National Archives (AIR 14/110 Disposal of bombs not dropped on allotted targets) that describes what to do with the remaining bomb load. It is stated that a captain could decide where ever the bombs are dropped, as long as they are dropped in safe condition. Despite this document, the logs of Coastal Command prove that bombs were also jettisoned in live condition.

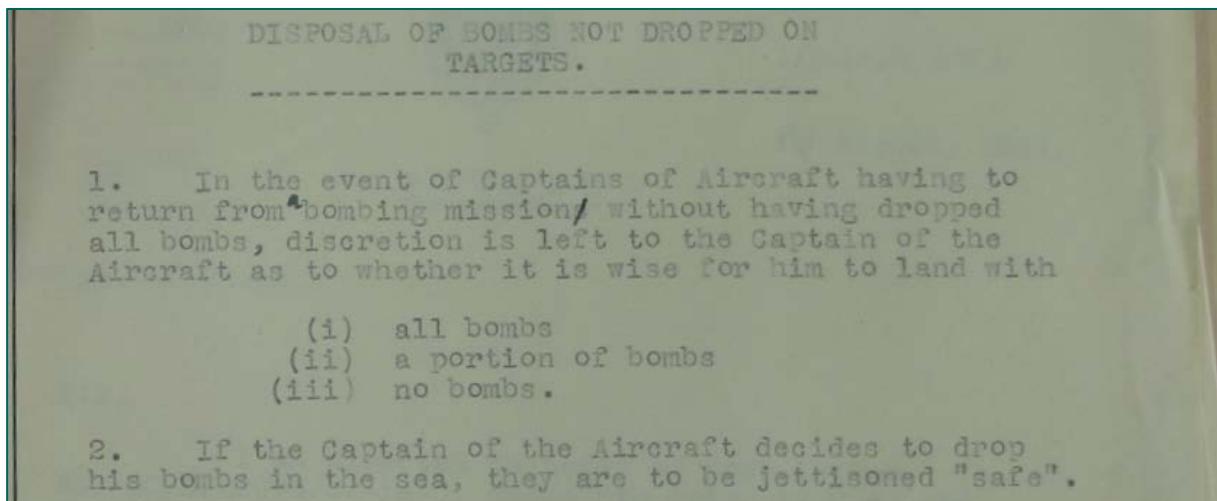


Figure 51: Extract from AIR 14/110 (Disposal of bombs not dropped on allotted targets). (Source: TNA).

Example of flight path of returning bombers, 4 January 1944. The route passed IJmuiden and the sea off IJmuiden.

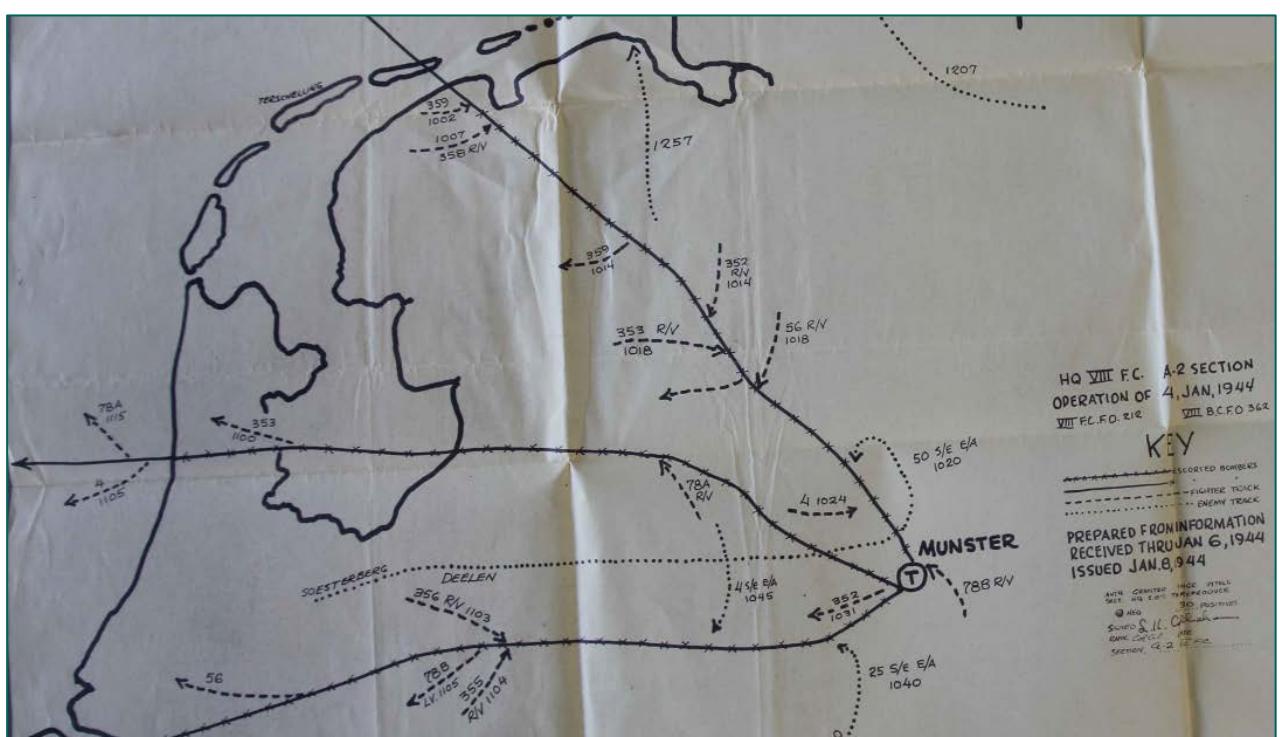


Figure 52: Example of a flight path of Allied bombers on their return flight, 4 January 1944. (Source: TNA, AIR 40)

National Archives and Records Administration

The following Record Groups have been consulted in the NARA:

- Record Group 18: Mission Reports.
The mission reports contain detailed information on allied bombing raids, including height, air speed and the deployed munitions.
- Record Group 242: Captured German Records
The Captured German Records are microfilmed German army records captured after the German capitulation. In several instances the captured records are more complete than the records maintained by the Bundesarchiv.
- Record Group 342: Records of U.S. Air Force Commands, Activities, and Organizations
Record Group 342 contains additional details not mentioned in Record Group 18.

Record Group 242: Captured German Records

The German 1. Sicherungsdivision (first security division) was responsible for safeguarding convoy routes along the Dutch coast. The area of analysis fell under the responsibility of the division. Digital copies of the *Kriegstagebücher* (war diaries) of this division have been ordered at the National Archives and Records Administration.

| | |
|-----------------|--------------------------------------------------------------------------------|
| T 1022 / R 3893 | Kriegstagebuch 20./Vorpostenflottille 16. September 1943 – 15. Februar 1945 |
|-----------------|--------------------------------------------------------------------------------|

25 February 1944. 0338-0415 hours. Battle with enemy fast boats.

Battle report:

- o 4 English fast boats.
- o 0340 hours firing started.
- o Used weapons and ammunition:

| <u>Eingesetzte Waffen und Munitionsverbrauch:</u> | | |
|---------------------------------------------------|-------------|---------|
| 1 - 10,5 cm SK | 52 Lgr. | |
| 1 - 3,7 cm SK | 14 Spgr. | Tp.2016 |
| 7 - 2 cm Flak | 60 Schuss | |
| | Just Schuss | |
| 1 - 8,8 cm SK | 76 Lgr. | |
| | 26 Spgr. | |
| 1 - 3,7 cm SK | 103 Schuss | Tp.2020 |
| 6 - 2 cm Flak | 125 Schuss | |
| 1 - 8,8 cm SK | 91 Lgr. | |
| | 30 Spgr. | |
| 1 - 3,7 cm SK | 55 Schuss | Tp.2021 |
| 6 - 2 cm Flak | 1165 Schuss | |

- o An 8.8 cm shell hit from Vp.2021 observed.
- o Vp.2021 was hit by a 40 mm shell.

Bundesarchiv-Militärarchiv (BAMA)

The German military archives have been consulted in the BAMA in Freiburg. This archive contains the documents from the German military in the Second World War. The following record groups have been consulted by REASeuro to gain more information about the German perspective of naval warfare in the area of investigation:

- RH 24-88: LXXXVIII Armeekorps
- RM 2: Kaiserliches Marinekabinett.
- RM 5: Admiralstab der Marine / Seekriegsleitung der Kaiserlichen Marine.
- RM 7: Seekriegsleitung der Kriegsmarine.
- RM 8: Kriegswissenschaftliche Abteilung der Marine (Marinearchiv).
- RM 35-I: Marinegruppenkommando Ost – Nord der Kriegsmarine.
- RM 45-II: Dienststellen und Kommandostellen der Kriegsmarine im Bereich Deutsche Bucht und Niederlande.
- RM 67: Sicherungsdivisionen der Kriegsmarine.
- ZA 5: Deutscher Minenräumdienst (German Minesweeping Administration).

The following documents have been found relevant for the area of investigation:

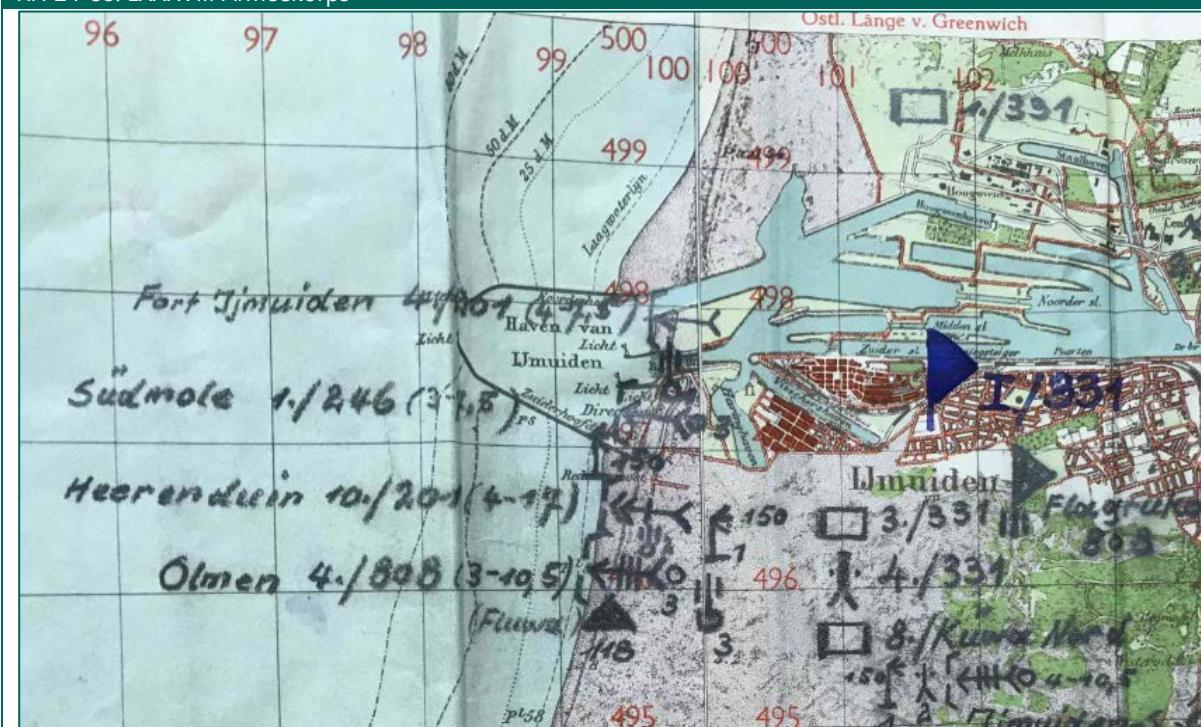
RH 24-88: LXXXVIII Armeekorps

The German 88th Army Corps (*Armeekorps*) manned the Atlantikwall north of the Scheldt. The records of this Corps are searched for information on coastal defences and guns, relevant for the area of analysis.

| | |
|---|----------------------------------------------|
| 9 | Teil A Nr. 1-131 29. Apr. - 26. Dez. 1942 |
|---|----------------------------------------------|

Map showing defences around IJmuiden.

RH 24-88: LXXXVIII Armeekorps



10 Teil B Nr. 1-125
22. Apr. - 31. Dez. 1942

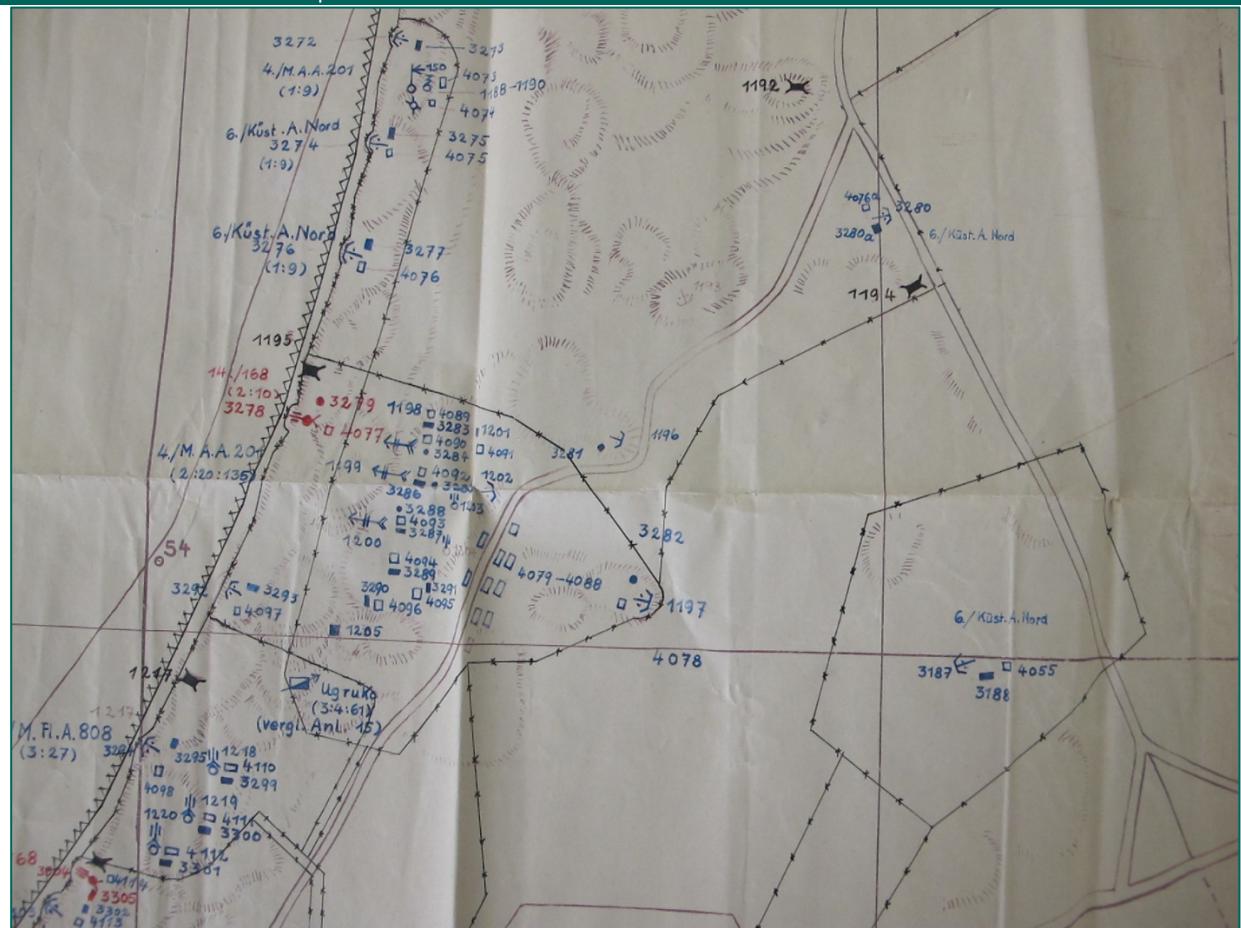
Defence area IJmuiden:



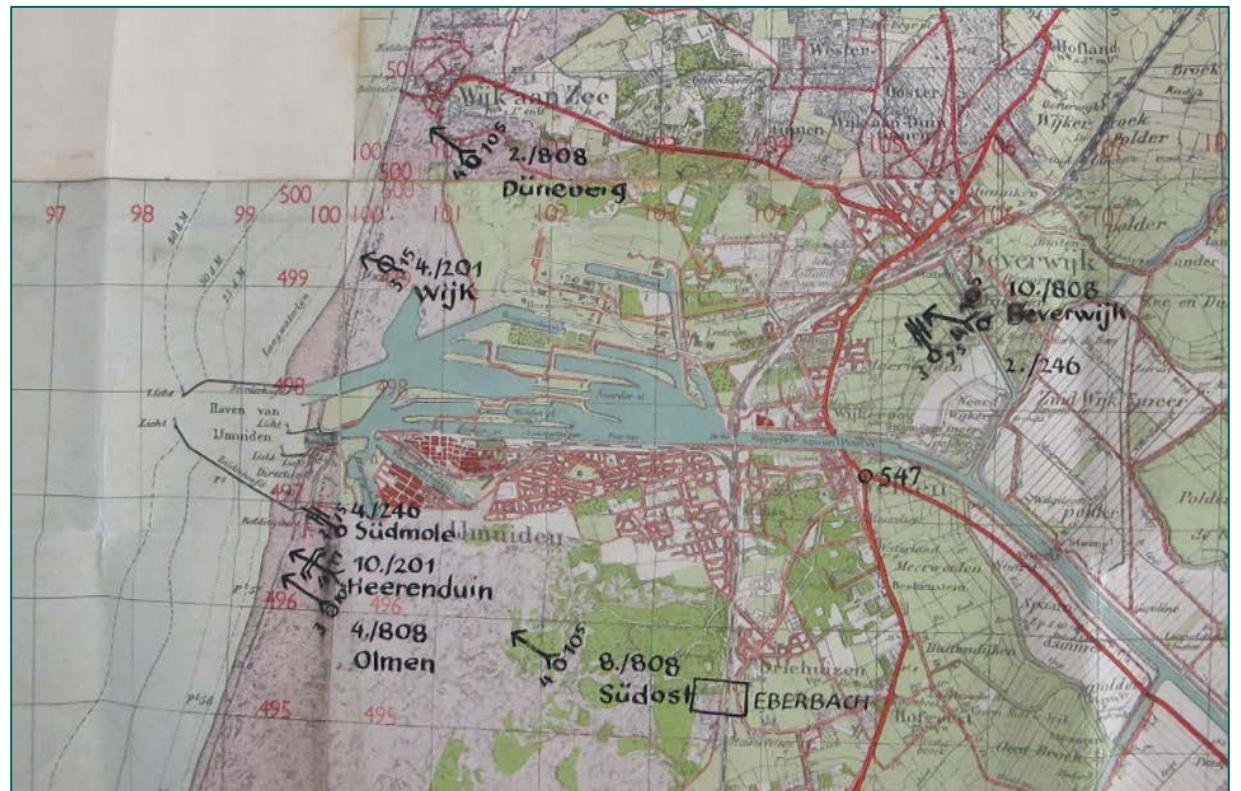
33 Stützpunkte IJmuiden
27. Jan. - 6. Mai 1942

Strongpoint IJmuiden, map:

RH 24-88: LXXXVIII Armeekorps



Situation



RH 24-88: LXXXVIII Armeekorps

b) Marine:

Die Batterien der M.A.A. 201
 die dem Ugruko der M.Fl.A. 808 untersteh. Mar. Flak-Battr.
 die dem Hafenkommandant IJmuiden untersteh. Teile d. Marine
 die b. u. S.Kp. der Küstenüberwachungs-Abt. Nord
 die 4./Mar. Baukomp. 313.

41

Abschnitt IJmuiden
 31. Jan. - 7. Feb. 1942

Information on coastal guns.

a) Marine:

1. Vorhandene Batterien:

| Kaliber | Einheit | Standort | Zweck | Wirkungsmöglichkeit der Batterien |
|---------|------------------|-------------------------|--------------------------|----------------------------------------------------|
| 12 cm | 2/M.A.A. Zol | Bergen a/Zee Km 31,5 | | |
| 15 cm | 4./M.A.A. Zol | Wijk, Km 53,5 | Bekämpfung von Seezielen | siehe Karte und plötzlich auftauchenden Landzielen |

2. Angeforderte Batterien:

| | | | | |
|-------|--------------------------|----------------------------------|-------|--------|
| 10 cm | Camperduin (Gasthaus) | JJmuiden, südl. d. Nordseekanals | | |
| 28 cm | | Zandvoort | | |
| 10 cm | | 486,75 + 96 | Land- | zielen |

b) Heer:

1. Vorhandene Batterien: Die Batterien der I. und III. Abt. beziehen im Alarmfall je nach Lage die auf der Karte eingezeichneten Feuerstellungen, bzw. Feuerstellungsraume. (xx)

2. Angeforderte Batterien:

| | | |
|-------|-------------------------------|--------------------|
| 15 cm | Camperduin 526,50 + 105 | Bekämpfung |
| 15 cm | Egmond a/Hoef 514,75 + 105 | von |
| 15 cm | Gastricum 508,50 + 103,50 | landen-siehe Karte |
| 15 cm | Zandvoort 487,50 + 99,75 | dem Gegner |
| 15 cm | Zandvoort 486,75 + 97,50 | und Land-zielen. |

42K

Karten der Stützpunkte Missingen, IJmuiden, den Helder, Scheveningen, Hoek van Holland und der Insel Texel
 Apr. 1942

RH 24-88: LXXXVIII Armeekorps

Strongpoint IJmuiden:

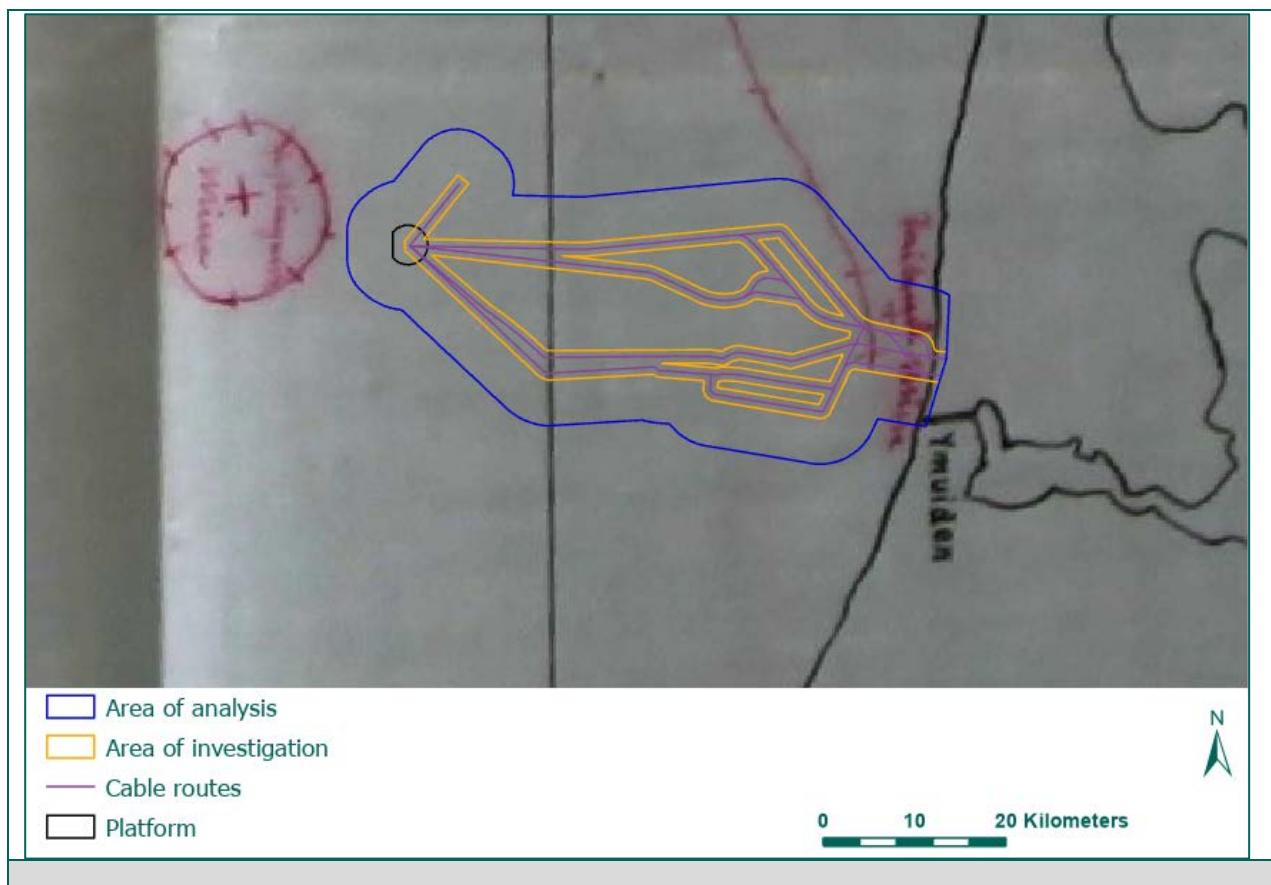


RM 5: Admiralstab der Marine / Seekriegsleitung der Kaiserlichen Marine.

The Admiralty of the Imperial Navy was the highest level of command of the German Navy during the First World War. Record Group RM5 contains documents from the admiralty. The following documents are considered relevant for the area of investigation.

| | |
|------------|---------------------------------------------------------------------------------------------------------------------------------------|
| RM 5/4721K | Kommando der Hochseestreitkräfte: "Zusammenstellung der bisher bekannten Minensperren und minenverdächtigen Gebiete". Druck, 3.3.1915 |
|------------|---------------------------------------------------------------------------------------------------------------------------------------|

Map showing known and suspected allied minefields, situation March 1915. The area of investigation has overlap with an area which was suspected to be mined.

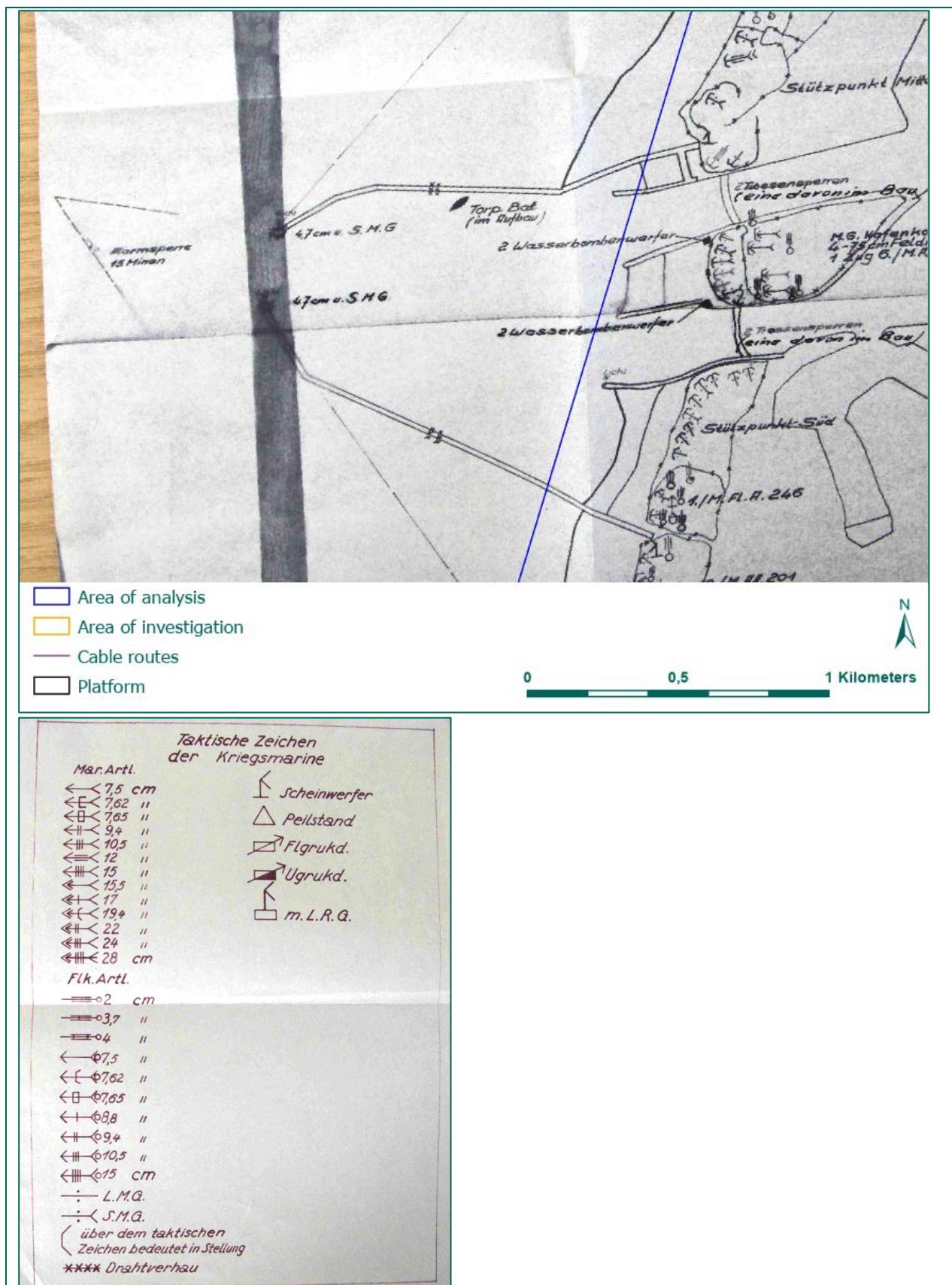


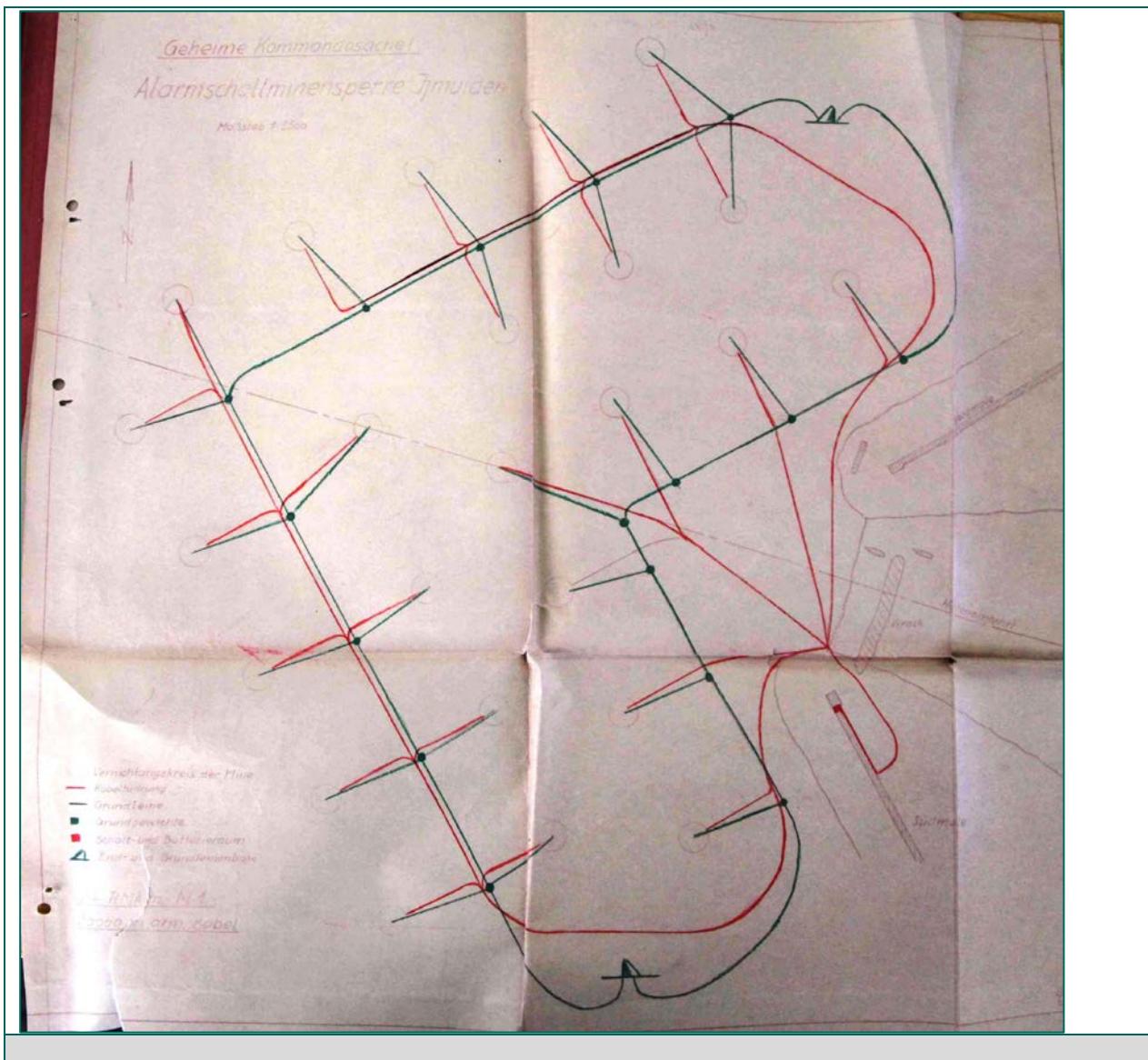
RM 35-I: Marinegruppenkommando Ost – Nord der Kriegsmarine.

The *Marinegruppenkommando Ost – Nord* operated as the commander of the units that had to secure the East and North Sea.

| | |
|-------------|-------------------------------------------------------|
| RM 35-I/277 | Minenlage Nord (M.L.N.) 1. Mai 1942 - 1. Okt. 1943 |
|-------------|-------------------------------------------------------|

Map showing the defences of IJmuiden harbour. A warning minefield is situated in front of the port entrance. The minefield consisted of 24 RMA magnetic ground mines. The mines had a remote controlled detonator and each mine was coupled to a device on land. This gave the German defender the option to turn the mines on and off.





RM 45-II: Dienststellen und Kommandostellen der Kriegsmarine im Bereich Deutsche Bucht und Niederlande.

The area of investigation lies in front of the Dutch coast. Different commanders were responsible for the defence.

The following command levels, from high to low, are potentially relevant: Harbour commander IJmuiden (*Hafenkommandant IJmuiden*), Commander of the Sea Defence North Holland (*Kommandant Seeverteidigung Nordholland*), and the Marine Commander in the Netherlands (*Marinebefehlshaber in den Niederlanden*).

Marinebefehlshaber in den Niederlanden

The records of the *Marinebefehlshaber in den Niederlanden* contain information about surface craft battles, attacks by air planes, the disposal and laying of mines and firing by coastal batteries. These are all brief notices without any comprehensive information. Because the information is given in other sources in a more elaborate way, REASeuro has chosen to rely on the information in other sources.

Kommandant Seeverteidigung Nordholland

| | |
|--------------|-------------------------------------------------------|
| RM 45-II/235 | Kriegstagebuch. Bd. 2 1. Juli 1941 - 31. Dez. 1942 |
|--------------|-------------------------------------------------------|

Relevant information:

26 August 1941. A convoy nearby IJmuiden was attack by 4 Bristol Blenheim's and 2 Spitfires. Two planes shot down, the steamship "Stadt Emden" was hit by bomb.

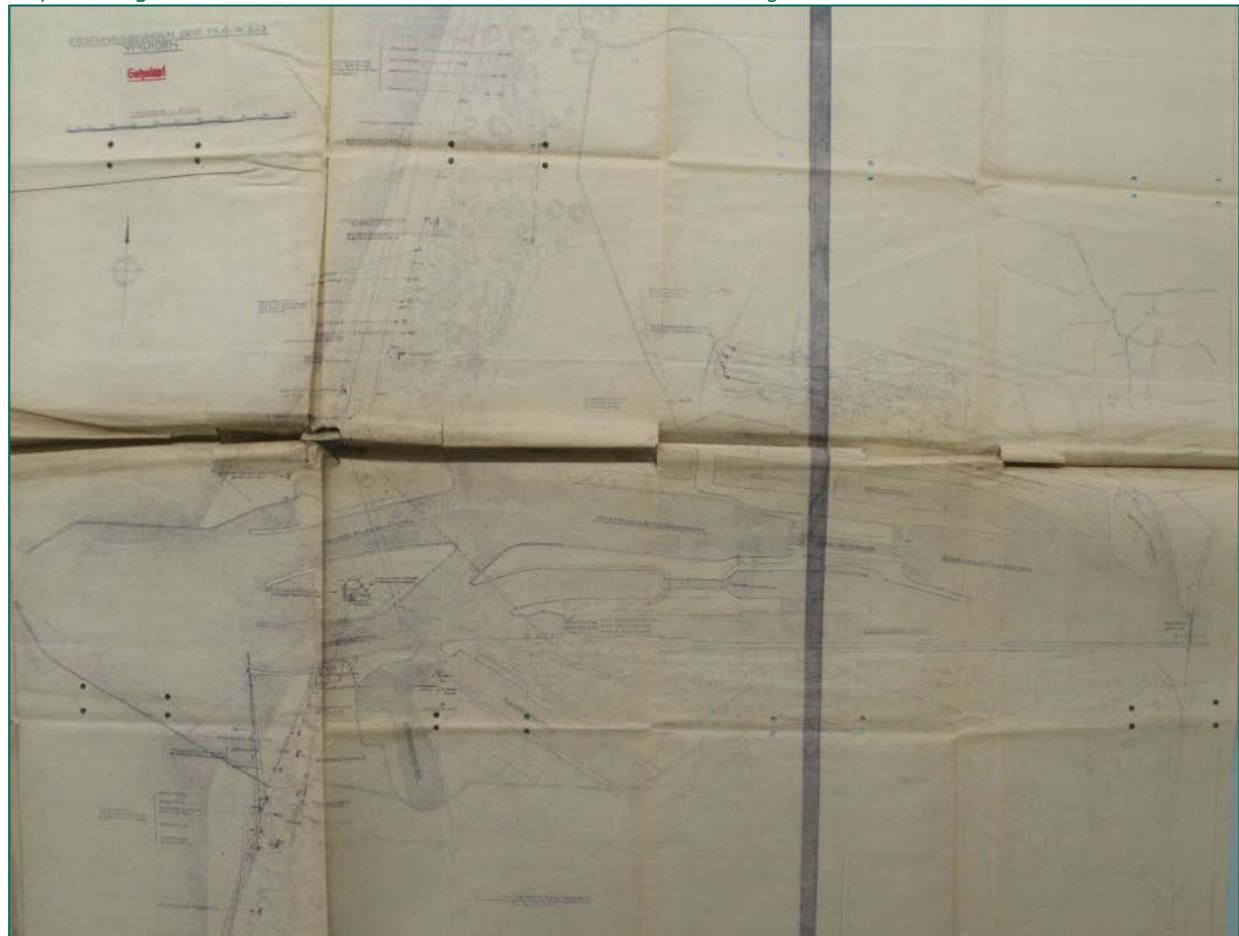
Hafenkommandant IJmuiden

| | |
|---------------|------------------------------------------------------------------------|
| RM 45-II/238K | Karte Festungsbereich der Marineartillerieabteilung 203, Ymuiden. 1940 |
|---------------|------------------------------------------------------------------------|

Relevant information:

RM 45-II: Dienststellen und Kommandostellen der Kriegsmarine im Bereich Deutsche Bucht und Niederlande.

Map showing the coastal defences of the 203rd Marine Artillerie Abteilung.



| | |
|--------------|---------------------------------------------------|
| RM 45-II/302 | Kriegstagebücher 16. Juni 1941 - 15. Jan. 1943 |
|--------------|---------------------------------------------------|

Relevant information:

16 and 17 June 1941. Many mines and buoys have drifted ashore.

26 August 1941. 1428 hours. Air attack on a convoy nearby IJmuiden. One English plane was shot down. The ship "Stadt Emden" was hit by bomb.

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------|
| The area of investigation fell under the joint responsibility of the 1st Sicherungsdivision (Security Division) of the German Navy. This security division escorted convoys through convoy routes, protecting them from attacks by surface vessels and aircraft and clearing mines along the way. Significant events were noted in the war diaries, referring to Quadrant-based locations. | | |
| 1 March 1941 | Mine barrier cleared. AN 8528/29. | RM 67/6 |
| 13 March 1941 | Probably mines were dropped in front of IJmuiden. | RM 67/6 |
| 15 March 1941 | AN 8524. Mark XIV mine barrier found. Control of AN 8524 and AN 8527. In AN 8524 four mines cleared and five disposed. | RM 67/6 |

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 31 March 1941 | AN 8529 is completely cleared, 2 mines found. The Sea in AN 8529, west of convoy route Red, is now clear of mines. | RM 67/6 |
| 26 August 1941 | Air strike. Attack on convoy 1366 in front of IJmuiden. 1 ship damaged owing to bombs. | RM 67/12 |
| 15 November 1941 | Air strike. Two harbour protection boats were attacked by English planes in front of IJmuiden with machineguns and cannon. Only light damage. | RM 67/15 |
| 19 January 1942 | Air strike. In the afternoon Group B of the 34 th <i>Minensuchflotille</i> was attacked in front of IJmuiden by 2 English fighter planes. They attack in a dive with machineguns and cannon. The M.3407 was hit 20 times. | RM 67/17 |
| 27 March 1942 | Surface craft battle. A Dutch fishing ship was sunk 21 miles NW of IJmuiden by 3 enemy fast boats. | RM 67/19 |
| 30 June/1 July 1942 | Surface craft battle and air strike, North off IJmuiden. Convoy 298 was attacked with torpedoes from an enemy fast boat. At the same time the convoy was subjected to an air raid. | RM 67/19 |
| 3 October 1942 | Air strike, AN 8553. Two air strikes with bombs on Group B of the 34 th <i>Minensuchflotille</i> in Position Zoo. No damage. | RM 67/23 |
| 23 December 1942 | Air strike, 0049 hours, AN 8529, on Vp.1335, 1336, 1341 and 1331 with guns. No bombs were dropped. | RM 67/25 |
| 9 January 1943 | Air strike, 1840 hours, AN 8553. Attack of a bomber plane on Vp.1311 (Position Rom). 5 bombs were dropped, no damage. | RM 67/26 |
| 10 February 1943 | Air strike, 1152 hours. 4 Spitfires attacked Vp.2011 in front of IJmuiden with bombs, machineguns and cannon. Great damage done to own boat. | RM 67/26 |
| 13 February 1943 | Air strike, 1057-1059 hours. Attack of 11 enemy bombers in the fishing harbour of IJmuiden. From 1603 to 1605 hours the Vp.1413/1414/1416/1417 gunfire at 12 enemy two-engine bombers. | RM 67/26 |
| 21 February 1943 | Surface craft battle, 0250 hours. The boats of the 14 th Vp.Fl. were attacked in Position Rom by 4 British fast boats. The attackers were forced off. | RM 67/26 |
| 28 February 1943 | Surface craft battle, 0357, Position Rom. Vp.-boats 1413, 1416 and 2012 were attacked by 3 enemy fast boats, one of the attacking boats was damaged. | RM 67/26 |
| 17 April 1943 | Surface craft battle, 0135-0300 hours, AN 8553. Battle between Position Rom and 2 enemy fast boats. No damage. | RM 67/27 |
| 29 April 1943 | Surface craft battle, 0335-0350 hours, AN 8553. Battle between Vp. Rom and 3 or 4 enemy fast boats. Vp.-boat 1408 sunk by torpedo. 1 enemy fast boat sunk, the other set on fire. | RM 67/27 |
| 3 May 1943 | Air strike, 1710 hours. The 9th R-Flotille was attacked in front of IJmuiden by 7 Lockheed bombers [probably Hudson's or Ventura's]. 1 plane shot down by R.85. | RM 67/28 |

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 5 May 1943 | Surface craft battle, 0240-0350 hours. Two times a short skirmish took place between boats of Position Rom and enemy fast boats. | RM 67/28 |
| 5 July 1943 | Owing to strong ongoing west winds, caused own mines to break loose and drift away. This resulted in an encounter with a Dutch fishing boat in AN 8529. Probably a drifting UMA/K mine [moored contact mine]. | RM 67/28 |
| 12 July 1943 | Air strike, 1022-1107, in front of IJmuiden. Repeated attack on M.203 and M.204 by 4 Spitfires. The M.203 was damaged owing to the detonation of a mine earlier before and was being towed to IJmuiden. M.204 lightly damaged, caused by machineguns and cannon. | RM 67/28 |
| 23 July 1943 | Surface craft battle, 0052-0325 hours, AN 8553. Battle between Position Rom (Vp.1401, 1410, 1412, 1416) and 6 to 9 enemy motor torpedo boats (MTB's) and motor gunboats (MGB's). Probably 1 enemy boat sunk. | RM 67/28 |
| 25 July 1943 | Surface craft battle, 0300 hours, AN 8553. Attack between Position Rom and 6 enemy fast boats. No damage. | RM 67/28 |
| 1 August 1943 | Surface craft battle, 0418 hours, AN 8529, Battle between Position Rom and 3 enemy fast boats. 1 enemy boat burning. Own boats have only minor damage. | RM 67/29 |
| 19 August 1943 | Surface craft battle, 0224 hours, AN 8553, convoy 456 was attacked by 6 enemy fast boats. New attack at 0534 hours. 1 enemy fast boat was probably sunk. | RM 67/29 |
| 25 August 1943 | Surface craft battle, 0047-0350 hours. In AN 8584 and 8553 enemy fast boats observed by Position Kairo and Rom and fired at. | RM 67/29 |
| 19/20 September 1943 | Surface craft battle. The hospital ship "Strassburg" was stranded in front of IJmuiden after being hit by a mine. During the night of 19/20 September 1943, the ship was attacked with by enemy fast boats with torpedoes. | RM 67/29 |
| 20 September 1943 | Surface craft battle, 0046 hours, 0245-0257 hours, AN 8529, short gunfire contact between 3 boats of the 14.Vp.Fl and an enemy AF-boat with 4 fast boats. One enemy fast boat damaged or destroyed. | RM 67/29 |
| 19 October 1944 | Air strike, 1100 hours, in front of IJmuiden. Wreck of the "Strassbourg" and security ships entering the harbour were attacked by 30 bombers. 4 aircraft in total were shot down (2 by gunfire of boats and 2 also by gunfire of coastal AA guns). | RM 67/29 |
| 15 February 1944 | Surface craft battle, 0344 – 0413 hours, AN 8553. Battle of position Rom (Vp.1412, 1416, AF 43) with about 12 MTB's and MGB's. 3 enemy boats sunk. Vp.1416 damaged, 3 crewmembers died, 11 wounded. | RM 67/30 |
| 24 February 1944 | 1 ELM (<i>Englische Luftmine</i>) disposed in AN 8553. | RM 67/30 |
| 25 February 1944 | Surface craft battle, 0338 – 0415 hours, AN 8525. Battle of Vp.2016, 2020, and 2021 with 4 fast boats. 1 enemy boat damaged. Light hits on own boats, two crewmembers wounded. | RM 67/30 |

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 6 March 1944 | Surface craft battle, 0425 hours, AN 8556. Enemy fast boats attacked Vp.1304 and AF 44. Vp.1304 sunk after torpedo hit. This was followed by a short gunfire contact at 0015 hours between the same fast boats and Position Rom. | RM 67/30 |
| 7 March 1944 | Surface craft battle, 0110-0130 hours, off IJmuiden. Battle between Group C of the 34 th Minensuchflotille and 8 enemy fast boats. Also gunfire contact between Position Rom and the same fast boats. 3 fast boats probably sunk. A lot of damage was done to the boats of the MS Group. | RM 67/30 |
| 25 March 1944 | Surface craft battle, 0100-0110 hours and at 0450 hours, AN 8553. Battle between Position Rom and 5 enemy fast boats. 1 fast boat damaged. | RM 67/30 |
| 29 March 1944 | Surface craft battle, 0410-0430 hours, AN 8556. Attack of 6 enemy fast boats with torpedoes on convoy. | RM 67/30 |
| 30 March 1944 | Surface craft battle, 2347-0100 hours, in front of IJmuiden. Attack of 5 enemy fast boats on the 9th R.Flotille and following convoy 1237. Despite attacks with torpedoes, no damage was caused. | RM 67/30 |
| 23 April 1944 | 3 ELM/A's disposed in AN 8553. | RM 67/31 |
| 24 April 1944 | 4 ELM/A's disposed in AN 8553. | RM 67/31 |
| 27 April 1944 | Air strike, 0015 hours, AN 8537. The mine search party of 13.Vp.Fl. was presumably attacked by a bomber with 5 bombs. No damage. | RM 67/31 |
| 30 April 1944 | The 9 th Raumflotille has cleared Weg Rot from Den Helder to Hoek van Holland. With a GBT (Geräuschboje Toni) an ELM/A was disposed in AN 8553. | RM 67/31 |
| | 1 ELM/A disposed in AN 8553. | |
| 21 May 1944 | Air strike, 0031 hours, AN 8525, on 9.Rheinflotille with bombs. No damage. | RM 67/31 |
| 23 May 1944 | Air strike, AN 8551, on 9.Rheinflotille with bombs. R 105 was hit by shrapnel, 2 members wounded. | RM 67/31 |
| 24 May 1944 | Air strike, 0137 hours, AN 8527, on 9.Rheinflotille with bombs. | RM 67/31 |
| 6 June 1944 | 1 ELM/A (<i>Englische Luftmine A</i>) disposed in AN 8553. | RM 67/32 |
| 7 June 1944 | 1 ELM/A disposed in AN 8561. | RM 67/32 |
| 9 June 1944 | 7 ELM/A's disposed in AN 8553. | RM 67/32 |
| 10 June 1944 | 1 ELM/A disposed in AN 8561. | RM 67/32 |
| 11 June 1944 | 3 ELM/A's disposed in AN 8553. | RM 67/32 |
| 14 June 1944 | 1 ELM/A disposed in AN 8529. | RM 67/32 |
| 15 June 1944 | 1 ELM/A disposed in AN 8553. | RM 67/32 |

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 19 June 1944 | 1 ELM/A disposed in AN 8561. | RM 67/32 |
| 25 June 1944 | 1 ELM/A disposed in AN 8553. | RM 67/32 |
| 29 June 1944 | 3 ELM/A's disposed in AN 8561. | RM 67/32 |
| | 1 ELM/A disposed in AN 8553. | |
| 3 July 1944 | 4 ELM/A's disposed in AN 8553. | RM 67/32 |
| 3 July 1944 | 1 ELM/A disposed in AN 8553. | RM 67/32 |
| 8 July 1944 | 1 ELM/A disposed in AN 8553. | RM 67/32 |
| 9 July 1944 | 3 ELM/A's disposed in AN 8553. | RM 67/32 |
| 14 July 1944 | Surface craft battle, 0132-0310 hours, AN 8553. Attack of 8 enemy fast boats on the boats of Position Rom (Vp.1412, 1415, 1418) with artillery and torpedoes. 2 enemy fast boats set on fire, one of them exploded. Vp.1412 sunk after being hit by torpedo. Other Vp. Boats lightly damaged. | RM 67/32 |
| 23 July 1944 | Surface craft battle, 2350 hours, AN 8529, gunfire contact between Position Rom and enemy fast boats, who retreated westward after shelling. | RM 67/32 |
| 24 July 1944 | Surface craft battle, 2345 hours, AN 8529, 6 enemy fast boats retreated westwards after shelling by Vp.1418 and AF.41, 42, and 47. | RM 67/32 |
| 27 July 1944 | 2 ELM/A's disposed in AN 8553. | RM 67/32 |
| 30 July 1944 | 1 ELM/A disposed in AN 8553. | RM 67/32 |
| 8 September 1944 | Air strike, AN 8543. Vp.1413 escorted steamship "Weichsel". Attack with bombs and steamship makes water. | RM 67/33 |
| 18/19 September 1944 | Air strike, Position Rom (Vp.1404/1410, AF 42/27). Different dive bomber attacks with bombs. | RM 67/33 |
| 19 September 1944 | Air strike, Position Rom. Attack by dive bombers, no damage. | RM 67/33 |
| 1 October 1944 | Surface craft battle, 0135-0155 hours, AN 8553. Battle between the escort ships of convoy 1291 (Vp.1301/1310/1313/1317/2019, 3 R-boats, 2 M-boats and patrol/minesweeper 675) and 6 enemy fast boats. 4 enemy ships sunk, 1 burning. Own damage: two crewmembers died. | RM 67/34 |
| 1/2 October 1944 | Air strike, 2255-0237 hours in AN 8529, AN 8553 and AN 8556. 6 Air strikes with guns, bombs and two torpedoes were dropped on convoy. No damage. | RM 67/34 |
| 5 October 1944 | Air strike, 0105 hours, AN 8553. Dive bombers attacked convoy 1293. No damage. | RM 67/34 |
| | Air strike, 0450 hours, AN 8553. Dive bombers attacked ships of Position Rom. No damage. | |

RM 67 Sicherungsdivisionen der Kriegsmarine

| Date | Event | Sources |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 9 October 1944 | Surface craft battle, 0323 hours. Position Rom (Vp.1413/1404, M.3421 and 1 KFK) in skirmish with 3 enemy fast boats. | RM 67/34 |
| 15/16 October 1944 | Surface craft battle, 2335 hours, AN 8556 and at 0138 hours in AN 8526. Convoy 1303 encountered 4 enemy fast boats, which retreated after shelling. | RM 67/34 |
| | Surface craft battle, 2335 hours and at 0135 hours in AN 8553, between the boats of Position Rom (Vp.1413, 1404, and 1417, M 3421) and 4 enemy fast boats. No damage. | |
| 16 October 1944 | Surface craft battle, convoy 1303, 0138 hours, AN 8526. Short gunfire contact with enemy fast boats. | RM 67/34 |
| 26/27 October 1944 | Surface craft battle, 2352-0035 hours, AN 8529. Battle between ships of Position Rom, tasked with the security of the convoy route between Den Helder and IJmuiden, and 4 enemy fast boats. 1 enemy fast boat sunk, 1 burning after shelling. Own boats not damaged. | RM 67/34 |
| 2 November 1944 | Surface craft battle, 0300 hours, Position Rom (Vp.2004/2007/2011/2015/2017). Battle with 2 enemy fast boat groups. 2 enemy boats damaged. | RM 67/34 |
| 3 November 1944 | Air strike, 0250 hours, AN 8526, dive bombers attacked convoy 1311 with rockets and guns. No damage or losses. | RM 67/34 |
| 16 November 1944 | Coastal battery. Off IJmuiden, in AN 8553, unknown objects with south westerly course, probably enemy fast boats. No Vp.-boats at sea, so area was released for firing. Unknown objects were being shot with 90 shells. | RM 67/34 |
| 11 December 1944 | Air strike, 2040 hours, AN 8553. Dive bombers attacked ships off Position Rom (Vp.2017, M 3200/3203/3205) with bombs. No damage. | RM 67/34 |
| 28 December 1944 | Air strike, 0300 hours, AN 8553, attack with bombs on Vp.-boats 2004, 2007, 2017 and a tug. No damage. | RM 67/34 |
| 6 January 1945 | Air strike, 2110 hours, AN 8553. Dive bombing attack on escort ships of convoy 1327 (9 in total) with 4 bombs. R 138 lightly damaged. 2 crewmembers died and 11 were wounded. | RM 67/34 |
| 10 March 1945 | Air strike. Bombs were dropped on Position Rom group. No damage. | RM 67/34 |

ZA 5 Deutscher Minenräumdienst (German Minesweeping Administration)

The German Minesweeping Administration was responsible for post-war mine clearance of German waters. This administration also summarized and mapped all German minefields laid during the Second World War.

| | |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------|
| ZA 5/27 | Im Kriege geworfene Minensperren in der Ost- und Nordsee etc. Information on Gardening fields Whelks and Trefoil (see also ADM 234/561) |
| ZA 5/44 | Summary of Enemy Minelaying, The Admiralty, United Kingdom (Großformat) |

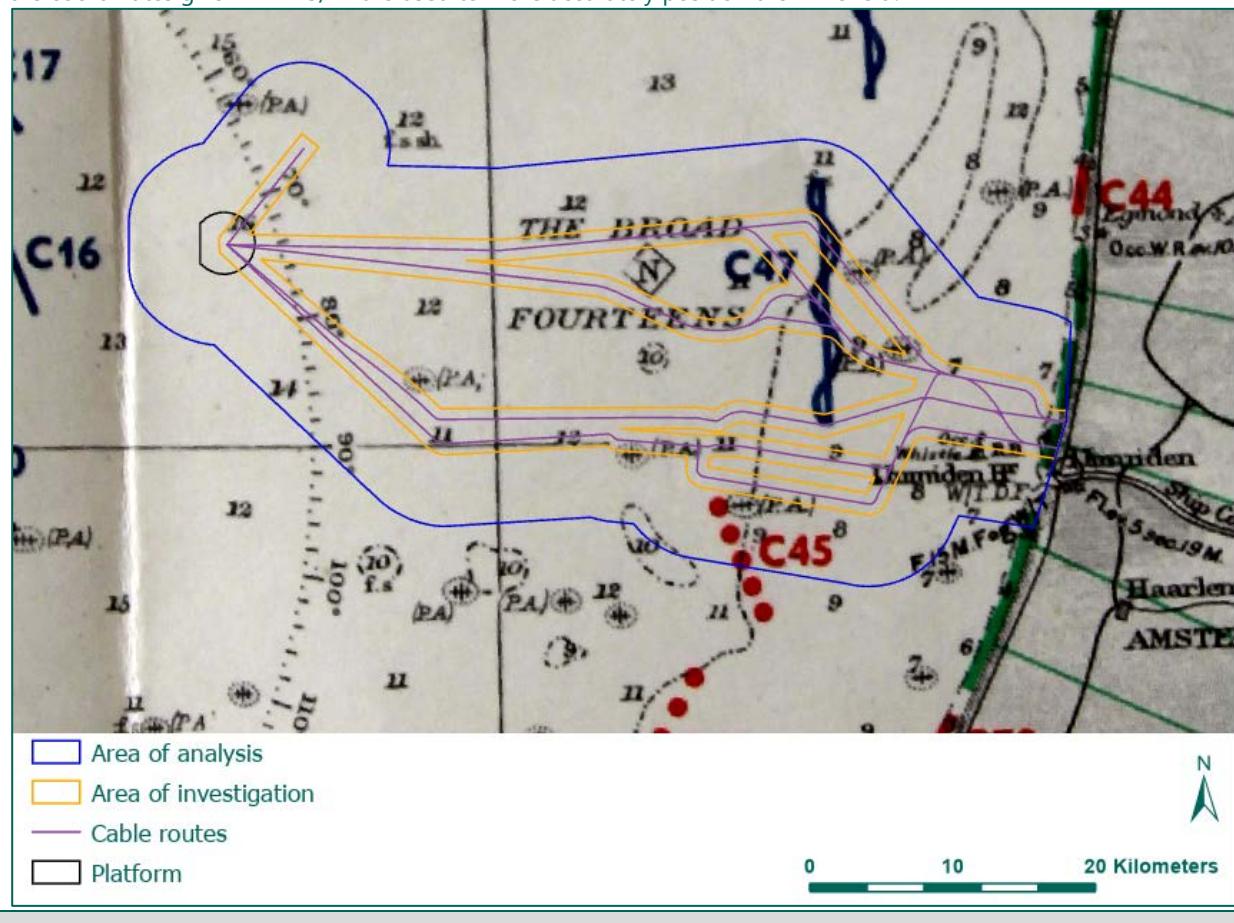
Detailed information concerning German minefields. This summary contains all relevant information that forms the basis for chart ZA 5/48, including mine types, rows, accuracy and coordinates.

The following minefields intersect with the area of analysis:

- C.45
The minefield was laid in September 1944 and contained 72 LMB ground mines. The mines were laid in two lines and had an arming delay of 24 hours.
- C.47
The minefield was laid in November 1944 and contained 160 EMC moored contact mines and 40 sweep obstructor. Both mines and obstructor were at a depth of 10 feet (= 3.05 meters), with chains of 4 mines and 1 obstructor.
- C.70
The minefield was laid in May 1944 and consisted of 75 KMA ground mines.
- C.71
The minefield was laid on 5 July 1944 and consisted of 285 KMA ground mines.

ZA 5/48 Chart C The North Sea.- Southern Sheet

Naval chart showing numbered German minefields. This map has not been used for this historical research, because the coordinates given in ZA 5/44 are used to more accurately position the minefield.



ANNEX 5 POST-WAR UXO CLEARANCE

This annex contain information about post-war UXO encounters and clearance. The information is derived from the Dutch Coast Guard and the OSPAR Commission.

Coast Guard

Since the Second World War the Dutch fishing fleet at times experienced weekly encounters with UXO in their fishing nets. To compensate fisherman for the loss of income due to UXO, a deficiency payments regulation was introduced. These payments caused some fisherman to deliberately fish for UXO when fishing was poor. As a consequence large amounts of UXO were reported each year. These UXO were subsequently rendered safe by the Dutch Naval EOD (Explosive Ordnance Disposal). This situation eventually led to the abolishment of the compensation. In the period that followed, no UXO incidents were reported. However, this does not mean that UXO were not encountered. Fisherman encountering UXO simply dumped the items back overboard. This often led to some extremely dangerous situations and to an uncontrolled migration of UXO.

On April the 6th 2005 three crewmembers of the vessel OD-1 'Maarten Jacob' (a trawler) were killed after an airplane bomb detonated on the deck of the vessel. This event led to an increase of the treat awareness amongst fisherman and also led to a change in government policy regarding the handling of UXO encountered by fisherman. The Dutch Coastguard implemented the current "Bijstands- en bijdrageregel". The aim of this regulation was to reduce the risks attached with encountering of UXO as much as possible. The regulation provides guidelines for fisherman and professional support from the Coastguard and EOD. To prevent fisherman from dumping the UXO a financial compensation was implemented.

After the tragic event with the OD-1 a detailed registration is kept regarding encountered UXO in the North Sea. In total 1,656 UXO were reported to the coast guard, Royal Netherlands Navy and other authorities. The figure below shows the UXO encounters within 10 kilometers around the area of investigation.

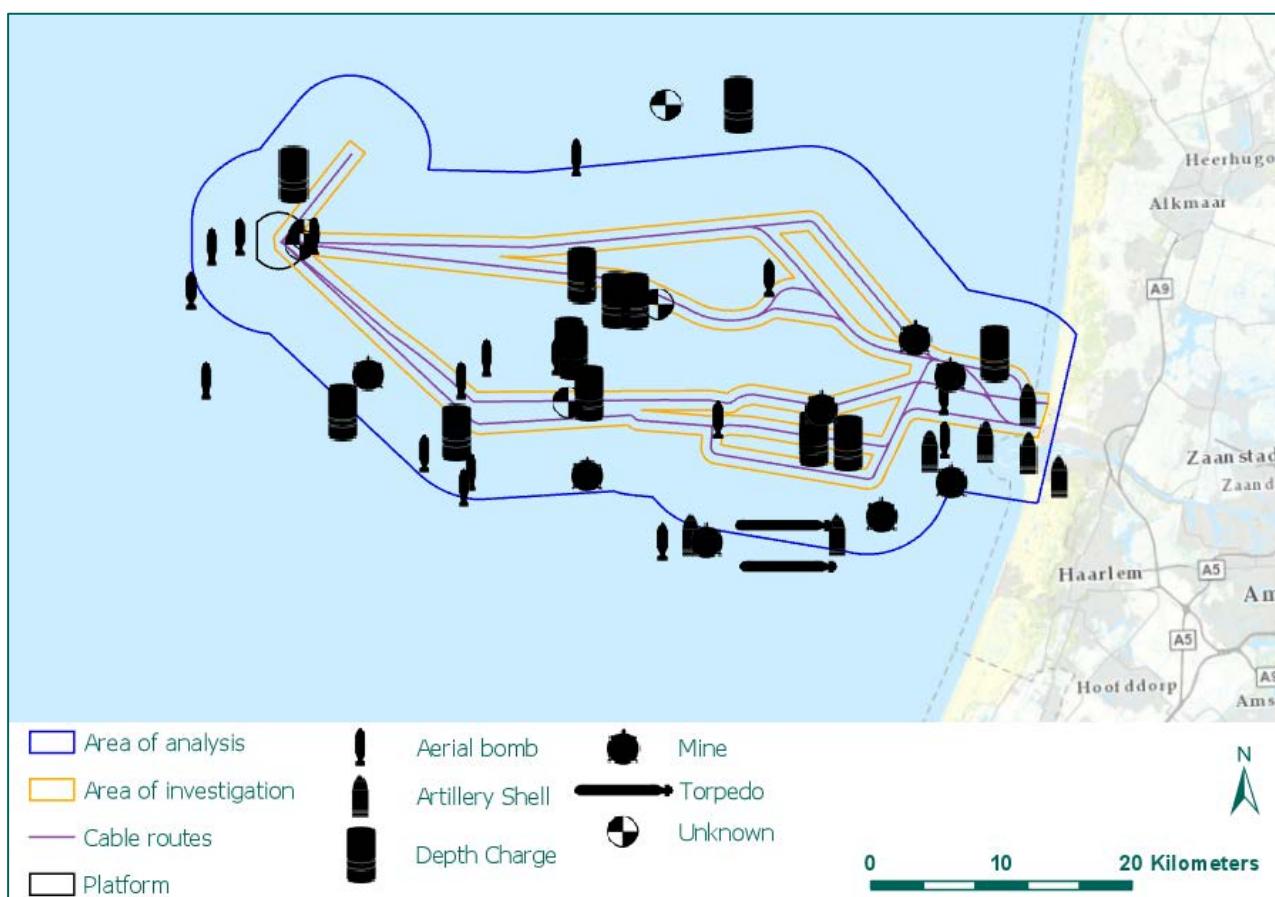


Figure 53: Overview of UXO encounters within an area of 10 kilometers around the area of investigation. (Source: Dutch Coast Guard).

According to the clearance information of the Coast Guard 54 objects were encountered. To get a better understanding of the encountered UXO, the area of analysis is divided into three parts. For each part, the UXO are described in Table 28.

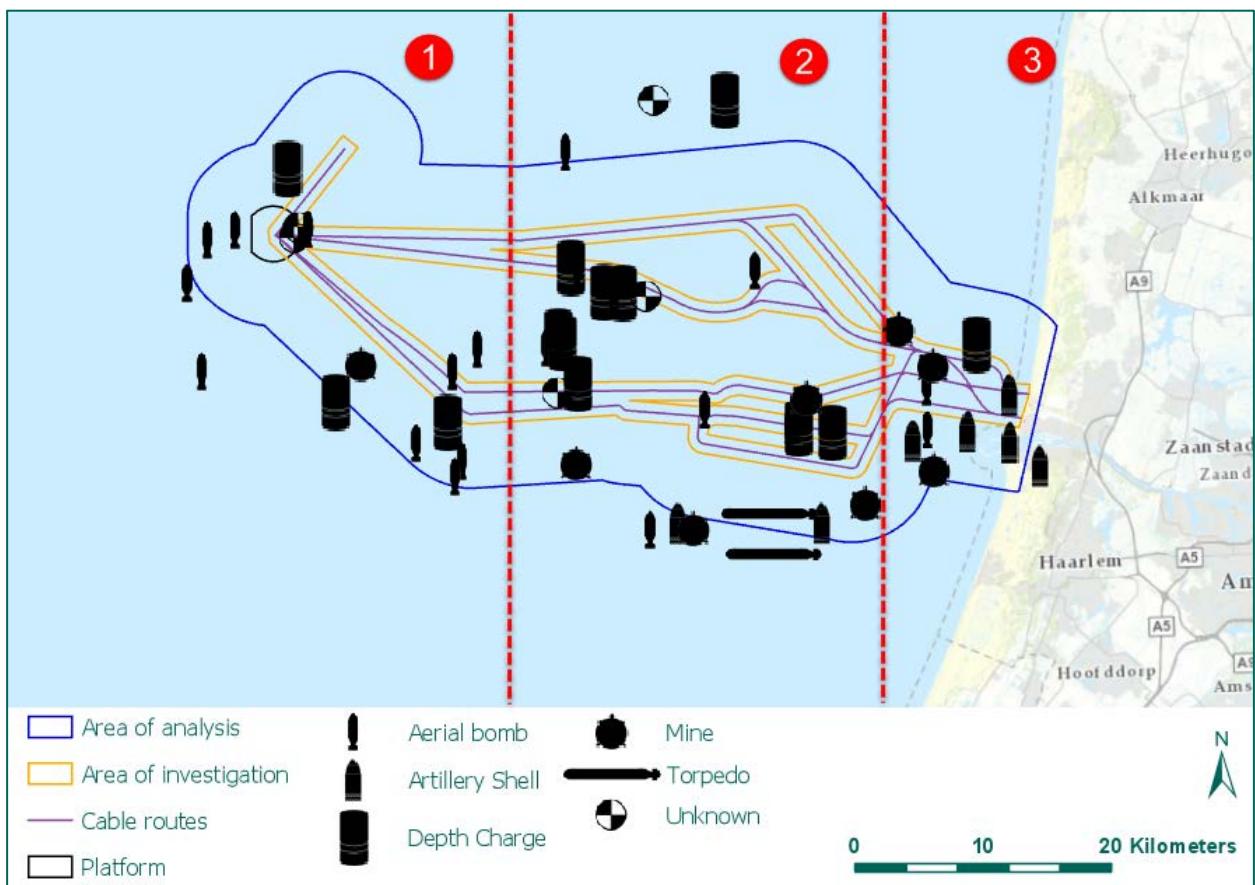
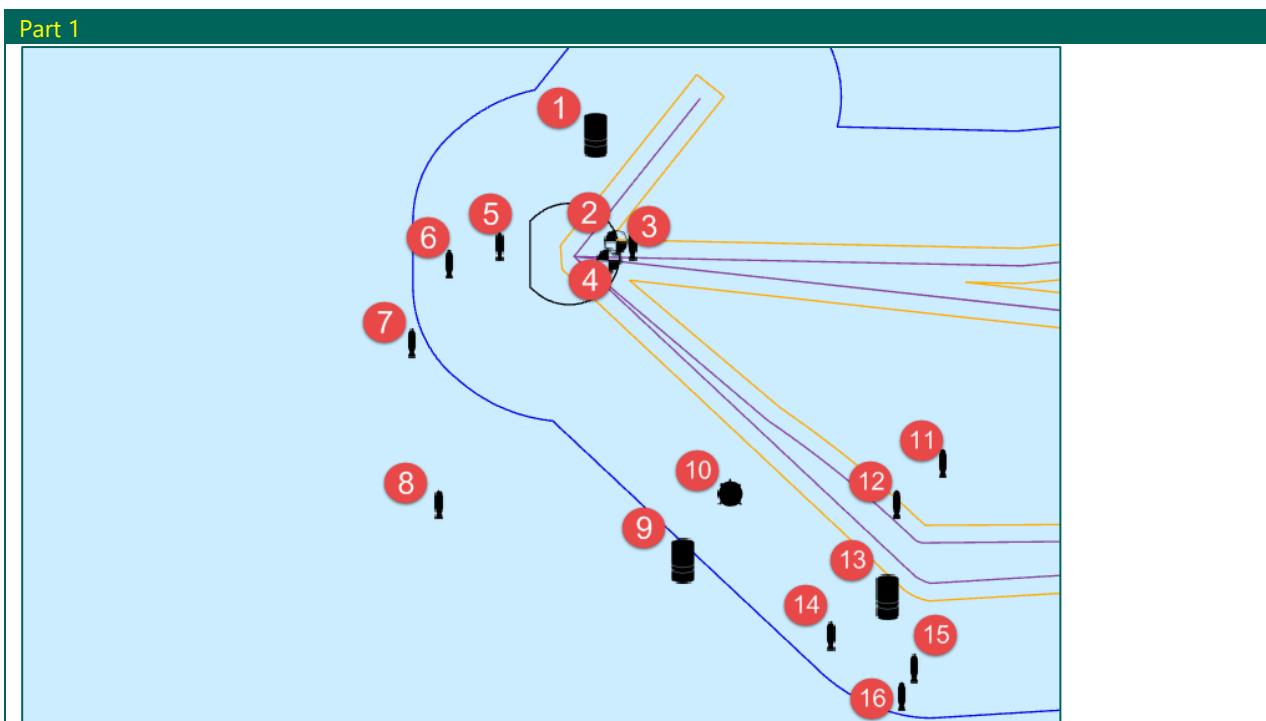
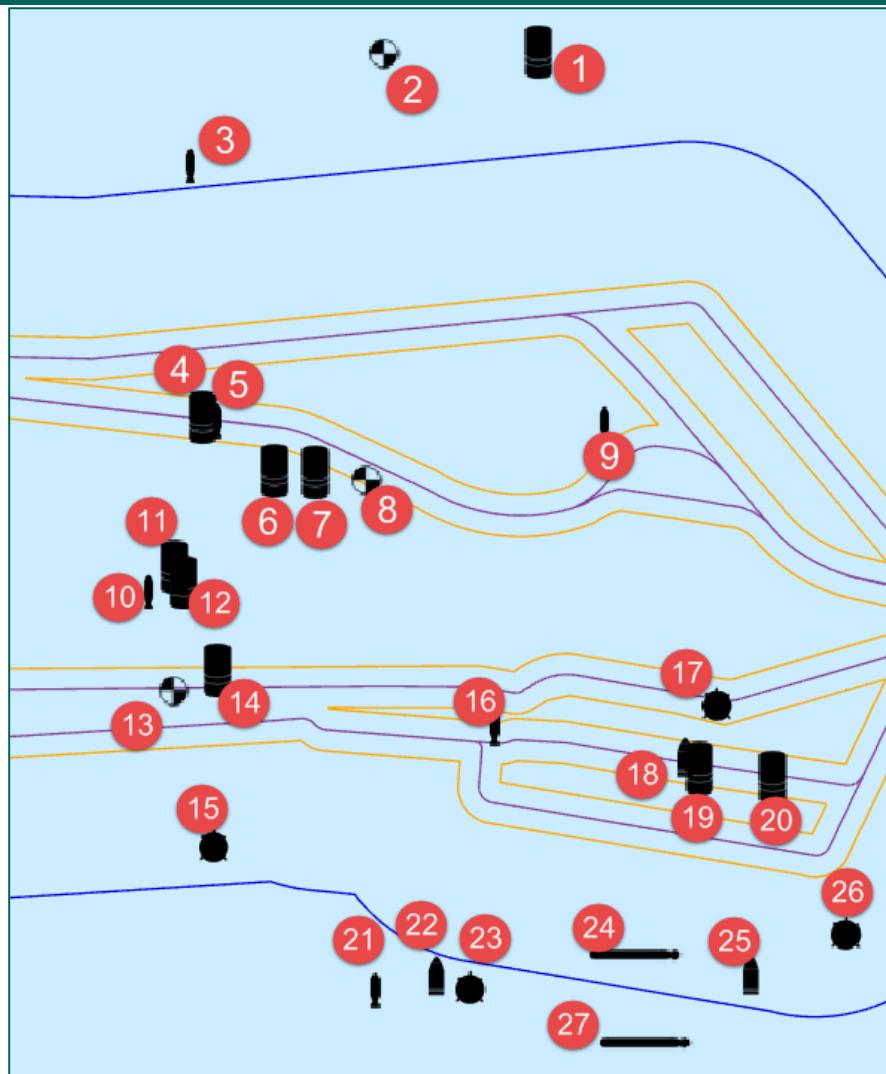


Figure 54: The three parts in which the area of analysis is divided.



| Nr. | UXO Type | Nr. | UXO Type |
|-----|---------------------|-----|---------------------|
| 1. | Depth charge nr. 42 | 9. | Depth charge nr. 43 |
| 2. | Unknown | 10. | Mine nr. 19 |
| 3. | Aerial bomb nr. 33 | 11. | Aerial bomb nr. 33 |
| 4. | Unknown | 12. | Aerial bomb nr. 29 |
| 5. | Aerial bomb nr. 30 | 13. | Depth charge nr. 44 |
| 6. | Aerial bomb nr. 29 | 14. | Aerial bomb nr. 29 |
| 7. | Aerial bomb nr. 33 | 15. | Aerial bomb nr. 29 |
| 8. | Aerial bomb nr. 30 | 16. | Aerial bomb nr. 30 |

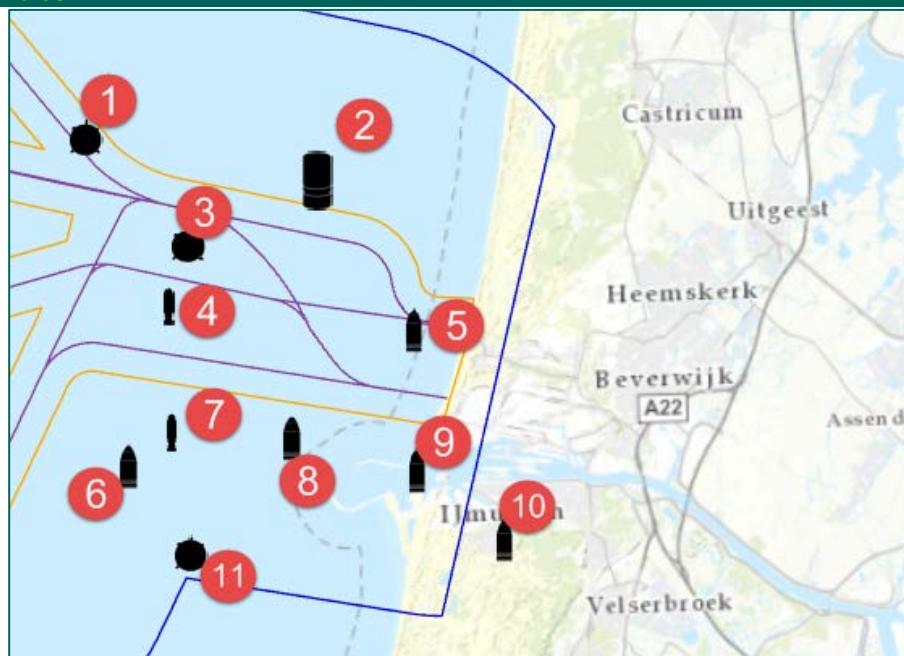
Part 2



| Nr. | UXO Type | Nr. | UXO Type |
|-----|---------------------|-----|------------------------|
| 1. | Depth charge nr. 42 | 15. | Mine |
| 2. | Unknown | 16. | Aerial bomb |
| 3. | Aerial bomb | 17. | Mine nr. 1 |
| 4. | Depth charge nr. 42 | 18. | Artillery shell |
| 5. | Aerial bomb nr. 30 | 19. | Depth charge nr. 47 |
| 6. | Depth charge nr. 43 | 20. | Depth charge nr. 46-47 |
| 7. | Depth charge nr. 42 | 21. | Aerial bomb nr. 29 |
| 8. | Unknown | 22. | Artillery shell |
| 9. | Aerial bomb nr. 29 | 23. | Mine nr. 6 |
| 10. | Aerial bomb | 24. | Torpedo nr. 36 |

| | | | |
|-----|---------------------|-----|-----------------|
| 11. | Depth charge | 25. | Artillery shell |
| 12. | Depth charge | 26. | Mine nr. 3 |
| 13. | Unknown | 27. | Torpedo nr. 40 |
| 14. | Depth charge nr. 43 | | |

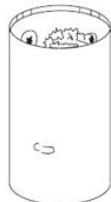
Part 3



| Nr. | UXO Type | Nr. | UXO Type |
|-----|-----------------------|-----|----------------------------------|
| 1. | Mine | 7. | Aerial bomb (unknown bomb 25 kg) |
| 2. | Depth charge nr. 42 | 8. | Artillery shell |
| 3. | Mine (contact mine) | 9. | Artillery shell |
| 4. | Aerial bomb (250 lbs) | 1. | Artillery shell |
| 5. | Artillery shell | 11. | Mine nr. 1 |
| 6. | Artillery shell | | |

Table 28: Overview UXO clearance. (Source: Dutch Coast Guard).

It should be noticed that some of the disposed UXO are accompanied with a number. The number refers to an explosives chart ('Explosievenkaart'), sampled by the Coast Guard. The chart gives a general overview of the most common UXO's in the North Sea and is an aid for fishermen to recognise an UXO they encountered. The purpose of the chart is to make the recognition of an UXO and the notification of it to the Coast Guard easier. Therefore the chart gives some general pictures of the UXO. This means that the UXO encounters of the Coast Guard in many cases do not refer to the reality. This is increased by two other factors: the different of UXO on the chart are not always given in the right proportions, and the aerial bombs are pictured with their tail however the tail is seldom still attached to a bomb when encountered. To give an impression of the UXO in the area of analysis, Table 29 shows the UXO that match the numbers on the explosives chart.

| Depth charge nr. 42 | Depth charge nr. 43 | Depth charge nr. 44 |
|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|  42 |  43 |  44 |

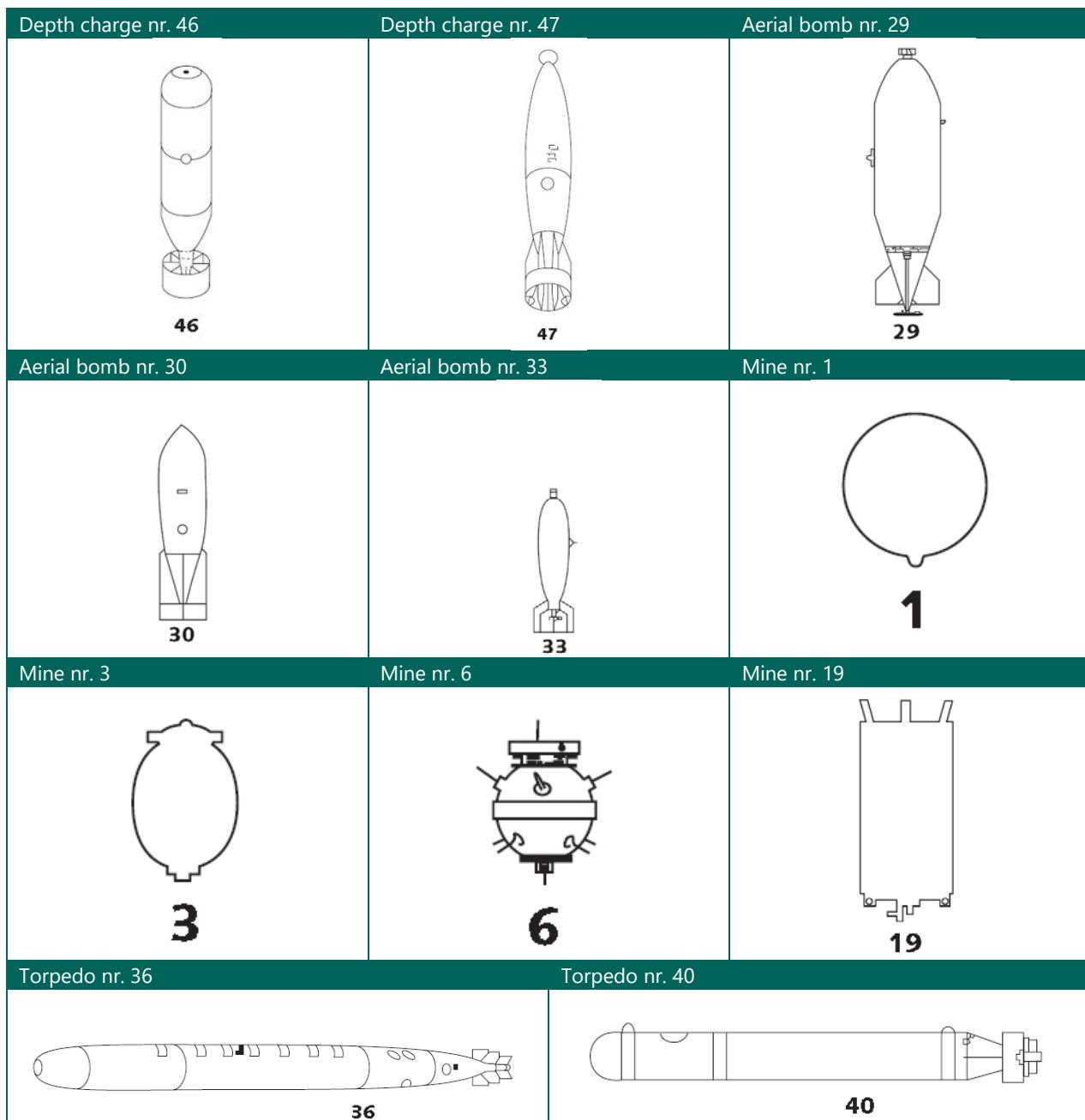


Table 29: Concordance between encountered UXO in the area of analysis and the number on the explosives chart.

OSPAR Commission

OSPAR is the mechanism by which 15 governments and the European Union cooperate to protect the marine environment of the North-East Atlantic. Since 1972 the OSPAR Convention has worked to identify threats to the marine environment and has organised, across its maritime area, programmes and measures to ensure effective national action to combat them. One of the Policy Issues of the OSPAR Convention is to report encounters with conventional and chemical munitions in the OSPAR maritime area. These encounters are kept in a database²¹. The munition encounters from 1999 onwards surrounding the area of analysis are rendered in Figure 55.

²¹ This database can be consulted at <http://odims.ospar.org/layers/?limit=100&offset=0>.

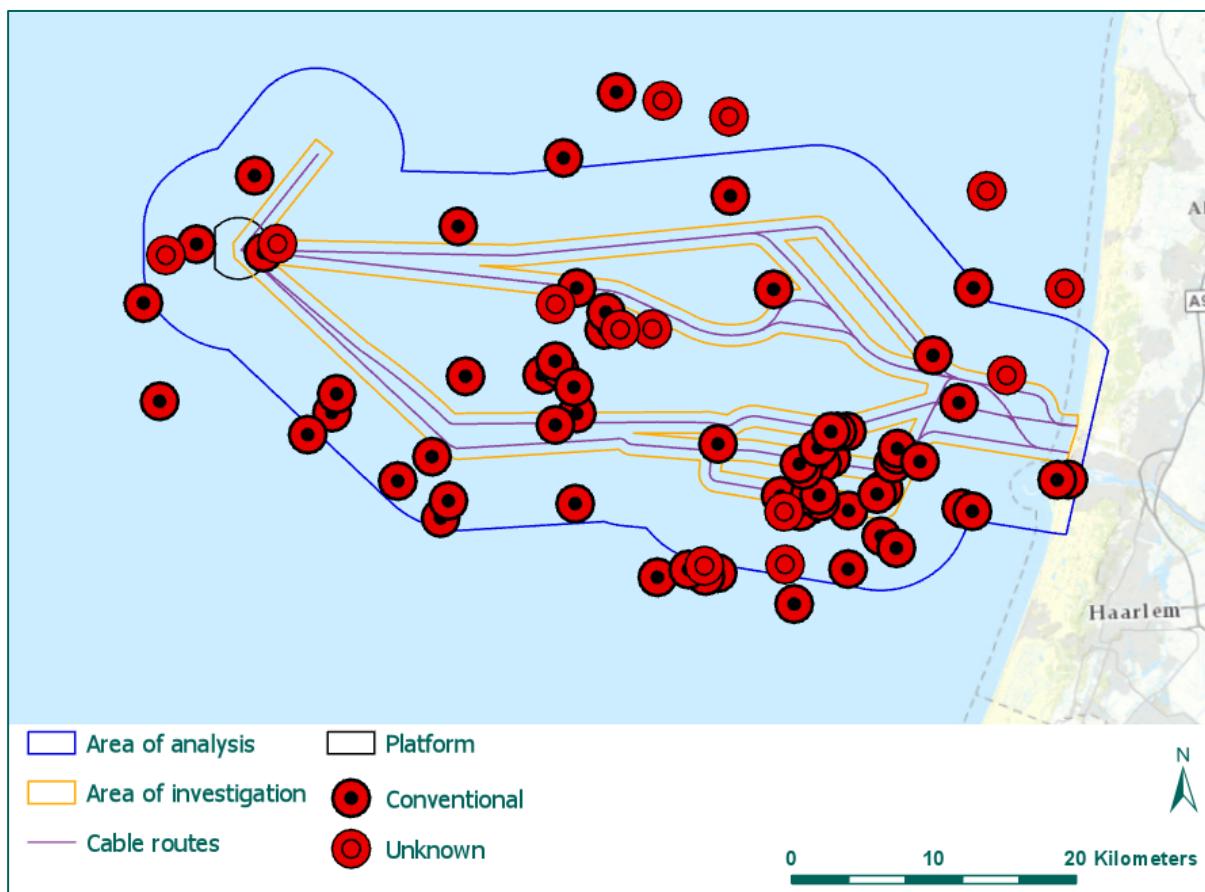


Figure 55: Overview OSPAR ammunition encounters within an area of 10 kilometres around the area of investigation.
(Source: OSPAR).

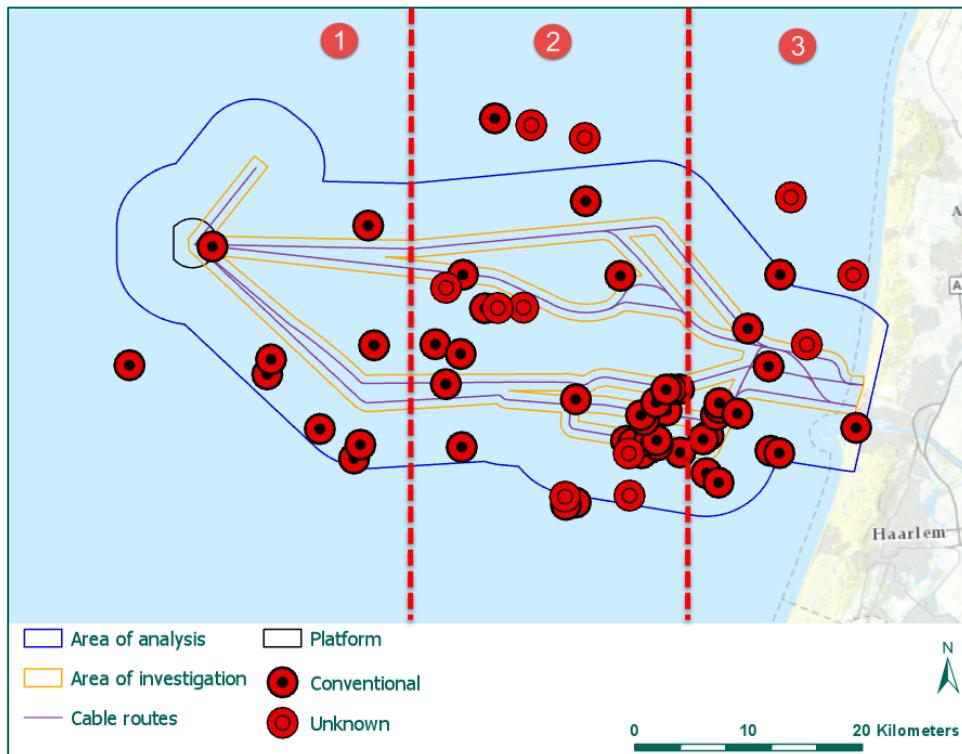
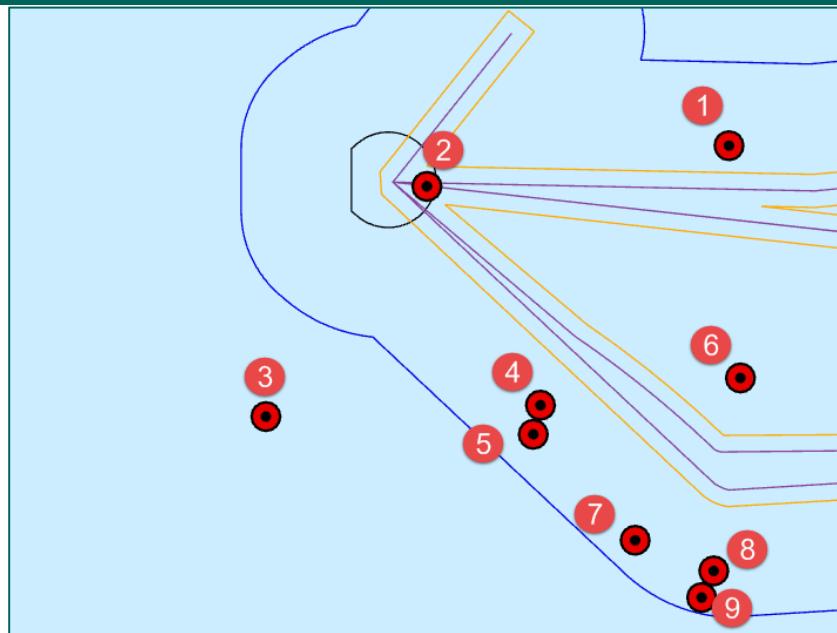
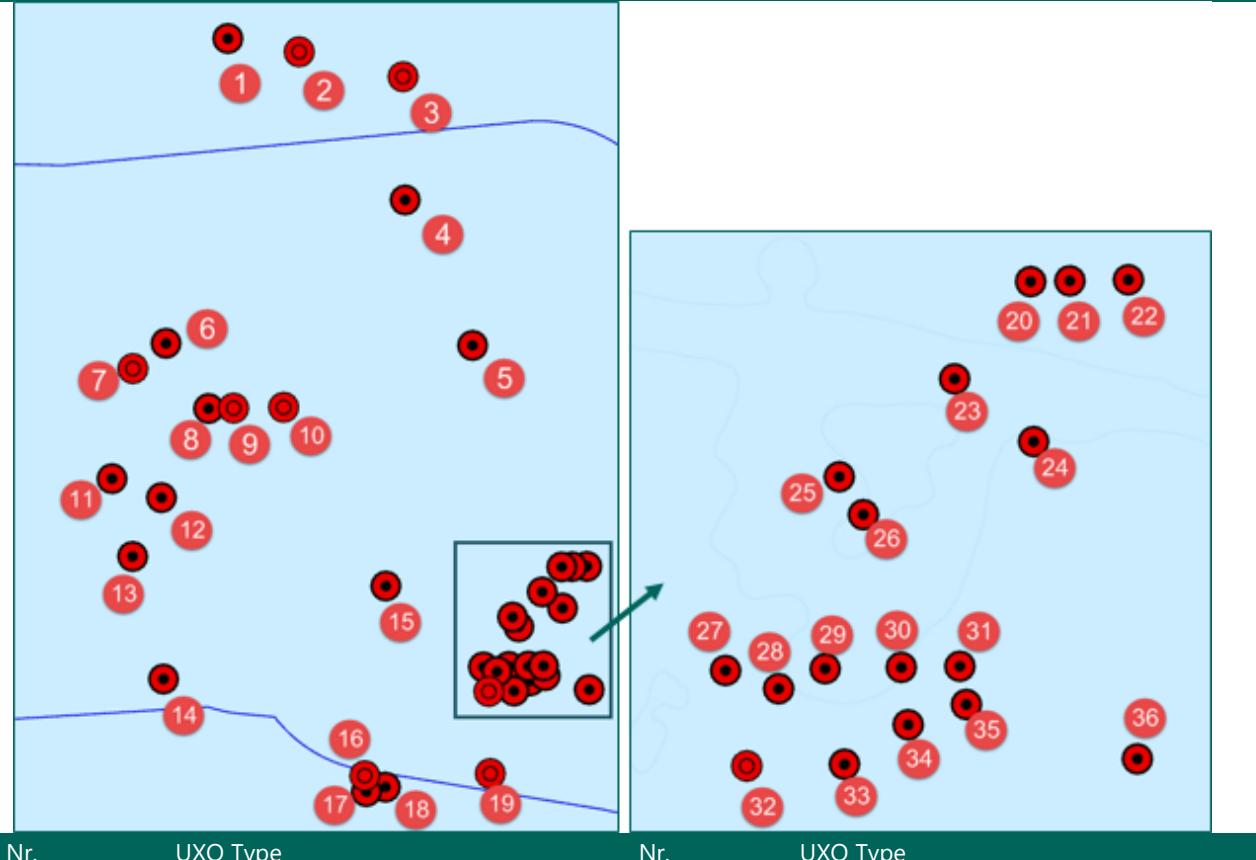


Figure 56: The three parts in which the area of analysis is divided.

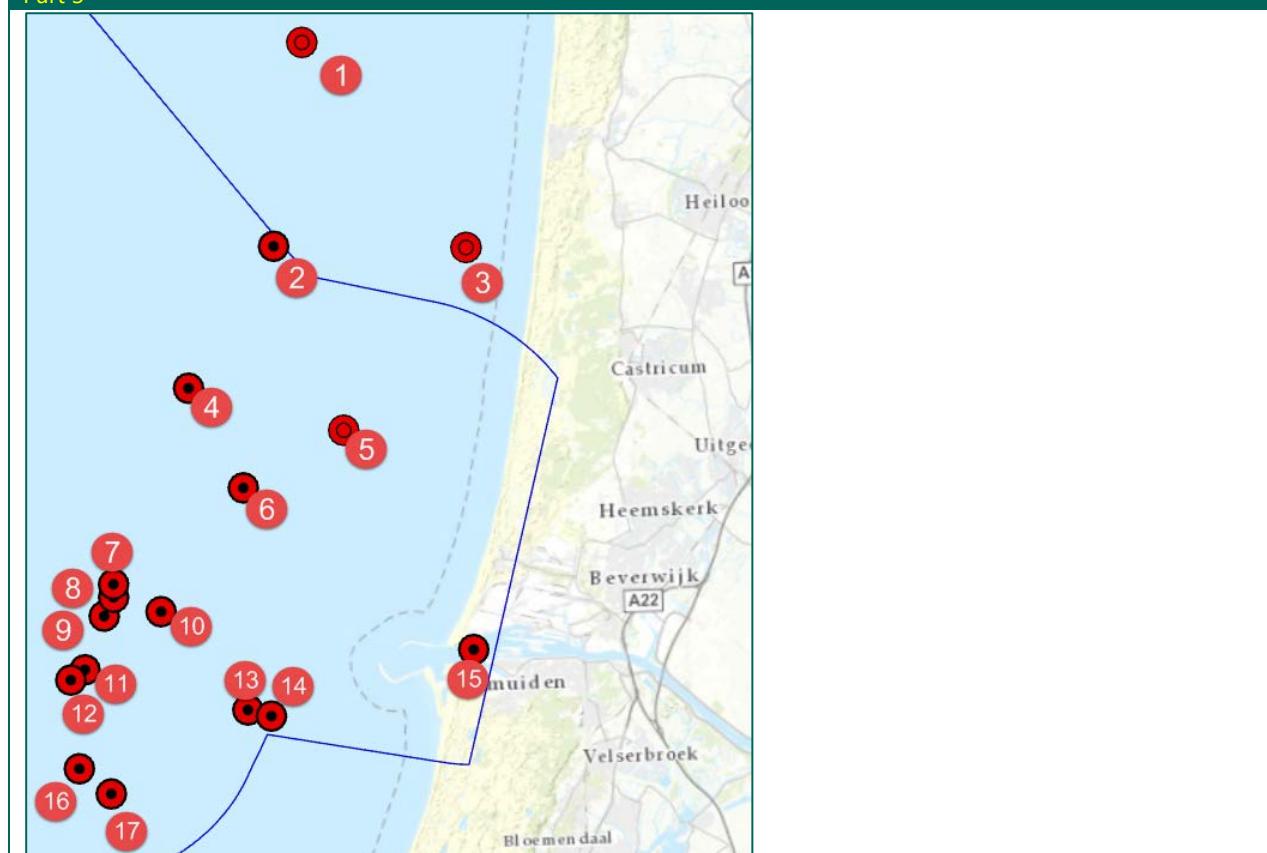
Part 1


| Nr. | UXO Type | Nr. | UXO Type |
|-----|--------------------------|-----|-------------------------------------------|
| 1. | Conventional, unknown. | 6. | Conventional, destroyed. |
| 2. | Conventional, destroyed. | 7. | Conventional, destroyed. |
| 3. | Conventional, destroyed. | 8. | Conventional, destroyed, tail of torpedo. |
| 4. | Conventional, unknown. | 9. | Conventional, destroyed. |
| 5. | Conventional, unknown. | | |

Part 2


| | | | |
|-----|------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Conventional, destroyed, unknown type of mine. | 19. | Destroyed, smoke marker. |
| 2. | Unknown, destroyed. | 20. | Conventional, destroyed. |
| 3. | Unknown. | 21. | Conventional, destroyed. |
| 4. | Conventional, destroyed. | 22. | Conventional, destroyed. |
| 5. | Conventional, unknown. | 23. | Conventional, destroyed. |
| 6. | Conventional, destroyed. | 24. | Conventional, disposed of on land, torpedo (Torpedo, concrete with steel end 6-7 feet long, 2-3 feet in diameter, steel nose cone with ring). |
| 7. | Unknown. | 25. | Conventional, destroyed. |
| 8. | Conventional, destroyed. | 26. | Conventional, destroyed. |
| 9. | Conventional, unknown. | 27. | Conventional, destroyed. |
| 10. | Unknown. | 28. | Conventional, destroyed. |
| 11. | Conventional, destroyed. | 29. | Conventional, destroyed. |
| 12. | Conventional, destroyed. | 30. | Conventional, destroyed. |
| 13. | Conventional, destroyed. | 31. | Conventional, destroyed. |
| 14. | Conventional, destroyed. | 32. | Unknown, destroyed, probably submarine marker flare. |
| 15. | Conventional, destroyed, 2,000 lbs UK, nr. 26. | 33. | Conventional, destroyed. |
| 16. | Destroyed, smoke marker. | 34. | Conventional, destroyed. |
| 17. | Destroyed, smoke flare. | 35. | Conventional, destroyed. |
| 18. | Conventional, smoke flare. | 36. | Conventional, destroyed. |

Part 3



| Nr. | UXO Type | Nr. | UXO Type |
|-----|--------------------------|-----|--------------------------|
| 1. | Unknown. | 10. | Conventional, destroyed. |
| 2. | Conventional, destroyed. | 11. | Conventional, destroyed. |

| | | | |
|----|--------------------------------------------------------------------|-----|-----------------------------------------------------------------------|
| 3. | Unknown, destroyed. | 12. | Conventional, destroyed. |
| 4. | Conventional, destroyed, unexploded bomb found on submerged wreck. | 13. | Conventional, destroyed, submarine marker smoke float found on beach. |
| 5. | Unknown. | 14. | Conventional, destroyed. |
| 6. | Conventional, destroyed. | 15. | Not relevant, wrongly positioned. |
| 7. | Conventional, destroyed. | 16. | Solid shot, recovered by dredger. |
| 8. | Conventional, destroyed. | 17. | Conventional, destroyed. |
| 9. | Conventional, destroyed. | | |

Table 30: Overview UXO encounters OSPAR. (Source: OSPAR).

ANNEX 6 CARTOGRAPHIC MATERIAL

This historical research uses extensively of cartographic materials. Relevant cartographic material includes historical coordinate systems, minefields and contemporary naval charts. Cartographic material from the following sources has been consulted.

- Allied map
- Defence overprint
- Bunkerarchief
- Latitude/longitude coordinates
- German Quadrantkarte
- Defence overprint
- Noordzeeloket
- Royal Netherlands Navy Hydrographic service
- Navy Museum Den Helder
- UK Hydrographic Office
- Library of Congress

Allied map

The allied maps are available in the Kadaster and give an impression of how the Dutch coast looked like during the Second World War. The maps contain a coordinate system based upon map squares, the so called Nord du Guerre system. A map square is an indication from one square kilometre (one by one kilometre). This squares were referred to by allied pilots and can be used to link information about air attacks to a location on the map. The figure below shows a fragment of the allied maps 344 Castricum and 348 IJmuiden with the map squares covering the area of analysis.

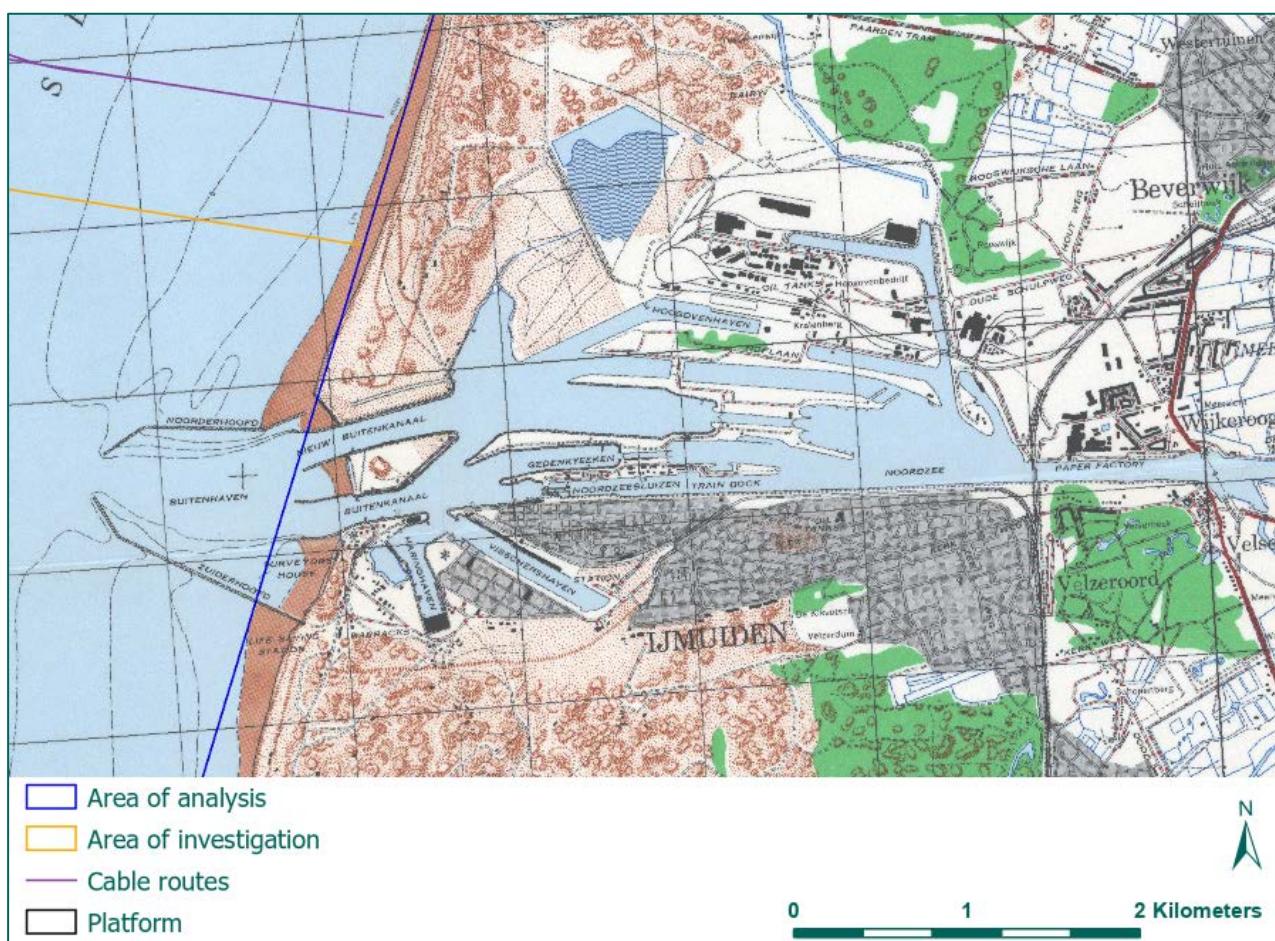


Figure 57: Fragment of the allied maps 344 Castricum and 348 IJmuiden. (Source: Kadaster).

Defence overprint

A defence overprint is a newer version of the allied map on which enemy positions and defence works are indicated. An overprint could give information about the strength of defence works, front lines and other information relevant for the allied forces. For this DTS-UXO the available overprints originated from the Library and Archives Canada and the Kadaster.



Figure 58: Fragment of the defence overprints 344 Castricum and 348 IJmuiden. (Source: LAC, Kadaster).

Bunkerarchief

The archives of the 2e Geniecommandement, Bureau Registratie Verdedigingswerken van het Ministerie van Defensie (2nd Engineer Command, Defence Works Registration Bureau of the Ministry of Defence) – also known as the 'Bunkerarchief' (Bunker archive) – contains information about defence works. An example of this are the defence works of the Atlantikwall. The figure below shows a fragment of the map

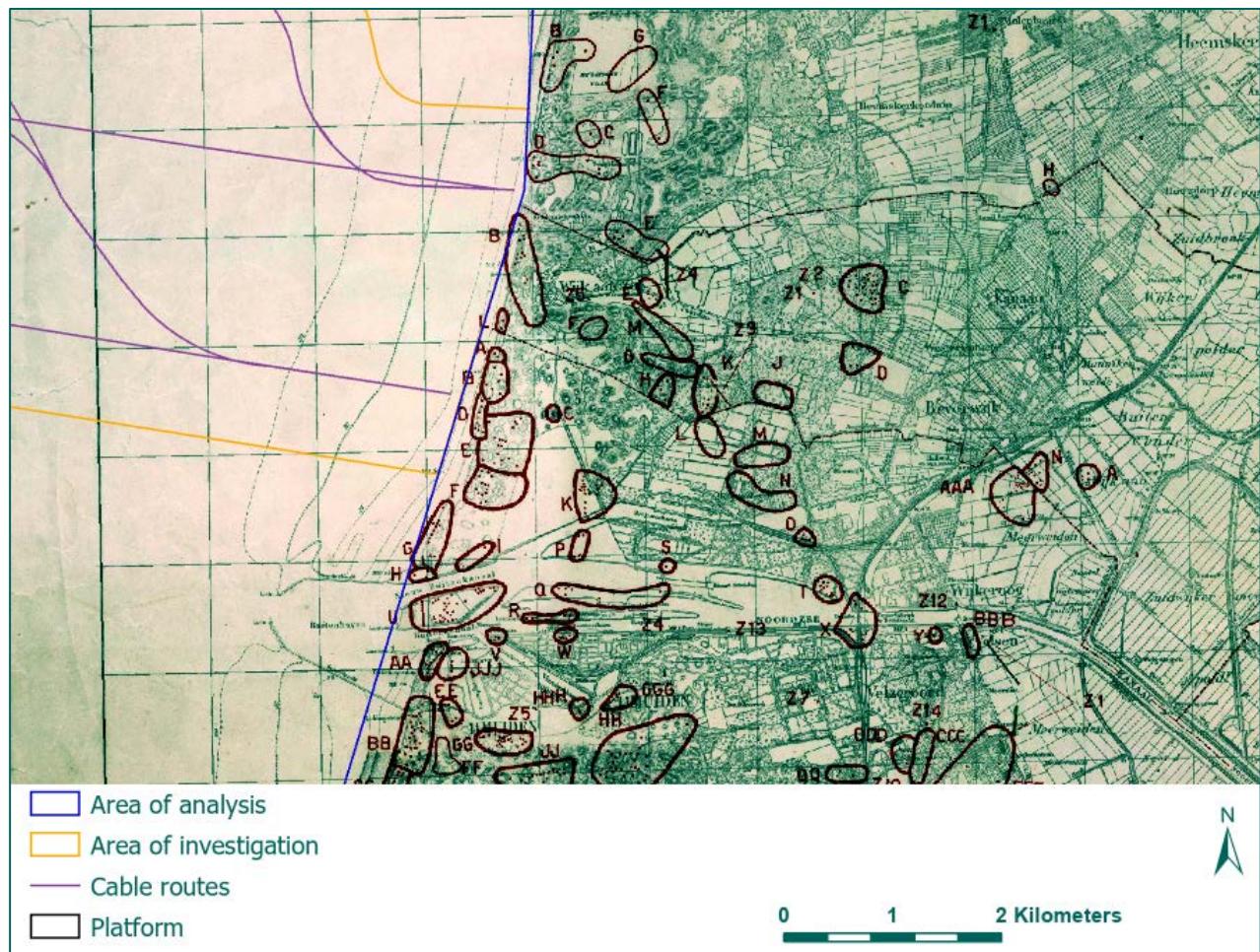


Figure 59: Fragment of the map 275 Block 3A showing defence works along the Dutch coast. (Source: NA).

Latitude/longitude coordinates

Naval locations in historical sources are often noted in decimal degrees and minutes. One minute is equal to one naval mile, or 1,852 meters.

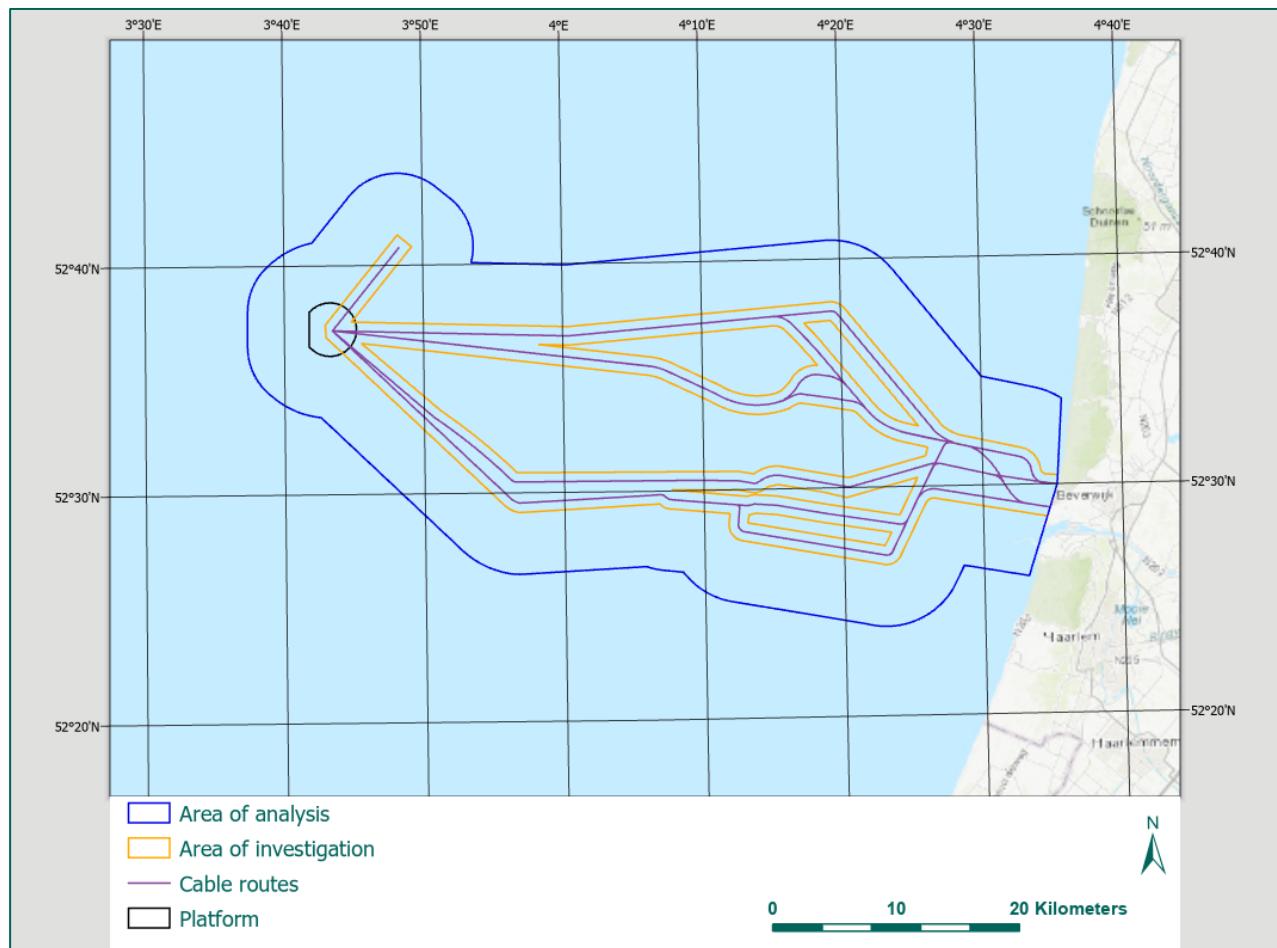


Figure 60: latitude/longitude grid. (Source basemap: ESRI).

German Quadrantkarte

The German Kriegsmarine (Navy) used the so-called *Quadrantkarte* as an aid to note naval locations. The grid square (*Quadranten*) measured 6x6 naval miles and were determined with a geographic formula. REASeuro digitized the German grid in the GIS system to accurately establish the relevant grid squares for the area of analysis.

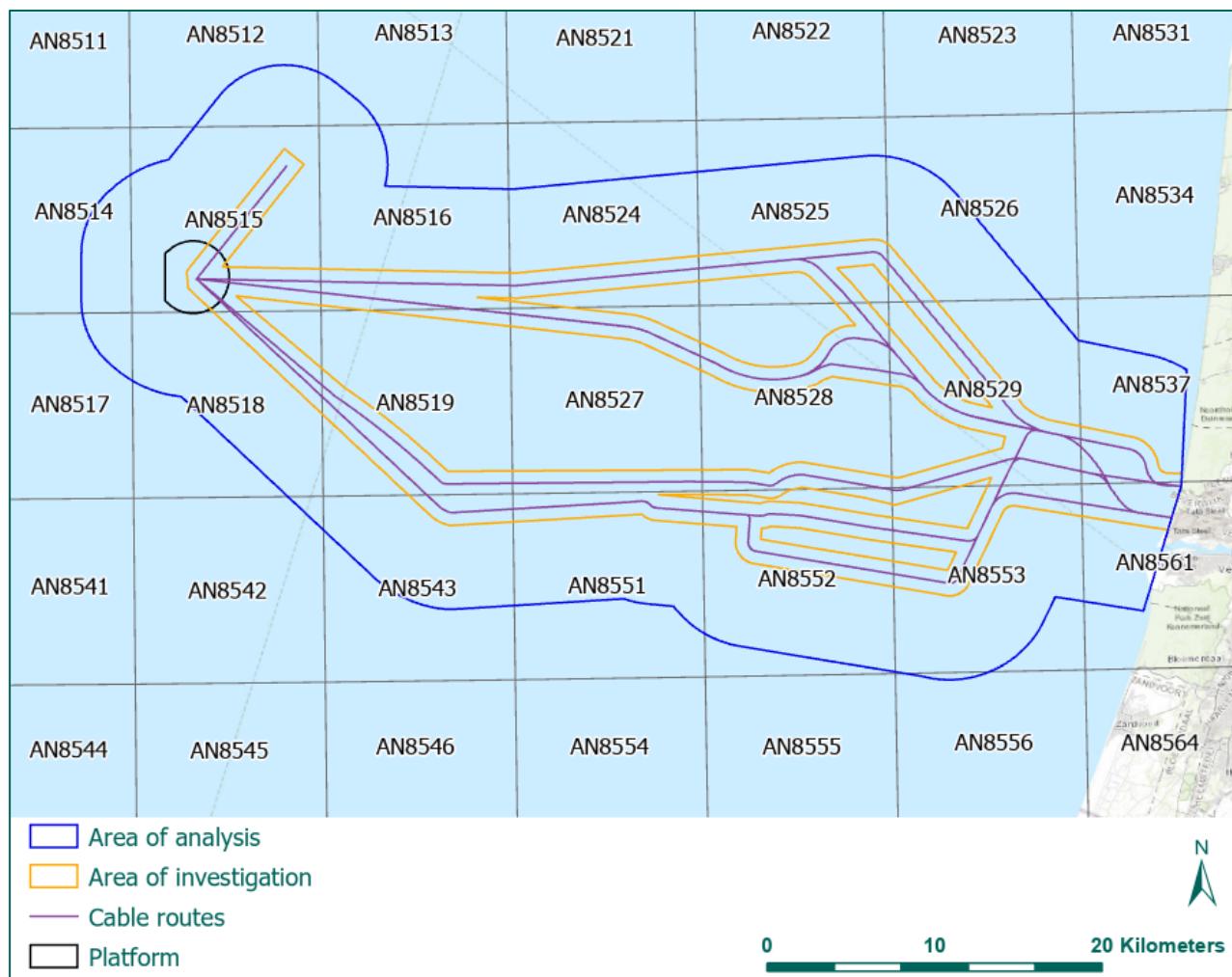


Figure 61: German grid squares relevant for the area of analysis. (Source base map: ESRI).

Noordzeeloket

The Noordzeeloket offers governmental information about the North Sea. A map showing military exercise areas is consulted on the Noordzeeloket's website. As shown in Figure 62 the area of analysis has overlap with an artillery firing range and an ammunition dump zone.

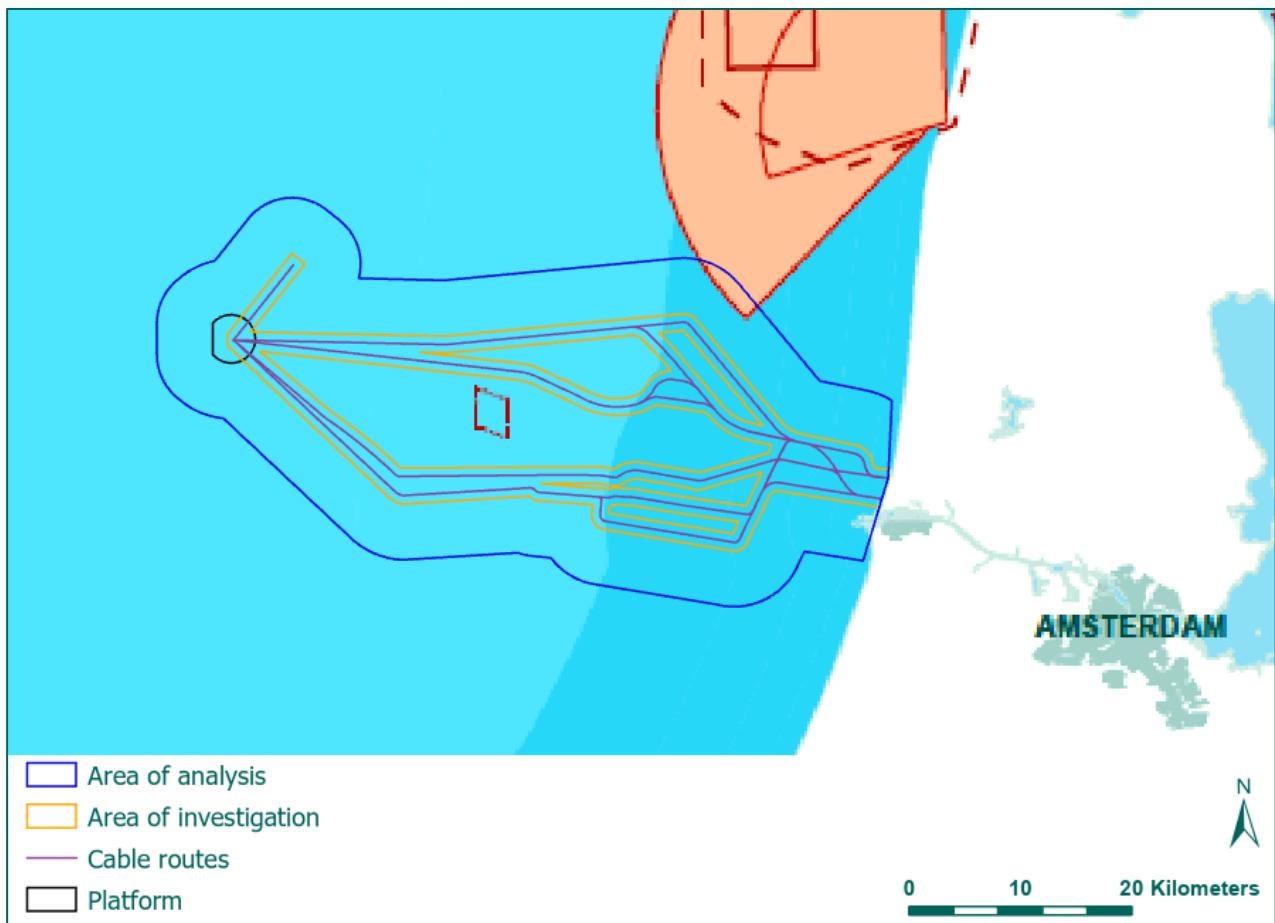


Figure 62: Extract from map Noordzeeloket (Source: Noordzeeloket).

Royal Netherlands Navy Hydrographic service

Naval charts of the area of analysis have been acquired through the Hydrographic Service. Besides naval charts the HP39 (wreck registry) publication has been consulted to gain information on possible wrecks in the area of investigation.

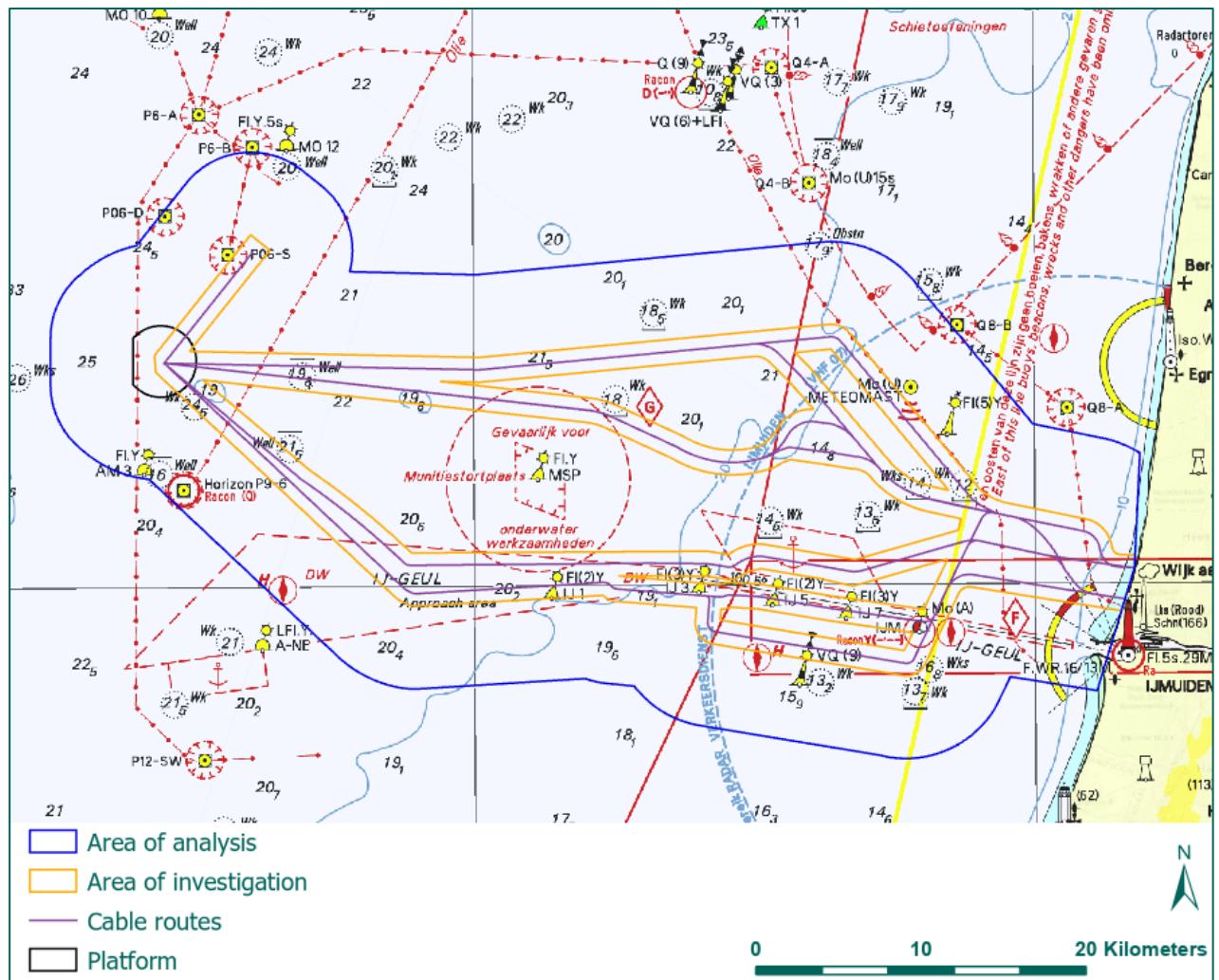


Figure 63: Naval chart.

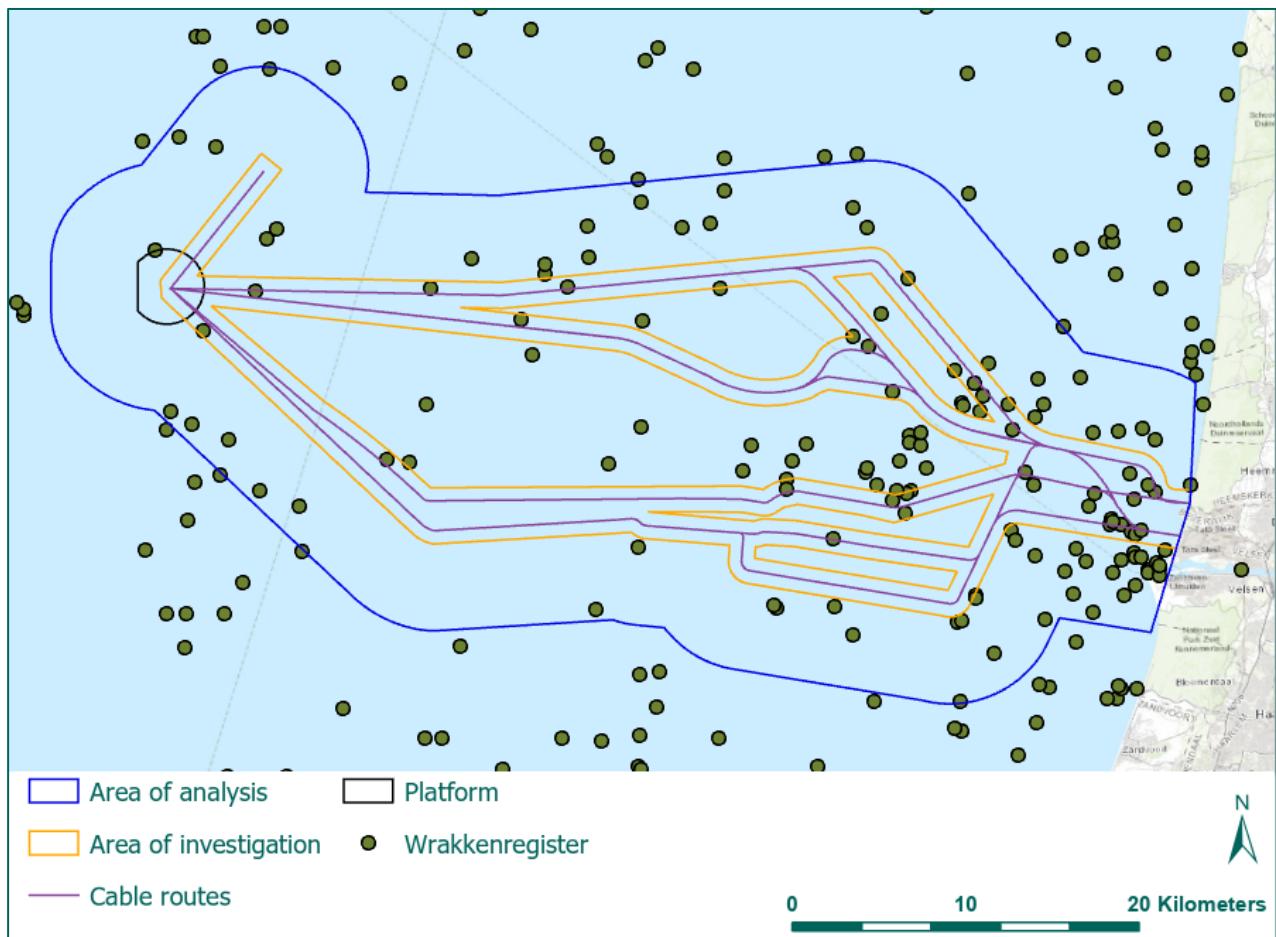


Figure 64: Wrecks. (Source: HP39 Wrakkenregister).

Navy Museum Den Helder

The map collection of the Navy Museum (Marinemuseum) in Den Helder has been consulted. NEMEDRI-maps were found in this collection. These maps offer information on minesweeping after the Second World War. The following figures are extracts of the NEMEDRI maps, showing the area of investigation shortly after the war. The area of analysis is consequently shown in a ubiquitous Danger Area, owing to naval mines.

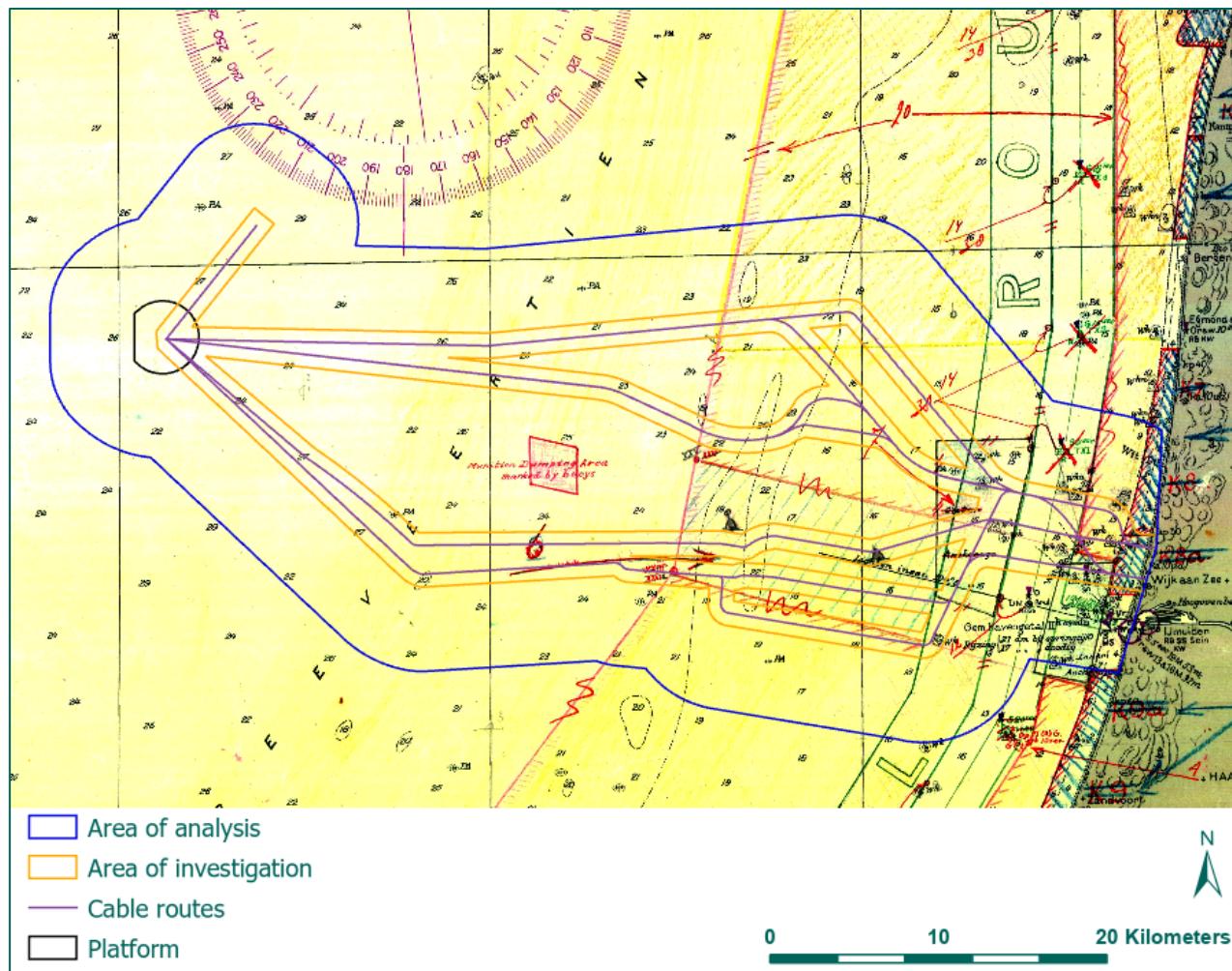


Figure 65: Extract from the NEMEDRI chart 227 (West Hinder tot Texel). (Source: Marinemuseum Den Helder).

UK Hydrographic Office (UKHO)

The UK Hydrographic Office maintains a large collection of historical nautical charts, including a collection of mine charts. These mine charts have been consulted, resulting in a map with known active minefields and German convoy routes at the moment of drawing. The map is a secret reproduction of a German map, obtained through intelligence work.

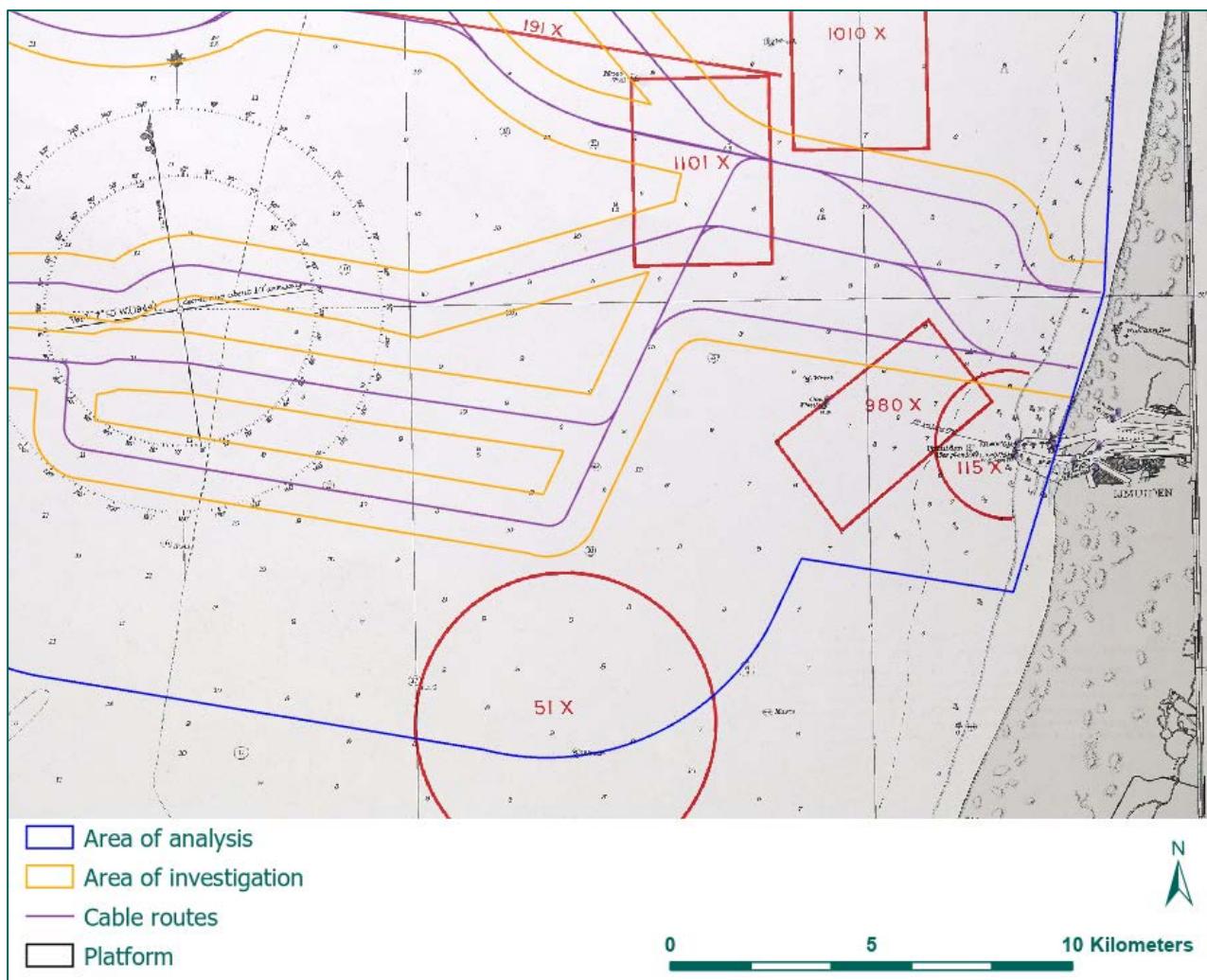


Figure 66: Mine chart OCB MO F6229 Hook of Holland 1944. (Source: UKHO).

Library of Congress

A map of known minefields on August 18, 1918 is available on the website of the Library of Congress. This map shows the area containing British minefields.

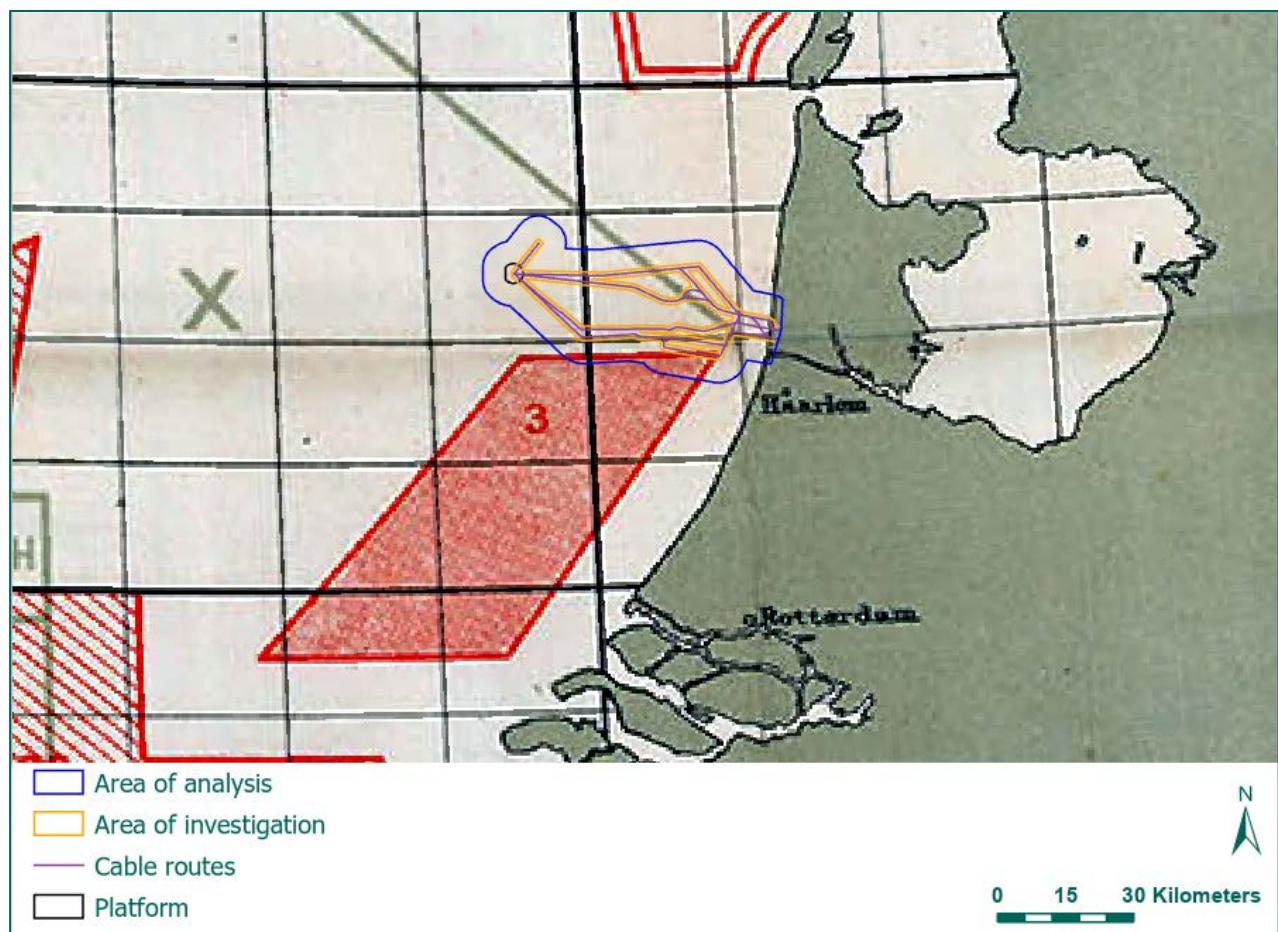


Figure 67: Figure 1: British Islands. Approximate position of minefields, 19th August 1918. (Source: Library of Congress).

ANNEX 7 OVERVIEW AERIAL PHOTOGRAPHS

In this desktop study aerial photographs are used as an additional source for mapping the coastal guns. Today, most defence works in the Atlantikwall don't exist anymore or they have disappeared under the sands of the dunes. Aerial photographs show the situation during the Second World War. Photos were used from the Dutch Topographic Service [Luchtfotocollectie Topografische Dienst Kadaster Zwolle, afdeling GEO-informatie (Kadaster)].

The selection of aerial photographs is based on the scale, the quality, the coverage and date of the photographs.

| Collection / sortie | Photo No. | Date | Source |
|---------------------|---------------------|---------------|----------|
| 106G / 5132 | 4150, 4163 | 30 March 1945 | Kadaster |
| 106G / 5133 | 3453, 3463, 3464 | 30 March 1945 | Kadaster |

Table 31: Overview aerial photographs.

ANNEX 8 DOCUMENTATION WARDOCS

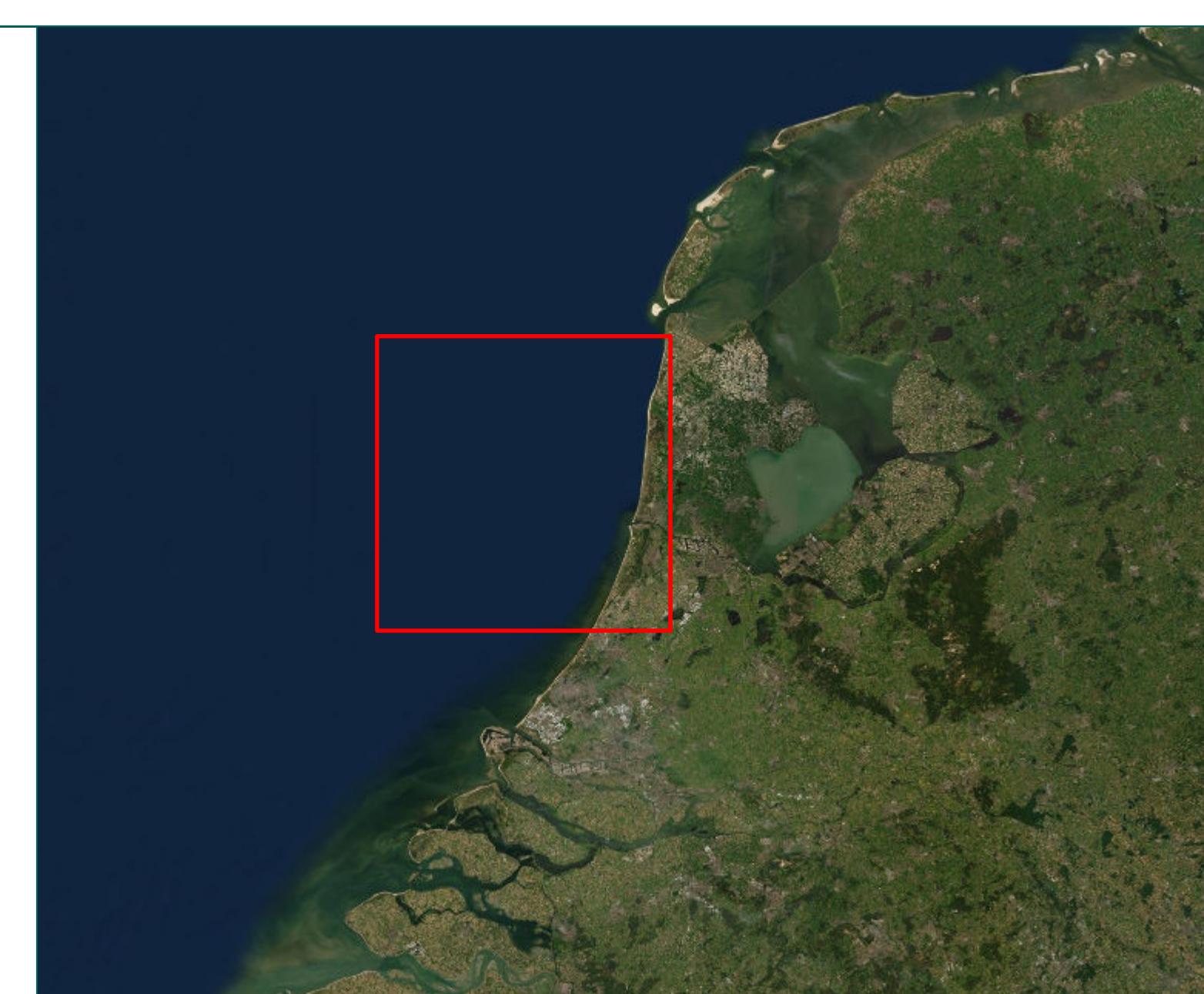
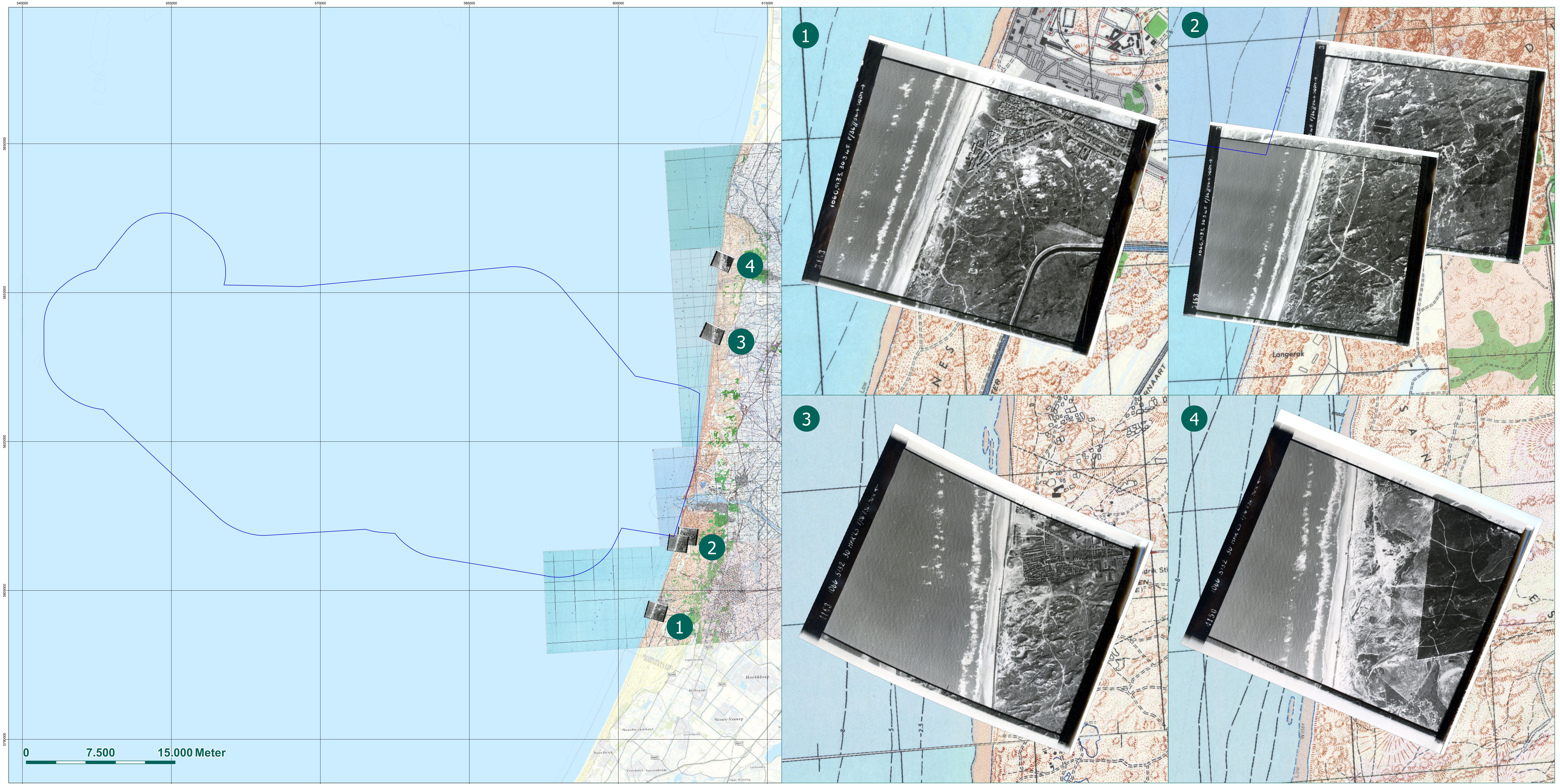
Separate folder.

ANNEX 9 DRAWINGS

Drawing 01: Georeferenced aerials and maps made by the geographical section general staff

Drawing 02: Factsmap (2 parts)

Drawing 03: UXO risk areas



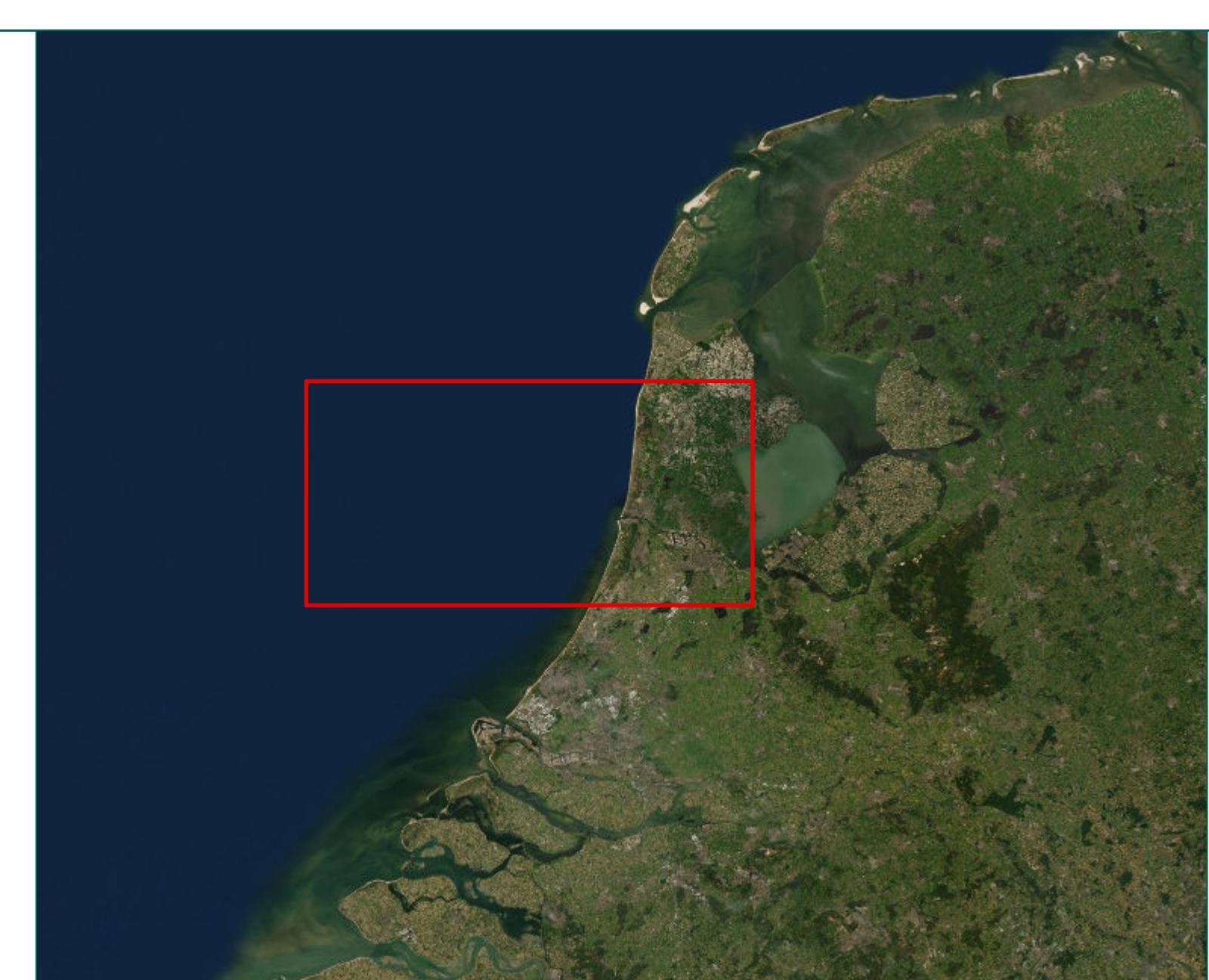
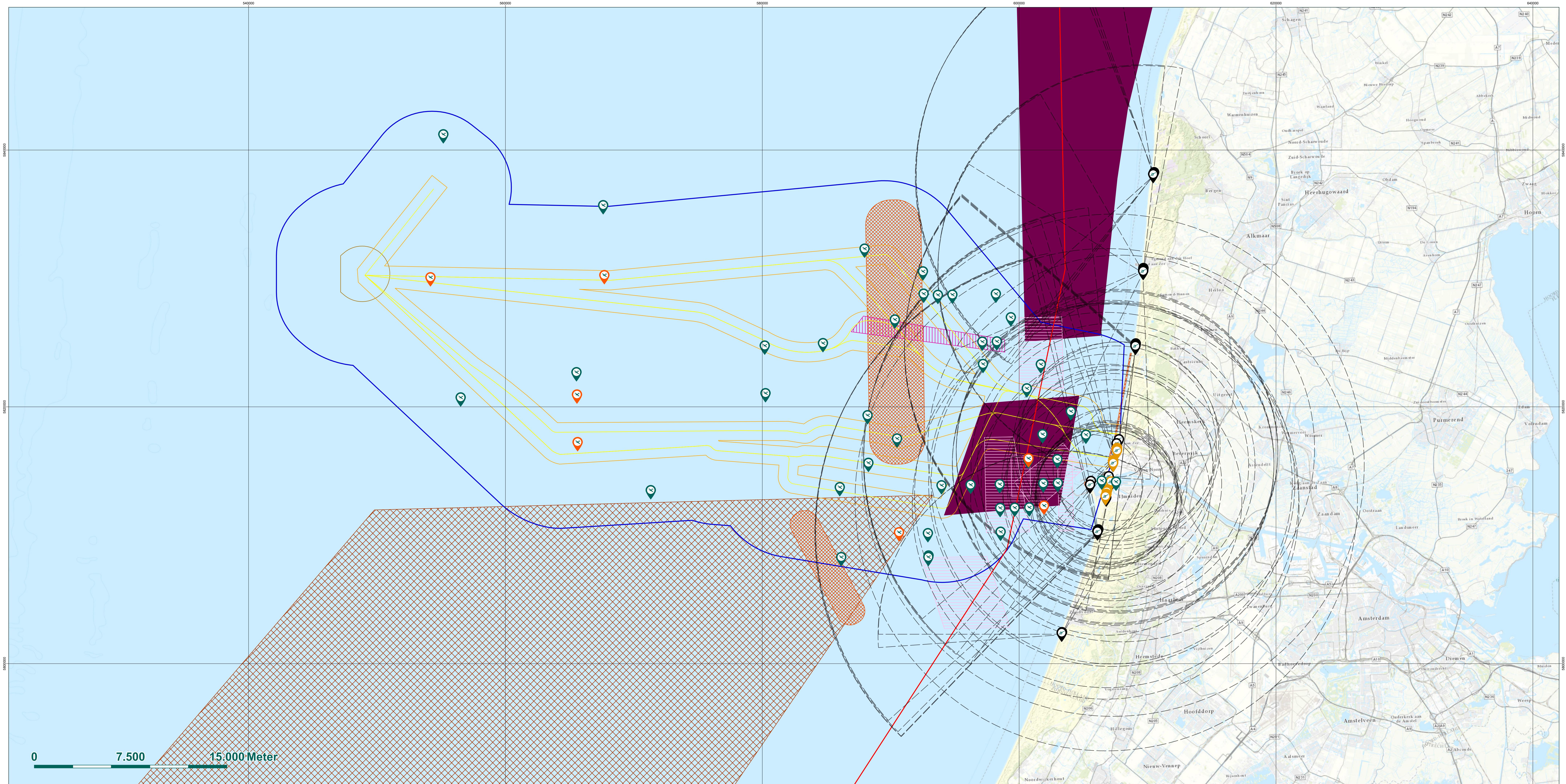
HKW Beta Arcadis

Georeferenced aerials and maps made by the geographical section general staff

Reportnumber: RO-190149
Mapsize: A0

| | | | |
|--------------|-----------------|----------|--------------|
| Drawn by: | L. van den Burg | 7-8-2019 | Drawing no: |
| Checked by: | K. Schuddinck | 7-8-2019 | 73556-01-001 |
| Accepted by: | M. Taks | 7-8-2019 | |





- 📍 Bomber Command
- 📍 Coastal Command
- 📍 Dutch guns
- 📍 German guns
- Cable routes
- Platform
- Area of investigation
- Area of analysis
- MarineGruppe Kommando Nord Navigation Routes - Convoy route "Weg Rot"
- Maximum range
- QU operations
- Operation CBX
- Gardening operations
- Minefields WWI World War I
- Minefields WWII World War II

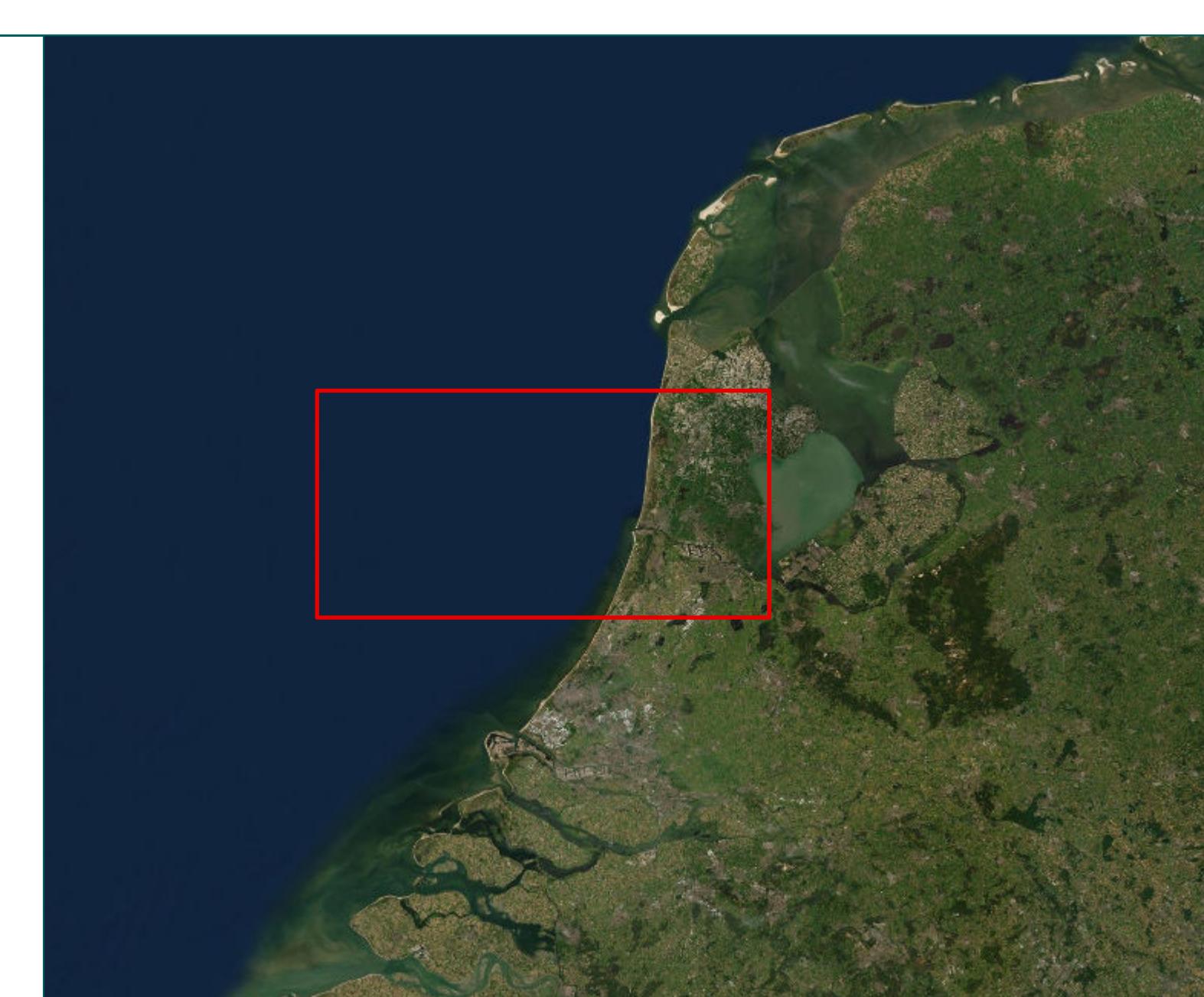
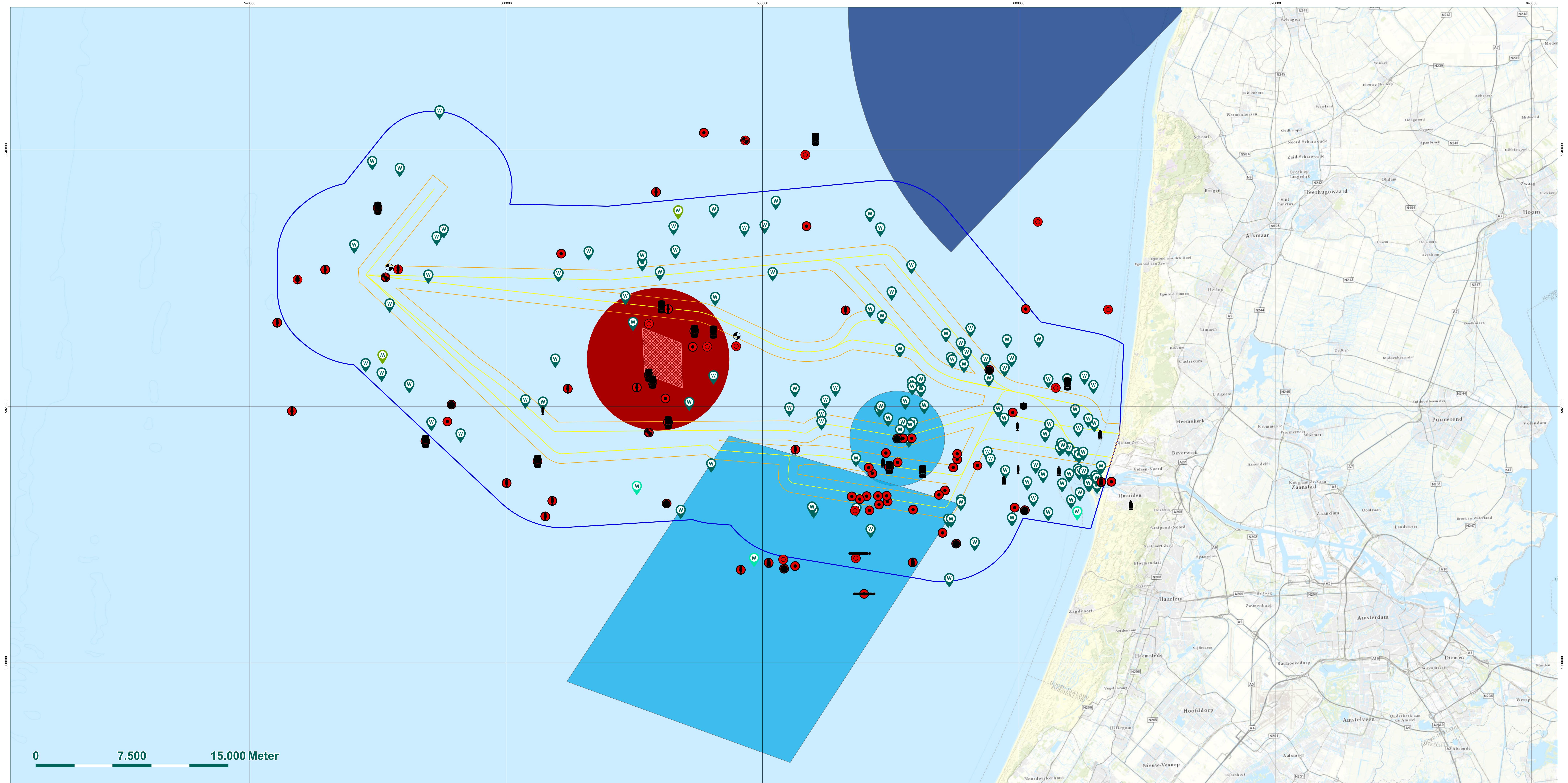
HKW Beta Arcadis

Factsmap

Rapportnummer: RO-190149
Mapsize: A0

| | | | |
|--------------|-----------------|----------|--------------|
| Drawn by: | L. van den Burg | 7-8-2019 | Tekening no: |
| Checked by: | K. Schuddinck | 7-8-2019 | |
| Accepted by: | M. Taks | 7-8-2019 | |





- | | | |
|-----------------------|-------------------|-----------------------------|
| Cable routes | ● Aerial bomb | ○ Unknown |
| Area of investigation | ■ Artillery Shell | ■ Ammunition dump ground |
| Area of analysis | ■ Depth Charge | ■ Marked danger zone |
| Mine encounters 1967 | ● Mine | ■ Former minesweeping areas |
| Mine encounters WWI | — Torpedo | ■ Artillery firing area |
| Wrecks | ○ Unknown | ○ Unexploded ordnance |
| | ● Conventional | ● Unexploded ordnance |

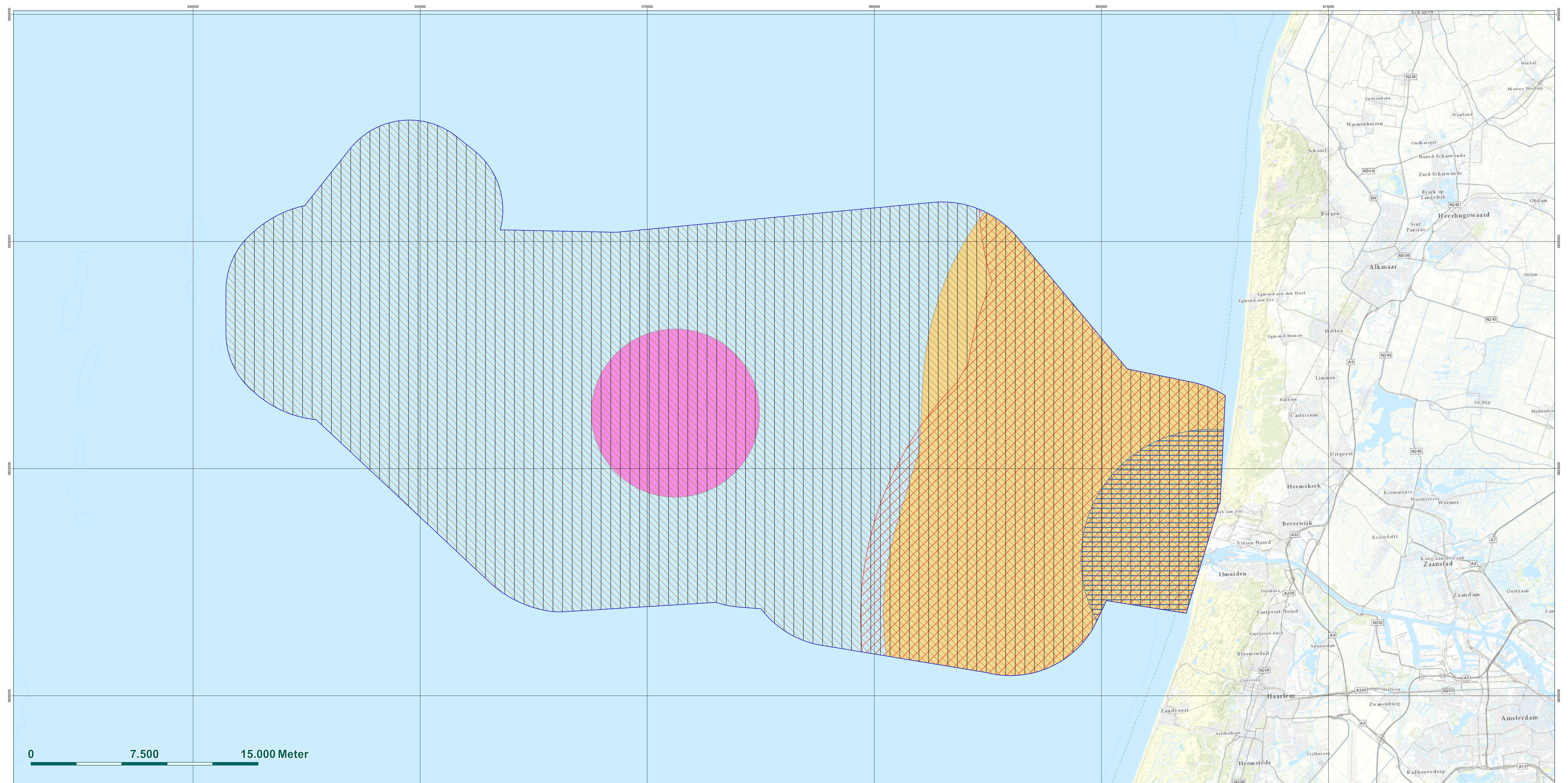
HKW Beta Arcadis

Factsmap

Rapportnummer: RO-190149
Mapsize: A0

| | | | |
|--------------|-----------------|----------|---------------|
| Drawn by: | L. van den Burg | 7-8-2019 | Tekening no: |
| Checked by: | K. Schuddinck | 7-8-2019 | 73556-01-002B |
| Accepted by: | M. Taks | 7-8-2019 | |





- █ Area of analysis
- █ Coastal guns 3.7 - 5 cm
- █ Naval mines
- █ Coastal guns 7.5 - 24 cm
- █ Air strikes, jettisons
- █ Surface craft battles
- █ Ammunition dump ground

HKW Beta Arcadis

UXO-risk areas

Reportnumber: RO-190149
Mapsize: A0

| | | | |
|--------------|-----------------|----------|--------------|
| Drawn by: | L. van den Burg | 7-8-2019 | Drawing no: |
| Checked by: | K. Schuddinck | 7-8-2019 | 73556-01-003 |
| Accepted by: | M. Taks | 7-8-2019 | |



ANNEX 10 SPECIFICATION OF UXO

BIJLAGE VIII-B

SPECIFICATIETABEL VERWACHTE NGE OP ZEE

Zandwinvak S7AE

| Hoofdsoort | Subsoort | Type | Kaliber / gewichtsklasse | Nationaliteit | Diameter (cm) | Lengte (cm) met staart | Lengte (cm) zonder staart | Totaal gewicht (kg) zonder staartstuk | Explosieve inhoud in TNT equivalent | Explosieve inhoud | Soort vulling* gewicht bij deze vulling | Metaalsoort | Ontstekers | Hoeveelheid | Verschijningsvorm |
|------------------|-----------------------------------------|-------------------|--------------------------------------------|---------------|---------------|------------------------|---------------------------|---------------------------------------|-------------------------------------|-------------------|-----------------------------------------|----------------------|------------|-------------|-------------------|
| Afwerpmunitie | Brand bom | | 4 lbs | UK/US | 4,2 | 57 | 37 | 1,8 | NVT | 0,73 | Thermiet | Aluminium /magnesium | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brand bom | | 25 lbs | UK | 12,8 | 82,8 | 39,4 | | NVT | nvt | Thermiet / Elektron | Blik | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brand bom | | 30 lbs | UK | 12,7 | 83 | 45,7 | 11,3 | NVT | 0,03 | Zwart buskruit | Uzter | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom AS | MK I tm III | 100 lbs | UK | 20 | 104 | 78,7 | 44,5 | 26,5 - 30,5 | 18,50 | Mitol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom AS | MK IV tm VI | 100 lbs | UK | 20 | 104 | 61 | 44,5 | 33 | 22,00 | Torpex /TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom AS | MK I tm MK III | 250 lbs | UK | 29 | 147 | 89,5 | 112 | 78 / 60 | 60,00 | RDX / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom AS | MK IV tm V | 250 lbs | UK | 29 | 147 | 89,5 | 112 | 80,6 / 62 | 62,00 | RDX / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | 250 lbs | US | | 27,7 | 115,3 | 91,4 | 117 | 56,7 | 58,50 | Amatol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom MC | 250 lbs | UK | | 26 | 133,4 | 70 | 102 | 35,9 | 37,00 | Amatol | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | MK I tm MK III | 250 lbs | UK | 26 | 140 | 70 | 112 | 29,9 / 30,8 | 30,80 | Amatol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | MK V tm MK VII | 250 lbs | UK | 26 | 142 | 70 | 104 | 25,8 / 30,7 | 30,70 | Amatol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom SAP | MK II tm MK V | 250 lbs | UK | 23 | 125 | 80,2 | 111 | 21,5 / 19 | 19,00 | Pentoliet / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom Frag | M 81 | 260 lbs | US | 21,5 | 111 | 82 | 118 | 17,7 | 15,00 | Comp. B | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom Demolition | | 300 lbs | US | 27,7 | 123,4 | 100 | 124 | 62 | 62,00 | TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | MK IV tm MK VII | 500 lbs | US | 36 | 150 | 118,4 | 227 | 116,4 / 120 | 120,00 | Amatol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | MK I tm MK III | 500 lbs | US | 36 | 150 | 118,4 | 227 | 116,4 / 120 | 120,00 | Amatol / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom GP | MK I tm IV | 1000 lbs | UK | 42 | 220 | 133 | 486 | 165,9 / 221 / 171 | 171,00 | Amatol / RDX / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom HC | MK I tm III | 1000 lbs | UK | 45 | 184 | 133 | 463 | 230,8 / 261,8 / 309,4 / 238 | 238,00 | Amatol / Amatex 9 / RDX / TNT | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom HC | HC 2000 lbs, Mk 1 | 2000 lbs | UK | 47 | 4114 | 2527 | 835,5 | 599,4 | 607,80 | Amatol 60/40 | Staal/plaat | | 0-3 | Afgeworpen |
| Afwerpmunitie | Brisant bom HC | MK I | 4000 lbs | UK | 76 | 292 | 225 | 1778 | 1267,8 | 1.307,00 | Amatol | Staal | | 0-10 | Afgeworpen |
| Afwerpmunitie | Brisant bom HC | MK II tm VI | 4000 lbs | UK | 76 | 279 | 208 | 1783 | 2166,5 / 1890,4 / 1303 | 1.301,00 | Amatol / Mitol / Torpex 2 / RDX / TNT | Staal | | 0-10 | Afgeworpen |
| Raket | AA Drahtseil | AA | | Du | 15,2 | nvt | 1,55 | | nvt | nvt | nvt | staal | | 0-10 | Verschoten |
| Raket | Gevechtскоп AP | AP | 3 inch raket met 25 lbs AP gewichtskon | UK | 8,74 | nvt | 31 | 27,5 | nvt | nvt | nvt | Staall | | 0-10 | Verschoten |
| Raket | Gevechtскоп SAP | SAP | 3 inch raket met 60 lbs SAP-HE gewichtskon | UK | 15,2 | nvt | 55 | 27,2 | 5,4 / 5,2 | 5,40 | TNT / Amatol | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | | 20 mm | UK | 2 | nvt | 0,08 | 0,1 | 0,02 | 0,02 | TNT | Staal | | 0-500 | Verschoten |
| Geschutmunite | Brisantbrandgranaat | | 20 mm | UK | 2 | nvt | 0,085 | 0,12 | 0,02 | 0,02 | TNT | Staal | | 0-500 | Verschoten |
| Geschutmunite | Halfpanzerbrisant- brandgranaat | | 20 mm | UK | 2 | nvt | 0,085 | 0,146 | 0,01 | 0,01 | TNT | Staal | | 0-500 | Verschoten |
| Geschutmunite | Brisantgranaat | | 2 cm | Du | 2 | nvt | 0,138 | 0,12 | 0,007 | 0,0066 | TNT | Staal | | 0-500 | Verschoten |
| Geschutmunite | Halfpanzerbrisant- brandgranaat | PomPom | 2-pdr | UK | 4 | nvt | 15,8 | 1,07 | 0,07 | 0,07 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | L/83 | 3,7 cm | Du | 3,7 | nvt | 14 | 0,665 | 0,45 | 0,45 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | SGr 181 | 4,7 cm | Du | 4,7 | nvt | 16,85 | 1,6 | 0,185 | 0,185 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | SGr 38 | 5 cm | Du | 5 | nvt | 22,5 | 1,86 | 0,2 | 0,20 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | 6-pdr | UK | 5,7 | nvt | 21,7 | 2,7 | 0,26 | 0,26 | TNT | Staal | | 0-25 | Verschoten | |
| Geschutmunite | Brisantgranaat | L/36 | 7,5 cm | Du | 7,5 | nvt | 34,5 | 5,7 | 0,69 | 0,69 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | SK L/45 | 8,8 cm | Du | 8,8 | nvt | 39,6 | 9 | 0,73 | 0,73 | TNT | Staal | | 0-25 | Verschoten |
| Geschutmunite | Brisantgranaat | HE Mk 1C Q.F. 3,7 | 3,7 (9,4 cm) | UK | 9,39 | nvt | 40,2 | 12,7 | 841,865,883 | 865,00 | Amatol, TNT, RDX/TNT | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | K38t | 10,5 cm | Du | 10,42 | nvt | 39,52 | 15,6 | 1,75 | 1,75 | FP2 | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK C/32 | 10,5 cm | Du | 10,5 | nvt | 45,9 | 15,1 | 1,395 | 1,395 | FP2 | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | L40 | 12 cm | OH | 12 cm | 49 | 49 | 23,65 | 2,635 | 20,14 | Trotyl | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK L/45 | 12 cm | Du | 12 | nvt | 51,2 | 45,3 | 3,9 | 3,90 | FP1 | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK C/32 | 15 cm | Du | 15 | nvt | 58,6 | 43,5 | 5,10 | 38,40 | TNT | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK L/40 | 15 cm | Du | 15 | nvt | 65,5 | 45,3 | 3,322 | 3,32 | FP1 | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK C/36d | 15 cm | Du | 14,91 | nvt | 65,5 | 45,3 | 3,322 | 3,32 | FP1 | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | L/30 | 15 cm | NL | 14,97 | nvt | 35,9 | 40 | 1900 | 1.900,00 | Gunpowder | Gietijzer | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | SK L/40 | 17 cm | Du | 17 | nvt | 80,8 | 62,8 | 23,4 | 23,40 | TNT | Staal | | 0-10 | Verschoten |
| Geschutmunite | Brisantgranaat | L/40 | 24 cm | NL | 24 | nvt | 98 | 151 | 16,33 | 16,33 | TNT | Staal | | 0-10 | Verschoten |
| KKM | Brisantgranaat | 15 mm MG 151 | 15 mm | Du | 0,15 | nvt | 0,71 | | 0,0025 | 0,002 | Pentriet | Staal | | 0-100 | Verschoten |
| KKM | Pantserkogel | 13 mm MG 131 | 13,2 mm | F | 0,132 | nvt | 0,62 | 38,5 | nvt | 0,001 | Lichtspoorsas | Tombac / staal | | 0-100 | Verschoten |
| Onderwatermunite | Torpedo | | 18 inch | UK | 45,7 | nvt | 495 | 789 | 202 / 303 | 202,00 | TNT / Torpex | Staal | | 0-3 | Gelanceerd |
| Onderwatermunite | Contactmijn type H Mk. II | Chemische hoom | | UK | 96,5 | nvt | | 318 | 140,6 / 145 | 145 | Amatol / TNT | Uzter | | 0-25 | Gelegd |
| Onderwatermunite | Contactmijn British Elia / Vickers Elia | Schakelhoren | | UK | 104 | nvt | 431 | 227 | | 227,00 | TNT | Uzter | | 0-25 | Gelegd |
| Onderwatermunite | Contactmijn | MK XVII | | UK | 102 | 122 | 122 | 461 / 547 | 145 / 204 | 145 / 227 | TNT / Amatol | Uzter | | 0-10 | Gelegd |
| Onderwatermunite | Contactmijn type | MK XIV | | UK | 102 | nvt | 149 | 461 / 561 | 227 | 145 / 227 | TNT / Amatol | Uzter | | 0-10 | Gelegd |
| Onderwatermunite | Inloodsmijn | A Mk. I-IV | | nvt | 44,6 | 287 | 287 | | 325 | 325,00 | TNT | Staal | | 0-10 | Gelegd |
| Onderwatermunite | Contactmijn | E-mine | | Du | 80 | 160 | 160 | 191 | 165 | 150,00 | Schietskatoen | Uzter | | 0-5 | Gelegd |
| Onderwatermunite | Contactmijn | EMC | | Du | 117 | 124 | 124 | | 338,5 | 239,00 | Hexaniet | Uzter | | 0-5 | Gelegd |

| | | | | | | | | | | | | | | |
|-------------------|-----------------|----------|-----|----|-----|-----|-----|------|-----|--------|----------|--------------------|------|--------|
| Onderwatermunitie | Invloeds mijnen | RMA (GH) | nvt | Du | 127 | nvt | 127 | 1225 | 757 | 544,00 | Hexaniet | Uzer | | Gelegd |
| Onderwatermunitie | Invloeds mijnen | LMB | nvt | Du | 66 | 300 | 264 | 984 | 786 | 696,00 | Hexaniet | Aluminum / Prestof | 0-25 | Gelegd |

Voor het bepalen van het TNT-equivalent zijn van de meeste gebruikte springstoffen tabellen beschikbaar, gepubliceerd in o.a. het Amerikaanse TM 9-1910, Estimating Equivalency Of Explosives Through a Thermochemical Approach by the Lawrence Livermore National Laboratory en An approach to determining the TNT equivalent of High Explosives by the military Academy Belgrado. Uit deze onderzoeken komt naar voren dat de uitkomst afhankelijk is van verschillende parameters zoals: de dichtheid van de springstof, is deze gegoten of gesperst, de zuiverheid van de springstof of de mengsels, de veroudering, de mate van opsplitsing, de snelheid van infleiden, etc. Daarnaast is niet van alle munitie bekend in welke mengselverhouding deze is toegepast Hierdoor ontstaan soms grote verschillen in uitkomsten die, zoals in onderstaande tabel gemiddelde afwijkingen laten zien tot wel 25%. Er is dus geen duidelijke lijst met een overzicht van equivalanten beschikbaar. In de door REAS Euro gebruikte lijst zijn de meest voor de hand liggende getallen gehanteerd met soms een gemiddelde of juist een "worst case" getal, voor zover deze te achterhalen zijn. Deze tabel is weergegeven in de onderstaande figuur

Table 3. Results of TNTe calculations for various explosives

| Explosive | Density ρ (g/cm³) | Number of moles, n | Best of max. Q (kJ/kg) | P (kbar) | D (m/s) | TNT _e (n) | TNT _e (Q) | TNT _e (p) | TNT _e (D) | TNT _e mean | Average deviation (%) |
|------------|-------------------------|--------------------------|------------------------------|-------------|------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|-----------------------------|
| TNT | 1.64 | 25.9 | 5566 | 190 | 6950 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Hexogen | 1.8 | 33.8 | 6334 | 347 | 8754 | 1.31 | 1.14 | 1.83 | 1.26 | 1.38 | 15.94 |
| Hexotol | | | | | | | | | | | |
| 90/10 | 1.61 | 33.1 | 6232 | 256 | 7910 | 1.28 | 1.12 | 1.35 | 1.14 | 1.22 | 7.58 |
| 80/20 | 1.6 | 32.3 | 6150 | 242 | 7745 | 1.25 | 1.10 | 1.27 | 1.11 | 1.18 | 6.57 |
| 70/30 | 1.7 | 31.6 | 6070 | 227 | 7580 | 1.22 | 1.09 | 1.19 | 1.09 | 1.15 | 5.00 |
| 60/40 | 1.59 | 30.8 | 6003 | 219 | 7415 | 1.19 | 1.08 | 1.15 | 1.07 | 1.12 | 4.24 |
| Oxogen | 1.9 | 33.8 | 6538 | 393 | 9100 | 1.31 | 1.17 | 2.07 | 1.31 | 1.46 | 20.55 |
| Ort | | | | | | | | | | | |
| 90/10 | 1.75 | 33 | 6438 | 303 | 8320 | 1.27 | 1.16 | 1.59 | 1.20 | 1.31 | 11.07 |
| 80/20 | 1.71 | 32.2 | 6342 | 278 | 8050 | 1.24 | 1.14 | 1.48 | 1.16 | 1.25 | 8.40 |
| 70/30 | 1.7 | 31.3 | 6242 | 267 | 7900 | 1.21 | 1.12 | 1.41 | 1.14 | 1.22 | 7.79 |
| 60/40 | 1.7 | 30.8 | 6156 | 253 | 7680 | 1.18 | 1.11 | 1.33 | 1.11 | 1.18 | 6.14 |
| Perogene | 1.77 | 32 | 6400 | 393 | 8300 | 1.24 | 1.15 | 1.59 | 1.19 | 1.34 | 18.34 |
| Tetryl | 1.68 | 27.5 | 5920 | 245 | 7560 | 1.06 | 1.06 | 1.29 | 1.09 | 1.13 | 7.52 |
| PBX-9011 | 1.77 | 33.2 | 6168 | 299 | 8700 | 1.28 | 1.11 | 1.57 | 1.25 | 1.30 | 10.19 |
| HMX/PU | | | | | | | | | | | |
| 80/20 | 1.43 | 34.1 | 5856 | 193 | 7334 | 1.32 | 1.05 | 1.02 | 1.06 | 1.11 | 9.23 |
| 70/30 | 1.4 | 33.8 | 5566 | 182 | 7200 | 1.31 | 1.00 | 0.96 | 1.04 | 1.07 | 10.31 |
| DXP/PU | | | | | | | | | | | |
| 80/20 | 1.57 | 33.8 | 5735 | 234 | 7778 | 1.31 | 1.03 | 1.23 | 1.12 | 1.17 | 8.33 |
| 70/30 | 1.38 | 33.7 | 5436 | 167 | 6901 | 1.30 | 0.98 | 0.88 | 1.06 | 1.04 | 12.50 |
| NAT | 1.38 | 33.6 | 6412 | 125 | 6533 | 1.30 | 1.00 | 0.99 | 1.05 | 1.06 | 25.76 |
| NGL | 1.59 | 32 | 6606 | 246 | 780 | 1.24 | 1.19 | 1.29 | 1.09 | 1.20 | 5.21 |
| DATB | 1.79 | 28.9 | 5498 | 259 | 7520 | 1.12 | 0.99 | 1.36 | 1.08 | 1.14 | 9.87 |
| PETN/PU | | | | | | | | | | | |
| 90/20 | 1.62 | 33.8 | 6454 | 263 | 7650 | 1.21 | 1.15 | 1.38 | 1.17 | 1.24 | 6.00 |
| 80/20 | 1.50 | 32.4 | 6014 | 215 | 7465 | 1.25 | 1.08 | 1.13 | 1.07 | 1.14 | 5.48 |
| 70/30 | 1.39 | 32.7 | 6882 | 165 | 6957 | 1.26 | 1.02 | 0.87 | 1.09 | 1.04 | 10.82 |
| PEP (8/15) | 1.50 | 32.40 | 6186 | 215 | 7600 | 1.25 | 1.11 | 1.13 | 1.09 | 1.15 | 4.78 |
| SEMTEX | 1.40 | 33.80 | 6372 | 198 | 7220 | 1.31 | 1.14 | 1.04 | 1.04 | 1.13 | 8.19 |
| COMP-A-3 | 1.38 | 33.8 | 6780 | 84 | 7070 | 1.27 | 1.27 | 1.27 | 1.27 | 1.27 | 7.63 |
| C-4 | 1.66 | 33.8 | 6650 | 257 | 8370 | 1.31 | 1.19 | 1.35 | 1.20 | 1.26 | 1.24 |
| COMP. B | 1.72 | 30.6 | 6009 | 281 | 8052 | 1.18 | 1.08 | 1.48 | 1.16 | 1.22 | 10.41 |
| LX-17 | 1.91 | 29.1 | 4407 | 316 | 7630 | 1.12 | 0.79 | 1.66 | 1.10 | 1.17 | 21.14 |
| LX-14 | 1.83 | 33.6 | 6452 | 363 | 8958 | 1.30 | 1.16 | 1.91 | 1.29 | 1.41 | 17.57 |
| LX-04 | 1.80 | 33.7 | 5940 | 350 | 8460 | 1.30 | 1.07 | 1.74 | 1.22 | 1.33 | 17.27 |

BIJLAGE IX-A

UITGANGSPUNTEN GELUIDONDERZOEK

TRANSFORMATORSTATION

BIJLAGE IX-A: UITGANGSPUNTEN EFFECTBESCHRIJVING GELUID TRANSFORMATORSTATION

De capaciteit van het transformatorstation bedraagt circa 2.100 MW. In de representatieve bedrijfssituatie is het transformatorstation 24 uur per dag in bedrijf.

De geluidemissie van het transformatorstation wordt bepaald door de transformatoren, de reactoren en de harmonische filters. Door TenneT worden de Beste beschikbare Technieken (BBT) toegepast om de geluidemissie zoveel mogelijk te beperken. Er wordt uitgegaan van de inzet van geluidarme installaties. Langs de meeste componenten van het transformatorstation worden aan twee of drie zijden scherfwanden geplaatst. De volgende scherfwanden zijn voorzien:

- vermogenstransformatoren: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- transformatorkoelers: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- 220 kV reactoren: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- 380 kV reactoren: 9 meter hoge scherfwanden aan de west-, noord- en oostzijde;
- 33 kV reactoren en condensatorbanken: 6,5 meter hoge scherfwanden aan de noord- west- en zuidzijde.

Aanvullend worden de vermogenstransformatoren inpandig gemaakt door de open noordzijde en het open dak met geluidisolerende panelen tussen de 9 meter hoge scherfwanden dicht te zetten. Hiermee worden de transformatoren volledig omsloten met vier geluidisolerende wanden en een dak. De wanden en het dak worden aan de binnenzijde bekleed met een geluidabsorberend materiaal met een hoge absorptiewaarde voor de 125 Hz tertsband. Met deze maatregelen wordt het geluid van de transformatoren met circa 8 dB(A) extra gereduceerd.

Ook wordt de afscherming van de 220kV reactoren verbeterd door de open noordzijde tussen de 9 meter hoge scherfwanden dicht te zetten met een 5 meter hoge geluidisolerende wand. De wanden worden aan de binnenzijde bekleed met een geluidabsorberend materiaal met een hoge absorptiewaarde voor de 125 Hz tertsband. De bovenkant blijft open voor de noodzakelijke luchtkoeling. Met deze maatregel wordt vooral het geluid in de noordelijke, noordwestelijke en noordoostelijke richting gereduceerd.

Het aantal verkeersbewegingen in de operationele fase is zeer gering, waardoor de geluidbelasting vanwege verkeersbewegingen binnen de inrichting verwaarloosbaar is.

Naast het continue geluid van het transformatorstation zijn er piekgeluiden van schakelhandelingen voor de 220 kV en 380 kV velden. Het maximale geluidniveau L_{Amax} vanwege de vermogensschakelaars bedraagt ter plaatse van woningen ten hoogste 51 dB(A). Hiermee wordt ruimschoots voldaan aan de grenswaarde van de 'Handreiking industrielawaai en vergunningverlening van 1998. Met de vermogensschakelaars voor de in de open lucht geplaatste

schakelvelden wordt slechts sporadisch geschakeld.¹ Deze schakelingen duren slechts enkele honderden milliseconden en vinden in principe alleen overdag plaats. Alleen in geval van calamiteiten zal in de avond- en nachtperiode worden geschakeld. Dit gebeurt dus slechts incidenteel.² De overige piekgeluiden binnen de inrichting vanwege het in- en uitschakelen van transformatoren, reactoren en filters zijn ondergeschikt aan de piekgeluiden van de vermogensschakelaars. In de avond- en nachtperiode is gewoonlijk sprake van een continue geluidemissie en zal het maximale geluidniveau vanwege de inrichting niet meer dan 10 dB(A) hoger zijn dan het gemiddelde geluidniveau.

De representatieve bedrijfssituatie is samengevat in onderstaande tabel. In deze tabel zijn ook de gehanteerde bronvermogens en bronhoogtes van de relevante geluidbronnen vermeld.

Representatieve bedrijfssituatie transformatorstation net op zee Hollandse Kust (west Beta) inclusief reeds vergunde situatie Hollandse Kust (noord) en Hollandse Kust (west Alpha)

| Geluidbron | | Bronvermogen L_{WA} [dB(A)]* | Effectieve bedrijfstijd in uren | | |
|---------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------|---------------------------------|-------------------|------------------|
| Nr. | Omschrijving | | Dag (7-19u) | Avond (19-23u) | Nacht (23-7u) |
| Relevante geluidbronnen gemiddelde geluidemissie | | | | | |
| 3B-1 t/m 3B-6 | Harmonische filters (veld 3) | 98 | 12 | 4 | 8 |
| 4B-1 t/m 4B-6 | Harmonische filters (veld 4) | 98 | 12 | 4 | 8 |
| 1D-1 t/m 1D-6 | 380/220/33 kV vermogenstransformatoren (veld 1) met geluidsarm ontwerp en omkasting | 88 | 12 | 4 | 8 |
| 2D-1 t/m 2D-6 | 380/220/33 kV vermogenstransformatoren (veld 2) met geluidsarm ontwerp en omkasting | 88 | 12 | 4 | 8 |
| 3D-1 t/m 3D-6 | 380/220/33 kV vermogenstransformatoren (veld 3) met geluidsarm ontwerp en omkasting | 88 | 12 | 4 | 8 |
| 4D-1 t/m 4D-6 | 380/220/33 kV vermogenstransformatoren (veld 4) met geluidsarm ontwerp en omkasting | 88 | 12 | 4 | 8 |
| 5D-1 t/m 5D-6 | 380/220/33 kV vermogenstransformatoren (veld 5) met geluidsarm ontwerp en omkasting | 88 | 12 | 4 | 8 |
| 6D-1 t/m 6D-6 | 380/220/33 kV vermogenstransformatoren (veld 6) met | 88 | 12 | 4 | 8 |

¹ Met sporadisch wordt bedoeld dat het af en toe voorkomt, maar wel dermate frequent dat het als onderdeel wordt gezien van de representatieve bedrijfssituatie.

² Met incidenteel wordt bedoeld dat dit hoge uitzonderingen zijn, naar verwachting minder dan 12 keer per jaar. Hiermee wordt het niet als onderdeel van de representatieve bedrijfssituatie beschouwd en niet getoetst aan de reguliere geluidnormen.

| Geluidbron | | Bronvermogen | Effectieve bedrijfstijd in uren | | |
|---------------------------------------|---------------------------------|--------------------------|---------------------------------|-------------------|------------------|
| Nr. | Omschrijving | L _{WA} [dB(A)]* | Dag (7-19u) | Avond (19-23u) | Nacht (23-7u) |
| | geluidsarm ontwerp en omkasting | | | | |
| 1F-1 t/m 1F-6 | 220 kV reactor (veld 1) | 98 | 12 | 4 | 8 |
| 2F-1 t/m 2F-6 | 220 kV reactor (veld 2) | 98 | 12 | 4 | 8 |
| 3F-1 t/m 3F-6 | 220 kV reactor (veld 3) | 98 | 12 | 4 | 8 |
| 4F-1 t/m 4F-6 | 220 kV reactor (veld 4) | 98 | 12 | 4 | 8 |
| 5F-1 t/m 5F-6 | 220 kV reactor (veld 5) | 98 | 12 | 4 | 8 |
| 6F-1 t/m 6F-6 | 220 kV reactor (veld 6) | 98 | 12 | 4 | 8 |
| 1I-1 t/m 1I-6 | 33 kV reactor (veld 1) | 96 | 12 | 4 | 8 |
| 2I-1 t/m 2I-6 | 33 kV reactor (veld 2) | 96 | 12 | 4 | 8 |
| 3I-1 t/m 3I-6 | 33 kV reactor (veld 3) | 96 | 12 | 4 | 8 |
| 4I-1 t/m 4I-6 | 33 kV reactor (veld 4) | 96 | 12 | 4 | 8 |
| 5I-1 t/m 5I-6 | 33 kV reactor (veld 5) | 96 | 12 | 4 | 8 |
| 6I-1 t/m 6I-6 | 33 kV reactor (veld 6) | 96 | 12 | 4 | 8 |
| 7AA-1 t/m 7AA-6 | 380 kV reactor | 98 | 12 | 4 | 8 |
| 8AA-7 t/m 8AA-12 | 380 kV reactor | 98 | 12 | 4 | 8 |
| Relevante bronnen piekgeluiden | | | | | |
| 1K-M1 t/m 1K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 2K-M1 t/m 2K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 3K-M1 t/m 3K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 4K-M1 t/m 4K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 5K-M1 t/m 5K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 6K-M1 t/m 6K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 7CC-M1 t/m 7CC-M16 | 380 kV AIS vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |

| Geluidbron | | Bronvermogen | Effectieve bedrijfstijd in uren | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------|---------------------------------|-------------------|------------------|
| Nr. | Omschrijving | L _{WA} [dB(A)]* | Dag (7-19u) | Avond (19-23u) | Nacht (23-7u) |
| <i>* De bronvermogens voor de geluidbronnen betreffende de gemiddelde geluidemissie zijn evenredig verdeeld over de zes deelbronnen per installatie.</i> | | | | | |

BIJLAGE IX-B

RAPPORT GELUIDBEREKENING

TRANSFORMATORSTATION

AKOESTISCH ONDERZOEK UITBREIDING TRANSFORMATORSTATION TENNET TE WIJK AAN ZEE

TenneT TSO B.V.

18 OKTOBER 2019

CONCEPT

Contactpersoon

ERIK KOPPEN
Senior adviseur geluid en
windenergie

T +31 (0)88 4261 551
M +31 (0)6 2706 2060
E erik.koppen@arcadis.com

Arcadis Nederland B.V.
Postbus 264
6800 AG Arnhem
Nederland

INHOUDSOPGAVE

| | |
|-----------------------------------------------------------------------------|-----------|
| 1 INLEIDING | 5 |
| 2 SITUATIE | 6 |
| 2.1 Ligging | 6 |
| 2.2 Representatieve bedrijfssituatie | 6 |
| 2.3 Geluidbronnen en geluidbeperkende voorzieningen | 9 |
| 3 TOETSINGSKADER | 10 |
| 3.1 Wet geluidhinder en Handreiking industrielawaai en vergunningverlening | 10 |
| 3.2 Vigerende omgevingsvergunning | 11 |
| 3.3 Geluideisen Activiteitenbesluit | 11 |
| 4 BEREKENINGSMETHODE | 13 |
| 5 BEREKENINGSRESULTATEN | 14 |
| 5.1 Langtijdgemiddelde beoordelingsniveau ($L_{Ar,LT}$) | 14 |
| 5.2 Maximale geluidniveaus (L_{Amax}) | 16 |
| 6 INDIRECTE HINDER | 17 |
| 7 CONCLUSIE | 18 |
| BIJLAGEN | |
| BIJLAGE 1 POSITIES VAN DE BEOORDELINGSPUNTEN | 19 |
| BIJLAGE 2 INVOERGEDEGENS VAN HET REKENMODEL | 20 |
| BIJLAGE 3 BEREKENINGSRESULTATEN REPRESENTATIEVE BEDRIJFSSITUATIE | 21 |
| COLOFON | 22 |

CONCEPT

1 INLEIDING

Op 7 mei 2019 is aan TenneT TSO B.V. (hierna: TenneT) een omgevingsvergunning verleend voor een 220/380 kV transformatorstation aan de Tussenwijkweg 2 te Wijk aan Zee. Dit transformatorstation zet de opgewekte stroom uit de windenergiegebieden Hollandse Kust (noord) en Hollandse Kust (west Alpha) om van een spanning van 220 kV naar een spanning van 380 kV.

Door TenneT is op 12 september 2019 een verandering van de omgevingsvergunning aangevraagd in verband met aanpassingen in het ontwerp en het treffen van extra maatregelen om het geluidniveau vanwege het transformatorstation verder te beperken. Een van deze maatregelen is het volledig omkasten van de transformatoren. Hierdoor vervalt de vergunningsplicht voor het transformatorstation. Er is dan immers geen sprake meer van "*transformatorstations, met niet in een gesloten gebouw ondergebrachte transformatoren, met een maximaal gelijktijdig in te schakelen elektrisch vermogen van 200 MVA of meer*". Na deze wijziging komt het transformatorstation onder het 'Besluit algemene regels voor inrichtingen milieubeheer' - het Activiteitenbesluit - te vallen.

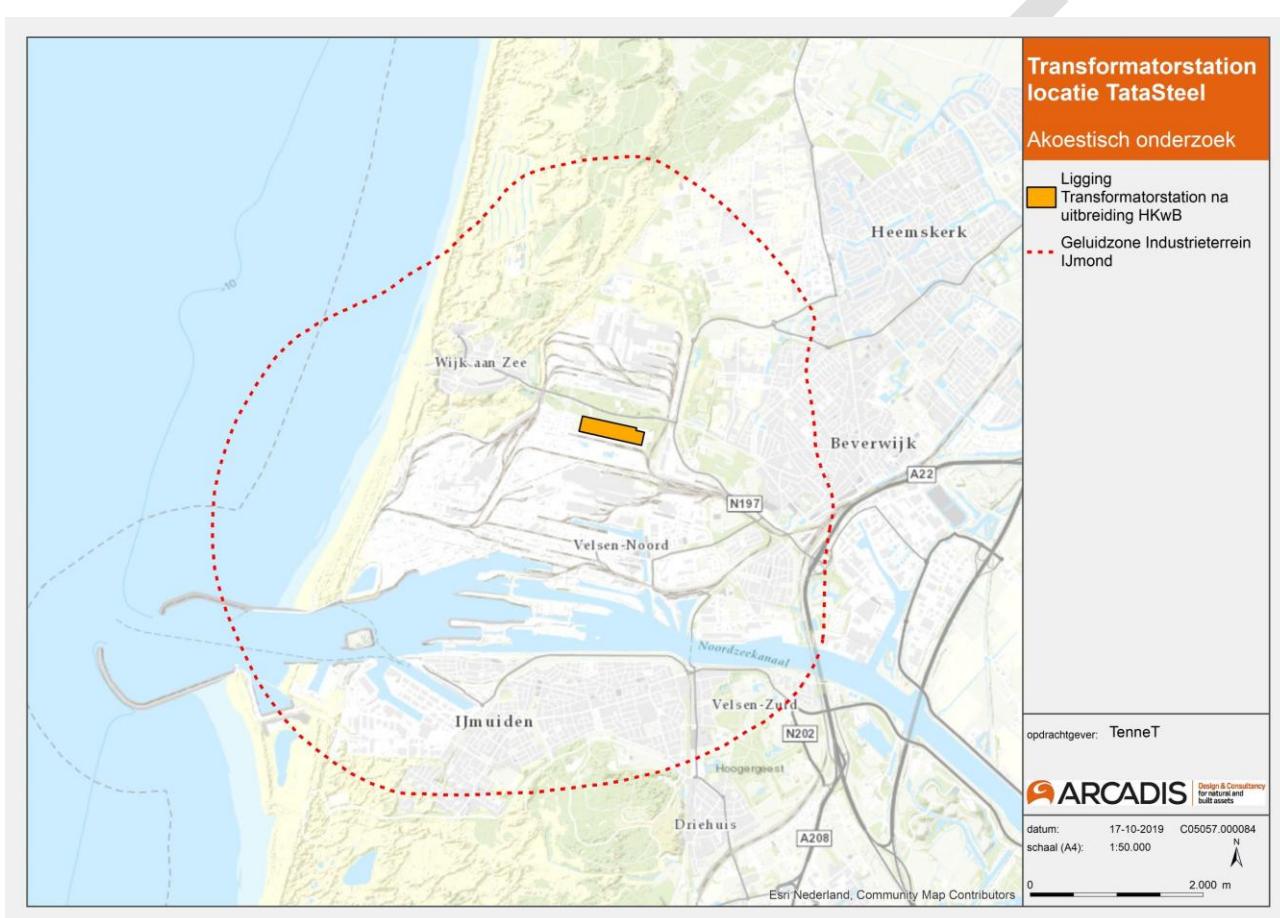
TenneT is voornemens om het transformatorstation uit te breiden voor de aansluiting van een derde windenergiegebied, het windpark Hollandse Kust (west Beta). Voor deze uitbreiding wordt een melding in het kader van het Activiteitenbesluit ingediend. Als onderdeel van deze aanvraag is een nieuw akoestisch onderzoek verricht. Het voorliggende rapport geeft een beschrijving van de representatieve bedrijfssituatie, de gehanteerde uitgangspunten, de berekeningsmethode, het toetsingskader en de onderzoeksresultaten.

2 SITUATIE

2.1 Ligging

Het transformatorstation van TenneT aan de Tussenwijkweg 2 te Wijk aan Zee is gelegen midden op het op grond van de Wet geluidhinder gezonneerde industrieterrein IJmond, ten zuiden van de Zeestraat. De ligging van het transformatorstation is weergegeven in Afbeelding 1.

In de geluidzone van het industrieterrein bevindt zich een groot aantal woningen. De afstand van het transformatorstation tot de dichtstbijzijnde woning, gelegen aan de Zeestraat 214A, bedraagt circa 500 meter.



Afbeelding 1: Ligging van het transformatorstation van TenneT te Wijk aan Zee

2.2 Representatieve bedrijfssituatie

De capaciteit van het transformatorstation zoals thans vergund bedraagt circa 1.400 MW. Na de uitbreiding voor de aansluiting van een derde windpark wordt de capaciteit circa 2.100 MW. In de representatieve bedrijfssituatie is het transformatorstation 24 uur per dag in bedrijf. De geluidemissie van het transformatorstation wordt bepaald door de vermogenstransformatoren, de harmonische filters en de reactoren. Het aantal verkeersbewegingen in de operationele fase is zeer gering, waardoor de geluidbelasting vanwege verkeersbewegingen binnen de inrichting verwaarloosbaar is.

Naast het continue geluid van het transformatorstation zijn er piekgeluiden van schakelhandelingen voor de 220 kV en 380 kV velden. Met de vermogensschakelaars voor de in de open lucht geplaatste schakelvelden

wordt slechts sporadisch geschakeld.¹ Deze schakelingen duren slechts enkele honderden milliseconden en vinden in principe alleen overdag plaats tijdens onderhoudswerkzaamheden of in geval van calamiteiten. Er wordt circa éénmaal per maand geschakeld, maar omdat het niet is uitgesloten dat het enkele keren meer gebeurt wordt het als onderdeel van de representatieve bedrijfssituatie beschouwd. In de avond- en nachtperiode zal alleen in geval van calamiteiten worden geschakeld. Dit gebeurt dus slechts incidenteel.² De overige piekgeluiden binnen de inrichting vanwege het in- en uitschakelen van transformatoren, reactoren en filters zijn ondergeschikt aan de piekgeluiden van de vermogensschakelaars.

De representatieve bedrijfssituatie is samengevat in Tabel 1. In deze tabel zijn ook de gehanteerde bronvermogens van de relevante geluidbronnen vermeld. De geluidbronnen betreffende de componenten voor de aansluiting van het windpark Hollandse Kust (west Beta) zijn in de tabel vetgedrukt weergegeven. De posities van de geluidbronnen zijn weergegeven in bijlage 2.

Tabel 1: Representatieve bedrijfssituatie transformatorstation TenneT te Wijk aan Zee na uitbreiding

| Geluidbron | | Bronvermogen | Effectieve bedrijfstijd in uren | | |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------|---------------------------------|-------------------|------------------|
| Nr. | Omschrijving | L_{WA} [dB(A)]* | Dag (7-19u) | Avond (19-23u) | Nacht (23-7u) |
| Relevante geluidbronnen gemiddelde geluidemissie | | | | | |
| 3B-1 t/m 3B-6 | Harmonische filters 33 kV (veld 3) | 98 | 12 | 4 | 8 |
| 4B-1 t/m 4B-6 | Harmonische filters 33 kV (veld 4) | 98 | 12 | 4 | 8 |
| 1D-1 t/m 1D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 1) | 88 | 12 | 4 | 8 |
| 2D-1 t/m 2D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 2) | 88 | 12 | 4 | 8 |
| 3D-1 t/m 3D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 3) | 88 | 12 | 4 | 8 |
| 4D-1 t/m 4D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 4) | 88 | 12 | 4 | 8 |
| 5D-1 t/m 5D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 5) | 88 | 12 | 4 | 8 |
| 6D-1 t/m 6D-6 | 380/220/33 kV vermogens-transformatoren met geluidsarm ontwerp en omkasting (veld 6) | 88 | 12 | 4 | 8 |
| 1F-1 t/m 1F-6 | 220 kV reactor (veld 1) | 98 | 12 | 4 | 8 |
| 2F-1 t/m 2F-6 | 220 kV reactor (veld 2) | 98 | 12 | 4 | 8 |

¹ Met sporadisch wordt bedoeld dat het af en toe voorkomt, maar wel dermate frequent dat het als onderdeel wordt gezien van de representatieve bedrijfssituatie.

² Met incidenteel wordt bedoeld dat dit hoge uitzonderingen zijn, minder dan 12 keer per jaar. Hiermee wordt het niet als onderdeel van de representatieve bedrijfssituatie beschouwd en niet getoetst aan de reguliere geluidnormen.

| Geluidbron | | Bronvermogen | Effectieve bedrijfstijd in uren | | |
|---------------------------------------|--------------------------------|--------------------------|---------------------------------|---------------------|---------------------|
| Nr. | Omschrijving | L _{WA} [dB(A)]* | Dag (7-19u) | Avond (19-23u) | Nacht (23-7u) |
| 3F-1 t/m 3F-6 | 220 kV reactor (veld 3) | 98 | 12 | 4 | 8 |
| 4F-1 t/m 4F-6 | 220 kV reactor (veld 4) | 98 | 12 | 4 | 8 |
| 5F-1 t/m 5F-6 | 220 kV reactor (veld 5) | 98 | 12 | 4 | 8 |
| 6F-1 t/m 6F-6 | 220 kV reactor (veld 6) | 98 | 12 | 4 | 8 |
| 1I-1 t/m 1I-6 | 33 kV reactor (veld 1) | 96 | 12 | 4 | 8 |
| 2I-1 t/m 2I-6 | 33 kV reactor (veld 2) | 96 | 12 | 4 | 8 |
| 3I-1-1 t/m 3I-6 | 33 kV reactor (veld 3) | 96 | 12 | 4 | 8 |
| 4I-1-1 t/m 4I-6 | 33 kV reactor (veld 4) | 96 | 12 | 4 | 8 |
| 5I-1 t/m 5I-6 | 33 kV reactor (veld 3) | 96 | 12 | 4 | 8 |
| 6I-1 t/m 6I-6 | 33 kV reactor (veld 4) | 96 | 12 | 4 | 8 |
| 7AA-1 t/m 7AA-6 | 380 kV reactor | 98 | 12 | 4 | 8 |
| 8AA-7 t/m 8AA-12 | 380 kV reactor | 98 | 12 | 4 | 8 |
| Relevante bronnen piekgeluiden | | | | | |
| 1K-M1 t/m 1K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 2K-M1 t/m 2K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 3K-M1 t/m 3K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 4K-M1 t/m 4K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 5K-M1 t/m 3K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 6K-M1 t/m 4K-M4 | Vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |
| 7CC-M1 t/m 7CC-M16 | 380 kV AIS vermogensschakelaar | 127 | spora-disch | inci-denteel | inci-denteel |

* De bronvermogens voor de geluidbronnen betreffende de gemiddelde geluidemissie zijn evenredig verdeeld over de zes deelbronnen per installatie.

2.3 Geluidbronnen en geluidbeperkende voorzieningen

De relevante geluidbronnen zijn beschreven in hoofdstuk 2. De gehanteerde bronvermogens zijn vermeld in Tabel 1. De geluidspecificaties van deze geluidbronnen zijn gebaseerd op gegevens van TenneT. Hierbij is het uitgangspunt dat de Beste beschikbare Technieken (BBT) worden toegepast om de geluidemissie zoveel mogelijk te beperken. Er wordt derhalve uitgegaan van de inzet van geluidarme installaties. Daarnaast worden langs de meeste componenten van het transformatorstation aan drie zijden scherfwanden geplaatst. Deze hebben een geluidafschermende werking. De volgende scherfwanden zijn voorzien:

- vermogenstransformatoren: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- transformatorkoelers: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- 220 kV reactoren: 9 meter hoge scherfwanden aan de west-, zuid- en oostzijde;
- 380 kV reactoren: 9 meter hoge scherfwanden aan de west-, noord- en oostzijde;
- 33 kV reactoren en condensatorbanken: 6,5 meter hoge scherfwanden aan de noord- west- en zuidzijde.

Aanvullend worden de vermogenstransformatoren inpandig gemaakt door de open noordzijde en het open dak met geluidsisolerende panelen tussen de 9 meter hoge scherfwanden dicht te zetten. Hiermee worden de transformatoren volledig omsloten met vier geluidsisolerende wanden en een dak. De wanden en het dak worden aan de binnenzijde bekleed met een geluidabsorberend materiaal met een hoge absorptiewaarde voor de 125 Hz octaafband. Met deze maatregelen wordt het geluid van de transformatoren met circa 8 dB(A) extra gereduceerd.

De 220kV reactoren worden zo goed mogelijk afgeschermd door de open noordzijde tussen de 9 meter hoge scherfwanden dicht te zetten met een 5 meter hoge geluidsisolerende wand. De wanden worden aan de binnenzijde bekleed met een geluidabsorberend materiaal met een hoge absorptiewaarde voor de 125 Hz octaafband. De bovenkant blijft open voor de noodzakelijke luchtkoeling. De extra schermwand reduceert het geluid in de noordelijke, noordwestelijke en noordoostelijke richting.

De gegevens van de relevante geluidbronnen zoals het bronvermogen, het geluidsspectrum, de bronhoogte en de representatieve bedrijfstijden zijn vermeld in bijlage 2.

3 TOETSINGSKADER

3.1 Wet geluidhinder en Handreiking industrielawaai en vergunningverlening

Het industrieterrein IJmond is een op grond van de Wet geluidhinder gezoneerd industrieterrein. Dit betekent dat op het terrein zogenaamde grote lawaaimakers zijn toegestaan en dat rondom het industrieterrein een geluidzone is vastgesteld. Op de buitengrens van deze zone – de zonegrens - mag het langtijdgemiddelde beoordelingsniveau $L_{Ar,LT}$ vanwege alle inrichtingen op het gezoneerde industrieterrein gezamen niet hoger zijn dan:

- 50 dB(A) tussen 07.00 en 19.00 uur;
- 45 dB(A) tussen 19.00 en 23.00 uur;
- 40 dB(A) tussen 23.00 en 07.00 uur.

Dit wordt ook wel aangeduid als 50 dB(A) etmaalwaarde³.

In de geluidzone van het industrieterrein bevindt zich een groot aantal woningen. Bij de woningen in de zone mag de cumulatieve geluidbelasting vanwege alle inrichtingen op het gezoneerde industrieterrein gezamen niet hoger zijn dan de vastgestelde maximaal toelaatbare geluidbelasting (MTG) c.q. de vastgestelde hogere grenswaarde. Deze waarde verschilt per woning. Ter plaatse van de dichtst bij het transformatorstation gelegen woningen in Beverwijk en Wijk aan Zee bedraagt de maximaal toelaatbare geluidbelasting 55 tot 58 dB(A). De zonegrens van het industrieterrein IJmond is weergegeven in Afbeelding 1.

Bij de toetsing van het geluidniveau vanwege het transformatorstation moet rekening worden gehouden met de cumulatie van het geluid van andere inrichtingen op het gezoneerde terrein. Deze toetsing vindt plaats door de zonebeheerder, de Omgevingsdienst Noordzeekanaalgebied.

Voor de maximale geluidniveaus (L_{Amax}) wordt op grond van de ‘Handreiking industrielawaai en vergunningverlening’ van 1998 gestreefd naar niveaus die ter plaatse van woningen niet meer dan 10 dB(A) hoger zijn dan de langtijdgemiddelde beoordelingsniveaus. De grenswaarden voor het maximale geluidniveau zijn in principe:

- 70 dB(A) in de dagperiode;
- 65 dB(A) in de avondperiode;
- 60 dB(A) in de nachtperiode.

In uitzonderlijke gevallen kunnen voor de dag- en nachtperiode nog tot 5 dB(A) hogere niveaus worden toegestaan, maar dit is voor het transformatorstation niet aan de orde.

³ De etmaalwaarde is gedefinieerd als de hoogste waarde van:

- het langtijdgemiddelde beoordelingsniveau $L_{Ar,LT}$ in de dagperiode;
- het langtijdgemiddelde beoordelingsniveau $L_{Ar,LT}$ in de avondperiode plus 5 dB(A);
- het langtijdgemiddelde beoordelingsniveau $L_{Ar,LT}$ in de nachtperiode plus 10 dB(A).

3.2 Vigerende omgevingsvergunning

De vigerende omgevingsvergunning voor het transformatorstation dateert van 7 mei 2019.

De geluideisen in de vigerende milieuvvergunning luiden kort samengevat dat het langtijdgemiddeld beoordelingsniveau ($L_{Ar,LT}$) vanwege de inrichting niet hoger mag zijn dan de in tabel 2 weergegeven waarden. Het maximale geluidniveau vanwege piekgeluiden (L_{Amax}) mag deze waarden met niet meer dan 25 dB(A) overschrijden.

Tabel 2: Vigerende geluideisen langtijdgemiddelde beoordelingsniveau transformatorstation TenneT te Wijk aan Zee

| Beoorde- lingspunt | Omschrijving | Langtijdgemiddeld beoordelingsniveau $L_{Ar,LT}$ [dB(A)] | | |
|-----------------------|--------------|-------------------------------------------------------------|---------------------------|--------------------------|
| | | Dagperiode 7-19 uur | Avondperiode 19-23 uur | Nachtperiode 23-7 uur |

Beoordelingspunten bij woningen in de geluidzone

| | | | | |
|------------|----------------------------------------|-----|-----|-----|
| W1 | Zeestraat 214A, Beverwijk | 32* | 32* | 32* |
| W2 | Zeestraat 212, Beverwijk | 30* | 30* | 30* |
| W3 | Zeestraat 208, Beverwijk | 29* | 29* | 29* |
| 111 | Burg. Rohestraat 1 t/m 7, Wijk aan Zee | 22* | 22* | 22* |
| 112 | Duinrand, Wijk aan Zee | 28* | 28* | 28* |

Controlepunten nabij de inrichting

| | | | | |
|---------------|----------------------------|-------------|-------------|-------------|
| T-RP01 | Referentiepunt west TenneT | 50 (55)* | 50 (55)* | 50 (55)* |
| T-RP02 | Referentiepunt oost TenneT | 36 (41)* | 36 (41)* | 36 (41)* |

* Indien op de beoordelingspunten en controlepunten sprake is van tonaal geluid, welke afkomstig is van het transformatorstation, betreft dit het geluidniveau inclusief 5 dB(A) tonaaltoeslag.

3.3 Geluideisen Activiteitenbesluit

Door het volledig omkasten van de transformatoren vervalt de vergunningsplicht voor het transformatorstation. Er is dan immers geen sprake meer van "transformatorstations, met niet in een gesloten gebouw ondergebrachte transformatoren, met een maximaal gelijktijdig in te schakelen elektrisch vermogen van 200 MVA of meer". Na deze wijziging komt het transformatorstation onder het 'Besluit algemene regels voor inrichtingen milieubeheer' - het Activiteitenbesluit - te vallen.

Op grond van artikel 2.17 van dit besluit gelden in principe de onderstaande geluideisen.

Op de gevel van woningen en andere geluidgevoelige gebouwen mag het langtijdgemiddeld beoordelingsniveau $L_{Ar,LT}$ niet hoger zijn dan:

- 50 dB(A) tussen 07.00 en 19.00 uur (dagperiode);
- 45 dB(A) tussen 19.00 en 23.00 uur (avondperiode);
- 40 dB(A) tussen 23.00 en 07.00 uur (nachtperiode).

Voor inrichtingen op een gezoneerd industrieterrein zoals voor in het onderhavige geval is gelden voornoemde waarden ook op een afstand van 50 meter vanaf de grens van de inrichting.

Op de gevel van woningen en andere geluidgevoelige gebouwen mag het maximale geluidniveau L_{Amax} niet hoger zijn dan:

- 70 dB(A) tussen 07.00 en 19.00 uur (dagperiode);
- 65 dB(A) tussen 19.00 en 23.00 uur (avondperiode);
- 60 dB(A) tussen 23.00 en 07.00 uur (nachtperiode).

In de dagperiode zijn voornoemde eisen voor het maximale geluidniveau niet van toepassing op laad- en losactiviteiten.

Voor woningen en andere gevoelige gebouwen op een bedrijventerrein zijn voor zowel het langtijdgemiddeld beoordelingsniveau als het maximale geluidniveau 5 dB(A) hogere niveaus toegestaan, maar dit is voor het transformatorstation niet aan de orde.

Op grond van artikel 2.20 van het Activiteitenbesluit kan het bevoegd gezag bij maatwerkvoorschrift andere waarden voor het langtijdgemiddeld beoordelingsniveau $L_{Ar,LT}$ en het maximaal geluidniveau L_{Amax} vaststellen.

4 BEREKENINGSMETHODE

De overdrachtsberekeningen zijn verricht conform de "Handleiding meten en rekenen Industrielawaai" van 1999 met het softwarepakket Geomilieu versie V4.50, methode Industrielawaai II.8.

Het transformatorstation is geïntegreerd in het zonebeheermodel van het industrieterrein IJmond zoals aangeleverd door de zonebeheerder, de Omgevingsdienst Noordzeekanaalgebied (ODNZKG), op 23 mei 2018. De gebouwen en objecten van het nieuwe transformatorstation zijn in dit rekenmodel ingevoerd als geluidafschermende en -reflecterende objecten. De objecten in de omgeving van het transformatorstation zijn conform het aangeleverde zonebeheermodel. In het zonebeheermodel is voor het gebied waar het transformatorstation wordt gevestigd een bodemgebied met de bodemfactor 1 (= 100% absorberend) gehanteerd. Aanvullend zijn voor het transformatorstation de volgende bodemgebieden ingevoerd:

- Voor de gehele inrichting van het transformatorstation is een bodemgebied met een bodemfactor 0,5 ingevoerd. In de berekeningen middelt dit uit met het onderliggende bodemgebied met bodemfactor 1, waardoor door effectief met een bodemfactor 0,75 (= 25% reflecterend) is gerekend. Hierbij is er van uitgegaan dat de gebieden tussen de verharde terreinen met los grind of gras worden ingevuld.
- Voor de verharde of grotendeels verharde terreinen binnen de inrichting (paden, terreinen onder en rondom de Centraal Diensten Gebouwen en alle componenten m.u.v. de vermogensschakelaars) is telkens vier keer een bodemgebied met een bodemfactor 0 ingevoerd. Tezamen met de andere onderliggende bodemgebieden, middelt dit uit tot een bodemfactor van 0,25 (= gemiddelde van 0, 0, 0, 0, 0,5 en 1). Effectief is dus met een 75% reflecterend bodemgebied gerekend.

De bodemgebieden buiten de inrichting zijn conform het aangeleverde zonebeheermodel. Voor het gebied buiten de ingevoerde bodemgebieden is conform het zonebeheermodel in de berekeningen een bodemfactor 0,5 gehanteerd (50% geluidreflecterend).

In de berekeningen is met alle van belang zijnde factoren rekening gehouden, zoals afstandsreductie, hoogteverschillen, frequentieafhankelijke reflecties, afscherming, luchtabsoorptie en bodemdemping. Bedrijfsduurcorrecties zijn niet aan de orde, omdat afgesehen van de sporadische schakelhandelingen alle geluidbronnen in principe 24 uur per dag in bedrijf zijn.

De invoergegevens van de gebouwen en de bodemgebieden zoals de positie, de hoogte, de reflectiecoëfficiënt, de bodemfactor e.d. zijn vermeld in bijlage 2. In deze bijlage zijn ook de invoergegevens van de relevante geluidbronnen vermeld zoals het bronvermogen per frequentieband, de bronhoogte en de bedrijfsduurcorrectietermen.