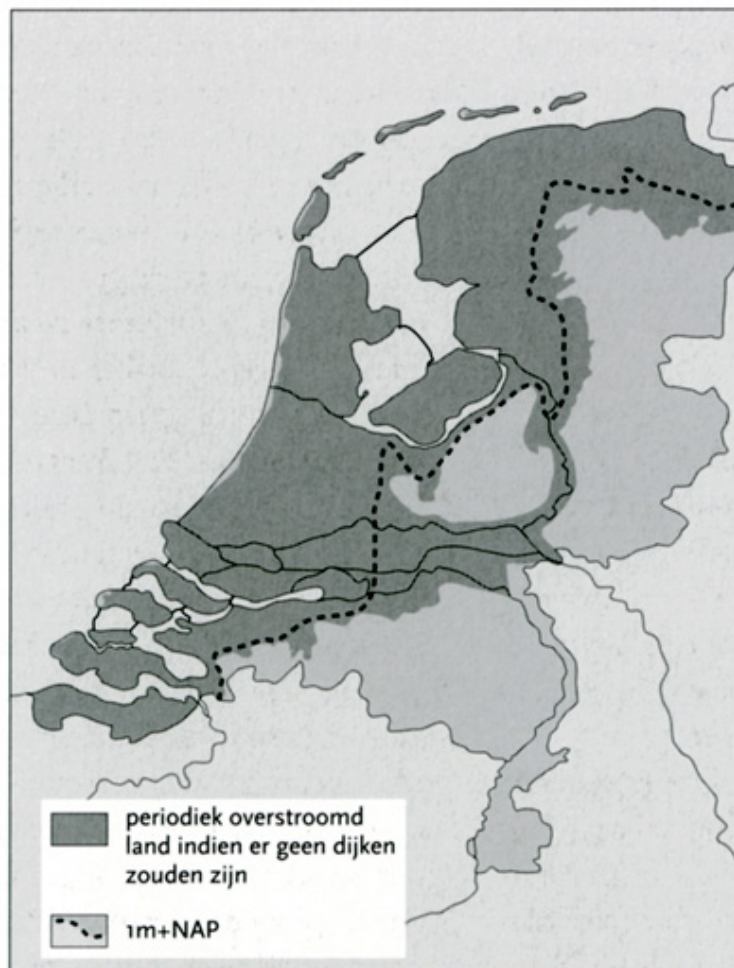


The Water Fortifications of the Dutch Republic

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The Dutch Republic created a unique defensive system known as the *waterlinie*, a system of dikes and sluices that was used for 340 years to halt or slow an invasion of Holland's heartland by flooding the land between its major cities. This was made possible because much of the western region—economically the most important part of the Republic--was below sea level. Central to the history of the Low Countries is the fact that much of its land is situated on the delta's of three major Western European rivers, the Rhine, the Maas (Meuse) and the Scheldt. While the rivers and the North Sea were crucial to the prosperity that fishing and trade brought



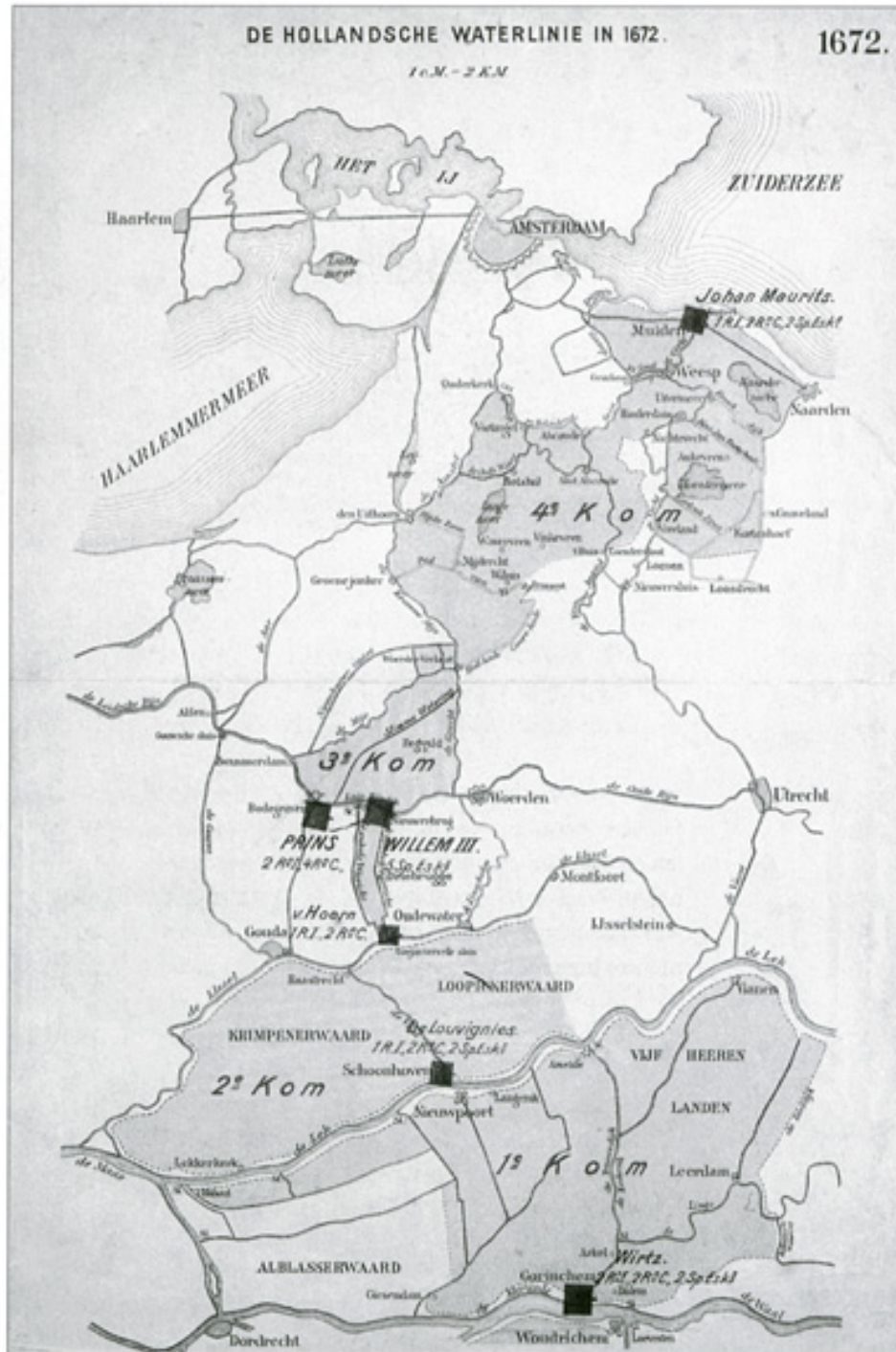
If there were no dikes, the dark area would be periodically flooded. The dotted line represents an altitude of about one meter above sea level, Chris Will, *Sterk Water: De Hollandse Waterlinie*, (Utrecht, 2002), p. 10.

to the inhabitants, the Dutch and the Flemish also faced the constant danger of floods. In order to make it possible for them to live in these deltas they created an impressive system of dikes, sluices and windmills to drain their polders and erected large dikes along coastal areas and rivers to prevent flooding. The low-lying and flat land offered no natural defenses against invaders except water. By flooding the land, the resulting labyrinths of mud and water made it difficult for invading armies to move large numbers of men and equipment to besiege the fortified cities.



An aerial view of Slot Loevestein, a 14th century water castle, during extremely high water in 1995. The earthen walls with bastions were built during the 16th and 17th centuries and are visible in the muddy water, Will, *Sterk Water*, p. 8.

During the 17th century, the Dutch Republic constructed a military *waterlinie*--an interconnected series of polders that could be flooded--and fortifications to hinder the advance of hostile armies. The water barrier was at least several kilometers wide and about a foot deep.



The inundation fields (in grey) of the old Holland waterlinie in 1672, from *Strategie en krijgsgeschiedenis* 1890 (a strategic military handbook), in Will, *Sterk Water*, p. 14.

It was wide enough so that an enemy could not fire across it. The water not only created muddy ground that was difficult to cross, but underneath the water there were unseen deeper ditches, canals and obstructions that made navigation impossible. Defensive batteries and forts were constructed on higher ground. Specialized troops garrisoned and maintained the system. The concept of the *waterlinie* was developed in the late 16th century during the Dutch revolt against Spain and prevented the Spanish, Europe's strongest power at the time, from putting down the revolt of the Northern Provinces. In 1672 the system was a key factor in the successful defense of the Province of Holland by the much larger forces of Louis XIV's France.



*At the Holland Waterlinie in 1672, a school picture from 1922 showing Prince William II with officers and men along the waterlinie with a gun platform and fortified city in the background, in Will, *Sterk Water*), p. 13,*

As late as 1939, the Netherlands sought to ensure its neutrality with propaganda pictures, such as this military vehicle pictured below, marooned by its *waterlinie*

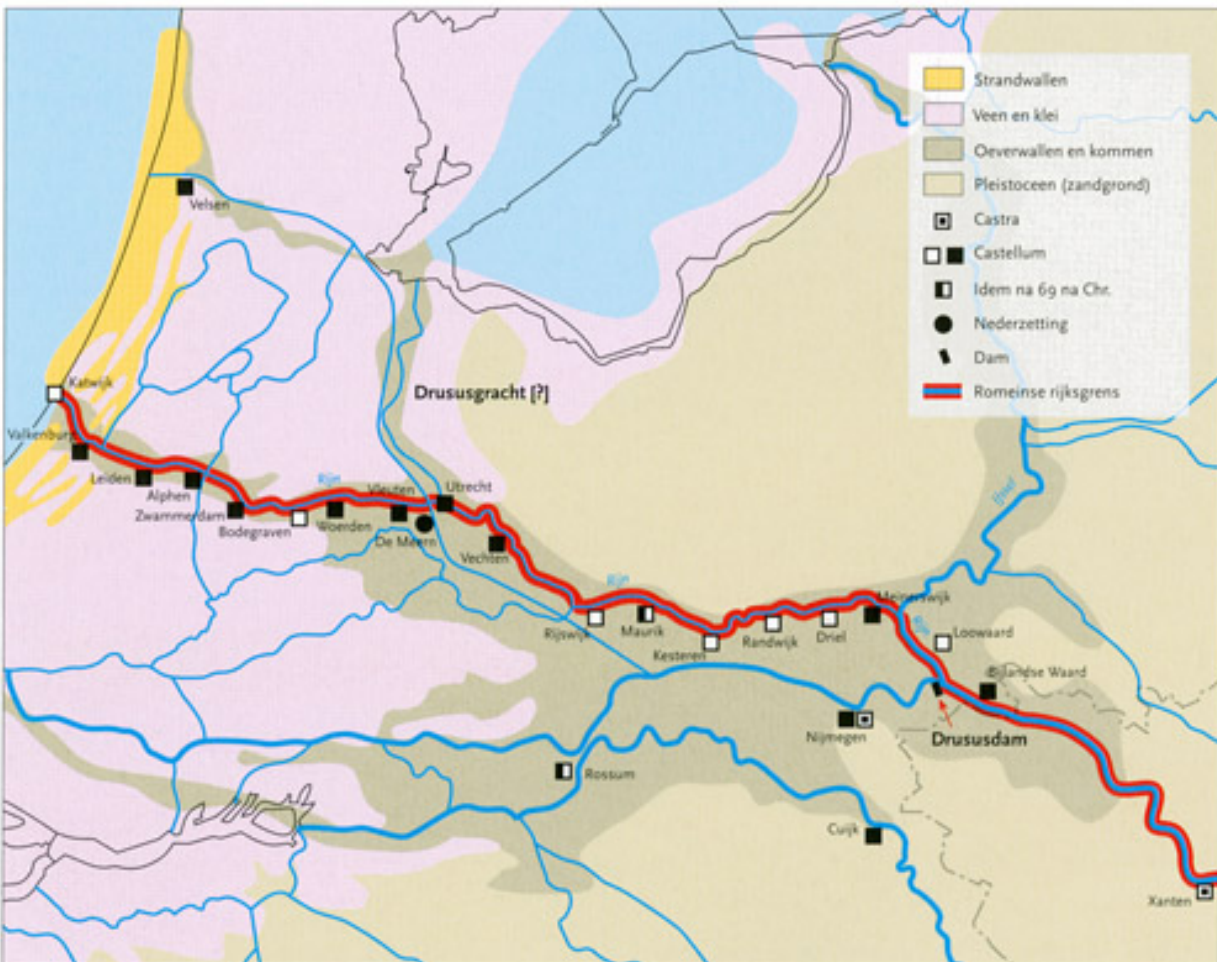


From *Het leven* (November, 1939), in Will, *Sterk Water*, p. 11.

One of the earliest written sources that provides a description of the geography of the Low Countries dates from a Roman officer, Plinius the Elder, who in 47 AD participated in a military action by the Roman Empire's Army of the Rhine. He was amazed by the tides that turned a vast area north of the Rhine into water so that the inhabitants, who lived on *terpen*--small hills that remained above water at high tide--collected the fish as the tide receded. According to Plinius the Romans found it extremely difficult to subdue the inhabitants north of the Rhine because they could not determine what was land and what was sea. Moreover, they had to deal with floating islands, consisting of giant oaks loosened by storms that carried their immense roots with them so that Roman ships had to fight not only the inhabitants but also the trees.¹ It was the Romans who first organized water defenses in the Low Countries. They used the river Rhine as the northern defense line of their West European Empire. In 10 BC, Drusus, a field commander and stepson of Emperor Augustus, built flood defenses where the Waal split

¹ Will, *Sterk Water* p. 17.

from the Rhine. It was designed to push more of the water northward and create a broad river that was more navigable and served as a defensive line that constituted the first *waterlinie*. In 47 AD the lower Rhine was provided with permanent forts and a military road along the south bank of the Rhine. On the North side the Romans established an uninhabited military zone.



The Rhine was the northern border of the Roman Empire from Katwijk on the North Sea to Drusesdam. Yellow=dunes, pink=peatbog and clay, dark tan=riverbanks and hummocks, light green=sandy areas, castra=major town, castellum=fort, black circle=settlement. Romeinse rijksgrens=border of Roman Empire, Will, *Sterk Water*, p. 20.

The defense line was abandoned in about 400 AD. From the tenth century the growth of population led to the establishment of new towns and a need for additional agricultural land. In about the year 1,000, the bishop of Utrecht and the Count of Holland began to systematically drain marshland by digging ditches and removing excess water. Local efforts also raised summer and winter dikes that channeled the rivers and provided more pasture. The compaction of the peaty soil progressively lowered the elevation of agricultural land so that it became necessary to

continually pump out excess water. From the fourteenth century, windmills were employed for this task. From Carolingian times (8th and 9th centuries), farmhouses, fortress houses, castles and towns surrounded themselves with earthen and stonewalls and moats. The invention of gunpowder and canons required the building of larger and more complex star-shaped fortifications surrounded by water. During the Revolt of the Netherlands against Spain, 1568-1648, the rebels used inundations for both defensive and offensive operations against the Spanish in a number of major sieges. The most spectacular use of water by the Dutch was the siege of 's-Hertogenbosch in 1629. Frederik Hendrik, the Prince of Orange, had a 45 mile dike built around the city and pumped the water out of the city's moat. He used the water to fill his own defensive



“The Siege of Leyden and its Relief” in 1574, Romijn de Hooghe, Will, *Sterk Water*, p. 27.

moat that he dug to guard his rear during the siege and as storage for water to be used to replace the city's defenses after its capture. A good example of an offensive inundation was the lake the Dutch rebel forces created around Leiden and used to end the Spanish of the city in 1574.



Map of important defensive lines and frontier and fort towns from the 17th to the 20th centuries
 Frontiersteden=fortified frontier cities. Stelsel van linies langs de grenzen van de Republiek in the 17^e eeuw=Military defense lines along the borders of the Republic in the 17th century. Overige vestingsteden=other fortified cities. Maas-vestingen=Fortifications along the Meuse. 19^e en 20^e eeuwse liniestelsels=19th and 20th century military defense lines. Waterlinie=water defense line. Stelling=Military District, Will, *Sterk Water*), p. 25

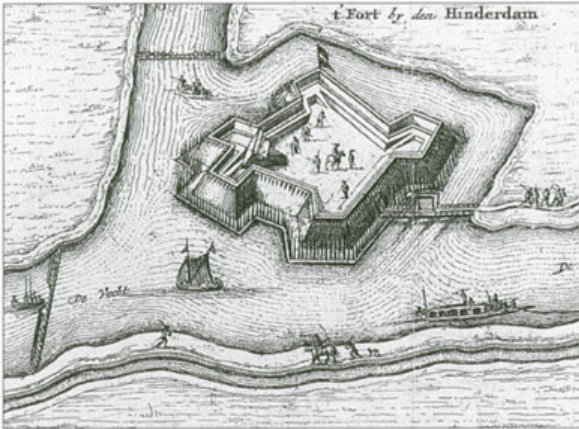
The water defense system of the Netherlands has its roots in the Dutch revolt against Spain. In 1579, seven provinces of the Union of Utrecht formed the Republic of the United Provinces and created a common army and navy. It soon became a Great Power on the seas and played a major role in the famous English victory over the Spanish Armada in 1588. In order to protect itself from land attacks from the south and east, it built a network of over twenty forts--*vestingsteden*--in both existing and new towns (see the map above). Between these forts the Dutch used rivers, swamps and *waterlinies* as barriers. William of Orange initiated this system with the installation of a superintendent of fortifications for the Province of Holland in 1584, who in the next year provided the first planned successful inundation against the Spanish. When the Spanish once again threatened to invade Holland and Utrecht in 1589-90, the Republic produced a comprehensive plan to construct two *waterlinies* in Utrecht and Holland along the River Vecht and around the city of Utrecht. The plan was not carried out until 1629 when a Spanish army crossed the IJsel in Gelderland and threatened the heart of the Republic. Known as the Utrecht *Waterlinie*, it successfully defended Utrecht and Holland to the west by allowing water from the Zuiderzee (the Southern Sea between North Holland and the eastern Provinces, now known as the IJselmeer) at Muiden (to the east of Amsterdam at the mouth of the Vecht) to inundate polders along the Vecht and around Utrecht. In the east they used peat bogs between Bourtange and Coevorden and the Overijsselse Vecht, and constructed the Ijsellinie between Zwolle and Arnhem. In the south there was a Brabant *waterlinie* between Grave and Gertruidenberg. From the latter to the south and east there was a fortified line to the sea at Sluis. Away from these fortified *waterlinies* there was a line of fortifications along the Meuse from Venlo to Maastricht. A weak point in this defensive arc was the area between Arnhem and Nijmegen, which provided a potential invasion route to the heart of the Republic from the east. Thus the Grebbelinie and the Nieuwe (New) Hollandse *Waterlinie* were constructed to protect the center. Late in the 19th century and early in the 20th century additional defensive lines were built, the Peel-Raamstelling in the southeast and the Stelling van Amsterdam (a military district around Amsterdam).

Forts along the *waterlinie* were located near dikes and roads that crossed the area. Originally, they consisted of simple many cornered raised earthen walls strengthened by wooden palisades surrounded by deep moats. Every sixth village male between 18 and 60 from Holland and Utrecht was 'pressed' into service to build the original *waterlinie*, but the hastily built

system was not tested against the Spanish, since their advance was halted before it reached Republic's water defenses.

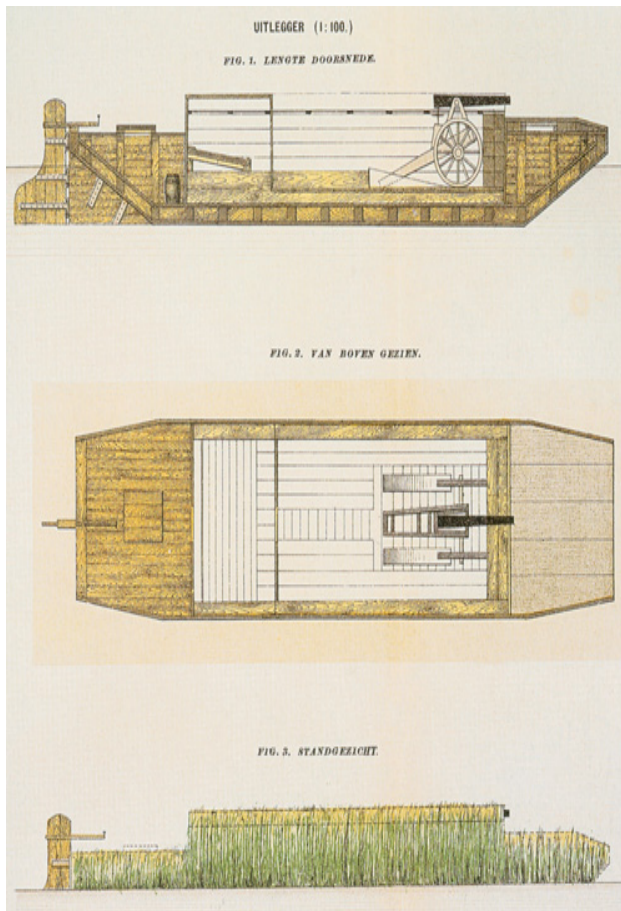


Muiden Castle at the mouth of the Vecht with its 18th and 19th century earthen walls protected the northern end of the Utrechtse *waterlinie* at Vecht, Will, *Sterk Water*, p. 28.



Left: *A fort at Hinderdam on the Vecht, a print from *Toneel des Oorlogs*, Lambert van de Bosch, 1673. Right: Aerial photo of Fort Hinderdam in 1927. Will, *Sterk Water*), p. 30.*

In 1672 the Republic faced the most serious crisis in its existence. It was attacked at sea by Britain while France and Munster invaded by land from the east. By June Louis XIV's enormous army had captured the cities along the IJsel and Utrecht and prepared to invade



Holland. The Republic decided to implement its *waterlinie* defenses from Muiden to Gorinchem in the east and along the Maas in the south. It positioned its troops on the dikes and roads, which the French would need to use to invade Holland, and on June 18 and 19 it flooded an area from two to thirty kilometers wide along its defense lines. At the same time it flooded the military territory around Amsterdam. Despite considerable opposition, and even sabotage, from farmers who saw their lands flooded and their herds drowned, as well as being faced with shortages of equipment, troops and money, Holland's eastern defense line was an insurmountable barrier to the French. The

Hollanders deployed artillery on flatboats (above) in the flooded region to harass the French camped across from the *waterlinie*. Marines

guarded the flooded region in Greenland boats, large rowboats used for whaling. Convoys of armed herring *buis* (vessels used in the North Sea herring fishery) patrolled the rivers. In Amsterdam the artillery was mounted on floating platforms so that it could be moved quickly wherever it was needed. Despite the fact that the French had captured Naarden, which was uncomfortably close to Muiden Castle, and several attempts by the French to cross the *waterlinie*, the Dutch held off the much larger French army for six months. Their great fear was that the water would freeze and allow the French to cross the barrier. An indeed, on December 27, the French crossed the ice with an army of over 8,000 men. Fortunately, the ice proved to be too thin to support mounted troops and heavy artillery and a thaw forced the French infantry to retreat. Through unforeseen military setbacks elsewhere, the French were forced to abandon their invasion of the Republic. The *waterlinie* had played an important role in the survival of the Republic during its *Rampjaar* (the year of disaster) of 1672 and the Republic immediately began to expand the system so that it could also defend the cities of Utrecht and Naarden. The inundations of 1672 had been accomplished by breaking through many dikes and hastily building new dams. In subsequent years many permanent and larger sluices were built so that the level of inundation could be controlled and accelerated.



The fortified city of Oudewater was included in the *waterlinie* in 1673. The print still shows the medieval city walls. The new bastions on the right protected the city. Will, *Sterk Water*, p. 41.



Nieuwpoort on the Lek River is a well-preserved fortified town on the Old Holland *Waterlinie*, Will, *Sterk Water*, p. 43.



The canal used for inundation is situated underneath the Town Hall of Nieuwpoort in the middle of town to protect it from sabotage from the farmers, Will, *Sterk Water*, p. 47.



The Wierekerschans on the Oude Rijn is the only one of the Old Holland *Waterlinie* forts that still exists in the Province of South Holland, Will, *Sterk Water*, p. 42.

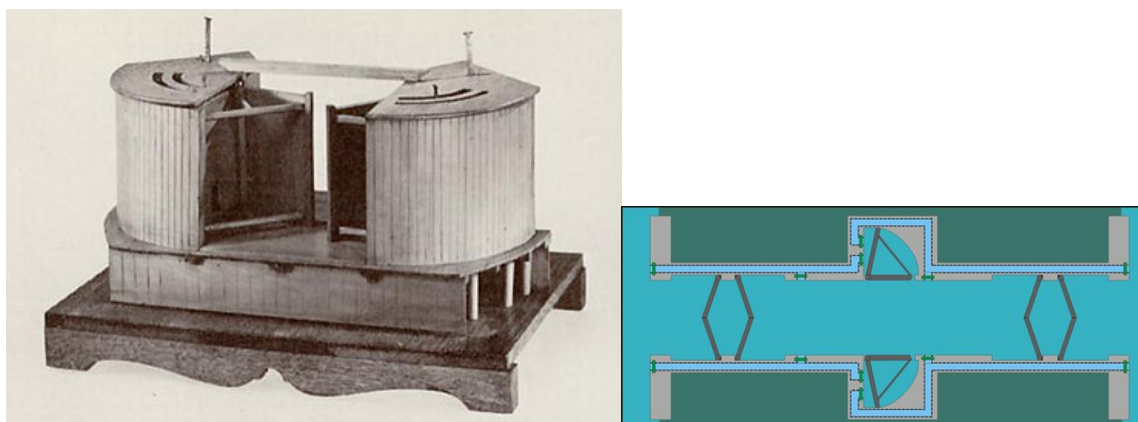


Naarden is the best preserved of the 17th century fortified towns in the Netherlands. It has a double moat and its bastions are clad with stone. Will, *Sterk Water*, p. 46.

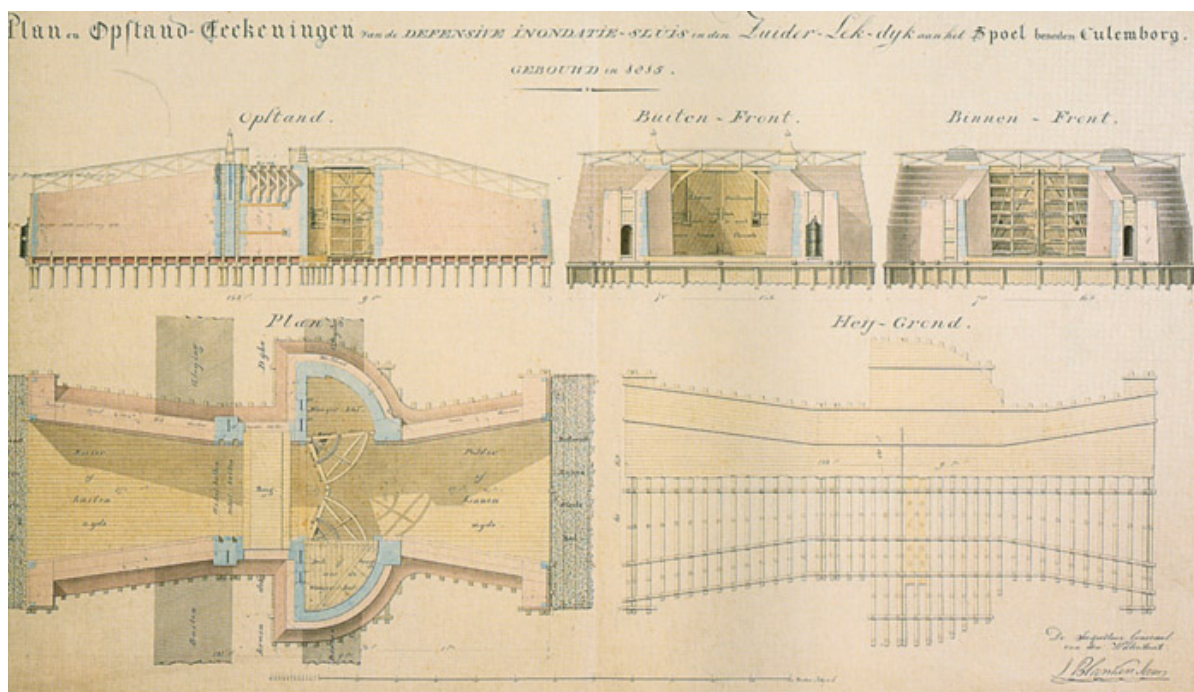
After the improvements to the *waterlinie* in the war with France, the defensive system was worked on again during the War of the Spanish Succession, 1702-1713 and the War of the Austrian Succession in 1741-1748. During the latter war there were trial inundations but subsequently there was less maintenance and some sections of the system became inoperable. By the 1730s the Republic no longer had the most dynamic economy in Europe and, given its small size and population, it ceased to be a Great Power. During the late 18th century the internal political conflict between the supporters of the ruling oligarchy and the Princes of Orange and the Patriots, who demanded a more democratic Republic, a revolutionary crisis developed in which the Prince of Orange's brother in law, Frederick William II, sent a Prussian army of 25,000 troops in 1787 to support the existing regime. The Patriots attempted to use the poorly maintained *waterlinie* to halt the invasion, but found many sections unusable. The Prussians quickly overwhelmed Patriot forces and demonstrated the weakness of the Holland *waterlinie* defenses. During the French Revolutionary Wars, the French invasion of the Netherlands in 1793 was halted by the southern *waterlinie*. During the next summer the French sent another and larger army of 70,000 to invade the Republic. They were stopped by the *waterlinies* until a severe winter froze not only the inundations, but also the large rivers. By late January the French army had defeated the Republic's defenses and were welcomed by the Patriots, who saw them as bringing Liberty, Equality and Fraternity. The Patriots created a more democratic Batavian Republic, but by 1801 it had become an oligarchy again and the Republic was finally abolished by Napoleon in 1806. The French made Louis Napoleon king and in 1810 the former Republic's territory formally became part of the French Empire.

Napoleon envisioned that Amsterdam would be the third city of the Empire, after Paris and Rome, and serve as the Continent's financial center. He personally took in interest in the defenses of this new Kingdom of his Empire and in 1811 rode with Cornelis Krajenhoff, the chief engineer of the Batavian Republic's *waterlinies*, to inspect and discuss improvements in the defensive system. The result was a plan for a *Nieuwe (New) Hollandse Waterlinie* from Naarden to Gorinchem. However, very little construction actually took place, since the political situation changed dramatically with the Fall of Napoleon and the creation of a United Kingdom of the Netherlands, which now included Belgium, as a buffer against France. The cost of building a new southern defense line on the southern border meant that the construction of a new *waterlinie* was largely put off until after an independent Belgian state was created in 1830. The *Nieuwe*

Hollandse waterlinie was finally completed largely in accordance with Krajenhoff's plans in 1864. Portions of the *Oude (Old) Hollandse Waterlinie* were abandoned as the system was moved east to include Utrecht, so that the old fortified towns of Oudewater, Schoonhoven and Nieuwpoort no longer played a military role. One of the key innovations of the new *waterlinie* was the invention in 1808 of the *waiersluis* (fan sluice), which allowed for rapid and controlled inundations. The doors of the sluice were opened and closed by water pressure by means of moveable doors in the sluice walls that admitted water from cisterns along the sides of the sluice and raised or lowered the water level in the sluice to open the appropriate end door.



Model of a *waiersluis* 1810, Rijksmuseum, Amsterdam, and schematic drawing.



Plan for a *waiersluis* for inundation at Culumborg 1815, National Archives, Will, *Sterk Water*, p. 60.

Tower forts that could resist artillery and drawbridges were built on roads that crossed the *waterlinies*. Fortified towns received larger defensive installations and stone reinforced earthen walls. Before the Franco-Prussian war of 1870 it was not economically feasible to provide permanent full military staffing of all the forts during peacetime. The rapid German defeat of France with new and more mobile military tactics, which included railroads and larger and more accurate guns, and the slow Dutch defensive mobilization during the war, demonstrated the



Fort Vuren on the Waal. Originally built in 1864, it was rebuilt during the 1870s. Photo of 1915, Will, *Sterk Water*, p. 64.



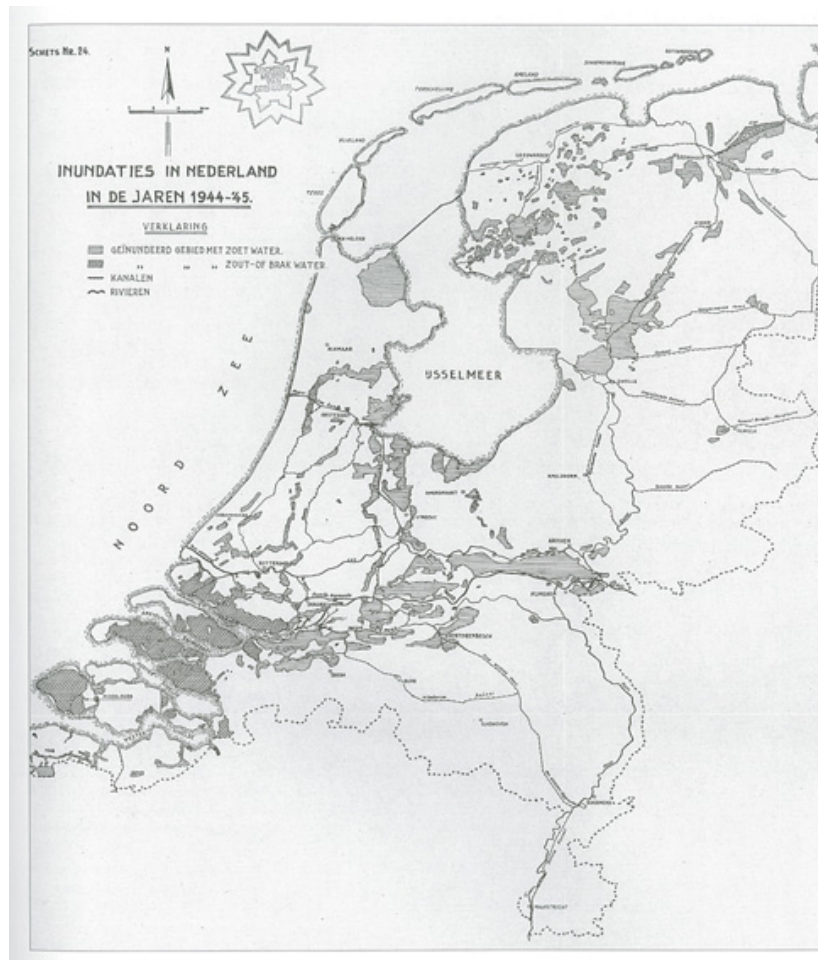
A photo of Fort Vechten from the West in 1926. To the left is the train-line from Utrecht to Arnhem, Will, *Sterk Water*, p. 73.

shortcomings of the country's defense system. Renewed economic growth during the late nineteenth century provided the resources to improve the country's military capabilities. Large new forts were built further east of the existing *waterlinie* and were linked by telegraph. The army was enlarged so that the forts could be fully staffed during peacetime and regular large-scale military war games and simulated inundations were carried out. The *Nieuwe (New) Hollandse Waterlinie* was the largest infrastructure project undertaken by the government during the nineteenth century. However, by the mid-1880s modern explosives had made the new forts useless as artillery redoubts. Instead, artillery became mobile and was dispersed between and behind the forts, while the forts became support bases for field armies. From 1887 until 1914, the government spent almost all of its defense line funds on building a new *Stelling van Amsterdam*, a defensive ring around the city where the army and the government could make a last stand if the *Nieuwe (New) Hollandse Waterlinie* was breached.



Map showing the Old Hollandse Waterlinie, the Nieuwe Hollandse Waterlinie, the Stelling van Amsterdam and the Grebbelinie in the late 19th century, Will, *Sterk Water*, p. 66.

Although the Netherlands was able to remain neutral in World War I, its army was mobilized and the *waterlinies* were strengthened. During the late 1930s, tank obstacles were added and forts were hardened against aerial bombardments. When the Germans invaded Poland in September of 1939, the Dutch mobilized and in March 1940 moved most of its military forces to the east of the *waterlinie* in the hope of slowing a German invasion and provide time to use its water defenses. The Germans invaded on May 10, but bypassed the *waterlinie* by landing paratroopers behind it and bombed the city of Rotterdam from the air. The Dutch forces surrendered within five days of the invasion. In 1943 the Germans fortified the Dutch North Sea coast and began a project to use water defenses designed to contain an Allied landing in the West. After the Allied invasion of France in June of 1944, the Germans used inundations in Holland in an effort to slow an Allied advance through the Netherlands. The German inundations were enough of a threat so that the Allies did not attempt to liberate the Northern Netherlands until German capitulation in May of 1945.



German inundations in 1944-45 after Allied landings in France, Will, *Sterk Water*, p. 119

After World War II the Dutch *waterlinies* were finally dismantled, but over three hundred years of its construction had left its mark on the country's landscape in both town and country. The water defenses of the Netherlands were made possible by the existence of polders whose elevation is below that of the sea and the country's big rivers. Linking the polders to make a continuous water barrier required a great deal of construction of dikes, sluices, pumps, and canals. The extensive civil infrastructure of Dutch dikes and drainage proved to be insufficient to accomplish military inundations quickly enough in an emergency. As late as 1859 it was estimated that it would take 26 days to achieve a full inundation. During the late nineteenth century, large military sluices were built to provide faster flooding from the mouth of the Vecht on the Zuiderzee and near Wijk bij Duurstede and Tiel. While Holland and Western Utrecht looks extremely flat, the elevation between the northern and southern end of the *Hollandse Waterlinie* differs by about two meters. To provide a five kilometer wide and 85 kilometer long field of water of from 30 to 60 centimeter deep required an extensive network of additional canals, sluices and dams. Inundations were done in phases during mobilizations. During the first phase, sufficient water was let in to fill the polder canals to the brim, which made the land barely usable. The second phase raised the water level so that the roads remained usable but water covered the land. The final phase completed the inundation. The original purpose of the forts was to store supplies and munitions at the front, as a safe place for housing troops, and, especially, to serve as a defensible platform for artillery. The last required obstacle free sightlines for artillery and produced surrounding areas in which buildings or large trees were prohibited.



On April 15, 1940, the inundation sluice near Dalem was opened at 3:00 PM and the water began to stream in. The second photo, three weeks before the German invasion, shows the inundation on April 17. The highest water level took place on April 23, Will, *Sterk Water*, p. 85.

These measures were codified in law during the late 18th century and were not repealed until 1951. The *waterlinies* landscapes can still be seen in many places today. Beginning in the the 17th century, the Dutch planted hawthorn hedges—an early form of barbed wire--next to the wooden palisades of the forts to serve as a barrier on their earthen walls. In the late 19th century, the government began a systematic program of planting trees and hedges as camouflage and harvestable wood. These plantings explain the contemporary wooded landscapes at the surviving forts. For information about visiting waterlinie sites, go to <http://www.hollandsewaterlinie.nl/pages/english-information.aspx>.



This photo provides a good view of the twentieth century plantings around Fort Everdingen. Note the sun's reflection in the water and the floating lily pads. Will, *Sterk Water*, p. 99.