

RESTORING THE MARITIME CHARACTER OF THE MONT-SAINT-MICHEL

Technical file

A N O P E R A T I O N O F N A T I O N A L I N T E R E S T

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THE COUESNON DAM



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A work of art all on its own, the dam's architecture blends in with the bay's landscape while managing the waters through regular sand build-up clearance flushing operations providing spaces for the public to discover.

For both technical and architectural reasons, the dam's eight sluice gates are installed downstream, on the Couesnon side. Facing the bay and the Mont, the maritime balcony offers an unhindered view over the landscape above the waters. On the land side, the promenade deck opens up the view to the channelled river and the valves' mechanics.

MECHANICS GOVERNED BY THE TIDES

The dam's technical originality rests in its operation. The eight valves, each activated by two hydraulic cylinders, can operate in both directions. They fill from the top as the tide rises and drain from the bottom as the tide goes out, in order to amplify the river's natural flow.

An international and independent scientific commission and the Joint Council are monitoring the hydro-sedimentary effects of the flush system and are checking the results obtained.

Each of the dam's components has been designed with the location's maritime character in mind. The valves' structural design calls to mind the circular forms of naval instruments such as sextants.



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THIS IS AN UNEXPECTED DELIGHT AT HIGH TIDE

The maritime balcony's surface features a bronze engraving of the four alphabets which founded the written history of Europe, but also shells and shields which make reference to the history of the Mont-Saint-Michel.



© Le pupitre des lettres / Luc Weizmann



© Thomas Jouanneau

The filling phases at each high tide provide an unexpected show. The sea rushes in through the 8 valves when they are gradually lowered, creating several waterfalls and pushing the current back up the river Couesnon.

Design teams: © BRL Ingénierie/ Luc Weizmann architect/ SPRETEC/ ANTEA/ © Le Pupitre des Lettres/ Luc Weizmann architect

HYDRAULIC DEVELOPMENTS

Long restrained by the floodgates of the first dam built between 1966 and 1969, the Couesnon had stopped acting as a rising tide storage basin and a falling tide flush system. It had lost its hydraulic power and sediment had built up on its bed. Downstream of the dam, the river would meander slowly through the sediment and vegetation.

The hydraulic developments give it back the strength to carry the sediment away from the Mont and maintain a maritime strand environment around the rock. It has regained its water storage capacities.

The cleaned Couesnon channel combined with the hydraulic reserve of the Moidrey cove enables up to 1, 200, 000 cubic metres of water to be stored for flushes, carried in by the rising tide and the river's own natural flow.



UPSTREAM OF THE DAM

- **CLEANING OF THE COUESNON CHANNELLED OVER 4.7 KM**, between the dam and the Moidrey cove. The sediment has been cleaned by suction dredging to reveal the coast at the channel bed (+2m IGN 69*).
Estimation of the volumes: 500, 000 m³.

- **REFILLING THE ANSE DE MOIDREY.** Former wetland surrounded by the Couesnon and long used to extract silt**, this hydraulic reservoir that complements the Couesnon is crossed by 9 km of channels.

A first phase was carried out in 2005 with the creation of pools intended for Common Parsley Frogs, protected amphibians who live in the cove.

Estimation of the volumes: 700, 000 m³.

* IGN69: reference vertical marker different from sea level

** silt: silver-grey sediment composed of sand and fine shell particles.

SILT CONVERSION: THE AGRICULTURAL ASPECT

Thanks to the extraction of these huge quantities of silt around 1.2 million m³, many farmers and a few horse-riding centres have been able to make use of this rich material. The silt is being converted for agricultural use between spring 2013 and spring 2015 by reloading land and conditioning acidic land, marking a return to traditional agricultural practices. Thanks to its limestone content, adding silt helps enrich agricultural land with minerals and also combat the appearance of a parasitic mushroom on cabbages in the Saint-Malo region.



DOWNSTREAM OF THE DAM

- **CREATION OF THE EAST AND WEST CHANNELS** to optimise the dam flush erosion work. The silt extracted downstream of the dam is used in part to build the new causeway road and in part carried away by the Couesnon's flushing.
Estimation of the volumes: 800, 000 m³ disturbed, half of which was put back into the Couesnon.

- **DISMANTLING OF THE COUESNON'S ROCK CORDONS (CREATED IN THE XIXTH CENTURY).** They were reused for the threshold between the dam and the Mont and the deflector and spreader spurs which will encourage the river to meander.

- **DEMOLITION OF THE FORMER MARITIME CAR PARKS AND THE CAUSEWAY ROAD.**

The silt* part of the causeway road will be either converted (reinforcement of the dykes to the east) or carried away by the flushing (depending on the quality of the silt). The causeway road rock protections may then be reused.

* silt: Silt is high agricultural quality fine loamy or loam-clay sand which is free of heavy metal pollution and does not contain any salt.

Design teams:

© BET Antéa/ BRL Ingénierie/ Cabinet HYL landscape architects and town planners (P. Hannetel / A. Yver / C. Lafogre)

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THE NEW ACCESS TO THE MONT-SAINT-MICHEL

Everything has changed between the Mont-Saint-Michel and the continent. An elegant floating footbridge straddles the reclaimed maritime areas before landing at the Mont-Saint-Michel's reception esplanade.

The new access provides new meaning to the crossing, by opening the view over the bay, the Tombelaine rock and the Mont-Saint-Michel. Visitors are able to walk out to the Monument in a new atmosphere of calm.

The causeway, which prevented free movement of water around the Mont since 1879, has been destroyed. This symbolic act marks the reconquest of the site.



© Thomas Jouanneau

THE NEW TO THE MONT FEATURES TWO SEQUENCES:



© Thomas Jouanneau

An access road leaves the mainland and crosses the salt marshes to reach the 760 m pedestrian footbridge over the Couesnon and the strands.

This structure has been designed to blend into the landscape as seamlessly as possible.

Supported by a series of thin posts, it becomes lost in the maritime horizon, skirting close to the high tides. Pedestrians are routed areas reserved for them on either side of a central section used by the shuttles. The pedestrian walkways (which are open to bicycles at certain seasonal times) are wood-covered, bringing to mind jetties and the dam's maritime balcony.



© Thomas Jouanneau / DPA / SBP

THE MONT TAKES OVER THE SEA

Re-establishing the Mont-Saint-Michel's maritime character is also based on highlighting the tides until the Mont becomes an island again.

During coefficients over 100, the ramparts are completely surrounded by water for two hours.

The Mont then regains its iconic island status.

This occurs around 20 days per year, early in the morning or late in the evening (40 tides out of 700 per year on average). Whatever the circumstances, the emergency services have permanent access to guarantee the Mont's safety thanks to amphibious vehicles, a helicopter landing pad and trained emergency personnel. This point is monitored by the French government.

Outside these exceptional periods, the esplanade at the bottom of the ramparts has been designed to strengthen the Mont's maritime dimension once the tides reach a coefficient of 90 (of 85 depending on the weather conditions). Visitors travel the last 300 metres on foot, like a final crossing of a ford while managing to keep their feet dry. No matter



© Thomas Jouanneau

how high the water is, the mediaeval fortifications (Mont ramparts) now appear in their full splendour, as they were before the causeway was built in 1879.

Design teams: © Dietmar Feichtinger Architect / Design office Schlaich, Bergermann & Partner.



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THE NEW RECEPTION ON THE MAINLAND



© Thomas Jouanneau

An information, guidance and reception site, the car park is the first step in discovering or rediscovering the Mont. Away from the Mont itself, its 4000 spaces blend in seamlessly into the site thanks to landscape development inspired by the surrounding area (vegetable fields, wooded activity area, etc.). As soon as they arrive, visitors can admire the Mont's outline thanks to the perspective they get from the Marais blanc, extended by a path alongside the marsh land. The spaces located near the shuttle departure point and the Tourist Information Centre are available all year round for people with disabilities and people who live and work on the Mont, as well as visitors during low and mid seasons. Other car parking areas, which have also been planted with trees and shrubs and have an earth and stone structure, open depending on visitor numbers.

THE MONT TO SUIT YOU: BY PASSEUR, ON FOOT, BY MARINGOTES OR BY BIKE

The Passeurs and Maringotes (horse-drawn shuttles) pick up visitors in the car park. The Passeurs stop at the main shopping and hotel area on the road to the Mont on both the outward and return journeys, and at the Place du barrage before heading onto the new access road. The Maringotes offer a trip along the banks of the Couesnon or the Lisière and cross the dam before heading out to the Mont. The terminus 400 m from the Mont-Saint-Michel provides a safe area for pedestrians at the foot of the ramparts.



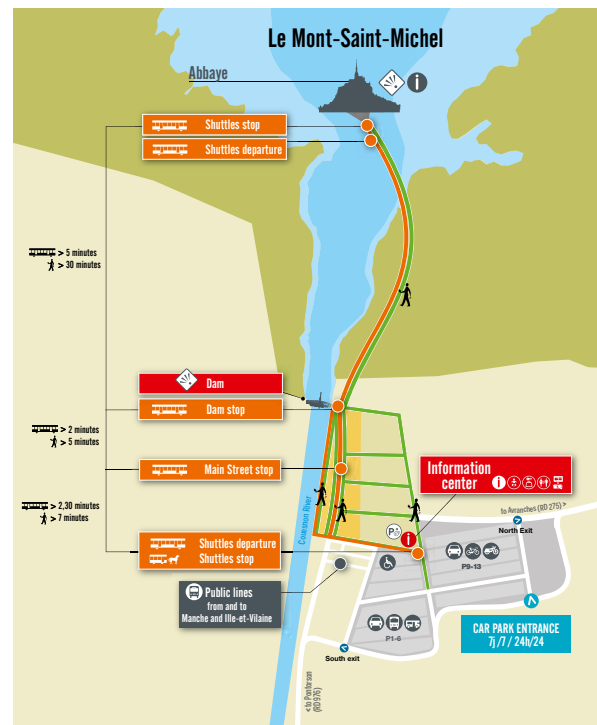
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Cyclists have 200 bike spaces (car park, dam) and are authorised to cycle out to the Mont all day from October to April and between 6pm and 10am between May and September.

For walkers, there are reserved pathways through the new public area, from the banks of the Couesnon to the dam, from the car park to the Mont. A wide range of routes is available to make visits special and distribute the visitors around the site.



© Thomas Jouanneau



The Tourist Information Centre provides information about everything to do at the Mont and in the bay. It gives visitors ideas to extend their stay in Normandy and Brittany. The museum space with its different exhibition areas has something for everyone. A range of useful facilities are also available (toilets, left-luggage lockers, cash machines and so on).

Design teams (public areas, reception buildings):

© Cabinet HYL, landscapers and town planners (P. Hannetel - A. Yver - C. Laforge), Paris / Bruno Mader Architect - SOGETI - COSIL design agency, Lighting.

Design teams (car parks and operational buildings):

© Transdev, Alfred Peter, Agence Artefact. © Transdev, Contrac (Le Passeur).

Practical info:

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