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DOWNSTREAM FISH MIGRATION ALONG THE LOW MEUSE RIVER

Action C1

Installation of a downstream pipe at the Grands-Malades site

Report on the construction of a downstream migration fish path

Révision				
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2	23/03/2021	Lorenz Leyssens		Second Version

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I. Introduction

Based on the extensive experimental findings available in the scientific literature and operational testing in the field and in the lab, on of the solution chosen for the LIFE4FISH project is a fish path.

The University of Liège has built a scale model of the Grands-Malades fish path in its laboratory. Once the models were validated to best attract smotls, Luminus issued a call for tenders to select a company that could carry out the pre-construction studies based on the university's models. A second call for tenders led to the selection of a company that could build the fish path in order to improve the downstream migration of smolts.

The effectiveness of this technology, in combination of the electrical barriers, if demonstrated at the Meuse pilot site, could be harnessed for diverting fishes from the water intake channels at hydropower plants and any other waterways that have an impact on the migratory movements of the species in question (canals, industrial water intake channels, etc.).

This construction is one of the solutions retained and will serve as a pilot. It was placed close to turbine 4 where the concentration of smolts was recorded during monitoring. As smolts swim on the surface, the fish path has its opening close to the water surface.

II. SITE PREPARATION

1. Supplier Selection

For the construction of the fish path we had to make two suppliers selection. One for the study and the second for the construction.

The study for the construction was made after a call of tender leading to the selection of Arcadis.

For the construction we had to make three call of tender. The final supplier selection was done on October 2019 according to several requirements:

- **Price criteria** 45%: purchasing price / purchasing conditions.
- **Respect of the instructions of the call of tender** 5%
- **General condition** 5%
- **Technical aspect** 40%
  o Technical quality of the project and proposed solutions 40%. (non-exhaustive examples: access to the work area, management of the work space, transport of materials (waste evacuation, new materials), execution of the work (in sections or in one go), proposed waterproofing during the execution phase of the outfall)
  o Planning of the works 20%.
  o Quality of project management 20%.
  o Unavailability of the production site units limited to a minimum during the execution of the works 20%.
- **Security aspect** 5% Risk analysis / Material choice

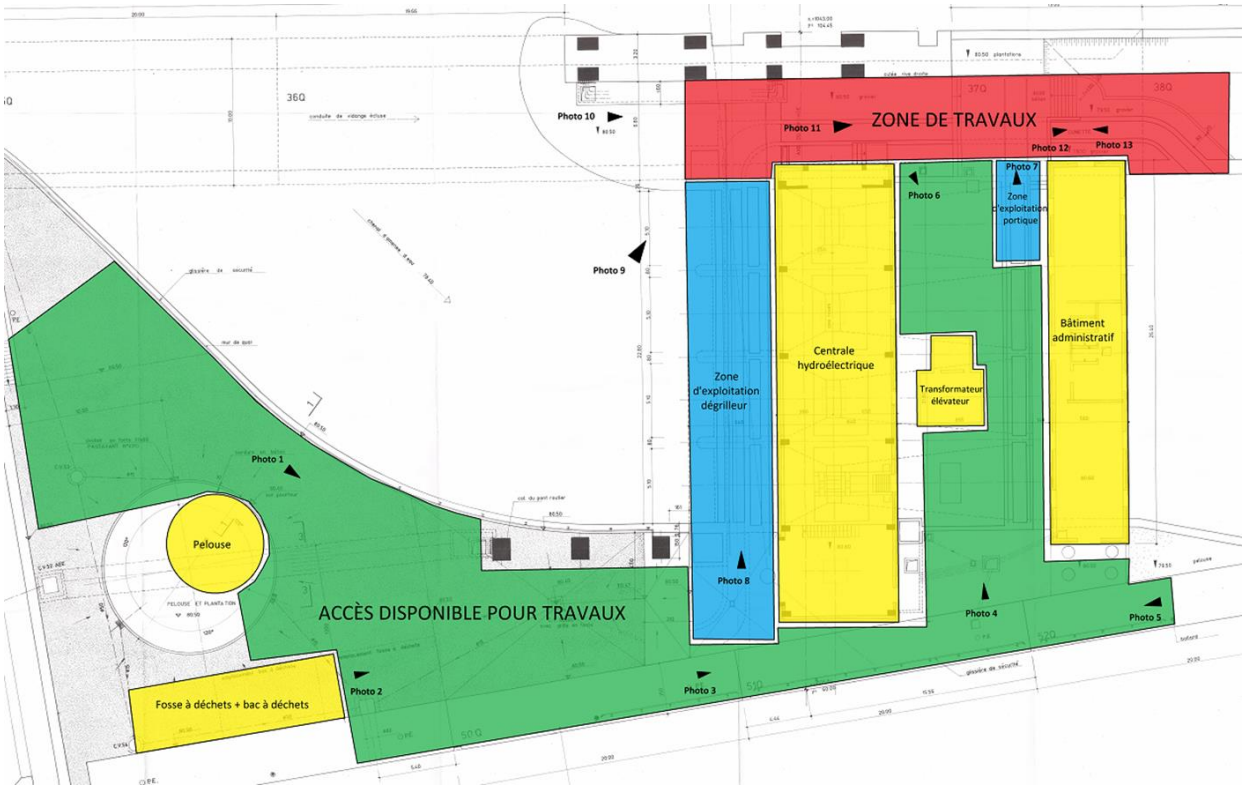

Figure 1: implantation of the site

2. Supplier Scope

A main contractor, ARTES TWT, for the realisation of the project, this company had 3 subcontractors:

- IKP Benelux for the demolition of the concrete

- ARTES DEPRET for the supply of the pontoon

- DPE DIVING for the supply and installation of the caisson

3. Projected Schedule and Actual Schedule

Projet : EDF Grand Malade

N°	Nom de la tâche	Durée	JourCal	Début	Fin
0	**EDF Grand Malade**	**60 jours**	**82 jours**	**Lun 10/08/20**	**Ven 30/10/20**
1	Installation de chantier + mise en place ponton + débroussaillement	5 jours	5 jours	Lun 10/08/20	Ven 14/08/20
2	**Arrêt de la centrale 1 jour + 1 réserve pour détournement des eaux d'exhaure**	2 jours	2 jours	Lun 17/08/20	Mar 18/08/20
3	**Arrêt de la central 1 jour + 1 réserve pour placement du caisson**	2 jours	2 jours	Lun 7/09/20	Mar 8/09/20
4	placement caisson	2 jours	2 jours	Lun 7/09/20	Mar 8/09/20
5	Démolition de la conduite existante	30 jours	42 jours	Mer 19/08/20	Mar 29/09/20
6	Déblais	33 jours	45 jours	Mer 19/08/20	Ven 2/10/20
7	Sable stabilisé	33 jours	45 jours	Mer 26/08/20	Ven 9/10/20
8	Pose de la nouvelle conduite	33 jours	45 jours	Mer 26/08/20	Ven 9/10/20
9	Remblais	33 jours	45 jours	Mer 26/08/20	Ven 9/10/20
10	Démolition de béton	15 jours	21 jours	Mer 9/09/20	Mar 29/09/20
11	Coffrage / ferraillage / béton	15 jours	21 jours	Mer 30/09/20	Mar 20/10/20
12	Vanne régulation	2 jours	2 jours	Mer 21/10/20	Jeu 22/10/20
13	Finitions	5 jours	7 jours	Ven 23/10/20	Jeu 29/10/20
14	**Arrêt de la centrale 1 jour + 1 réserve pour connection du tuyaux d'exhaure**	2 jours	2 jours	Mer 16/09/20	Jeu 17/09/20
15	**Arrêt de la central 1jour +1 réserve pour enlèvement du caisson**	2 jours	4 jours	Ven 23/10/20	Lun 26/10/20
16	Enlèvement caisson	2 jours	4 jours	Ven 23/10/20	Lun 26/10/20
17	Enlèvement installation de chantier et pontons	4 jours	4 jours	Mar 27/10/20	Ven 30/10/20

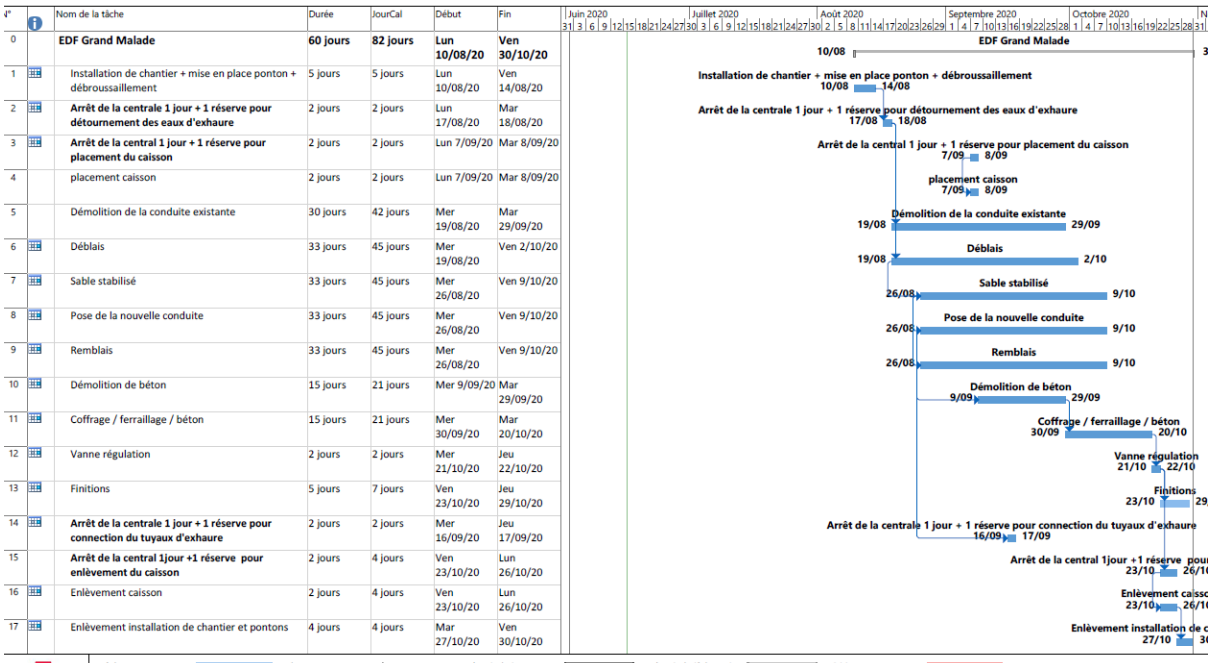

Figure 2: First part of the planning

Projet : EDF Grand Malade

N°	Nom de la tâche	Durée	JourCal	Début	Fin
0	**EDF Grand Malade**	**62 jours**	**100 jours**	**Jeu 29/10/20**	**Ven 5/02/21**
1	Remblais	3 jours	5 jours	Jeu 19/11/20	Lun 23/11/20
2	Coffrage / ferraillage / béton	15 jours	21 jours	Jeu 29/10/20	Mer 18/11/20
3	Vanne régulation et toutes les strutures métalliques (echelles, caillebottis, grilles ...)	50 jours	84 jours	Jeu 12/11/20	Mer 3/02/21
4	Mise en place de gravier	3 jours	5 jours	Jeu 19/11/20	Lun 23/11/20
5	**Arrêt de la central 1jour +1 réserve pour enlèvement du caisson**	2 jours	2 jours	Jeu 4/02/21	Ven 5/02/21
6	Enlèvement caisson	2 jours	2 jours	Jeu 4/02/21	Ven 5/02/21
7	Enlèvement des pontons	4 jours	4 jours	Mar 24/11/20	Ven 27/11/20
8	Finition diverse	7 jours	9 jours	Lun 30/11/20	Mar 8/12/20
9	Enlèvement installation chantier	8 jours	10 jours	Mer 9/12/20	Ven 18/12/20

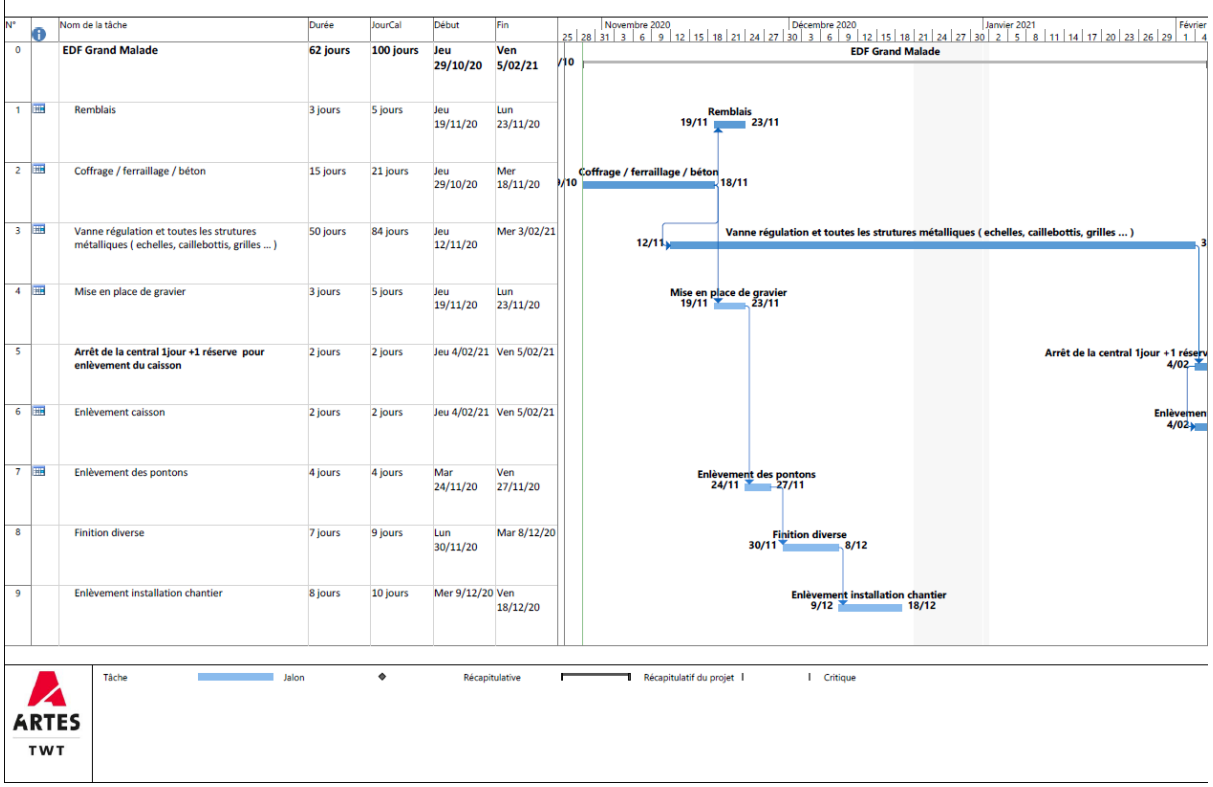

Figure 3 : Second part of the planning

4. Financial aspect

Société	Personne de contact	Travaux	Prix HTVA
TOTAL			**429.428,13€**

Figure 4: Financial table

During the construction of the fish path many additional costs were added. As the plans of Luminus and SPW installations were old, new elements were discovered and disturbed the construction. There was also a lack of communication between the different parties.

Additional works affecting the quantities foreseen:

- Reinforced concrete slab behind the pumping and intermediate CVs not foreseen and necessary for the laying of the rails.

- Anchored concrete gutter, former downstream fish path in the quay wall

- Reinforced and anchored concrete gutters for the passage of cables

- Reinforced and anchored concrete staircase to the building

- Additional concrete sail in the intermediate CV of the plug, as the existing one was not in a condition to be left as is

The 5 interventions affect items 2.1;2.4;2.5 and PC 13

- replacement of a reinforced concrete inspection chamber trap (demolition of the old one, surface preparation, evacuation, supply of new cover and concrete, installation of the new cover and its concrete and sealing of the whole with the concrete in place)

the above intervention is booked in the amount of 1100.00 euros excluding VAT

III. Project Realization

1. Security aspect

At Luminus, security is the most important. The safety rules must be applied by employees, suppliers, subcontractors. To ensure the safety of the site, the worksite manager provided the necessary documentation for the good progress of the works: work permit and risk analysis. The risk analysis is written by the company performing work. This document is approved or completed by the worksite manager, the work permit is written afterwards.

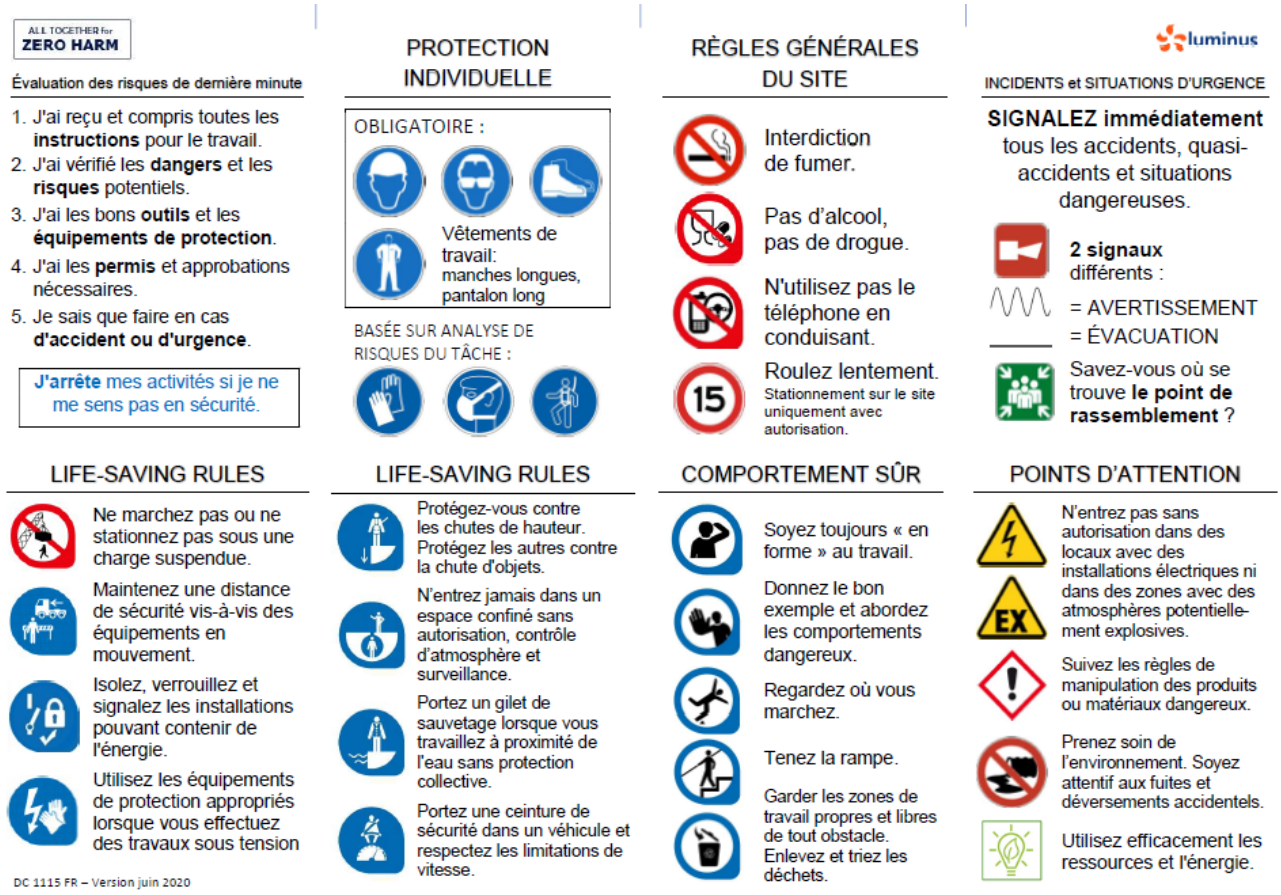

Figure 5 : Safety rules at Luminus. Provided to suppliers

The main risks are related to the fall of a person into the water, a risk increased during the short period when the fence was down to let us put the electrodes in the water. Several solutions were implemented to make the workers as safe as possible. All work areas are marked out. Wearing the lifejacket is mandatory close to the water.

A site opening prior to the start of the work is carried out in the company of the representatives of the winning company. All risks inherent in the work to be carried out will be discussed.
Following this site opening, a work permit will be given to the contractor.
The winning company must submit a PSS, according to 25 JANUARY 2001. - Royal Decree concerning temporary or mobile construction sites.
A health and safety coordinator has been appointed by the project owner, it is :
PRAUXILIUM SRL
Chaussée de Waremme, 13B
4520 ANTHEIT
info@prauxilium.com

Due to COVID period, the risk analysis was made in consequence. During the work we often checked if all the workers were wearing a facial mask as mandatory.

On the site we were also construction the fish path and we had to share the area with an other company, PROCOM. We clearly separated the site to be sure that we couldn't create any accident.

PROCOM must set up an electrical barrier, this barrier consist in two rows of electrodes, one for the anodes and the other one for the cathodes.

2. First phase of the demolition : August 2020, installation of the site and concrete demolition

Firstly we had place the platform to access to the construction site and remove the plants before beginning the demolition.

Figure 6 : Removing od the green spaces

Figure 7 : Placement of the platform

Then, from mid-August to end of September we began the demolition of the channel. The pipe for the smolts. This pipe had to be placed under the exiting channel.

Figure 8 : demolition of the existing channel. Picture 1

Figure 9 : demolition of the existing channel Picture 2

Figure 10 : demolition of the existing channel Picture 3

Figure 11 : demolition of the existing channel Picture 4

Figure 12 : demolition of the existing channel Picture 5

Figure 13 : Exit of the existing channel Picture 6

3. Laying the new pipe, October 2020

Secondly, for the exist of the fish path we had to create a new hole in the concrete. Then we layed the pipe for the smolts. It is a pipe of 1.5m wide

Figure 14 : Preparation of the support for the pipe. Picture 1

Figure 15 : View of a part of the pipe

Figure 19 : Preparation of the support for the pipe. Picture 2

Figure 20 : Placement of the exit of the pipe.

Figure 21 : View from above of the exit of the fish path. Picture 1

Figure 22 : View from above of the exit of the fish path. Picture 2

4. Second phase of upstream concrete demolition and in September 2020 laying of the rest of the pipe

Figure 23 : demolition of the remaining concrete. Picture 1

Figure 24 : demolition of the remaining concrete. Picture 2

Figure 25 : demolition of the remaining concrete. Picture 3

Figure 26 : demolition of the remaining concrete. Picture 4

Figure 27 : Placement of the pipe (upstream). Picture 1

Figure 28 : Placement of the pipe (upstream). Picture 2

Figure 29 : Placement of the pipe (upstream). Picture 3

Figure 30 : Placement of the pipe (upstream). Picture 4

Figure 31 : View of drainage pipes for dewatering pumps

5. Formwork and reinforcement phase

Then we had to place the reinforcement and pour the concrete.

Figure 32 : placement of reinforcement. Picture 1

Figure 33 : placement of reinforcement. Picture 2

Figure 34 : view from above of the chamber with entry of the pipe. Picture 1

Figure 35 : view from above of the chamber with entry of the pipe. Picture 2

Figure 36 : View from above of the chamber with the pump. Picture 1

Figure 37 : View from above of the chamber with the pump. Picture 2

6. Finition

The land was then backfilled and covered with gravel. The safety barriers removed during the works were replaced.

Figure 38 : View of the site after the end of the work. Picture 1

Figure 39 : View of the site after the end of the work. Picture 2

7. Flooding of the outlet

In February 2020 we finally remove the waterproofing box with a crane and divers.

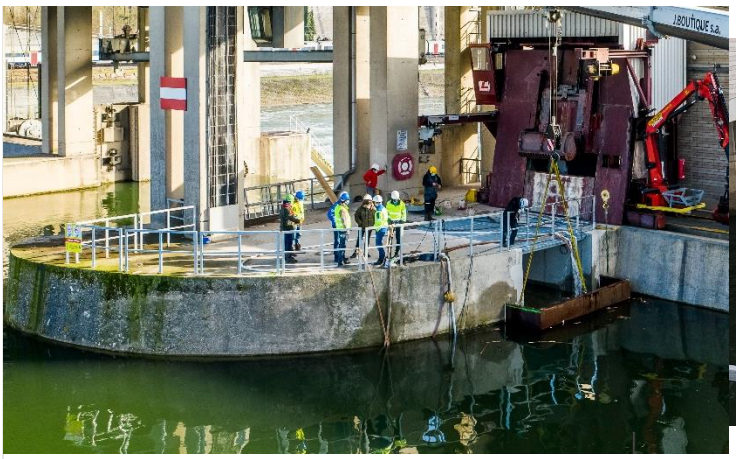

Figure 40 : Removing of the waterproof box

Figure 41 : Exit of the fish path