

## Memory provisions for the Manche Surface Repository

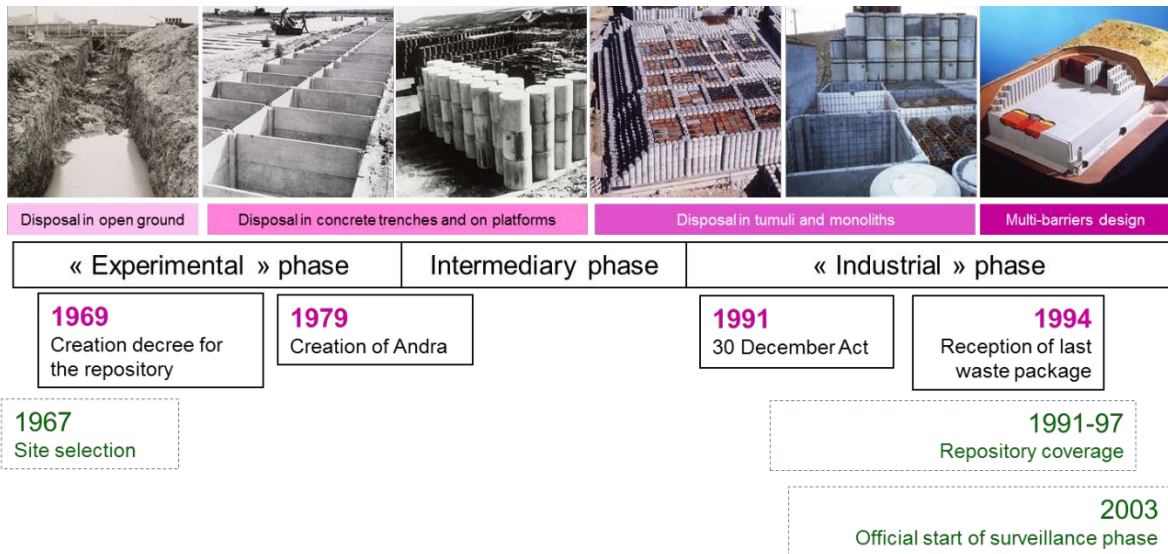
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### Introduction

The Manche Surface Repository (CSM), the first radioactive waste repository operated in France, was created in 1969, and received its last waste package in 1994. The closure operations lasted from 1991 to 1997. It entered officially in the surveillance phase in 2003. The surveillance phase will last at least 300 years. The main milestones of the life of CSM are presented in Figure 4.

**Figure 4: Main milestones regarding the Manche Surface Repository**



### The memory provisions of the Manche Surface Repository

As required by the safety authority, memory regarding the repository must be preserved for at least three centuries, corresponding to the oversight period. This requirement relates to the existence of the repository and its content. A complementary objective is to provide knowledge in order to: i) understand how the repository was implemented and what is happening on the site; ii) correct possible unwanted events; or iii) transform the site if desired. A set of provisions has been defined by Andra to allow this. They consist in: i) “passive” provisions; and ii) “active” provisions.

## Passive provisions

Passive provisions comprise three archives provisions: i) the “detailed record”, set of more than 10 000 documents, enriched with a complementary set every 5 years (surveillance data); ii) the “summary record”, one single volume describing in widely understandable terms the repository, its history, its inventory; iii) public utility easements, reported in documents restricting future uses of the site. The detailed record is copied in two sets; one is kept at Andra, the second is transferred to the French National Archives. To allow durability of the physical support, all documents have been duplicated on permanent paper, according to international standards.

The summary record is written for decision makers and for the public. When stabilised, it will be widely distributed, maybe by thousands of copies: one copy per decision maker (mayor, notary, etc.), one per audience (non-governmental organisation NGO, etc.) and one per organisation or state agency. The diffusion of the public utility easements will be instituted by a ministerial decree.

### Why “permanent paper”?

Until the middle of the 19<sup>th</sup> century, paper was made out of rag. At the beginning of the industrial revolution, its composition was modified by the massive use of wood pulp and rosin during the sizing stage. Those components produced an acid that generated the self-destruction of paper within a few decades.

Therefore, international standards have been adopted for a long-lasting paper, called “permanent paper” (International Organization for Standardization [ISO] 9706 and 11108).

“Permanent paper” allows a long durability, demonstrated over more than three centuries, thanks to its composition: no mechanical wood pulp, no recycled paper, no composite material and no wood pulp mix in the manufacturing process; minimum alkali reserve of 2% in calcium carbonate; presence of lignin providing a high oxidation resistance.

Permanent paper allows easy and intuitive access to the documents, and by-passes the impossibility to demonstrate that digital archives will be legible for at least 300 years.

## Active provisions

Active provisions consist in communication activities, vis-à-vis two types of audiences: i) institutional partners, such as the French Safety Authority (Autorité de sûreté nucléaire [ASN]), the Local Information and Oversight Committee (Commission locale d'information [CLI]); ii) the public in general.

Regarding the public, in order to promote the transmission of living memory, Andra:

- Proposes guided visits all year long.
- Organises exhibitions and events related to memory preservation and transmission.
- Develops partnerships with associations and scientific societies whose missions deal with memory.
- Has established a think tank on memory, composed of local representatives, local residents, former workers from Andra and from the nuclear industry, and artists. Meetings are held several times per year. Work areas include, for example, memory through art, long-term markers, a project of “ultra-summary record”, analysis and critical follow-up of work being performed by Andra at the Manche repository, etc.

Another type of active provisions is the periodic review of the set of memory provisions, which will be performed on a ten-year basis, by Andra experts and by national and international experts. The first review was conducted in 2012; it focused on

the detailed record. Two internal assessments were performed in January 2012, followed by the first international assessment in September of the same year. This was prepared by: i) an internal critical review in 2009, based on comments from the safety authority (ASN) and its technical support organisation (*Institut de radioprotection et de sûreté nucléaire* [IRSN]) when they reviewed the 2009 Safety Report; and ii) a critical review of the summary record in 2011-2012 performed by the CLI.

In the future, appraisals will be organised regularly. This monitoring process, which will be associated to the decennial revisions of the safety case, will aim at periodically testing and upgrading the so-called “passive memory” provisions of the CSM. This could build a kind of local ritual contributing to memory preservation. This process could be subject to validation reviews, outside of the decennial framework.

## **Constituting the detailed record of the Manche Surface Repository**

### **First phase of implementation of the solution: “Historical reconstruction”**

At the beginning of the operation phase of CSM, in the very first years, part of the waste was received without inventory. Knowledge on the waste content had thus to be built a posteriori. This was done through an investigation work and through modelling. Historical data were collected with operators of activities producing the waste, in the various nuclear workshops. Then, radioactive spectra of possible waste were inferred for each of these activities. Finally, waste inventory was reconstructed, residual uncertainties being covered by safety margins.

### **Second phase: Selection/incorporation**

The second phase of implementation of the solution dealt with identification of needs, through a risk approach, consistent with long-term safety analysis. This was followed by the selection of relevant information and knowledge necessary for addressing the needs, which was performed with the help of retired staff from Andra. Then collected information was hierarchised, according to a tree structure. Work was conducted to enhance legibility of information: a glossary was created, acronyms explained, a short abstract was written for each archive box. All the selected documents were printed on permanent paper.

Around 20 000 hours were spent in preparing the first set of the detailed record.

## **The international appraisal of the detailed record**

As mentioned above, in 2012, Andra organised an international appraisal of the detailed record. The appraisal process was prepared by internal exercises in January 2012 with former CSM workers and new Andra employees. It was based on a role-playing game simulating “future memory needs”. The scenarios placed the participants in a somewhat far future, in 2262, and they had access to records (the detailed record) related to the CSM site. Information available on the origin and nature of CSM varied according to the scenarios. Participants were asked to imagine that they were facing a green hill (the closed repository), and have to answer a set of questions. These questions were elaborated on the basis of the plausible evolution scenarios defined when the first set of detailed record had been constituted (1995-2000).

The questions had been established in connection with the safety assessment scenarios. They dealt with general understanding of the site and knowledge on the components of the repository, environmental pollution issues and intervention modalities above or inside the site.

The experts had access to a “numerical image” of the detailed record archives (more than 60 metres of archive boxes, several thousands of plans).

Experts had a few guiding tools to get through these thousands of pdf documents:

- The summary record, which in 2262 would have been distributed on a large scale (local, national and international).
- All the guides and search lists elaborated when constituting the successive complementary sets of the detailed record (2004, 2005 and 2010).

### **Lessons learnt**

During the appraisal, the summary record revealed its key role for getting into CSM history as well as into the detailed record, as it is self-supporting and understandable by all public. This appraisal highlighted the importance and quality of the work performed over more than 15 years on memory preservation, which was quite a surprise for some of the participants, and the relevancy of such simulation exercise.

However, some difficulties were also encountered, and issues were raised, for example:

- The detailed record proved difficult to access (structure and volume of documents); it was found that the summary record was the tool most often used for understanding the CSM and getting access into the set of documents.
- New needs were brought to light, for example the need for: i) upgrading the environment evolution scenarios, namely on the toxic chemicals aspect and for a better visualisation of the radioactive decay by steps of ten years; ii) adding societal documents and iconographic inputs.
- This type of exercise was considered very fruitful for upgrading the memory provisions.

### **Areas for improvement**

- Access to the detailed record: updating and merging the various search methodologies is recommended. This work should be based on the simple and instinctive logic of the summary record. This should lead to simplification and a better access to relevant information, providing in a single document the tools for guiding the search, according to various simple and instinctive logics: chronology, geography, context, etc. Concomitantly, work has to be performed to develop a new classification of the archives. First level documents will be emphasised.
- New documents: work will also be continued on checking the completeness of the archives, possibly leading to introducing records from external sources, and on assessing the relevance of the present selection of records. This will be performed, not only, in the framework of plausible events but also by considering the evolution of environmental protection issues, of societal expectations, or by anticipating events not considered during the initial safety assessment (where no existing archive is available). Work will also be devoted to introducing historical knowledge on the disposal process context.
- Ease of access for all types of audience access to the information provided in the detailed record should be made easier, by adding pictures for example. To help solving understanding difficulties of non-experts, providing knowledge frameworks on specific subjects with a high scientific content (e.g. plutonium) is also envisioned.
- For future appraisals, experts from other realms (ethnologists, sociologists, archivists, etc.) could join the panel.

## Current actions and projects

Based on the experience gained from the past, Andra continues its efforts related to memory preservation for the GSM. The main current actions are:

- Improvement of the detailed record: searching methodology, new structure, incorporation of new documents (societal context, press articles, etc.).
- Upgrading of the summary record.
- Periodical appraisals of the memory provisions.
- Perpetuation of the think tank on memory.
- Creation of three herbaria presenting plants growing at the repository. It will include a very short description of the repository (“ultra-summary record”), thus being the first marker of the repository. One of them will be kept at the repository; the others will be kept by scientific institutions together with historical herbaria.

## Reference

Boissier, F., P. Charton and G. Martin (2011), “The Long-Term Memory-Preservation Project of the French National Radioactive Waste Management Agency (Andra)”, Andra, Châtenay-Malabry, [www.andra.fr/international/download/andra-international-en/document/andra---long-term-memory-program.pdf](http://www.andra.fr/international/download/andra-international-en/document/andra---long-term-memory-program.pdf).