A fast-track approach through the design and permit phases for an ash landfill

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Working closely with the regulatory agency throughout the permit process, Champion's mill in Sartell was able to anticipate proposed regulatory changes, build credibility, shorten review times, and obtain its permit in six months.

Obtaining a permit for a solid waste landfill in today's regulatory climate tends to be a lengthy and tedious process. Time frames of 2-4 years or more for obtaining landfill permits have become the norm rather than the extreme. Also, local opposition in conjunction with heavy media attention, which tends to focus on the negative rather than the positive aspects of land disposal, frustrates even the most optimistic environmental manager.

For the Champion mill in Sartell, Minn., the prospect of a lengthy siting process with local opposition was unacceptable. The mill had plans for a possible expansion, with a landfill that was scheduled to close within a few years. A permit for long-term disposal capacity had to be obtained within seven months. Consequently, the company took steps to obtain the necessary permit within an extremely short time frame.

Industrial waste at the mill

Three types of individual waste are generated at the facility, as listed in **Table I**. The first is woodyard waste, composed of log washing grit, truck sweepings, bar screenings, and grit from the mill's on-site wastewater treatment plant. The second type, boiler ash, is the bottom ash left from the combustion of coal, bark, and primary and secondary sludge from the wastewater treatment plant. Scrubber cake is the third, and it results from the removal of particulates from boiler flue gases, which are thickened and filtered.

At the time the landfill permit was being prepared, the mill was being considered for possible expansion. Producing roughly 725 metric tons/day of coated and uncoated catalog and magazine paper, the manufacturing process generates 18,970 m^3/year of industrial solid waste. The expansion would have increased industrial waste generation by about 40%, which had to be considered in the site design.

To properly characterize the waste, the mill collected representative samples of boiler ash and scrubber cake and subjected them to the EP toxicity test[1] and the ASTM water leach test.[2] Woodyard waste was not characterized because it is nonhomogeneous, making it extremely difficult to collect a representative sample. The waste also has a relatively limited leaching potential. Results of the analyses are summarized in **Tables II and III.**

Neither of the two individual wastes would be classified as hazardous on the basis of EP toxicity criteria. The results of the ASTM water leach tests indicated that leachate from the waste would likely include parameters such as fluoride, selenium, manganese, total dissolved solids, and sulfate at measurable concentrations.

Mill objectives

To properly begin the permit process, the mill determined its objectives for the proposed facility. With these objectives in mind, the mill personnel focused on the major potential obstacles. The six objectives were:

- To provide 20 years of environmentally sound disposal capacity for the mill, accommodating possible increases in waste volume arising from the proposed expansion
- To minimize local opposition
- To site a facility within the Sartell city limits
- To have the capability of transporting leachate to either a municipal wastewater treatment plant or the mill's on-site wastewater treatment plant
- To meet both the letter and intent of the environmental regulations

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[1]EP Test No. 1, EPA, Washington, D.C., 1986.

[2]ASTM Test No. 1, Am. Soc. for Testing and Materials, ASTM, Philadelphia, Pa., 1983.

I. Summary of waste materials generated

Waste	Annual quantity, m^3/year	Percent of total
Woodyard waste	3,620	19.1
Boiler ash	11,570	61.0
Scrubber cake	3,780	19.9
	18,970	100

II. Summary of EP toxicity tests, mg/L

	Boiler ash	Scrubber cake	Hazardous waste limit
Arsenic	<0.001	0.007	5.0
Barium	1.0	<0.2	100.0
Cadmium	<0.01	0.06	1.0
Chromium, total	<0.05	<0.05	5.0
Lead	<0.1	<0.1	5.0
Mercury	<0.0002	<0.0002	0.2
Selenium	<0.001	0.024	1.0
Silver	<0.02	<0.02	5.0

III. Summary of ASTM water leaching test, mg/L

	Boiler ash	Scrubber cake
Arsenic	0.008	0.002
Barium	<0.2	<0.2
Cadmium	<0.01	<0.01
Chloride	5.3	6.4
Chromium, total	<0.05	<0.05
COD	54	<20
Copper	<0.02	<0.02
Cyanide	<0.02	<0.02
Fluoride	0.30	9.8
Iron	<0.03	<0.03
Lead	<0.005	<0.005
Manganese	<0.01	0.09
Mercury	<0.0002	<0.0002
Nickel	<0.04	<0.04
Nitrate-N	<0.10	0.54
Oil and grease	8	7
Phenols	<0.01	<0.01
Selenium	0.001	0.044
Silver	<0.02	<0.02
Total dissolved solids	88	2,380
Sulfate	50.0	1,730
Zinc	<0.01	<0.01
Boron	1.1	2.7
pH	9.9*	9.1*

*pH is reported in pH units.

- To obtain a permit within seven months after final site selection.

Of all the objectives, minimizing local opposition and obtaining a permit within seven months were the two that shaped the permitting activities.

Public communications plan

Previous attempts by the mill to obtain long-term disposal capacity were unsuccessful because of local opposition. The proposed site was located nearly 32 km from the plant in another community. Although the site was technically feasible, local efforts to stop the development of the site through restrictive zoning ultimately forced the mill to withdraw the permit application. Much of the local opposition was based on the NIMBY ("not in my backyard") syndrome. The lessons learned from the past siting effort convinced the mill of the need to develop an effective public communications plan and to site the facility as close to the mill as possible.

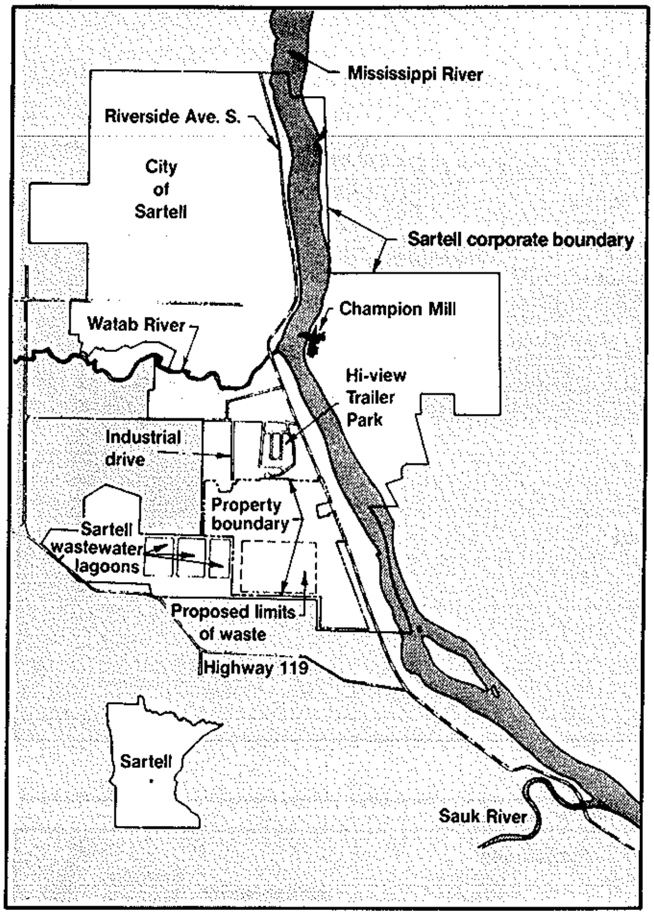
The public affairs manager, with the responsibility of developing a public communications plan, chose to take an active, positive approach toward communicating with the public. This approach underscored the need to anticipate what could happen, plan to prevent it, and know how to contend with the situation if it deteriorated. The plan focused on identifying the key figures of the public and the media and characterizing their position on the proposed facility. It was also important to identify the major issues as perceived by the mill and as perceived by the key public figures.

Once this was completed, the mill was ready to determine how and where the message would be communicated and who from the mill would be doing the communicating. The final element of the public communication plan included a program to monitor the effectiveness of the plan using public feedback. In this way, mid-course corrections to the plan could be made, depending on the situation.

One of the key features of the public communication plan included the formation of the Sartell Action Committee, a citizens' committee made up of members from business, government, and local residents of Sartell. The committee had a two-fold purpose: to communicate issues associated with siting the new landfill and to communicate issues associated with the potential mill expansion. The committee held several open public meetings and became an effective vehicle for dispelling local rumors and misconceptions, such as the misconception that all industrial waste is hazardous. In addition to the meetings held within the community, newsletters summarizing the meetings were prepared and distributed to the residents of Sartell.

Another important feature of the plan called for the public affairs manager to initiate contacts with area legislators and the governor. The officials were invited to the mill and given personalized presentations and tours of the operation. These informal presentations allowed plant personnel to communicate the mill's objectives to

1. Map of the site location



these public officials.

Finally, the mill conducted a public open house which allowed residents to tour the mill and discuss their concerns on an informal basis with plant personnel. To stimulate conversation with the public, mill staff prepared a number of displays and graphics illustrating the types of wastes generated by the facility and some of the concepts associated with the preliminary landfill design.

Regulatory issues

During the siting and permitting process, the Minnesota Pollution Control Agency (MPCA) was making major revisions to its solid waste regulations. The proposed revisions affected the design of the facility in two major areas. First, the state was considering design standards for solid waste facilities which had previously not existed. These proposed design standards included a liner system capable of achieving a high collection efficiency in conjunction with a multilayer final cover system.

The proposed groundwater protection standards developed by the MPCA presented an even more significant hurdle to overcome. In these proposed standards, compliance boundaries would be set up. The purpose of the protection standards was (a) to evaluate potential impact of the facility on groundwater and (b) to allow sufficient time for possible remedial actions if the monitoring determined this action necessary.

In addition, the mill personnel considered one of the primary objectives to be the development of credibility with the regulatory agency. This objective included not only establishing the technical credibility of the mill's consultant but also strict adherence to anticipated submittal schedules. For the mill to achieve the objective of a permit within seven months, the project schedule dictated that the MPCA review would have to be completed in one month. Mill personnel believed that they could not expect regulatory staff to provide a fast-track review of the permit application without adherence to deadlines for submitting information.

All these regulatory issues convinced the personnel to maintain regularly scheduled meetings with the MPCA to keep abreast of the status of proposed regulations. Also, it was important that senior staff from MPCA were involved at these meetings so that policy decisions could be made and shortened time frames for reviews could be achieved.

Site selection

Siting efforts were focused on an area within the city near the municipal wastewater lagoons. The city had expanded to the point at which these lagoons were not sufficient to effectively treat the wastewater. Plans were in the development stage for constructing an interceptor sewer to convey wastewater from the city to the St. Cloud Wastewater Treatment Plant.

The mill selected a site approximately 72 hectares in area immediately east of the treatment lagoons (**Fig. 1**). An area of 10 ha was required for waste disposal. The predominant land use in the vicinity of the site was agricultural, with some residential areas to the north and east of the site. The parcel was in a relatively flat plain between two gently rolling hills.

The major advantages of this site included:

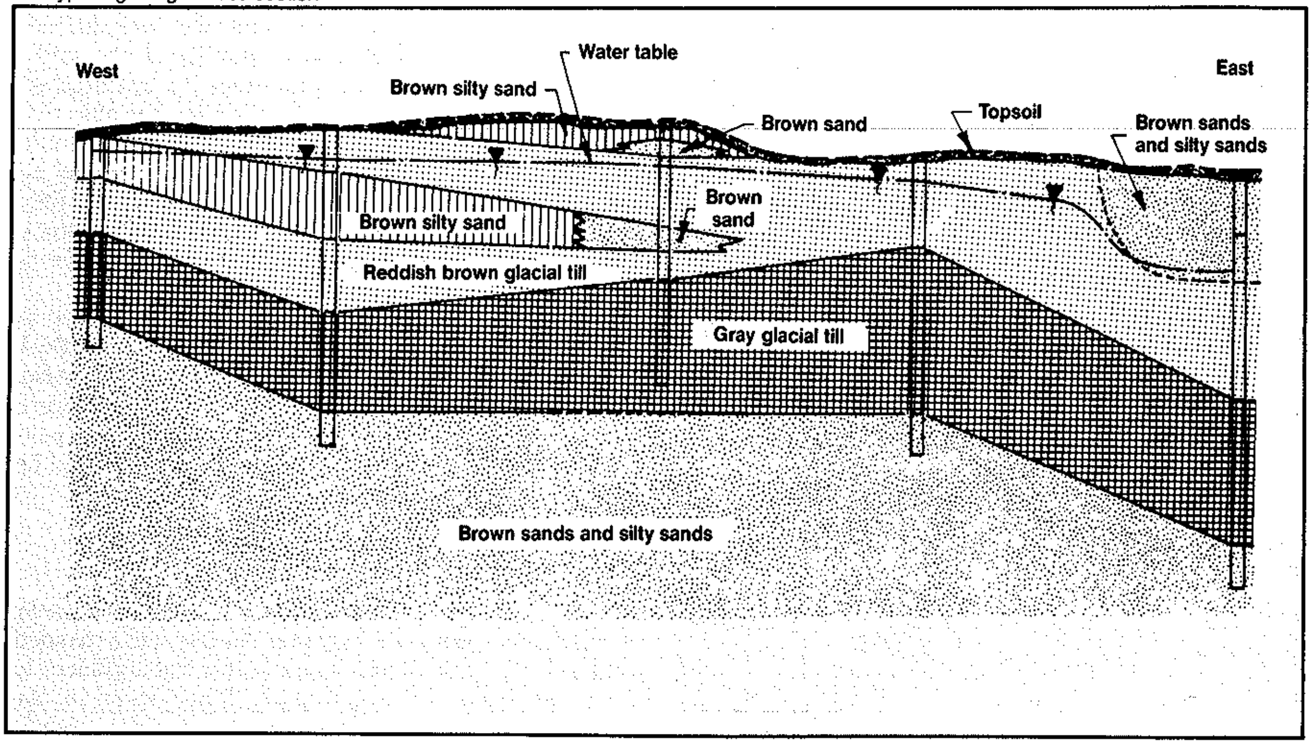
- The ability to tie into the proposed interceptor so that leachate could be conveyed to a municipal wastewater treatment plant
- The site location within a 2.4-km hauling distance from the mill, which minimized hauling costs
- The proximity of the site to the Sartell wastewater lagoons, viewed as a consistent land use
- The availability of city water to the residences along the river, meaning few down-gradient drinking water users or the availability of alternative water supplies
- The proximity of the site to the Mississippi River, which acts as a regional discharge for groundwater, which could minimize the impact on groundwater.

The only negative features associated with the proposed site included relatively poor surface water drainage and the visibility of the site from the north, east, and south. These problems could be overcome through proper engineering modifications.

Site hydrogeology

To characterize the hydrogeologic conditions at the site, a subsurface study was conducted, consisting of 22 soil borings, 19 groundwater monitoring wells, and a terrain conductivity survey. The unconsolidated deposits at the site

2. Typical geologic cross section



consisted of three major strata, as illustrated in **Fig. 2.**

The upper layer was made up of reddish brown glacial till with an average thickness of 7 m. In the upper layer were also some discontinuous sand "lenses" approximately 1 m thick.

The middle layer was composed of a dense, gray glacial till from 3 m to 11 m thick. This till acted as a confining layer between a shallow aquifer in the reddish brown glacial till and a deeper aquifer in the brown outwash sand.

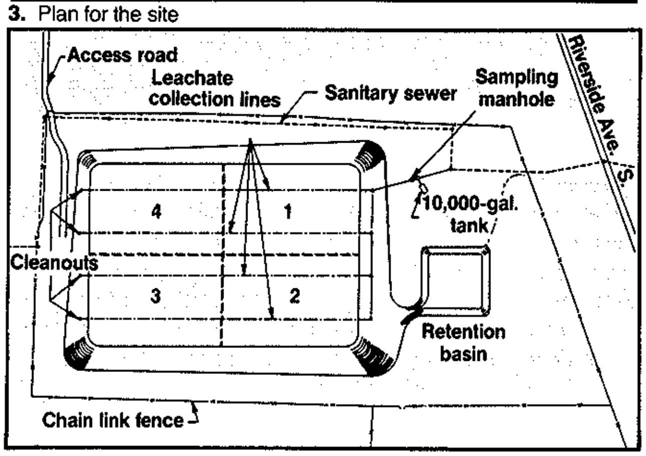
The bottom layer consisted of this brown outwash sand, with a minimum thickness of 9 m. This stratum served as the water supply aquifer in the area.

According to regional information, bedrock in the vicinity of the site was generally 30 m below the surface, and it consisted of a quartz diorite which was weathered at the surface. This weathered material was a blue-gray to white, clayey residual material which formed the base of the water supply aquifer.

Groundwater in the shallow aquifer flowed eastward toward the Mississippi River, with water levels fairly near the surface and hydraulic conductivities which averaged 7×10^{-5} cm/s. A deeper aquifer was separated from a shallow aquifer by the dense gray glacial till that exhibited a hydraulic conductivity of 2.3×10^{-7} cm/s. The flow in the deep aquifer was also eastward, with hydraulic gradients of 3×10^{-4} cm/s.

In the extreme eastern portions, the reddish brown till in the upper layer was absent, and the brown outwash sand was present as the uppermost deposit. A terrain conductivity survey was conducted to properly locate the contact between the glacial till and the outwash at the site.

3. Plan for the site

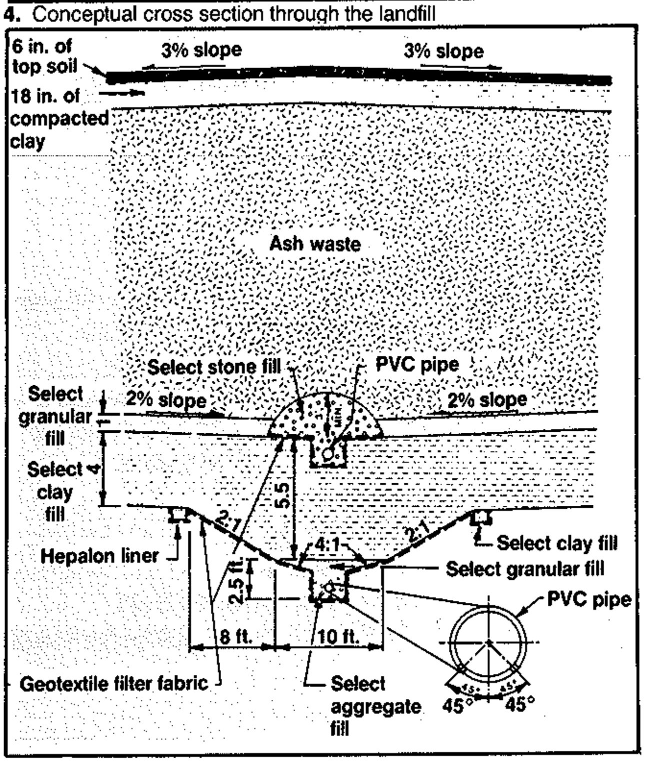


Site design

The hydrogeologic study in conjunction with waste characterization was the cornerstone for selecting a design strategy for the site. The dense glacial till layer between the two flow systems provided a natural barrier for protection of groundwater quality in the lower aquifer. Results of the waste characterization indicated that leachate from the waste materials would likely include a number of chemical constituents that are conservative in nature and not rapidly attenuated as they migrate through the subsurface.

The need to minimize the release of these conservative chemical constituents from the base of the landfill, along with the proposed groundwater protection standards which could be applied to the shallow aquifer, dictated the need for design of an efficient liner and leachate collection system. One of the benefits of the site was that the groundwater flow system was fairly well defined and relatively easy to monitor. The potential for significant

4. Conceptual cross section through the landfill



impact on the groundwater was limited.

Base grades

The site was designed to maintain a minimum 1.5-m separation between the bottom of the waste and the shallow groundwater surface. The site footprint was oriented to stay within the finer grained glacial till soils located in the central and western portions of the site (**Fig. 3**). Base grades were designed to provide a 2% slope toward leachate collection pipes and a 1/2% slope toward the leachate collection header.

Liner and leachate collection system

Design for the clay liner called for a 1.2-m-thick clay liner with a maximum permeability of 1×10^{-7} cm/s. An off-site area for borrowing clay would serve to supply construction material for the clay liner which would meet the design hydraulic conductivity. Above the clay liner was a 0.3-m-thick sand blanket having a minimum permeability of 5×10^{-3} cm/s and a porosity of 0.3. Leachate collection pipe design called for 15.2-cm-diameter, Schedule 80, perforated, polyvinylchloride (PVC) pipes spaced 61 m apart and sloped at 1/2%. The collection efficiency for this liner system was 90%.

The four leachate collection lines discharged into manholes connected to a main header which fed a sampling manhole. The sampling manhole was designed to facilitate the collection of 24-h flow proportional composite samples of the leachate. Leachate from the sampling manhole could be discharged either to a 37,900-L storage tank or to a 25.4-cm-diameter sanitary sewer line that would ultimately convey the leachate to the St. Cloud Wastewater Treatment Plant. The leachate storage tank would give the mill the capability of transporting the leachate to its own on-site wastewater treatment plant if a suitable leachate treatment agreement could not be reached with the City of St. Cloud.

The company also decided to construct a trench lysimeter under a portion of the liner to assist in evaluating liner performance (**Fig. 4**). The lysimeter consisted of a trench (4.9 m wide and 21.4 m long) beneath a portion of the base of the clay liner lined with a 36-mil Hypalon® membrane liner. A 15.2-cm-diameter, Schedule 80, slotted PVC pipe was placed above the liner, and the trench was backfilled with granular material. This lysimeter was not required by the regulatory agency, but company personnel believed its installation and the evaluation of the clay liner performance would greatly enhance subsequent efforts to obtain permit renewals from the MPCA.

Final cover

The final cover design for the facility included 46 cm of clay soil with 15 cm of topsoil to establish vegetative cover. Final slopes on the facility were a minimum of 2% on top with maximum side slopes of 25%.

Surface water management

Because the site itself and the highway to the east had relatively poor surface water drainage, a storm water retention basin was designed to minimize run-off from the facility. The size of the basin was determined by providing for a storage volume equal to the 100-year, 24-h runoff event for the facility at final closure. Though conservative, this storm water management was considered prudent for minimizing the impact downstream from the facility.

Site operations

The operation of the new facility was anticipated to be relatively straightforward and similar to the disposal facility already in operation. The site was to be constructed in four phases to minimize the surface area exposed to infiltration. Because of the predominantly inorganic nature of the waste materials, daily cover was not required for the facility. However, periodic cover was to be made available if fugitive dust became a problem.

Site operations simply called for grading and compacting the waste at a frequency of once per week. Past experience indicated that the material could be moved easily even during periods of wet weather. To screen the facility, evergreen trees were to be planted, and perimeter berms were to be constructed.

The permit

The final permit application for the facility was submitted to the MPCA on Oct. 12, 1984. In accordance with the fast-track review schedule, the agency completed its review and prepared a draft permit on Oct. 25, 1984. The final permit was granted on Nov. 29, 1984, following the public comment period.

This date was roughly six months after the final selection of the site for the facility. During the public comment period, not one adverse public comment was received by the MPCA. In fact, the only comment received on the draft permit was a comment provided by the mill. Local zoning approval for the site was also obtained in December 1984 from the City of Sartell.

Summary

The plan proved effective, and a number of key aspects were instrumental in achieving each of the mill's solid waste objectives. First, the mill adhered strictly to a well-planned, well-timed, active public communications plan.

Second, the work associated with the permit application was based on doing a sound technical job in all facets of study and design.

Third, the company personnel maintained close contact and coordination with the regulatory agency throughout the permit process, which assisted in building credibility and shortening the time frames for review. The company properly anticipated the proposed regulatory changes and incorporated those changes into the design throughout the course of the permit process. Furthermore, the MPCA demonstrated an honest willingness to work with the company in achieving the mill's objectives.

Fourth, the nature of the waste materials generated by the mill were primarily dry ash materials as opposed to organic sludges. Consequently, the design and operation of the proposed facility was relatively straightforward, and it received a somewhat more positive reaction from the public.

Finally, both mill staff and management demonstrated a strong commitment to the success of the project.

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