Central

JUN 2 1 1989

MEMORANDUM FOR: John J. Surmeier, Chief
Technical Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

FROM: R. John Starmer, Section Leader
Technical Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

SUBJECT: TRANSMITTAL OF TRIP REPORT, MADRID AND CORDOBA, SPAIN MAY 1 - 15, 1989

Attached is a report on my trip to Spain in early May. I went to Madrid to provide technical support to the Consejo de Seguridad Nuclear (CSN) staff in licensing a low-level waste disposal facility to be located in southern Spain. The support was provided under a cooperative agreement between the NRC and the CSN. The objective of the visit was to provide the CSN staff with information about NRC regulations, licensing documents, and procedures; and, to observe and comment on the licensing process underway at the CSN. In addition I visited the proposed site which is about 60 kilometers northwest of Cordoba.

Since my return, CSN staff have visited the NRC to participate in the Cement Workshop held in Gaithersburg and to discuss engineered barriers. I expect more interactions may be worthwhile, particularly in the area of performance assessment.

Original Signed By

R. John Starmer, Section Leader
Technical Branch
Division of Low-Level Waste Management
and Decommissioning, NMSS

Enclosure: As stated

cc: R. Bernero, NMSS
J. Greeves, LLWM
R. Hauber, GPA/IP
S. Schuyler, GPA/IP
J. Diaz, CSN
M.C. Ruiz, CSN

1/1

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ACNW Yes:/ V / No:/ /

SUBJECT ABSTRACT:

OFC	:LLTB RJS	:LLTB	:LLTB	:LLWM
NAME	:RJStarmer/lj	:		
DATE	:6/21/89	: / /89	: / /89	: / /89

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ENCLOSURE - TRIP REPORT,
MADRID AND CORDOBA SPAIN

TRIP REPORT

Madrid and Cordoba, Spain
Licensing Consulation with CSN on El Cabril
Low-Level Radioactive Waste Disposal Facility
May 1 - 15, 1989

R. John Starmer, PhD.

TRIP REPORT ABSTRACT 1989
DATE OF REPORT
6/20/89

OFFICIAL TRAVELER:
R. John Starmer

TRAVEL TO:
Madrid, Spain
Cordoba, Spain
BEGINNING ON:
5/1/89
UNTIL:
5/15/89

OFFICE: NMSS
Division: Low-Level Waste Management and Decommissioning
Branch: Technical Branch
Section Leader

MEETING TITLE AND/OR AFFILIATION:
Provide Technical Support in Licensing of Low-Level Waste Disposal Facility - Consejo de Seguridad Nuclear (Nuclear Safety Council) Spain

ORGANIZED BY: Consejo de Seguridad Nuclear and NRC/GPA

ABSTRACT:

I went to Madrid to provide technical support to the Consejo de Seguridad Nuclear (CSN) staff in licensing a low-level waste disposal facility to be located in southern Spain. The support was provided under a cooperative agreement between the NRC and the CSN dated September 28, 1984. The objective of the visit was to provide the CSN staff with information about NRC regulations, licensing documents and procedures and to observe and comment on the licensing process underway at the CSN. I also visited the proposed site which is about 60 kilometers northwest of Cordoba.

The proposed site is located in an arid, mountainous and remote area of southern Spain. The fractured nature of the underlying rock and the proximity to a major earthquake producing fault concerns the CSN staff. The proposed design is similar to designs seen in States which require engineered barriers. The original design was similar to the monolithic lower portion of the French disposal facility at La Manche but that had been modified to provide a measure of retrievablility using modular waste containers. Another interesting aspect of the design was the emphasis placed on a complex drainage system as a barrier to migration. CSN staff are concerned with the claimed durability of concrete, the lack of ability to monitor the concrete barriers to verify their condition and the optimistic predictions of performance submitted by the applicant. Differences in the approach of the Spanish to low-level waste disposal regulation that deserve mention are lack of specific regulations for disposal of low-level waste apparent acceptance of long term active maintenance, for a period of 300 years, and a decision made while I was there to store waste at the site in the proposed disposal containers for at least 40 years before making a decison on disposal at the site.

On Monday May 1, 1989 I traveled to Madrid, Spain to provide technical assistance to the Spanish Consejo de Seguridad Nuclear (CSN) in licensing a low-level radioactive waste disposal site at El Cabril in southern Spain. The rest of that week was spent in general orientation by the licensee, Empresa Nacional de Residuos Radiactivos, S. A. (ENRESA), an introduction by me concerning low-level radioactive waste disposal practices and regulation in the United States, and detailed discussion with ENRESA and CSN staff concerning characteristics of the El Cabril site. ENRESA, which is a government owned company charged with disposal of radioactive waste, provided details of site characterization studies and results while CSN provided a synopsis of its concerns with the site at a separate session.

Spain has no regulations governing low-level waste disposal but the goals in siting are generally the same as those in 10 CFR Part 61; to ensure long term stability, to provide some degree of isolation, and to allow long term predictability of performance. The CSN staff is most concerned with tectonic or seismic stability and predictability of site behavior in limiting release to the groundwater pathway. The concerns appeared to arise because of of incomplete information and analyses provided by ENRESA. However, there also seemed to be areas where there was serious disagreement on the meaning and importance of data and analyses presented by the company.

On Sunday May 7th I traveled to Cordoba in southern Spain and participated in a site visit on Monday with CSN and ENRESA staff. The El Cabril site, located about 60 kilometes northwest of Cordoba, is large, mountainous, remote and arid (Enclosure 1). The buildings at the site today were formerly a mining camp serving several nearby uranium mines. Currently there are three low-level waste storage buildings on site which contain waste originally stored in the old mines. The fact that the site was used for mining uranium and has had low-level waste stored there for many years apparently has lead to the decision to develop a low-level waste disposal facility at El Cabril rather than to follow a more usual technical based siting procedure.

The facility is to be located on the crest of a long ridge which extends Northeast from the mine workers camp. The disposal facility site is flanked to the northwest by a high quartzite ridge which is considered to control the regional hydrology, is underlain by the faulted and fractured gneisses of the El Cabril formation and looks down on the valley of the Montesina considered the major pathway to the public. The fractured nature of the underlying rock was revealed in several exploratory trenches. It also was obvious why as much a 40 meters is to be excavated from the top of the ridge to make room for the disposal cells, the ridge is very narrow in it's current state. The site visit was very useful in later discussions of siting, design and safety assessment.

Discussion during the next three days concentrated on engineering design aspects of the proposed disposal facility (Enclosure 2),

monitoring, and safety assessment. The format was similar to the siting discussions of the preceding week with presentations by ENRESA followed by private discussions with CSN staff. There was some confusion on my part because the design is in a state of flux. The design that I had reviewed, the original design, was similar to the monolithic concrete bunker of the French Center de la Manche (EMCB) design, but located above ground and then covered by an infiltration-limiting cover. Due to concerns of the Consejo members that there was no way to remove the waste from the monolithic concrete "cubeto," the ENRESA staff had developed a design based on modular concrete blocks (2 x 2 x 2 meters) of about 25 tons gross weight to be piled into a mass of the same dimensions as the origianal cubeto. The scale distinction was not clear in the presentation materials leading to some interesting discussion until we realized the problem and defined a new disposal unit, the "cubetito" or small cubeto. Another interesting design feature is a complex drainage system for collection, monitoring and, if necessary, treatment of any infiltrate. This system is designed to be operable for a 300 year observation period. NRC regulations do not allow credit for such a long period periods of observation or maintenance, and some discussion followed concerning the role that ENRESA expected to have over the long term. It was not clear what ENRESA planned for the period from closure after about 40 years of operation until the free use period begins after about 300 years.

The rest of the design is not unusual, but they plan on long term surveilance and on leachate collection and treatment. The idea of stabilizing the slopes of the final covers with vegitation seems somewhat optimistic given the arid climate and the sparse native vegitation, particularly where the ground has been disturbed. Otherwise, the design and proposed operation is similar to designs that have been proposed by developers in the United States, particularly developers trying to meet stringent State regulations.

Further discussion centered around the analysis of the performance of the facility. The applicant provided information on inventory which was not altogether clear although based on information in NUREG/CR-1759. ENRESA staff had manipulated the information in that document to provide estimates of Spanish waste production needing disposal. It was not clear that this gave a good estimate of inventory for use in performance assessment for the El Cabril facility. There was some discussion of estimates of concrete durability when used as a construction material for waste disposal structures. ENRESA provided CSN and me with the French study on which the estimates were based late in the second week of my visit. The French appeared to have considered the mechanisms for degradation considered important by the authors of the BARRIER code used to predict behavior of the concrete barriers for the below ground vault PLASAR. CSN staff had not seen this document before and discussion was therefore limited.

CSN staff had required a sensitivity analysis of the critical parameters of the pathways assessment. In performing the analyses

ENRESA staff had apparently not held all but one variable constant and there was some discussion of the practice of sensitivity analysis in general. Finally, ENRESA staff had analysed a release to surface water as the base case (and only case) for estimating exposure of the public. The pathway chosen was long and circuitous and ignored other possible pathways considering them unrealistic and unlikely. At any rate, given the low rainfall, the encapsulation of the waste and other design feature for limiting infiltration, the small predicted doses are probably reasonable and would not likely be much greater for other pathways. It appears that there is a need to demonstrate those low doses with more extensive analyses before CSN staff can accept the optimistic estimates of site performance provided by ENRESA.

My discussions with CSN staff were focused on concrete stability, monitoring and performance of engineered barriers. Much of the concern results from a strong perception that the El Cabril site does not add much to the ability of the proposed disposal facility to contain waste and control any potential migration off site. Again, some of the data and analyses needed for CSN staff to understand and accept the validity of ENRESA assertions of safety was not yet available to CSN staff. For example, information on the details of the calculations, data, and assumptions used by ENRESA to predict the life expectancy of concrete structures had not been provided to the CSN. In addition, the designs of some features, necessary to support estimates of performance, have not yet been developed by ENRESA staff. Information on the performance of the cover is necessary to predict water infiltration into the disposal units used for safety assessments. As is the case with us, CSN staff found design objectives unacceptable bases for predictions of performance and need detailed design information in order to make a licensing decision. They would of course like to have test results to back up the predictions based on design considerations.

On Friday morning, I presented and discussed my observations on the meetings of the preceding two weeks. I formatted my presentation in terms of general observations and more specific technical observations. An edited version of my presentation materials is attached (Enclosures 3 & 4). It should be noted that, while we discussed the requirements of 10 CFR Part 61 and other NRC regulations, in no case did we attempt to make findings against those regulations. We did discuss the basis for the NRC regulations and how they might be applied to the case of El Cabril, noting at the same time basic policy differences such as plans for a long term licensee presence on the order of 300 years, recoverability, and reliance on leachate collection for long periods. The Consejo's decision to license storage of the cubetitos for 40 years and to delay a disposal decision until that time makes direct comparison to 10 CFR Part 61, a disposal regulation which assumes prompt disposal in addition to minimum maintance and long term stability, more difficult.

Recognizing the lack of regualtions and the political realities of

the situation, I suggested that CSN could speed up the process of license application review and meet the tight time schedule under which they are working by developing a set of issues which, when resolved, would allow issuance of a license. The issue identification would need to define the issue clearly and include the importance of the problem to health and safety, define the information and analyses required of ENRESA by CSN staff, and provide some indication of what CSN staff would find necessary and sufficient for resolution of the problem.

During our discussions it became clear that little thought had been given by CSN or ENRESA to quality control for disposal facility development, operation and closure. CSN staff was referred to NUREG-1293, "Quality Assurance Guidance for Low-Level Radioactive Waste Disposal Facility" which had been made available to them earlier. Observations of borehole placement in the field at El Cabril indicated the importance of a quality assurance program for site characterization activities. Engineered barriers are assumed critical to facility performance by both ENRESA and CSN relative to site characteristics. It appears that quality assurance may be the only way CSN staff can have confidence in the ability of such features to operate in a satisfactory manner to isolate waste for at least 300 years as claimed by ENRESA.

During a meeting with two members of the Consejo, Luis Echavarri and Rafael Caro, it was made clear that there was concern with the site and that the license would be issued for storage with the intent to dispose of the waste in place at a later date when all characteristics of the site had been satisfactorily resolved. To that end the Consejo would require a demonstration of recoverability and would not allow the placement of an earthen cover over the disposal (storage) units for 40 years. This decision had been reached only the day before and was not widely known inside or outside of the CSN. Certainly this will add some complexity to the analyses to show the durability of the concrete structures and to show that the disposal sub-units, "cubetitos," can be recovered if necessary; but, the ENRESA design should be demonstrably robust to these requirements.

Overall, I believe that my assignment to the CSN was a useful exercise, both by giving the Spanish insight into the business of low-level waste disposal and regulation in the United States and by allowing me to work in an active licensing environment. Several areas were obvious candidates for further cooperative work, particularly in the area of engineered barriers, waste form qualification and performance assessment. In the area of performance assessment, a CSN staff member could benefit from a longer term assignment to learn the philosophy, theory, and practice of low-level waste disposal facility performance assessment at the NRC. Shorter visits have been arranged in the areas of cement waste form and general engineered barrier topics. The Spanish will have to come to grips with high level waste disposal and are planning for a deep geologic repository. They also are in the process of stabilizing a mill tailings pile in

southern Spain. Both these areas are active programs at NRC and the CSN staff might learn from our experiences.

TRIP REPORT - ENCLOSURE 1

Location Map of El Cabril LLW Disposal Site

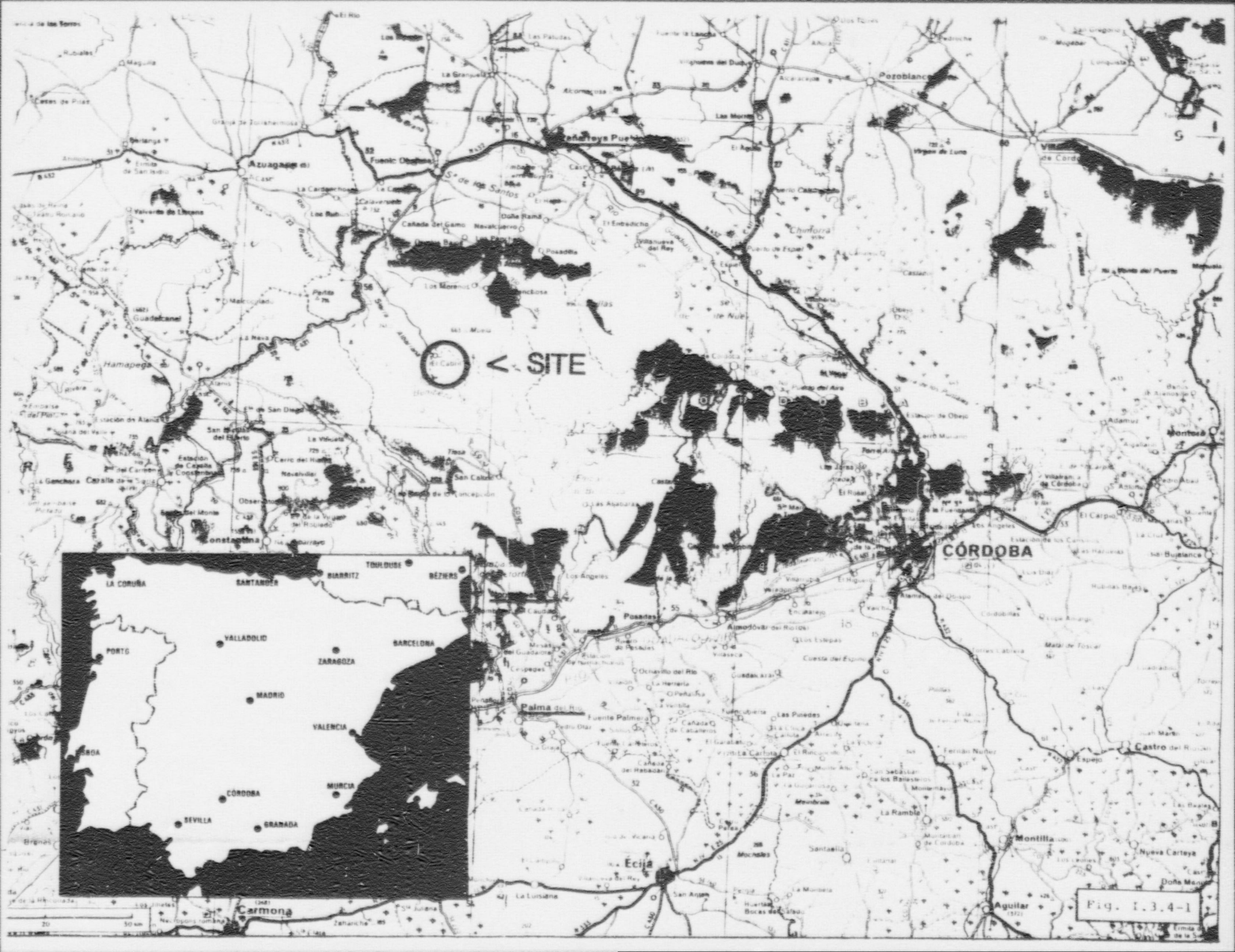
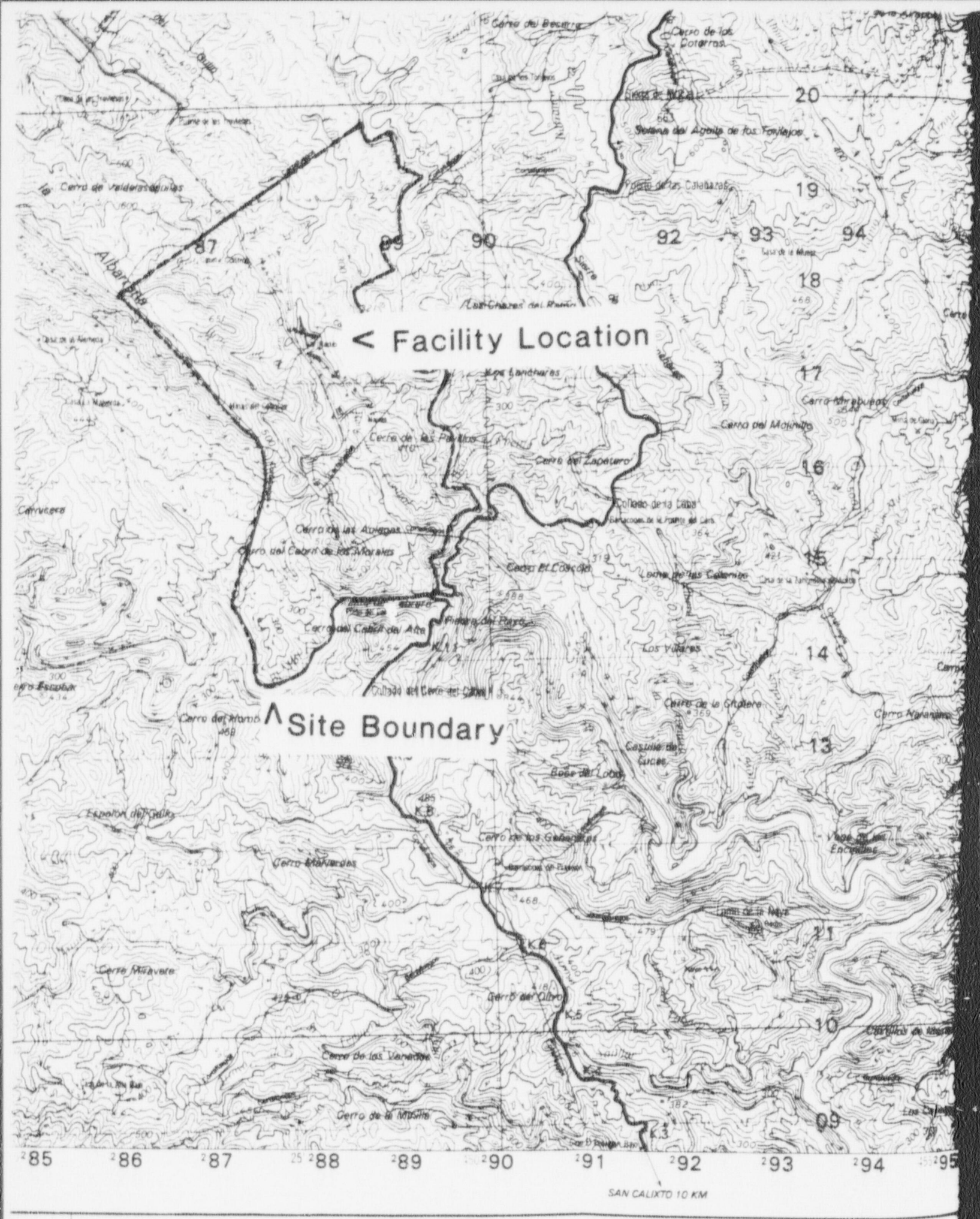

SITE
CÓRDOBA
Pozoblanco
Azuaga
Fuente Obejuna
Peñarroya Pueblonuevo
Hornachuelos
Posadas
Palma del Río
Ecija
Carmona
Montilla
Aguilar
Castro del Río
Nueva Carteya
Constantina
Guadalcanal
Almodóvar del Río
Montoro
Adamuz
LA CORUÑA
SANTANDER
BIARRITZ
TOULOUSE
BÉZIERS
PORTO
VALLADOLID
ZARAGOZA
BARCELONA
MADRID
VALENCIA
MURCIA
CÓRDOBA
SEVILLA
GRANADA

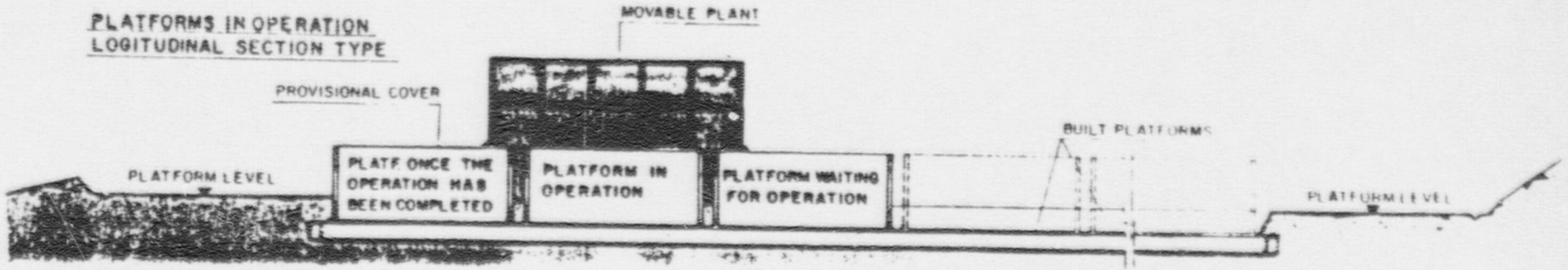
Fig. I.3.4-1


< Facility Location
^Site Boundary
SAN CALIXTO 10 KM
meters
1.000 500 0 1.000 2.000 3.000 4.000
Escala 1:50.000
Camino. Camino carretero
Camino de herradura. senda
electrificado

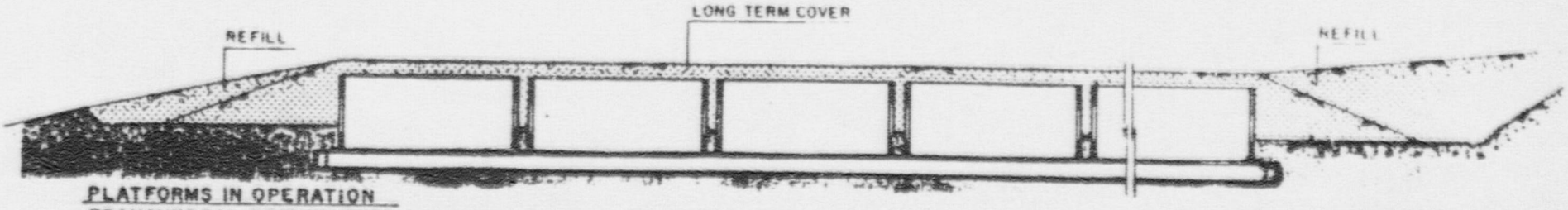
TRIP REPORT - ENCLOSURE 2

Drawings of El Cabril Disposal Facility

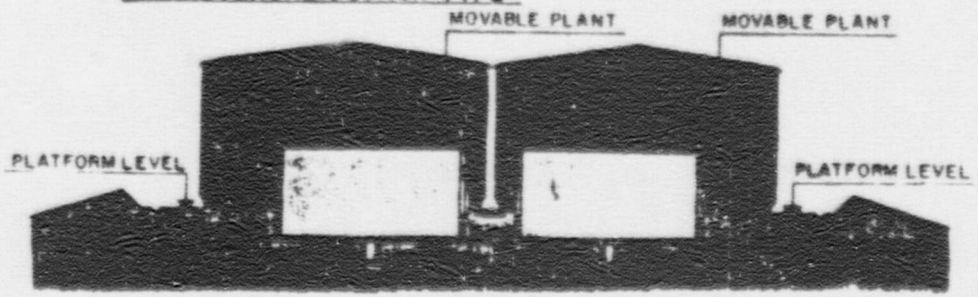
PLATFORMS IN OPERATION
LOGITUDINAL SECTION TYPE



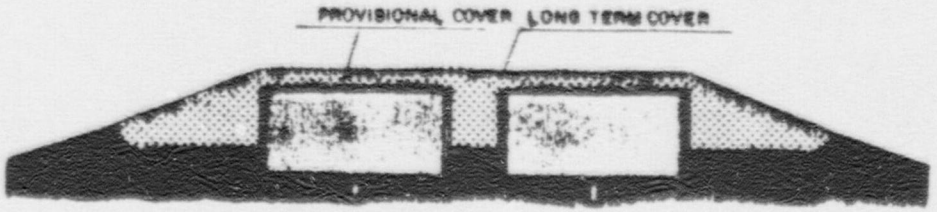
PLATFORMS WITH LONG TERM COVER
LONGITUDINAL SECTION TYPE



PLATFORMS IN OPERATION
TRANSVERSAL SECTION TYPE



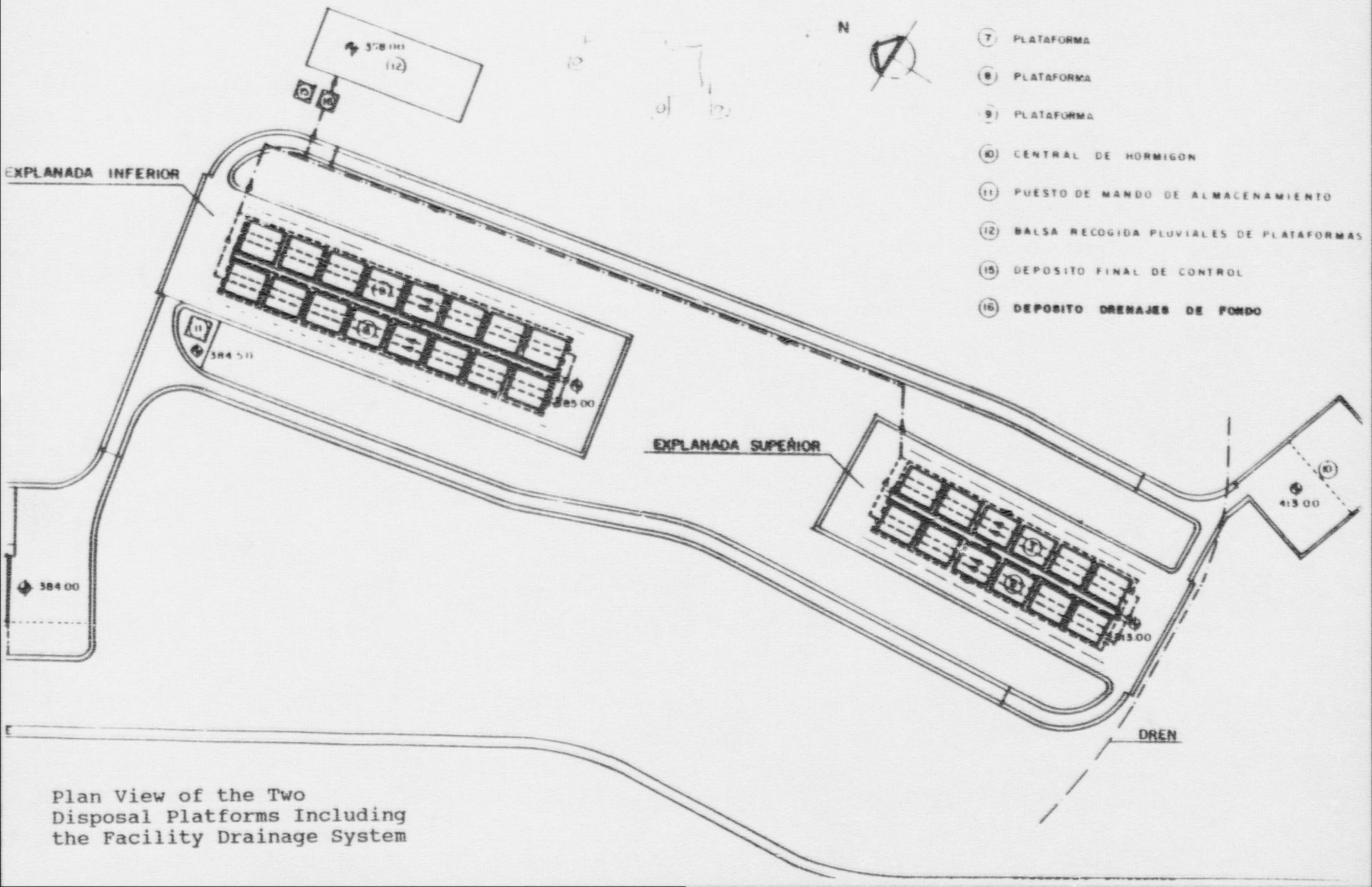
PLATFORMS WITH LONG TERM COVEN
TRANSVERSAL SECTION TYPE



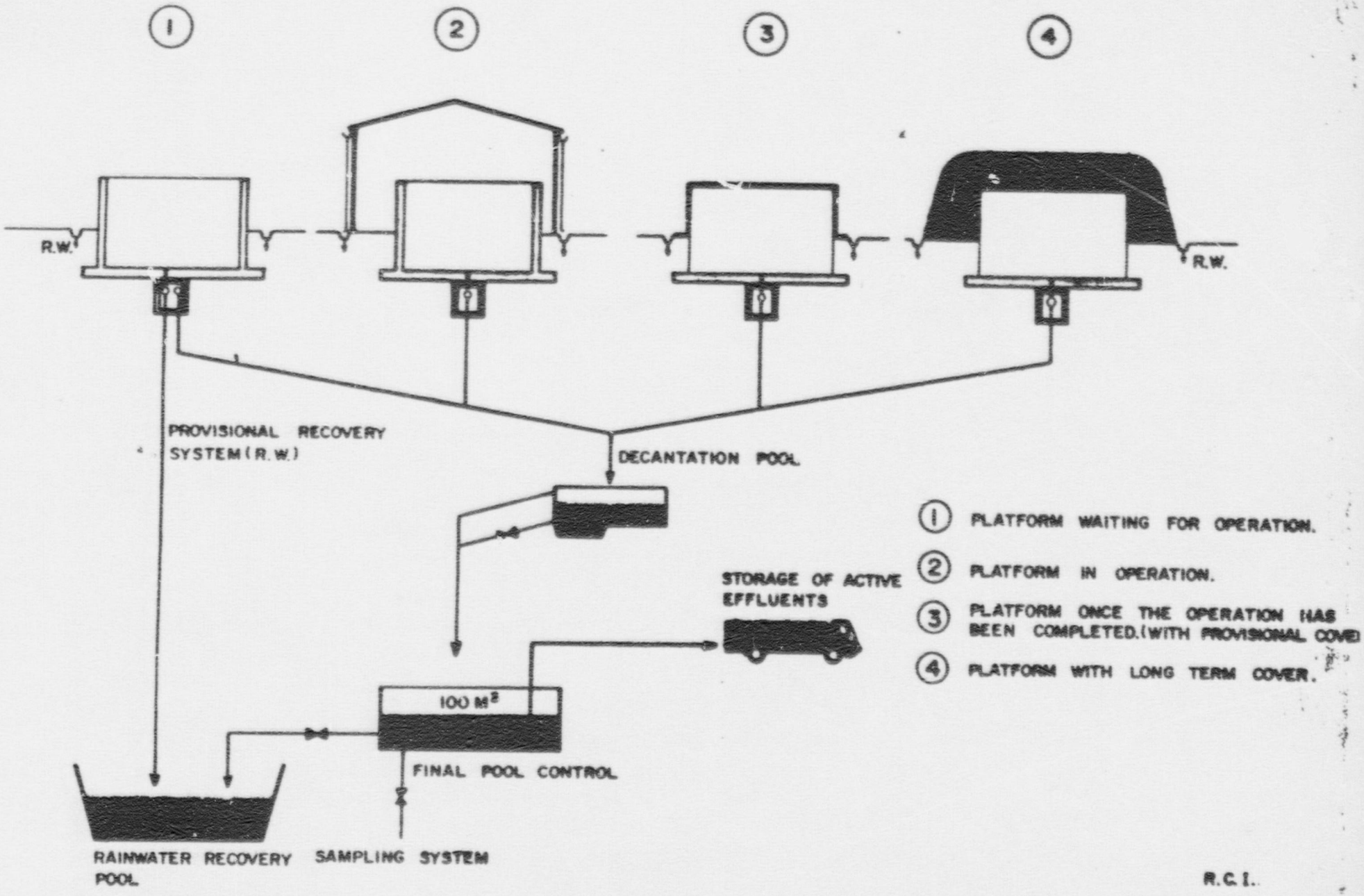
PLATFORMS ARRANGEMENT

- SECTIONS -

Disposal Platform Sections



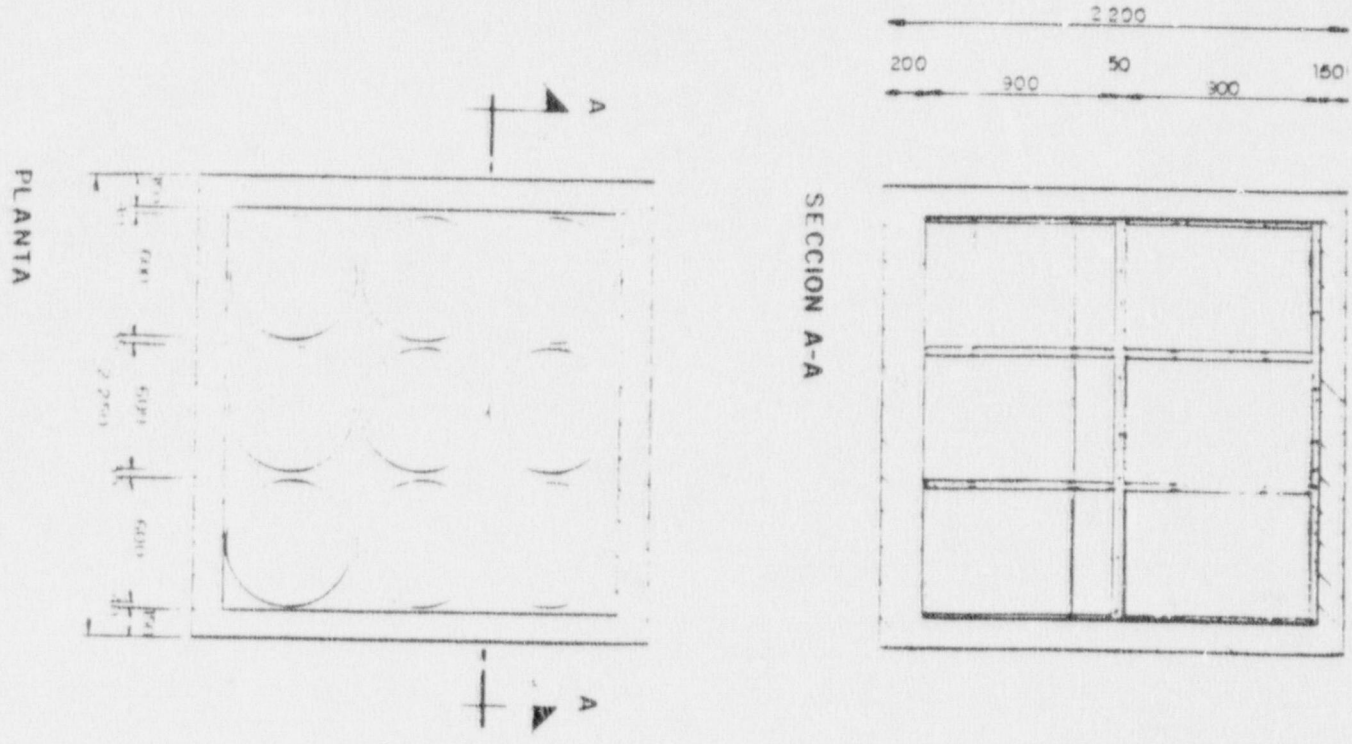
Plan View of the Two
Disposal Platforms Including
the Facility Drainage System

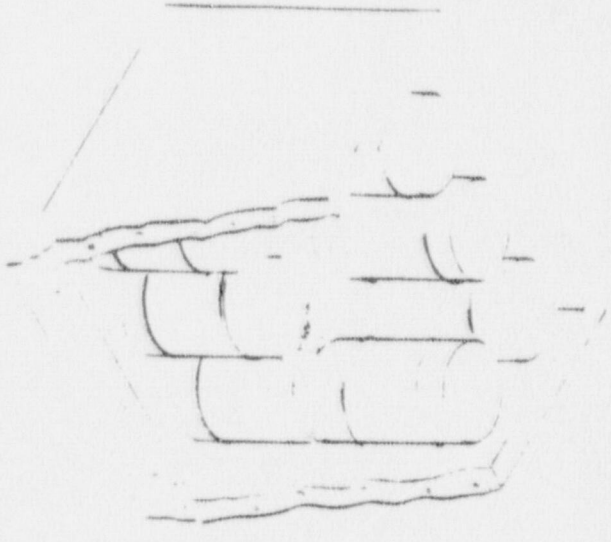


R.C.I.

Leachate Collection System

CONTENEDOR CUBICO



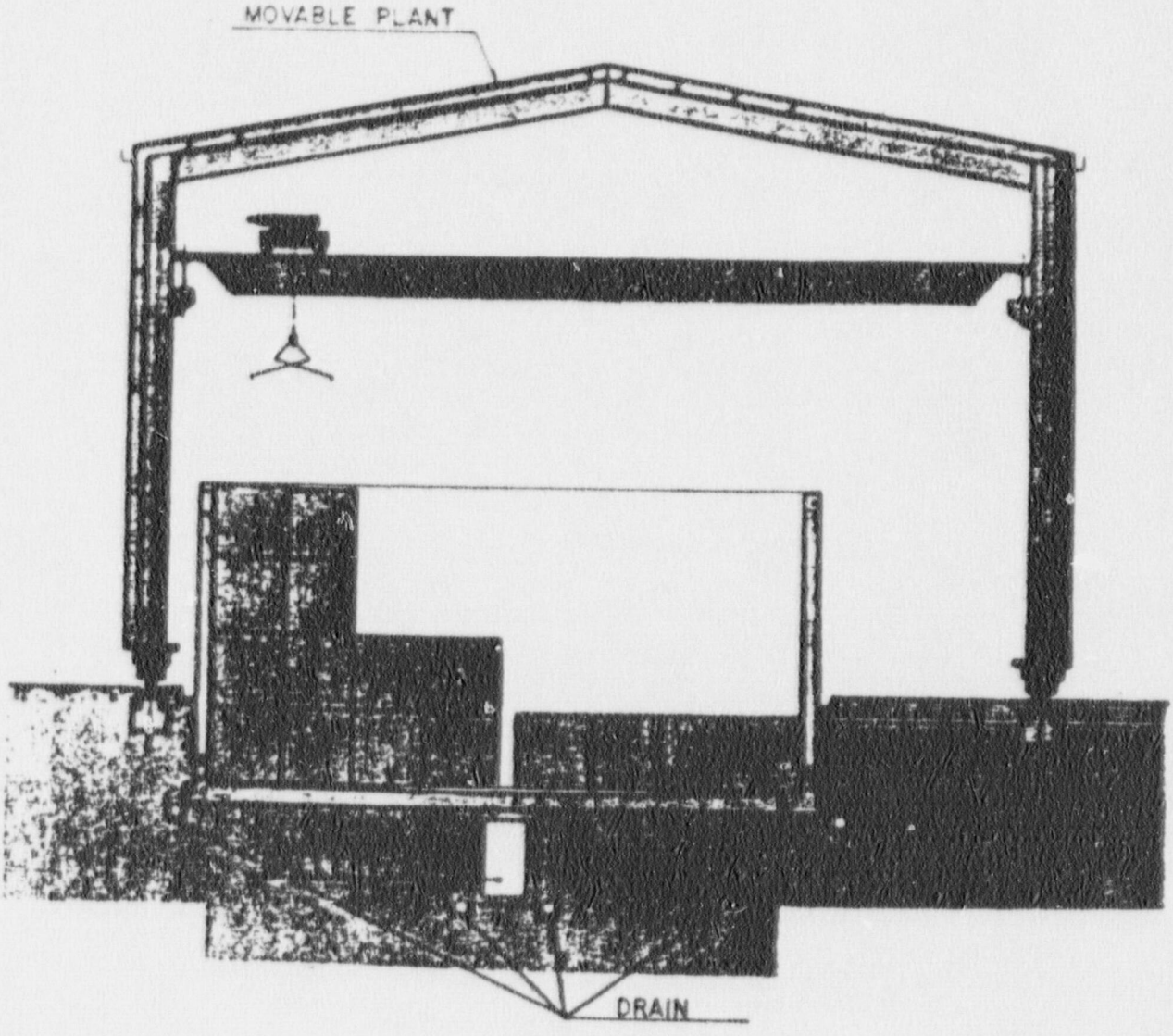


Cubetitos (Best Available Diagram)

Fig - 3

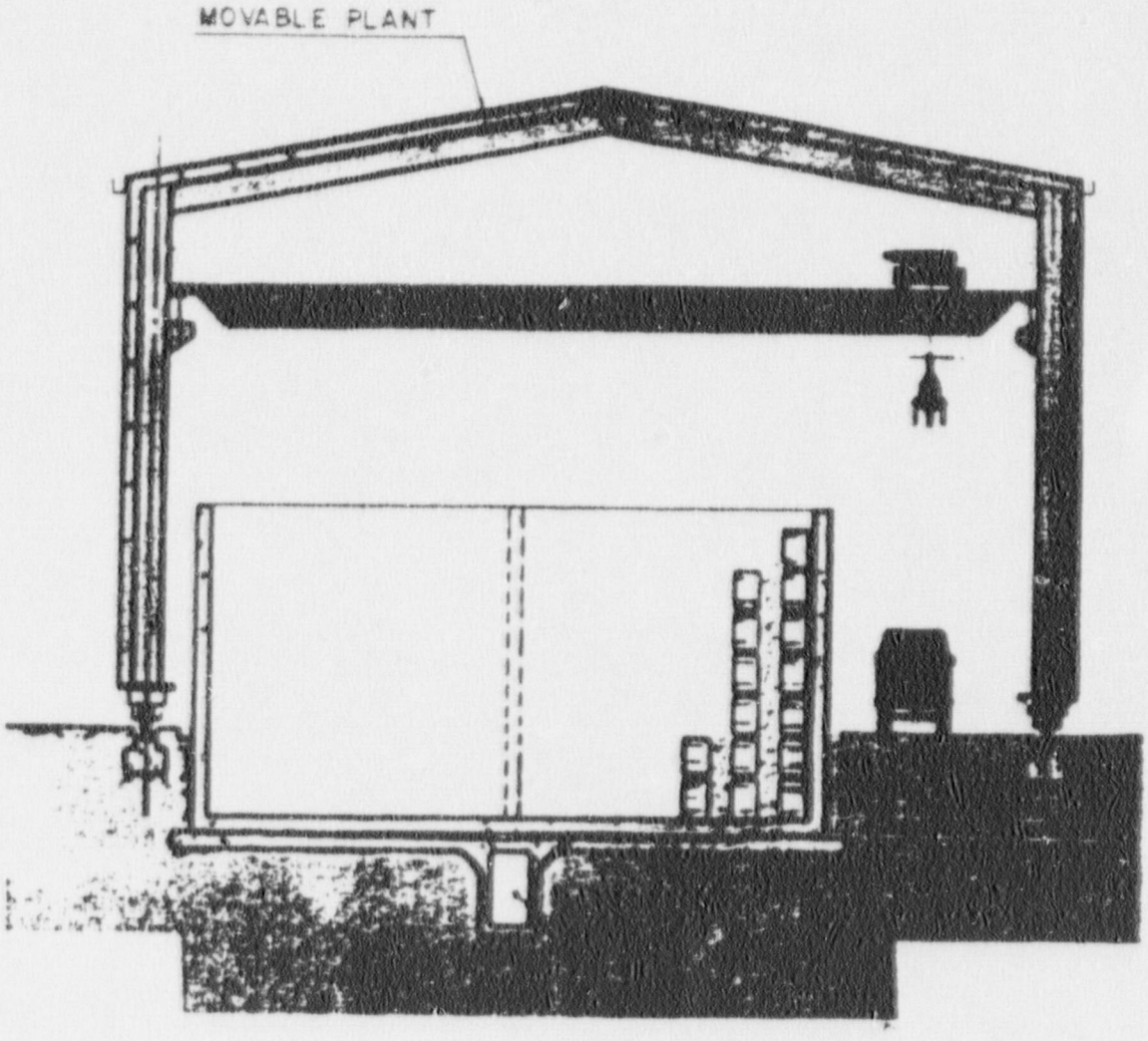
PLATFORM

Cubetito Disposal Unit - Operational Phase



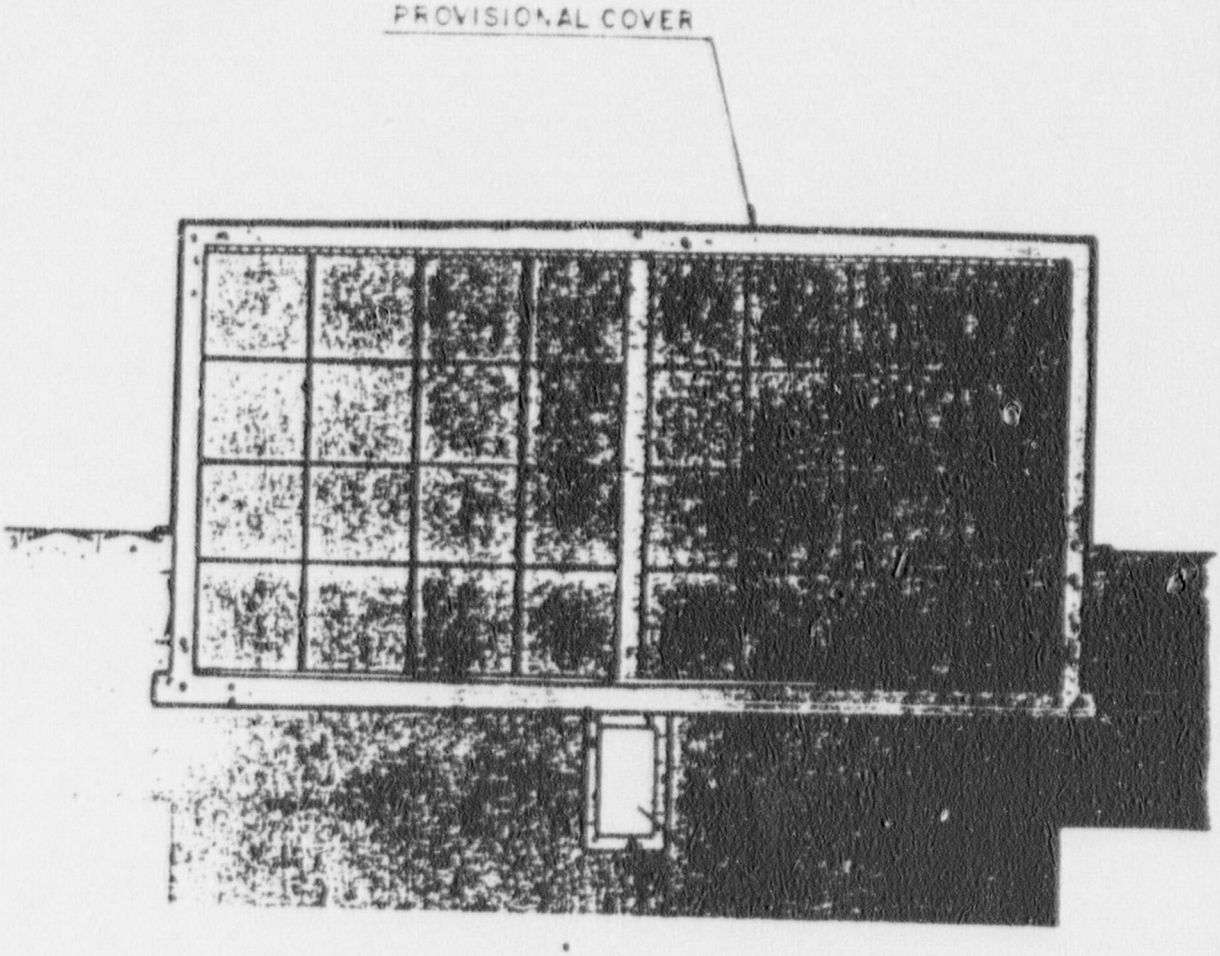
SIMPLE MONOLITH

Monolith Disposal Unit - Operational Phase



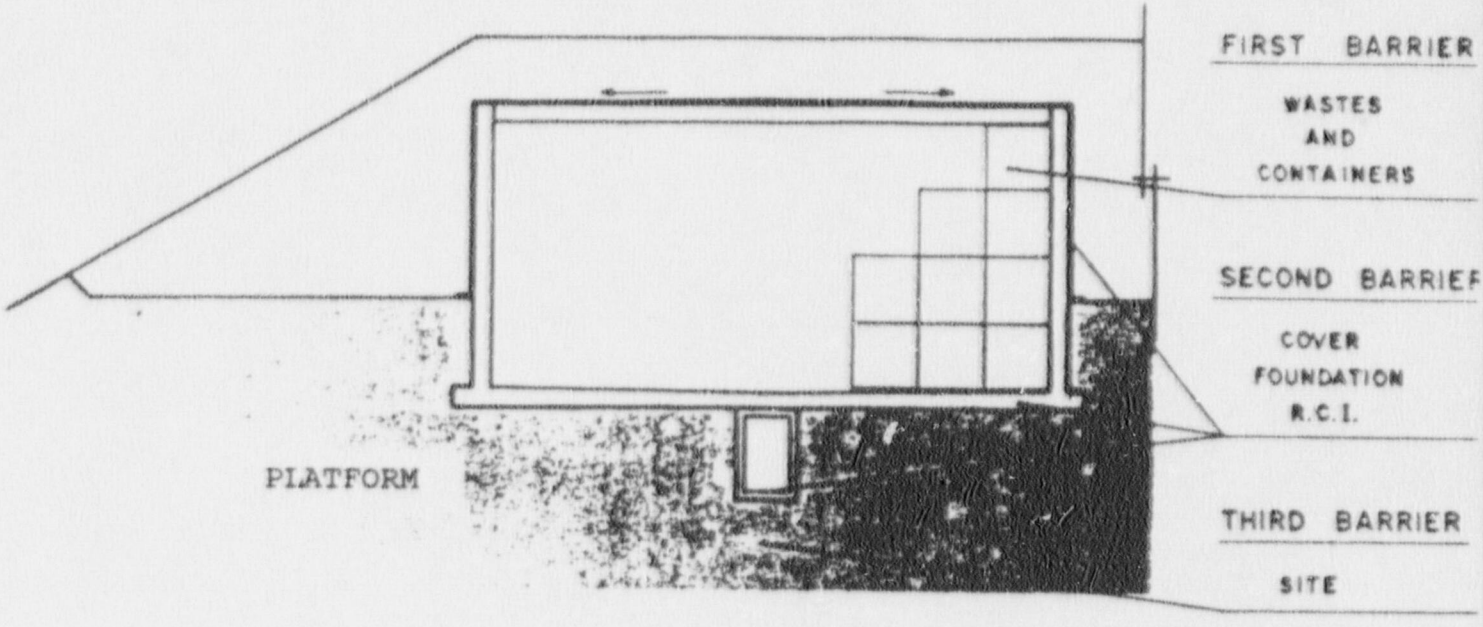
PLATFORM WITH PROVISIONAL COVER

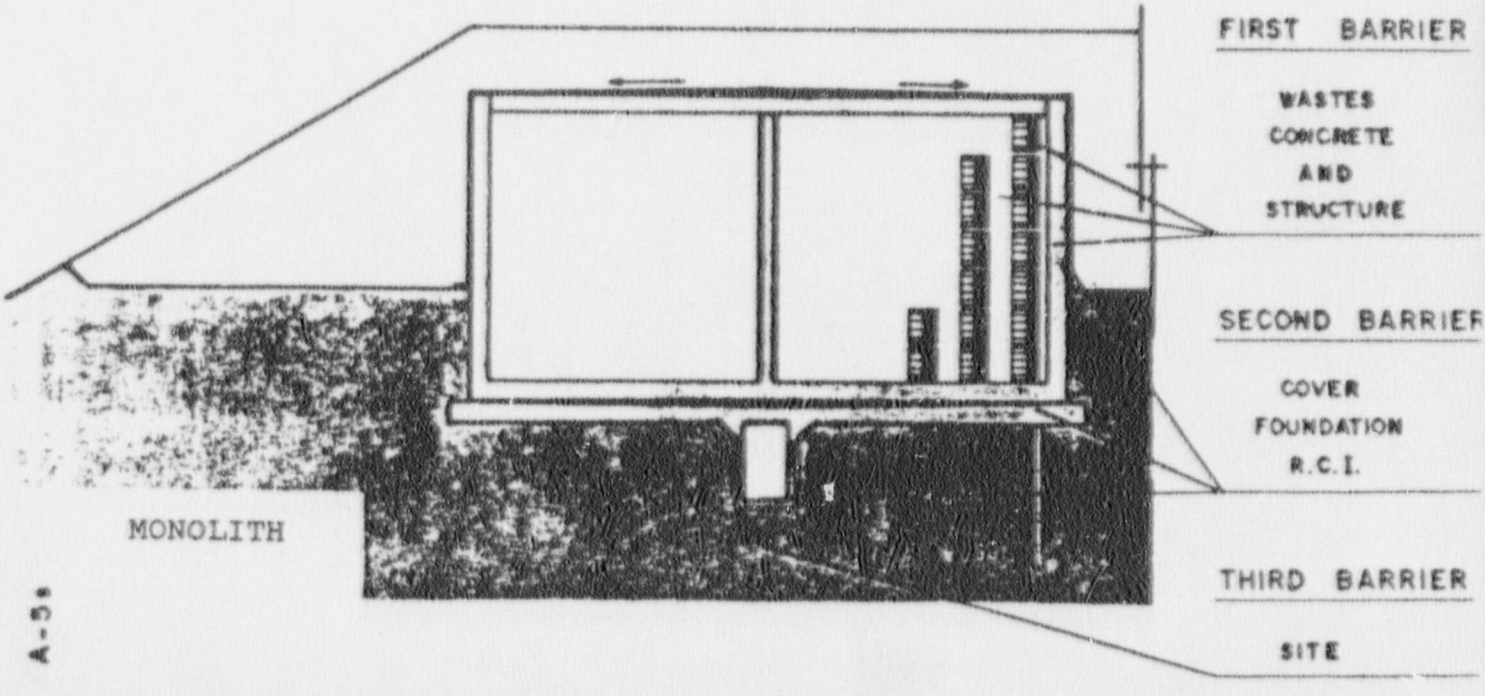
Planned Configuration for Storage

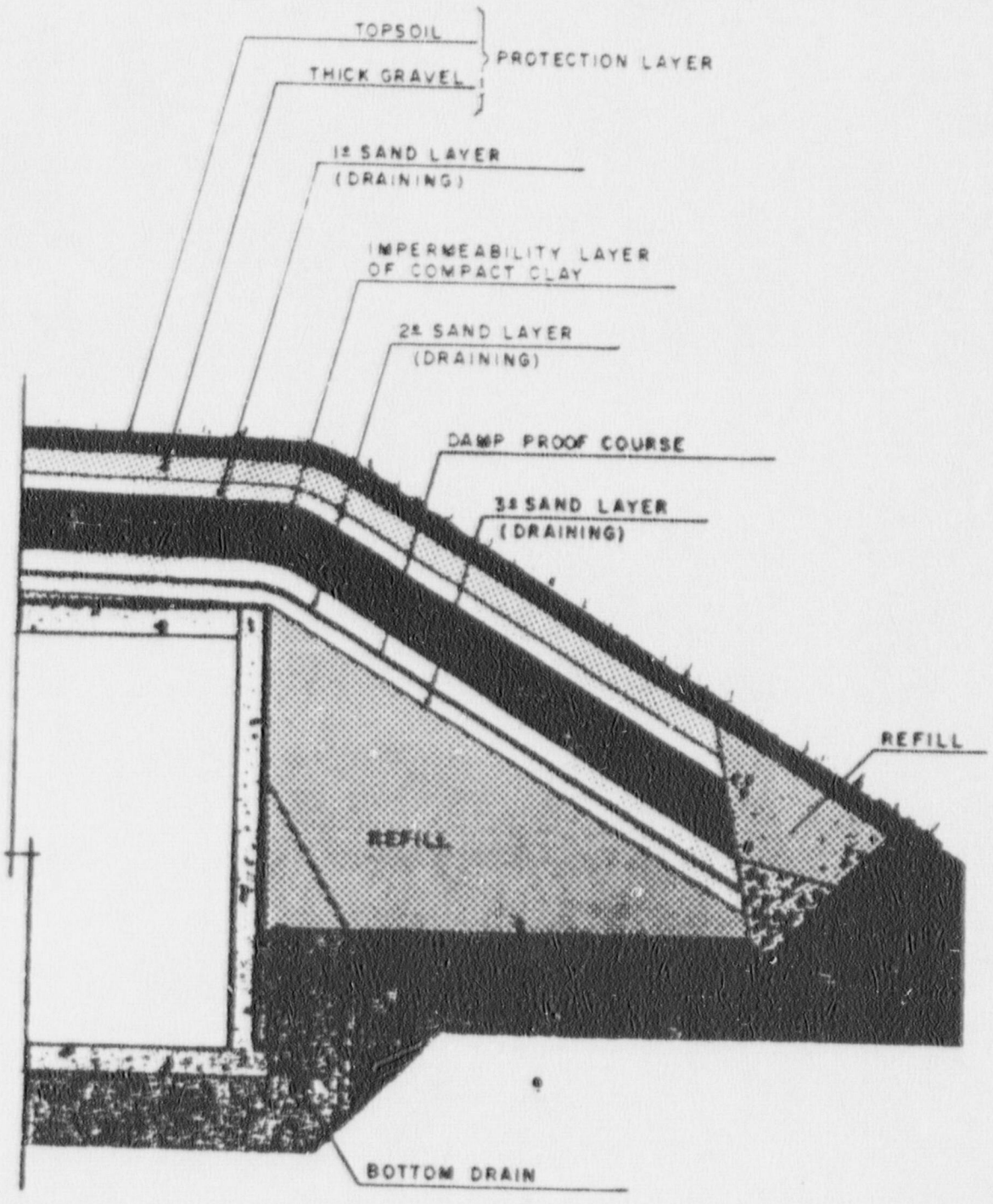


BARRIERS

Disposal Units Covered
for Disposal Facility Closure
(after 40 Years)







Detail of Infiltration Limiting Cover Design

TRIP REPORT - ENCLOSURE 3

Edited Viewgraphs from Summary Presentation of 5/12/89

REGULATIONS FOR LOW-LEVEL WASTE DISPOSAL WOULD MAKE LICENSING MORE STRAIGHTFORWARD FOR THE CSN STAFF AND FOR ENRESA

EVEN A SET OF PERFORMANCE OBJECTIVES COULD IMPROVE THE SITUATION

CSN STAFF APPEARS TO BE HARD PRESSED TO KEEP UP WITH THE MANY LICENSING ACTIONS FOR WHICH THEY ARE RESPONSIBLE

CSN APPEARS TO LACK STAFF IN CRITICAL AREAS SUCH AS HYDROLOGY, GEOHYDROLOGY, AND MODELING

HYDROLOGIC AND SOURCE TERM MODELS ARE NOT AVAILABLE TO STAFF

CSN STAFF IS WORKING IN THE SHADOW OF SOME POLICY UNCERTAINTY AND UNDER PRESSURE OF POLITICAL CONSIDERATIONS

POLICY SHOULD BE CLARIFIED AND POLITICAL REALITY ACCEPTED OR CHANGED

CSN STAFF HAS NOT BEEN PROVIDED WITH ADEQUATE INFORMATION FOR REVIEW BY THE APPLICANT

DATA AND ANALYSES SUPPORTING ASSERTIONS MADE BY THE APPLICANT SHOULD BE PRESENTED IN ENOUGH DETAIL SO THAT THE CSN STAFF CAN INDEPENDENTLY CONFIRM THE RESULTS

NO FATAL FLAWS -- SOME COMPONENTS OF THE SYSTEM APPEAR WEAK AND REQUIRE MORE DATA AND ANALYSES

A MORE ROBUST SYSTEMS ANALYSIS IS NEEDED INCLUDING SENSITIVITY ANALYSIS

TRIP REPORT - ENCLOSURE 4

Reorganized and Edited Discussion Notes
from Summary Presentation of 5/12/89

OBSERVATIONS ON LICENSING
THE
PROPOSED LOW-LEVEL WASTE DISPOSAL SITE
EL CABRIL

TECTONICS:-
- IMPORTANCE OF DEFINING AND RESOLVING ISSUES
  - MAGNITUDE
  - FREQUENCY
  - EFFECT
- SEISMOTECTONIC ELEMENTS OF IMPORTANCE
  - GUADILQUIVIR FAULT (ATTENUATION)
  - "FAR FIELD" SEISMIC ACTIVITY (AZORES SUTURE)
  - MICROSEISMIC ACTIVITY (LOCALIZED VS. RANDOM)
- ISSUE IS EFFECT
  - COVER
  - CUBETITOS
  - PATHWAYS

GEOMORPHOLOGY:-
- SLOPE STABILITY
- EROSION RATES/POTENTIAL

GEOHYDROLOGY:-
- REGIONAL GEOHYDROLOGIC MODEL LOOKS REASONABLE
- APPLICABILITY OF REPRESENTATIVE ELEMENTARY VOLUME CONCEPT?
  - MAP INDICATES LARGE NORTHEAST TRENDING DISCONTINUITIES
  - GEOTECHNICAL STUDY INDICATES EXTREME INHOMOGENEITY
- SHOULD MODEL SITE WITH "INFILTRATION LIMITING FACILITY"
  - IMPORTANCE OF "NEAR SURFACE" FLOW
  - RISE OF "GROUNDWATER" LEVEL

GEOCHEMISTRY:-
- IS DATA USEFUL FOR FRACTURE FLOW MODEL?
- IS REPRESENTATION OF RETARDATION USED CORRECT -- FRACTURE FLOW
- MOBILIZING SPECIES -- EG. BICARBONATE
- CONSIDER CHELATING AGENTS -- DECON WASTE

HYDROLOGY (SURFACE WATER):-
- USE OF 24 HOUR FLOODS
- EROSION

COVER:-
- BASIS FOR PERFORMANCE EXTIMATES NOT GIVEN
- CONSTRUCTABILITY
- STABILIZATION AGAINST EROSION
- STABILITY AGAINST EARTHQUAKES
- REPAIRABILITY

CONCRETE DURABILITY:-
- WHAT MECHANISMS ARE CONSIDERED?
- BASIS FOR DEGRADATION RATES AND VARIABILITY ASSUMED?

PERFORMANCE ASSESSMENT:-

- WATER FLOW PATHS
- RECEPTOR LOCATIONS
- INADEQUATE BASIS PROVIDED FOR CHOICE OF PATHWAYS
- UNEXPECTED REASONABLE PATHWAYS AND POINTS OF EXPOSURE IGNORED
- IMPORTANT DESIGN PARAMETERS NOT AVAILABLE TO SUPPORT ANALYSES

SOURCE TERM:-

- BASIS FOR INVENTORY ESTIMATES NOT CLEAR
- LEACH CHARACTERISTICS SOLIDLY BASED
- MULTIPLICATION OF LEACH ESTIMATES BY 0.01 NOT EXPLAINED
- DRUM DURABILITY NOT CONSIDERED
- BEHAVOIR OF CUBETITOS AND FINAL COVER NOT CLEAR

SENSITIVITY ANALYSIS:-

- APEARS TO VARY MORE THAT ONE PARAMETER AT A TIME
- "SENSITIVITY ANALYSIS INVOLVES THE PERTURBATION OF A SINGLE MODEL PARAMETER WHILE LEAVING ALL REMAINING PARAMETERS AT THEIR NOMINAL VALUES."

MONITORING:-

- REFER TO ICRP-43 AND U. S. NRC TECHNICAL POSITION
- HOW?
  - PREFERENTIAL PATHWAYS -- DEFINED?
  - HOMODENEOUS FRACTURES -- PROVEN?
- TRACER TESTS POSSIBLE?
- BACKGROUND MEASUREMENTS -- AT LEAST ONE YEAR

POLICY:-

- ROLE OF CSN IN WATE PACKAGE ACCEPTANCE SHOULD BE CLARIFIED
- INSTITUTIONAL INVOLVEMENT-COMMITMENT
  - SCOPE
  - RESPONSIBILITY
  - FINANCIAL BURDEN
- REQUIRED RETRIEVABLILITY
  - MITIGATION
  - REMOVAL (FOR DISPOSAL ELSEWHERE)
  - FINANCIAL COMMITMENT

A BASIC PRINCIPAL:-

"THE APPLICANT MUST SUBMIT ENGOUGH DATA AND DETAILS OF ANALYSES SO THAT STAFF CAN REVIEW FOR REASONABLNESS AND TECHNICAL VALIDITY OR INDEPENDENTLY CONFIRM THE APPLICANT'S RESULTS."

TRIP REPORT - ENCLOSURE 5

Meeting Agenda

AGENDA FOR MR. STARMER VISIT

MONDAY 1,MAY,1989, TUESDAY 2, MAY,1989

SINCE THIS TWO DAYS ARE HOLLIDAYS IN SPAIN WE SUGGEST TO USE THEM FOR TRAVEL FROM THE U.S. TO SPAIN.

WEDNESDAY 3,MAY,1989

9:00 - 9:30 RECEPTION AT THE CSN.
9:30 - 13:00 PRESENTATION BY ENRESA (THE APPLICANT FOR A LICENSE OF NEAR-SURFACE LOW LEVEL RADWASTE DISPOSAL) OF THE GENERAL ASPECTS OF THE SITE AND THE INSTALLATION.
13:00 - 15:00 LUNCH
15:00 - 17.30 FIRST PART OF THE PRESENTATION BY MR. STARMER OF LICENSING CRITERIA,ASSESSMENT METHODS, SPECIFIC REGULATIONS, STANDARD REVIEW PLAN EXPLANATION, STATUS OF SITE SELECTION ACTIVITIES, EXPERIENCE,ETC IN THE U.S.

THURSDAY 4,MAY,1989

9:00 - 11:00 SECOND PART OF THE PRESENTATION BY MR. STARMER.
11:00 - 13:00 PRESENTATION BY ENRESA OF THE SPECIFIC ASPECTS RELATED TO THE SITE OF THE INSTALLATION
13:00 - 15:00 LUNCH
15:00 - 17:30 PRESENTATION BY CSN PERSONNEL OF THEIR IDEAS OR CONCERNS REGARDING THE SITE.

FRIDAY 5,MAY,1989

9:00 - 13:00 DISCUSSION OF TOPICS RELATED TO THE SITE.
GROUNDWATER CHARACTERISTICS, SISMOLOGICAL, GEOTECHNICAL AND GEOCHEMICAL CHARACTERISTICS,ETC
13:00 - 15:00 LUNCH
15:00 - 17:30 DISCUSSION OF TOPICS RELATED TO THE SITE.
SITE CHARACTERIZATION MONITORING, PREOPERATIONAL ENVIRONMENTAL PROGRAMS AND ENVIRONMENTAL EFFECTS.

SUNDAY 7.MAY.1989

TRIP TO CORDOBA, CITY SIGHTSEEING.

MONDAY 8.MAY.1989

7:30 DEPARTURE FOR THE SITE.
10:00 - 13:00 SITE VISIT
13:00 - 14:00 LUNCH
14:00 DEPARTURE FOR MADRID

TUESDAY 9.MAY.1989

10:00 - 12:00 PRESENTATION BY ENRESA OF THE SPECIFIC ASPECTS RELATED TO THE ENGINEERING BARRIERS.
12:00 - 13:00 PRESENTATION BY CSN PERSONNEL OF THEIR IDEAS AND CONCERNS REGARDING THE ENGINEERING BARRIERS.
13:00 - 15:00 LUNCH
15:00 - 17:30 DISCUSSION OF TOPICS RELATED TO THE ENGINEERING BARRIERS. FUNCTIONS OF THE ENGINEERING BARRIERS, THEIR DURABILITY, THE DURABILITY EVALUATION METHODOLOGY.

WEDNESDAY 10.MAY.1989

9:00 - 13:00 DISCUSSION OF TOPICS RELATED TO THE ENGINEERING BARRIERS. ACCEPTANCE CRITERIA FOR ENGINEERING BARRIERS DEGRADATION, CONVENIENCE OF ENGINEERED BARRIERS INSPECTIONABLE, SINGULAR CONSTRUCTION ARRANGEMENTS IN THE US LIKE USE OF LINER PLATES,ETC.
13:00 - 15:00 LUNCH.
15:00 - 17:30 DISCUSSION OF TOPICS RELATED TO THE ENGINEERING BARRIERS INFILTRATION STUDIES THROUGH ENGINEERING BARRIERS, NORMAL AND SPECIAL CONSTRUCTION TECHNIQUES.

THURSDAY 11.MAY.1989

9:00 - 13:00 FREE FOR LAST QUESTIONS, DISCUSSION OF SPECIFIC TOPICS AND PREPARATION OF IDEAS FOR THE FRIDAY COMMENTS.
13:00 - 15:00 LUNCH