

EHC 1426

Memo to: Arjun, Brice
From: L.A. Lovejoy, Jr.
Date: 3 May 2005
Re: LES; WCS site

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Here is a memo that I just got, written by TNRCC staff in 1996 concerning the WCS site. They observe a couple of things:

1. The WCS site is vulnerable to oil and gas exploration and the prospect of intrusion needs to be considered (page 3).
2. The WCS site is in an erosional area, and wastes disposed of at the site could be exposed and removed within 5000 years (page 7).

This document suggests that the undisturbed performance scenario (i.e., no intrusion) should include significant erosion and exposure of the waste. Apparently there is some difference of opinion about the role of erosion, but this memo clearly supports the idea that erosion will affect the site.

The prospect of human intrusion must be considered against these facts:

1. WCS is a resource-area site and intrusion is almost certain to occur—perhaps several times—during the long life of the depleted uranium.
2. There is no specific dose limit in 10 CFR Part 61 upon exposure of the intruder to radioactivity. Such a limit (500 mrem) was included in the draft of 10 CFR 61.42 but deleted in the final. NRC then said that intrusion protection was provided by the classification system, which was based upon the same 500 mrem limit. As I understand it (and the DEIS and FEIS should explain this), any waste that would expose the intruder to more than 500 mrem at the 500 year point was classed as GTCC. The trouble is that the final version of 10 CFR Part 61 also removed depleted uranium from the classification system. So, under 10 CFR Part 61 apparently you can dispose of depleted uranium near the surface and give the intruders a dangerous dose—but not other radionuclides. This is irrational (i.e., arbitrary and capricious, thus illegal). It would help us in judicial review to have in the record that, under an intrusion scenario, the intruder would have a dose in excess of the 500 mrem limit that NRC based its classifications upon. Such information may actually be contained in the DEIS or the FEIS (which I don't yet have). If it isn't in there, perhaps we can produce the analysis, using the model that NRC used in its classification effort—again, the model should be set forth in the DEIS or FEIS.
3. The lack of a limit on the intruder's dose does not mean that intrusion may not be considered under 10 CFR Part 61. Since this is a resource site, there will be intrusions—maybe several. The waste released upon intrusion would reach the surface and be dispersed by water, wind, etc., and contribute to population doses, which are limited to 25 mrem to any member of the public. The challenge here is to assign a probability and frequency to intrusion, calculate the quantity of radioactivity released upon each intrusion, model its movement and derive a dose. Maybe ResRad does most of this. In any case, it is an element of the analysis that is lacking from WCS's analysis. If we could model such performance, it could be very important.

April 1996

ECR 1996

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DRAFT

MEMO TO: SUSAN WHITE, STAFF ATTORNEY

THRU: ALICE ROGERS, MANAGER,
UIC, URANIUM & RADIOACTIVE WASTE SECTION

FROM: STEPHEN D. ETTER, STAFF GEOLOGIST

CONFIDENTIAL

SUITABILITY OF THE WASTE CONTROL SPECIALISTS, INC. SITE, ANDREWS
COUNTY, TEXAS, FOR DISPOSAL OF RADIOACTIVE WASTES

PRELIMINARY STAFF TECHNICAL ASSESSMENT

Stephen D. Etter
Staff Geologist

Introduction. Waste Control Specialists, Inc. (WCS) has indicated to TNRCC staff that it wishes to utilize a site in western Andrews County, Texas for the disposal of U.S.DOE low-level radioactive and mixed radioactive and hazardous wastes, and possibly for disposal of byproduct materials from uranium recovery facilities. Through a complicated arrangement, currently contemplated between the State of Texas, the U.S.NRC, the U.S.DOE, and WCS (summarized elsewhere), disposal of the U.S.DOE wastes would not be "licensed" by the TNRCC but would generally be managed according to appropriate TNRCC regulatory programs approved by the U.S.NRC. The WCS site is currently permitted by the TNRCC for disposal of RCRA hazardous wastes and is undergoing construction for that facility. An application for processing radioactive wastes has been submitted to the Texas Department of Health, Bureau of Radiation Control (TDH, BRC).

The purpose of this informal review is to give the results of a preliminary (geotechnical) staff assessment of the Andrews County site relative to site suitability requirements for low-level radioactive waste disposal (TRCR Part 45.50). It also identifies to technical staff and management siting issues for which the WCS site could be difficult for TNRCC staff to defend in the type of controversial, high-profile, contested public hearing that generally accompanies radioactive waste disposal licensing actions.

Staff stresses that this is a preliminary review only; no application materials have yet been submitted by WCS. The review, therefore, is based on information in the RCRA permit application.

representations made by the applicant at meetings or during phone consultations, generally available information on the area, and the staff's experience with reviews of the Sierra Blanca application and other radioactive waste disposal projects. The review was also guided by the consistency principle; that is, that the level of scrutiny by staff and caliber of technical information required for the WCS application should be consistent with that previously required for similar applications. In the discussion below, therefore, the attributes of the WCS site are compared to those of the Sierra Blanca site in Hudspeth County as well as to the regulatory requirements.

45.50(a): The disposal site shall be capable of being characterized, modeled, analyzed, and monitored.

To some extent, staff feels that any site can be characterized, modeled, etc. The Sierra Blanca site is the most comprehensively characterized site staff has reviewed. The application consists of about 30 large volumes, many of which are detailed technical reports. Analytical and numerical modeling studies were done for many subject areas including surface water flow and floodplain studies, unsaturated zone processes, local and regional groundwater flow, and seismic impact studies.

The depth and breadth of studies undertaken for the Sierra Blanca site will be difficult for another applicant to emulate. WCS has not yet submitted an application but their consultants believe TNRCC should, in large part, rely on geological/hydrological characterization studies done in support of the RCRA permit which, as they point out, has already been issued. TNRCC staff notes that the information included with the RCRA application is not complete for radioactive waste disposal site licensure and does not resolve several significant questions about site adequacy (some of these are described below). In addition the close proximity of other waste disposal, treatment, and processing facilities could interfere with and complicate monitoring of the radioactive and mixed waste disposal units.

Staff assessment: Staff finds nothing inherent in the site itself that makes it incapable of being characterized, modeled, analyzed, or monitored. The adequacy of the demonstration that such is the case, however, lies entirely up to WCS and its consultants.

45.50(b): Within the region where the facility is to be located, a disposal site should be selected so that projected population growth and future developments are not likely to affect the ability of the disposal facility to meet the performance objectives of this part.

The Sierra Blanca site is located 5 miles from the nearest population center and is not in an area expected to experience rapid development or population growth.

The WCS site also appears to be in an area with little future growth potential.

Staff assessment: There are no trends evident in anticipated development or population growth for the area surrounding the WCS site that should interfere with attainment of performance objectives.

45.50(c): Areas shall be avoided having known natural resources which, if exploited, would result in failure to meet the performance objectives of this part.

An extensive study of local and regional natural resources showed that none are located near the Sierra Blanca site and that there is very low potential for future resource exploitation. Nonetheless an inadvertent intruder analysis (drilling scenario) was done as part of the performance assessment of the facility.

The WCS site is surrounded on all sides by oil and gas fields. Part of the site boundary is actually offset, presumably to avoid an active well. Although records may indicate satisfactory plugging, records are often incomplete, particularly in older fields, and questions always remain regarding the potential for enhanced migration.

Staff assessment: The WCS site is not placed favorably with regard to potential oil and gas exploration. An appropriate performance assessment will be required to demonstrate protection for inadvertent intruders. There will always be some level of uncertainty regarding potential migration for areas which have been extensively drilled.

45.50(d): The disposal site shall be generally well drained and free of areas of flooding or frequent ponding. Waste disposal shall not take place in a 100-year flood plain, coastal high-hazard area or wetland, as defined in Executive Order 11988, "Floodplain Management Guidelines."

Extensive studies were carried out at the Sierra Blanca site to define the main drainage basin and contributing subbasins, model surface runoff, define 100-year, 500-year, and probable maximum event floodplains, and model runoff velocities and erosion potential. During operations, the facility will be protected by a berm designed to withstand the probable maximum flood event. The surrounding area is well drained and ponding occurs only locally in well defined drainages or in an ephemeral playa lake a few miles down stream from the site.

Floodplain information is incomplete in the WCS RCRA permit application. Contrary to representations made at a recent meeting between INRCC staff and WCS personnel, the 100-year floodplain is not defined or located in the WCS RCRA permit application.

Impacts of a 100-year flood event due to precipitation falling within a surrounding berm system are discussed but without extensive details. Moreover, there are no data demonstrating that the berm system is constructed to withstand the 100-year flood event. The overall drainage basin is not delineated. Subbasins (within the protective berm) are apparently defined but details are not presented. At least part of the area can not be considered "well drained" or free of frequent ponding. There are numerous small to moderate sized surface depressions which collect runoff from precipitation throughout the area. The largest surface depression in the area, about 1-mile long, lies just upslope of the facility's northern boundary. Smaller depressions are in areas which will be excavated for disposal cell construction.

Staff assessment: The WCS site does not appear to be generally well drained or free of areas of frequent ponding. Infiltration from the large depression which collects surface runoff just upslope of the facility could impact the area of the waste disposal cells. Floodplains will need to be delineated to demonstrate that the facility is not sited within the 100-year floodplain.

45.50(e): Upstream drainage areas shall be minimized to decrease the amount of runoff which could erode or inundate disposal units.

Location of the Sierra Blanca site within the drainage area of Blanca Draw is well delineated.

The boundaries of the drainage basin in which the WCS site is located are not shown in the permit application.

Staff assessment: The WCS site is probably located near the upstream boundary of the drainage basin and so, ought to be favorably placed. This, however, needs to be demonstrated with appropriate drainage basin boundary maps.

45.50(f): The disposal site shall provide sufficient depth to the water table that groundwater intrusion, perennial or otherwise, into the waste will not occur.

No water table, as such, was detected at the Sierra Blanca site. The basin-fill sediments beneath the site are apparently unsaturated for their entire thickness of from about 100 to over 600 feet. Uppermost bedrock units are also unsaturated. Most groundwater occurs under confined or semiconfined conditions at depths of about 670 to 750 feet. A recent well, however, did detect a confined lens of water at a depth of about 500 feet.

Most sediments appear to be unsaturated beneath the WCS site to depths of at least 100 ft. The main aquifer in the area is well below the site at a depth of about 1200 feet and is under confined conditions. There are, however, siltstone units within the generally unsaturated upper sediments which do produce small

area was noted in the eastern part of the WCS site. WCS has associated the occurrence of water in the basal young sediments with surface depressions. If so, then there is a good potential for saturation of the interface zone beneath the large surface depression on the northern fringe of the proposed facility. This would be especially true under slightly wetter conditions. The interface zone appears to intersect the ground surface along the escarpment (really a very gentle slope). Enhanced vegetation and springs along the base of the escarpment suggest that water from the interface zone may be discharging to the surface. If that is the case, then condition 45.50(h) would be violated at the site.

Staff assessment: It is possible that even under current, relatively dry conditions one of the disposal hydrogeologic units may be discharging groundwater to the surface within the site boundary. This would be more likely should conditions become somewhat more humid in the near future.

45.50(i): Areas shall be avoided where tectonic processes such as faulting, folding, seismic activity, or vulcanism may occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of this part, or may preclude defensible modeling and prediction of long-term impacts.

Because the Sierra Blanca site is in an area generally considered the most seismically active in Texas, a great deal of effort was expended in demonstrating the ability of the site and facility to withstand anticipated seismic shaking. In addition to gravity, shallow seismic, and other geophysical studies, three detailed investigations were performed which: (1) identified all active or potentially active faults and determined their movement characteristics; (2) estimated potential groundmotions at the site from an earthquake on the most significant area fault as well as from a random event occurring immediately beneath the site; and, (3) determined the impact to the facility using maximum anticipated events and computer simulations of facility behavior.

The Andrews County area is also in one of the most seismically active areas of Texas. Events of significant size (Intensity V) have occurred recently within about 7 miles of the WCS site. The seismic activity has generally been attributed to oil and gas operations but could also be due to deep seated salt dissolution processes and adjustments along the central basin platform. Detailed geophysical site studies and seismic impact modeling have not been performed for the WCS facility.

Staff assessment: Seismic activity associated with salt dissolution and subsidence or oil and gas operations is difficult to predict but seismic energy could be generated at significantly shallower depths than those associated with Basin and Range Province tectonics at the Sierra Blanca site. Thus, although the

magnitude of events that might be anticipated at the WCS site might be less than at the Sierra Blanca site, potential impacts could conceivably be greater. Detailed investigations should be performed to demonstrate the long-term stability and safety of the WCS site and facility. Vulcanism is not a concern at either site.

45.50(i): Areas shall be avoided where surface geologic processes such as mass wasting, erosion, slumping, landsliding, or weathering occur with such frequency and extent to significantly affect the ability of the disposal site to meet the performance objectives of this part, or may preclude defensible modeling of long-term impacts.

Extensive sedimentological and geomorphological investigations of northwest Eagle Flat (which includes the Sierra Blanca site) quantify sedimentation and erosion rates and delineate a detailed recent history of the site area. Results demonstrate that the site has been an area of net sediment deposition for the last 12 million years and that local erosion rates do not pose a threat to the long-term site stability or waste isolation.

Detailed geomorphological studies have not been done for the Andrews County site and long-term erosion rates are not known. The site is located directly on the caprock "escarpment," which, although at the site appears relatively flat to the eye, is a gently sloping erosional feature. Rough calculations by staff indicate that if the escarpment in the vicinity of the WCS site continues to retreat due to erosion at the same average rate that it has retreated since the integration of the Pecos River system 600,000 to 2 million years ago, then wastes disposed of at the WCS site could be exposed and removed within 5,000 years.

Staff assessment: The WCS site is clearly an erosional area and nothing short of a wholesale change in geologic and climatic conditions is likely to alter the situation in the foreseeable future. Even stopgap engineering measures to slow erosion must be considered only temporary fixes in the long-term. Eventually the radioactive wastes will be exposed by erosion and available for migration into the environment.

45.50(k): The disposal site shall not be located where nearby facilities or activities could adversely impact the ability of the site to meet the performance objectives of this part, or significantly mask the environmental monitoring program.

There are no interfering facilities at the Sierra Blanca site. The only facility with any potential to interfere with site monitoring is the MERCO operation which is located upgradient in the same drainage basin. Potential contamination from MERCO can easily be determined from surface water or soil samples taken above the low-level waste disposal facility.