

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

In the Matter of the Petition of the)
CITY OF PITTSBURG)
For Review of Waste Discharge)
Requirements for the Keller Canyon)
Landfill Company, a Subsidiary of)
Browning-Ferris Industries, Contained)
in Order No. 91-052 of the California)
Regional Water Quality Control Board,)
San Francisco Bay Region. Our File)
No. A-741.)

ORDER NO. WQ 92-06

BY THE BOARD:

I. INTRODUCTION

On March 20, 1991, the California Regional Water Quality Control Board, San Francisco Bay Region (Regional Water Board) adopted Order No. 91-052 prescribing waste discharge requirements for the discharge of nonhazardous solid waste and designated waste to a Class II landfill in Contra Costa County. The landfill project is being undertaken by the Keller Canyon Landfill Company, a subsidiary of Browning-Ferris Industries (BFI). The landfill site is located in a canyon just outside of the City of Pittsburg (City) in the foothills of Mount Diablo. The City opposes the proposed location of a landfill on its boundary and in proximity to recently developed residential neighborhoods. The City objected to the project on various grounds before the County and the Regional Water Board. The City asked us to review the action of the Regional Water Board,

alleging procedural and technical deficiencies in the Regional Water Board's adoption of Order No. 91-052.

II. BACKGROUND

Contra Costa County is facing a solid waste management crisis. It has very nearly exhausted the capacity available at existing landfills within the county and has been exporting waste to adjacent counties. The county's existing landfills are located in lowland areas and encroach upon the ecologically sensitive wetlands that fringe the Bay and Delta. Impelled, at least in part, by the Regional Water Board's disapproval of proposals to expand existing landfills into these wetlands, the county solicited proposals for the development of new landfills located in upland areas. The Keller Canyon landfill project was one of several proposals submitted to the County.

Regional Water Board's Order No. 91-052 prescribes requirements for the discharge of waste in accordance with the waste and site classification provisions of our regulations governing discharges of waste to land. These regulations implement our authority to regulate discharges of waste that could affect the quality of waters of the State.

The City contends generally that the Regional Water Board's requirements for the landfill are inappropriate because the requirements do not implement our Chapter 15 regulations. The City has raised several technical issues in support of this contention. The most controversial issue presented in this matter is the level of containment needed for a Class II waste management unit. In addition, the City has raised questions

about the separation between the waste management unit and shallow ground water at the site; the stability of the slopes upon which the landfill containment structures would be installed; and the adequacy of BFI's assessment of the hydrology in the canyon and, consequently, the ability of BFI's monitoring system to detect any leakage of waste or leachate from the waste management unit before it could degrade or pollute waters of the state.

Our staff reviewed the administrative record submitted by the Regional Water Board in response to the petition and concluded that there was no documentation in the record evidencing detailed analysis of either the stability of the site or of potential differential settlement, and that BFI's data on site hydrology were insufficient and inadequately presented to support the findings of the Regional Water Board. Without this information, it was impossible to determine if the site was suitable for a Class II landfill or if the requirements adopted by the Regional Water Board were appropriate.

Because of these inadequacies in the record, we exercised our authority under Section 13320 of the Water Code to augment the record by convening a prehearing conference on January 23, 1992 and by holding a public hearing on March 31, 1992. This order is based on the record as supplemented.

III. CONTENTIONS AND FINDINGS¹

1. Contention: The City contends that the Keller Canyon site is unsuitable for use as a waste management unit and that the single composite liner approved by the Regional Water Board will not meet the performance standard for containment structures at Class II waste management units.

Finding: For the reasons discussed below we find that the Keller Canyon site is a satisfactory location for discharges of waste to a Class II waste management unit and that the liner system approved by the Regional Water Board for use at the Keller Canyon landfill satisfies the performance standard for Class II landfills.

A. Chapter 15

Our review of the major contentions raised in the petition revolves around our regulations governing discharges of waste to land. In 1972, recognizing the potential impact of municipal and industrial disposal sites on water quality, we adopted regulations governing discharges of waste to land. The regulations were codified in Subchapter 15 of our regulations, in Chapter 3 of Title 23 of the California Administrative Code (later renamed the California Code of Regulations). In 1982 the Water Code was amended to clarify our authority to classify wastes and disposal sites (Water Code 13172) and in 1984 we adopted comprehensive amendments to Subchapter 15, including the

¹ All other contentions raised in the petition which are not discussed in this order are dismissed. (Title 23 California Code of Regulations, Section 2052; People v. Barry, 1987, 194 Cal.App.3d 158.)

provisions that are the subject of this review. (As a result of editorial changes to the California Code of Regulations, "Subchapter 15" is now "Chapter 15" and Chapter 3 is now Division 3.)

In Chapter 15 we established four categories of waste "based on an assessment of the potential risk of water quality degradation associated with each category of waste" (23 CCR 2520a). Each category of waste (with the exception of inert waste) may be discharged only to a suitably classified waste management unit, with increasing levels of separation or isolation between wastes and waters of the State for categories that present a greater threat of pollution.

We have classified municipal solid waste as "nonhazardous solid waste" using a definition that echoes the statutory definition of "solid waste" in Division 30 ("Waste Management", commencing with Section 40000) of the Public Resources Code (23 CCR 2523). Nonhazardous solid waste may be discharged at a Class III waste management unit "where site characteristics provide adequate separation between nonhazardous solid waste and waters of the state" and "where soil characteristics, distance from waste to ground water, and other factors will ensure no impairment of beneficial uses of surface water or of ground water beneath or adjacent to the landfill" (23 CCR 2533). Class III landfills that cannot satisfy these siting criteria must have "containment structures which are capable of preventing degradation of waters of the state as a result of

waste discharges to the landfill if site characteristics are inadequate" (23 CCR 2540c).

We have provided a separate category, known as "designated waste" for wastes that consist of or contain higher concentrations of pollutants (including low levels of hazardous constituents if the waste qualifies for a variance under the State's regulations governing the management and disposal of hazardous wastes) or wastes that consist of or contain liquids and semi-solids (less than 50 percent solids). (23 CCR 2520d, 2522.) Designated wastes may be discharged only at a Class II waste management unit "where site characteristics and containment structures isolate waste from waters of the state" (23 CCR 2532).

Class II waste management units must be "designed and constructed to prevent migration of wastes from the waste management unit to adjacent geologic materials, ground water, or surface water, during disposal operations, closure, and the post-closure maintenance period [i.e., as long as the waste could have an adverse effect on the quality of waters of the state]" (23 CCR 2540a, 2601). A Class II unit must be "immediately underlain by natural geologic materials which have a permeability of not more than 1×10^{-6} cm/sec and which are of sufficient thickness to prevent vertical movement of fluid, including waste and leachate, from waste management units to waters of the state as long as wastes in such units pose a threat to water quality" or must have a liner consisting of not less than 2 feet of clay compacted to a permeability of not more than 1×10^{-6} cm/sec (23 CCR 2532).

Within this framework of performance standards, we established statewide minimum standards for the construction of classified waste management units. A Class II unit that uses an engineered liner rather than a suitable geologic setting to isolate wastes from waters of the state must be provided with a compacted clay liner at least 2 feet thick and with a permeability of not more than 1×10^{-6} cm/sec (23 CCR 2532, 2542). A Class III unit required to have a liner to provide the necessary separation between wastes and water must have a single clay liner at least 1 foot thick with a permeability of not more than 1×10^{-6} cm/sec (23 CCR 2533, 2542). We explicitly preserved the authority of the Regional Water Quality Control Boards to prescribe more stringent requirements as needed at each site to protect water quality in accordance with the performance standards applicable to each category of waste management unit (23 CCR 2510a).

Having discussed the Chapter 15 requirements governing discharges of waste to land, we will now focus on the Keller Canyon landfill.

B. Geologic Setting

In any review of a landfill containment system for compliance with Chapter 15 requirements, we must analyze both the system itself and the geographical setting in which it will be installed. Site characteristics are an important factor in assessing the suitability of any containment system. In this regard, we note the efforts of the County of Contra Costa in 1984 to expand an existing landfill into wetlands associated with

Suisun Bay. The Regional Water Board adopted requirements that restricted expansion into the wetlands to an area that would provide the County only with a limited period in which to find an alternative, nonwetland, disposal site (Regional Water Board Order No. 84-18). We concurred in that limitation (State Water Board Order No. WQ 84-9). The Keller Canyon site is consistent with these directives to avoid discharges of waste to Bay wetlands.

Landfills located in upland canyons generally do not present as great a threat to water quality as do landfills that are located in alluvial plains, bayshore wetlands, or areas overlying significant ground water resources. Canyon areas generally do not contain major ground water aquifers. In addition, despite the potential for leachate migration provided by the secondary permeability of fractured bedrock, canyon topography tends to channel shallow ground water flows to the mouth of the canyon, where they can be monitored for pollutants and intercepted for corrective action.

At the Keller Canyon site, bedrock consists of layers of sedimentary rock with low permeability overlain by weathered bedrock and alluvial materials with higher permeabilities (ranging from 1×10^{-5} cm/sec to 1×10^{-3} cm/sec). Rainfall percolating through the surface alluvial deposits and weathered bedrock will generally follow the topographic contours of the watershed to the bottom of the canyon and through its mouth as surface or shallow subsurface flow. Despite some downward movement along the strata that underlie the canyon, the

canyon floor is not a significant recharge area for the ground water basin beneath the plain where Pittsburg is located. The only significant hydraulic connection between the canyon watershed and the ground water basin would be through the mouth of the canyon. Monitoring wells in this area could detect any pollutants leaking out of the landfill in the canyon.

Accordingly, we find that the Keller Canyon site satisfies the directives adopted in 1984 by the Regional Water Board with our concurrence and is a suitable geologic setting for discharges of waste to land, provided that the discharger complies with requirements that implement our regulations governing such discharges.

C. Waste To Be Discharged

The most important factor that is considered in determining the level of containment needed for a proposed discharge is the nature of the waste that will be discharged. BFI proposes to discharge wastes that will consist predominantly of municipal solid waste ("nonhazardous solid waste") together with sewage sludge from wastewater treatment facilities within the County. BFI also proposes to accept some "designated" wastes, which means that the landfill must meet the siting and containment standards for a Class II waste management unit instead of the less stringent standards for a Class III landfill.

D. Containment Structures

The Regional Water Board has approved a containment system that goes beyond the minimum prescriptive standards for containment at a Class II waste management unit.

The composite design approved by the Regional Water Board combines a two-foot thick clay liner with the additional impermeability of a synthetic membrane to prevent moisture from being wicked from the waste into the clay by capillary forces. In addition, the liner is overlain by a leachate collection and removal system consisting of pea gravel and perforated drain pipes designed to accommodate ten times the amount of liquid that is anticipated to percolate through the waste due to precipitation and leachate formation within the waste. This configuration is designed to ensure that liquids will not collect at any point of the liner in a manner that would impose a hydraulic head on the synthetic membrane or on the underlying clay. The only area of the liner at which liquids are supposed to collect is at the leachate collection and removal sump located at the lowest point in the landfill, immediately behind and at the base of the toe berm. That area is provided with doubled layers of flexible membrane liner and is drained by gravity through a double-walled pipe that leads through the toe berm to aboveground storage tanks for leachate.

The synthetic membrane at the Keller Canyon landfill is a full 80 mils thick (approximately 2 mm), double the minimum thickness for synthetic liners prescribed by our regulations (23 CCR 2542), and therefore much less likely to be damaged by construction activities or unanticipated stresses during the life of the landfill. Seams in the membrane are sealed together by a thermal welding process that produces a double line of bonding at the seam. The enclosed air space can

be pressurized and tested for integrity to ensure that there are no gaps in the seals between sheets of liner material.

In addition, the containment system for this site includes an underdrain layer beneath the clay component of the composite liner. While this feature was installed to provide an engineered alternative to the separation that is ordinarily required between wastes and waters of the State, it may add some, albeit minimal, containment value to the liner system.

We conclude that the landfill's total containment system, including the geologic advantages of the upland canyon setting and the composite liner system approved by the Regional Water Board, provides reasonable assurances that waste and leachate from the landfill will be isolated within the waste management unit as long as the wastes pose a threat to the quality of waters of the State.

2. Contention: The City contends that differential settlement and landslide-related slope instability will compromise the integrity of the landfill's engineered structures.

Finding: For the reasons discussed below we find that discharges of waste should be limited to the Phase I area of the Keller Canyon landfill until additional data regarding stability issues is provided.

In Chapter 15 the State Water Board requires that containment structures such as liners have a foundation capable of preventing failure due to settlement (Section 2530(d)). In addition, Class II landfills need to be designed, constructed,

and maintained to preclude failure due to "rapid geologic change" such as landslides (Section 2532(e)).

BFI's site characterization report and the County's Environmental Impact Report discuss the potential instability of soils in the vicinity of the site, and identify the presence of four major landslides within the area where waste will be discharged. BFI's consultant indicates that a comprehensive analysis of slope stability will be necessary to design and construct a Class II waste management unit at this location and the Environmental Impact Report indicates that such an analysis will be undertaken for the entire site before construction begins.

The specific slope stability issues at the Keller Canyon landfill can be divided into those related to the earthen toe berm that closes the mouth of the canyon and buttresses the landfill, those related to the stability of Landslides 3 and 4, and those related to potential slope failures created by construction activities.

Based upon all of the documentation submitted for our review to date, we find that:

- a. Differential settlement beneath the liner is not a concern.

The City, having reviewed the supplementary documentation provided by BFI at the prehearing conference, conceded that differential settlement was not an issue at the site.

- b. Slope stability analyses should be done for all phases of the project.

The Environmental Impact Report (EIR) required that analyses be done for all phases of the project prior to commencement of construction of any phase (Table 1.1, Page 1-9). The County's "Conditions of Approval" for the land use permit contained a similar provision. Finally, Provision 7 of the waste discharge requirements call for BFI to submit "Final Design Proposals," including slope stability analyses and details regarding the sequence of development, to the Regional Water Board for review and approval before the initiation of construction. The applicant has done such analyses only for Phase 1. Analyses for the remaining phases of construction should be done immediately and should be provided to the Regional Water Board for analytical review and approval before BFI begins construction on any subsequent phase of the landfill.

The slope stability analyses done for Phase I address the potential for slope failure due to construction activities for Phase I. Instability induced by construction activities for phases after Phase I can only be evaluated once the slope stability analyses for these phases have been provided.

We are concerned that incidental grading activities done before additional phases are formally begun could create instability. The City has expressed concern that cut slopes at the toe of landslides could destabilize the slide materials. BFI has argued that its grading plans do not call for such cut slopes, and that all excavation of landslides will be done from

the top down. However, grading has already been initiated for areas beyond Phase I, and, in particular, the upper portion of landslide number 3 has been laid back from the edge of the Phase I liner without the requisite analysis and without any buttressing. Discharges of waste should not be allowed within 200 feet of the southern edge of the Phase I liner until stability analyses for the large cut slope at the southern end of Phase I have been submitted and reviewed.

- c. Seismic analyses should be done for all phases of the project.

Seismic activity could disrupt the surface water drainage and liner systems, damage the landfill's leachate collection and removal system, or induce slope failure. While the record includes a discussion of the magnitude and location of the maximum credible earthquake, the record does not contain results of site-specific seismic stability analyses. We understand that such analyses have been completed but they were not submitted with the Regional Water Board record; the analyses should be provided to the Regional Water Board immediately for review.

- d. Additional stability analysis should be done on the toe berm.

Consultants retained by the respective parties disagree regarding the data on soil characteristics that should be used to assess the stability of the toe berm. The evidence in the record on this issue is inconclusive because of questions about the accuracy of data in the record on engineering properties of the

geologic materials that underlie the toe berm. These data need to be collected according to methods that are generally recognized to be appropriate and for both short- and long-term conditions that can be expected once the additional weight of the toe berm is added. Once these parameters have been set, the results of the revised stability analysis of for the toe berm should be submitted to the Regional Water Board for review. As an interim step while additional data is collected, slope inclinometers should be installed to monitor berm stability.

It should be noted that the structure is currently stable and that, in the unlikely event of a failure, movement of earthen materials and waste would be confined to an area immediately adjacent to the toe berm (in the area of the sedimentation pond). The stability of the toe berm will increase with time as materials in the toe berm consolidate further and as ground water levels are lowered due to the installation of the final cover. In addition, installation of the final cover should contribute to this consolidation. However, the current condition of the alluvial and landslide materials beneath the toe berm should be modeled as undrained because the underdrain components and finger drains that underlie the toe berm cover only a limited area (Construction Drawings, revised December 16, 1991, Drawings 14 and 25), and the year-round upward ground water gradient at the toe berm will ensure that the alluvial/landslide material will remain saturated.

e. Landslide 3 should be stabilized immediately.

Excavation of landslide materials from the lower portion of landslide number 3 (LS3) during the first phase of construction has left an unbuttressed cut slope on the face of that landslide to the west of the Phase I disposal area. Removal of material from the lower portion of a landslide generally reduces stability and has the potential to contribute to reactivation of a previously stable landslide. The upper part of the slide was not unloaded. Data in the record indicates that the toe of the slide is to be buttressed by the channel drain and toe berm. However, the upper portion of the slide above the cut slope stands approximately 40 feet above the channel drain and the toe berm (which rests upon the toe of LS3) terminates far from the cut slope. The stability of the upper portion of LS3 is of concern because it abuts the Phase I disposal area. The upper part of the slide should be unloaded and the cut slope should be laid back (flattened). Dewatering should be considered to increase landslide stability. Slope inclinometers should be installed to monitor landslide stability.

f. A grading plan showing the sequencing for grading to reconfigure or remove Landslide 4 should be provided.

Landslide 4 will be removed during construction of one of the later phases of the landfill but the record contains only limited data on when and how the slide will be removed. Interim

soil disturbance in the vicinity of Landslide 4 should be prevented and inclinometers should be installed to monitor slope movement.

All analysis required by this order shall be submitted to the Regional Water Board through its chairperson. This data shall also be provided to State Water Board staff who will conduct an independent review and make recommendations to the Regional Water Board regarding its adequacy.

3. Contention: Although not specifically listed as a contention in the City's petition, we have, on our own motion, reviewed the proposed ground water monitoring network and concluded that it is unlikely that the 4 apparently upgradient and 10 downgradient monitoring wells (depicted on the Drawing C attachment to Order No. 91-052) will provide representative background ground water quality data and earliest detection of potential leakage as required by our regulations.

Findings: The monitoring requirements contained in Article 5 of Chapter 15 are designed to ensure the earliest possible detection of leakage from a landfill. The record before us in this matter, including BFI's supplemental submittals, does not contain sufficient information to support BFI's assertions regarding ground water flow directions, particularly on flow paths within all rock layers beneath and downgradient from the landfill site. In fact, the data supports the conclusion that there is flow in the unweathered bedrock to unknown depths. Because of the lack of data, we cannot verify that wells are located in the actual downgradient direction of ground water

flow. Also, wells are not deep enough to monitor movement of leakage down the inclined rock layers.

To improve the likelihood that any leak from this landfill will be detected at the earliest opportunity, the monitoring network for Phase I should be modified to include the following:

(1) In the berm area:

- test holes;
- piezometers completed in the alluvium, the landslide material, and in underlying bedrock; and
- monitoring wells completed in the uppermost saturated zone, in the most permeable zones within the weathered materials, and as pairs above and below the contact between the weathered and unweathered bedrock.

(2) In the area east of phase I:

- test holes; and
- monitoring wells completed in the uppermost saturated zone, in the most permeable zones within the weathered materials, and as pairs above and below the contact between the weathered and unweathered bedrock.

Additional monitoring points as specified by the Regional Water Board should be installed for subsequent phases.

4. Contention: The City contends that BFI has failed to demonstrate the required basis for using an engineered

alternative to the five-foot separation between wastes and waters of the State prescribed in our regulations.

Finding: We find that the blanket subdrain installed beneath the liner at this site constitutes an engineered alternative to the requirement in Chapter 15 that new landfills be sited, designed, constructed, and operated to ensure that wastes will be a minimum of five feet above the highest anticipated elevation of underlying ground water.

The excavation and grading plan for the Keller Canyon landfill involved the removal of substantial deposits of alluvial and landslide materials in the lower portion of the landfill site. This excavation reduced the separation that would have existed between wastes in the landfill and the shallow ground water in the bottom of the canyon (where percolating ground water is known to surface in seeps along the watercourse that defines the canyon). Despite this excavation, most ground water levels throughout the landfill site will be below ground surface. At the isolated seeps along the floor of the canyon where ground water is expected to surface BFI has installed channel drains below ground surface to carry off the rising ground water.

Our regulations require 5 feet of separation between wastes and ground water (including any ground water that rises above the zone of saturation as a result of capillary forces) in order to reduce the potential for ground water to infiltrate into the waste management unit. Accordingly, liners and leachate collection system components may be taken into account to satisfy the separation requirements. In this case BFI is installing a

liner system that measures approximately 5 feet from ground surface to the top of the protective soil layer covering the leachate collection and removal system. In addition, as an alternative to maintaining the prescribed separation, BFI has installed a blanket underdrain layer beneath the liner system. This layer interrupts the capillary continuity that might have permitted rising ground water to infiltrate the clay liner and, thereby, the waste management unit.

IV. CONCLUSIONS

Based on the foregoing discussion we conclude as follows:

1. The composite liner approved by the Regional Water Board for the Keller Canyon landfill provides reasonable assurance that the wastes that will be discharged at that landfill will not migrate from the landfill to adjacent geologic materials. The containment systems approved by the Regional Water Board for the Keller Canyon landfill will isolate the wastes from waters of the State as required by the performance standards in our Chapter 15 regulations.

2. BFI should provide comprehensive slope stability analyses and engineering proposals for the entire landfill project in order to determine whether or not the proposed waste management unit complies with the provisions of Chapter 15 dealing with areas of rapid geologic change. BFI must provide the information necessary to satisfy this requirement before proceeding to develop any subsequent phase of the Keller Canyon landfill.

3. The water quality monitoring system for the Keller Canyon landfill needs to be upgraded to provide assurance of the earliest possible detection of any release of waste from the waste management unit in order to satisfy the provisions of Chapter 15 relating to monitoring.

4. The underdrain system approved by the Regional Water Board provides an engineered alternative to the prescribed five-foot separation between wastes and waters of the state that will be equally effective in preventing infiltration.

5. The requirements for the Keller Canyon landfill contained in Order No. 91-052 should be revised as follows to ensure compliance with our regulations governing discharges of waste to land and thereafter remanded to the Regional Water Board for implementation and enforcement:

a. Discharges of waste at the site will be restricted to the Phase I area until the Regional Water Board approves the discharger's technical reports relating to design and construction of containment structures in an area of rapid geologic change for all phases of landfill construction.

b. Discharges of waste within 200 feet of the southern edge of the liner should be prohibited until the Regional Water Board approves the discharger's technical report regarding the stability of the cut slope beyond the southern edge of the Phase I area.

c. The discharger should be required to provide the Regional Water Board and this Board with the following technical reports within 90 days of the adoption of this order,

and not less than two months before initiating any construction activity, including excavation or grading, outside the Phase I area for subsequent phases of the landfill.

i. Comprehensive slope stability analyses, including analysis of seismic stability for all containment structures, and including documentation of the basis for selecting the angle of internal friction and the coefficient of cohesion to be used, for the remaining phases of construction;

ii. Seismic analysis of the stability of containment structures, landslides, and slopes in Phase I;

iii. Information regarding the preparation of the foundation for the toe berm and analysis of the relative forces affecting the stability of the toe berm; and

iv. A grading plan showing the sequence of grading operations for removal or reconfiguration of Landslide 4.

d. The discharger should be required to unload the top of Landslide 3 and lay back (flatten) the cut slope adjacent to the Phase I area of the landfill.

e. The discharger should be required to install slope inclinometers in Landslide 3, Landslide 4, and in the toe berm.

f. The discharger should be required to drill test holes and install monitoring wells in the toe berm area and to the east of the Phase I area, as indicated on the attached map. The discharger should also be required to install piezometers in the toe berm area.

V. ORDER

IT IS HEREBY ORDERED that Order No. 91-052 of the California Regional Water Quality Control Board, San Francisco Bay Region, containing waste discharge requirements for a Class II landfill in Contra Costa County owned and operated by Keller Canyon Landfill Company, a subsidiary of Browning-Ferris Industries, is amended as follows:

1. The caption of the order is amended to read, in relevant part:

"Order No. 91-052, as amended by Order No. WQ92-06 of the State Water Resources Control Board."

2. Finding No. 4 is amended to add the following statement:

"The regulations governing discharges of waste to land (Chapter 15, commencing with Section 2510, of the State Water Resources Control Board's regulations in Division 3 of Title 23 of the California Code of Regulations, "Chapter 15") require that discharges of designated waste be isolated from waters of the state in Class II waste management units with containment structures that are designed and constructed to prevent migration of waste from the waste management unit to adjacent natural geologic materials (23 CCR 2532, 2542)."

3. Finding No. 7 is amended to read:

"Discharger has designed the landfill to isolate wastes from waters of the state by installing a single composite liner system consisting of at least 2 feet of clay compacted to a permeability of not more than 1×10^{-6} cm/sec overlain by a synthetic flexible membrane liner consisting of 80 mil High Density Polyethylene (HDPE) with a leachate collection and removal system above the liner and a blanket underdrain layer beneath the liner to intercept rising ground water, if any."

4. Finding No. 8 is amended to read:

"Discharger's excavation and grading plan will reduce the separation between wastes and waters of the state to less than 5 feet in some places. It is not feasible for discharger to maintain the requisite separation without incurring unreasonable expense to import fill material and reconfigure the design of the landfill. Discharger's proposal to install a blanket underdrain provides an engineered alternative to the prescribed separation because it will prevent infiltration of the waste management unit by rising ground water at least as effectively as the prescribed separation."

5. Finding No. 9 is amended to read:

"Keller Canyon is an area of rapid geologic change: the landfill site includes 4 landslides and

slopes in the area are known to have the potential for instability. Discharger has undertaken substantial technical analysis of slope stability for the first phase of the project, but has not demonstrated the validity of the assumptions used in the analysis. In order to proceed with development of this project discharger must provide a comprehensive slope stability analysis for the entire project and must justify the assumptions underlying any conclusions reached."

6. Finding No. 16 is amended to add the following statement:

"The predominant ground water flow paths in Keller Canyon will be defined by the topography of the canyon: precipitation will recharge on the ridge tops and percolate through the alluvium and weathered bedrock towards the bottom of the canyon and north to the mouth of the canyon where the flows surface as the canyon narrows. Absent surface diversion to storm drains these flows would be tributary to the aquifer in the Cierbo and Nerolly formations underlying the Pittsburg plain. There is a slight downward gradient in the unweathered bedrock formations underlying the landfill site."

7. Finding No. 22 is added to the order, to read:

"Following adoption of this order, the City of Pittsburg asked the State Water Resources Control

Board (State Water Board) to review the Regional Water Board's action by filing a petition under W.C. 13320. During its consideration of this petition the State Water Board requested, and discharger provided, additional documentation of slope stability analyses and engineering plans for the construction of Phase I of the landfill, and additional data on site hydrology. The City of Pittsburg submitted comments addressing the adequacy of the supplemental documentation submitted by discharger. Following a prehearing conference and a public hearing on the technical issues raised by the City, the State Water Board adopted Order No. WQ 92-06 amending this order."

8. Paragraph 11 is added to Section "A" (Prohibitions) of the order, to read:

"Discharges of waste to areas outside of Phase I of the landfill shall be prohibited until the Regional Water Board approves discharger's technical reports relating to design and construction of containment structures in an area of rapid geologic change for all phases of landfill construction."

9. Paragraph 12 is added to Section "A" (Prohibitions) of the order, to read:

"Discharges of waste shall not occur within 200 feet of the southern edge of the liner installed in "Phase I" of the construction of the waste management unit until the Regional Water Board approves

discharger's technical report regarding the stability of the cut slope beyond the southern edge of the Phase I area."

10. Paragraph 7 of Section "C" (Provisions) is amended to read:

"The discharger shall submit Final Design Proposals acceptable to the Executive Officer. The proposal should provide workplans for development of the various components of the landfill, including detailed specifications for construction of composite liners and leachate collection and removal systems and should include Quality Assurance & Quality Control Procedures, (QA/QC), for all aspects of construction and installation. The proposal shall also address maintenance, operation and closure plans, as well as a slope stability analysis (including seismic stability analysis) for all phases of landfill construction, for the landfill operation. The workplans for construction and operation of the liners and LCRS should include detailed specifications regarding the sequence of construction of the various segments of the project, and provide sufficient detail about how the various cells and modules of the landfill areas will interface structurally. All design and as-built construction reports must be approved in writing by the Executive Officer, prior to disposal of wastes in those areas.

REPORT DUE DATE: Within 90 days of the adoption of Order No. WQ92-06.

11. Paragraph 22 is added to Section "C" (Provisions) of the order to read:

"The discharger shall provide the following technical reports within 90 days of the adoption of Order No. WQ 92-06 of the State Water Resources Control Board, and not less than two months before initiating any construction activity, including excavation or grading, outside the Phase I area for subsequent phases of the landfill. This limitation on construction activity does not apply to remedial measures specifically required by Order No. WQ 92-06 of the State Water Resources Control Board.

"a. Comprehensive slope stability analyses, including analysis of seismic stability for all containment structures, and including documentation of the basis for selecting the angle of internal friction and the coefficient of cohesion to be used, for the remaining phases of construction. The discharger shall, in good faith, meet and confer with staff of the Regional Board and the City of Pittsburg as a prerequisite to determining the basis for selecting the angle of internal friction and the cohesion intercept to be used in these analyses and the documentation necessary to support such selection; the Executive Officer of the Regional Board shall approve

the dischargers' selections before the discharger undertakes the slope stability analysis required by this paragraph.

"b. Seismic analysis of the stability of containment structures, landslides, and slopes in Phase I;

"c. Information regarding the preparation of the foundation for the toe berm and analysis of the relative forces affecting the stability of the toe berm;

"d. A grading plan showing the sequence of grading operations for removal or reconfiguration of Landslide 4.

12. Paragraph 23 is added to Section "C" (Provisions) of the order to read:

"The discharger shall unload the top of Landslide 3 and lay back (flatten) the cut slope adjacent to the Phase I area of the landfill within 90 days of the adoption of Order No. WQ92-06 of the State Water Board.

13. Paragraph 24 is added to Section "C" (Provisions) of the order to read:

"The discharger shall install slope inclinometers in Landslide 3, Landslide 4, and in the toe berm, and shall monitor them on a routine basis to detect any indication of slope instability. All readings shall be reported to the Regional Water Board in the reports

required pursuant to the Self Monitoring Program attached to this order."

14. Paragraph 25 is added to Section "C" (Provisions) of the order to read:

"The discharger shall, in consultation with the staff of the Regional Water Board, drill test holes and install monitoring wells in the toe berm area and to the east of the Phase I area, as indicated on the attached map, and install piezometers in the toe berm area."

Paragraph 26 is added to Section "C" (Provisions) of the order to read:

"All reports required by Order No. WQ 92-06 shall be submitted to the Regional Water Board through its chairperson. This information shall also be provided to the State Water Board staff who will conduct an independent review and make recommendations to the Regional Water Board regarding its adequacy."

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IT IS HEREBY FURTHER ORDERED that this matter be remanded to the Regional Water Board for implementation, enforcement, and further action consistent with this order.

CERTIFICATION

The undersigned, Administrative Assistant to the Board, does hereby certify that the foregoing is a full, true, and correct copy of an order duly and regularly adopted at a meeting of the State Water Resources Control Board held on June 3, 1992.

AYE: W. Don Maughan
 John Caffrey
 Marc Del Piero
 James M. Stubchaer

NO: None

ABSENT: Eliseo M. Samaniego

ABSTAIN: None



Maureen Marché
Administrative Assistant to the Board