APPENDIX

SITE CLOSURE PLAN SUMMARY FOR THE VINE HILL COMPLEX ADJACENT TO WALNUT CREEK AND PACHECO CREEK, MARTINEZ CALIFORNIA

DATED JUNE 11, 2007

PREPARED BY

Ninyo & Moore

Geotechnical and Environmental Sciences Consultants

1956 Webster Street, Suite 400

Oakland, California 94612

June 12, 2007
Project No. 401329001

FEMA

Info Scale: 16 %60

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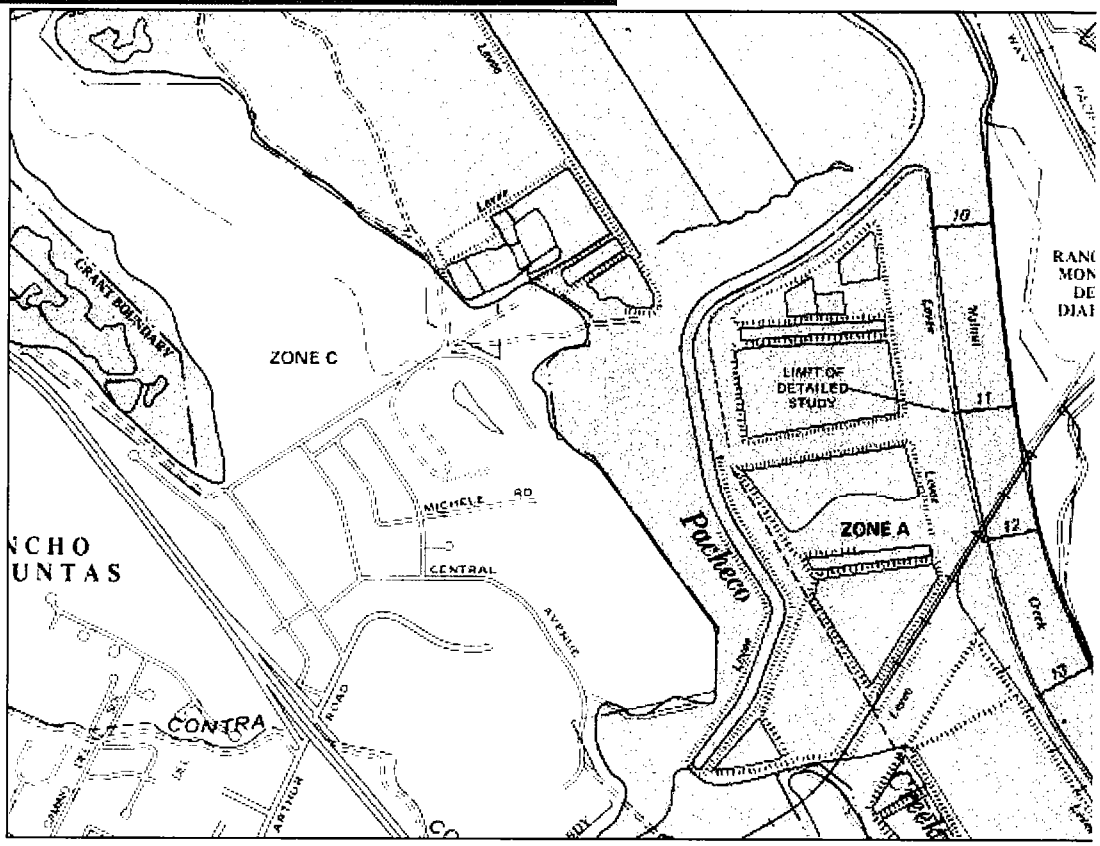
Zoom In Zoom Out

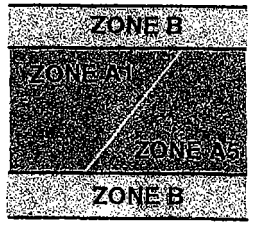
1:1 Zoom In MAX Zoom Out

Make a FIRMette



KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations*
100-Year Flood Boundary
500-Year Flood Boundary



Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7×

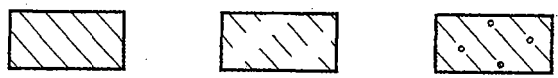
Zone D Boundary

River Mile — •M1.5

Approximate 100- Year Flood Boundary — ZONE A

**Reference to the National Geodetic Vertical Datum of 1929

UNDEVELOPED COASTAL BARRIERS†



Identified 1983 | Identified 1990 | Otherwise Protected Areas

†Coastal barrier areas are normally located witnin or adjacent to special flood hazard areas.

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CONTRA COSTA COUNTY, CALIFORNIA
(UNINCORPORATED AREAS)

PANEL 90 OF 625
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
0600250090 C

MAP REVISED:
SEPTEMBER 7, 2001

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

hazard factors not determined.

B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFEs, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of special flood hazard (100-year flood) include Zones A, A1-30, AE, AH, AO, A99, V, V1-30 and VE.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

For adjoining panels, see separately printed Map Index.

INITIAL IDENTIFICATION:
NOVEMBER 1, 1974

FLOOD HAZARD BOUNDARY MAP REVISION:
SEPTEMBER 6, 1977

FLOOD INSURANCE RATE MAP EFFECTIVE:
JULY 16, 1987

FLOOD INSURANCE RATE MAP REVISIONS:

Map revised September 7, 2001 to update corporate limits, to add base flood elevations, to change special flood hazard areas, to change zone designations, to add roads and road names, and to reflect updated topographic information.

APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CONTRA COSTA
COUNTY,
CALIFORNIA
(UNINCORPORATED AREAS)

PANEL 90 OF 625
(SEE MAP INDEX FOR PANELS NOT PRINTED)

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DRAWN BY	CHECKED BY		DRAWING NUMBER
BJW 7-18-91	APPROVED BY	7-31-91	AABG13-B111

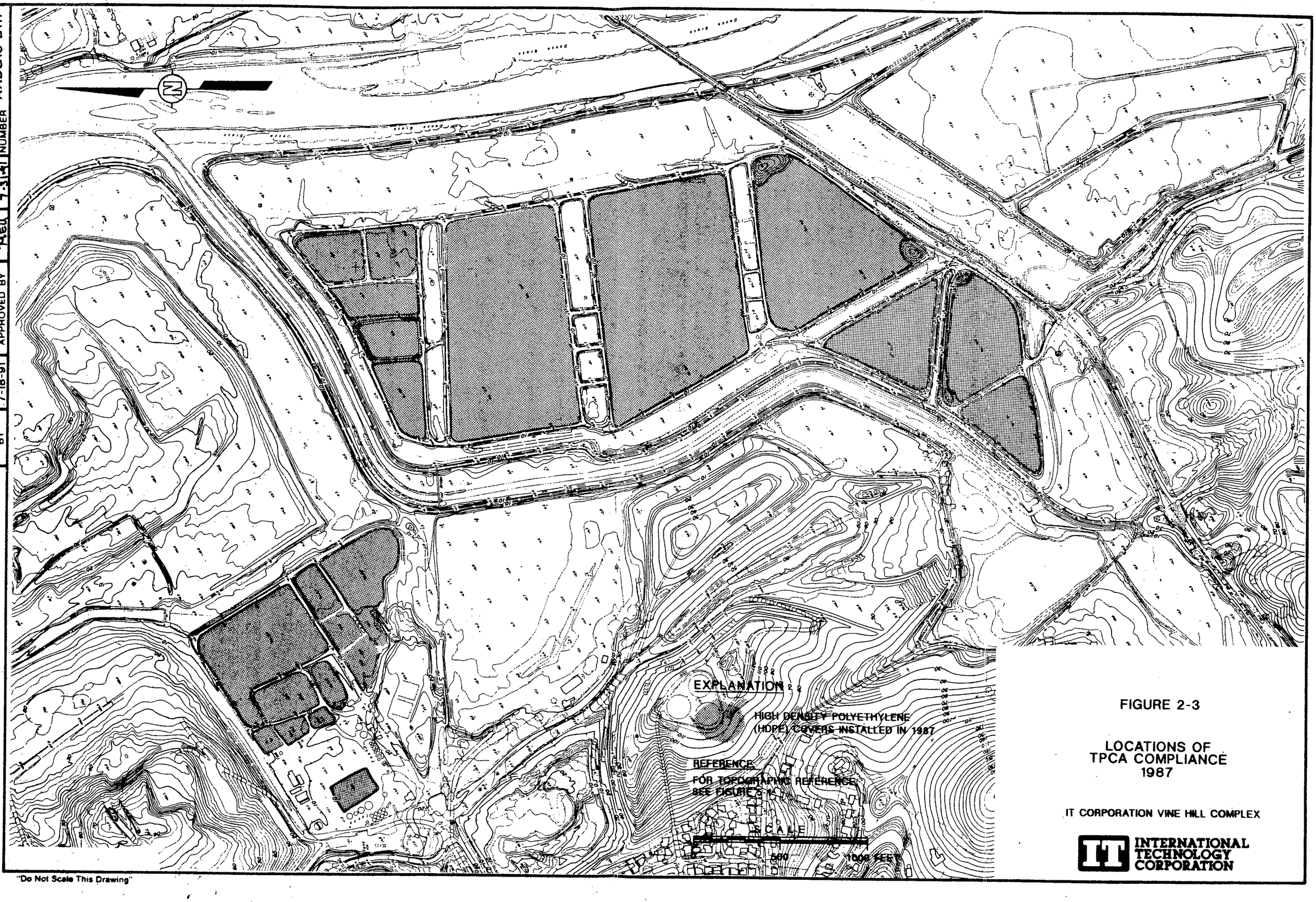


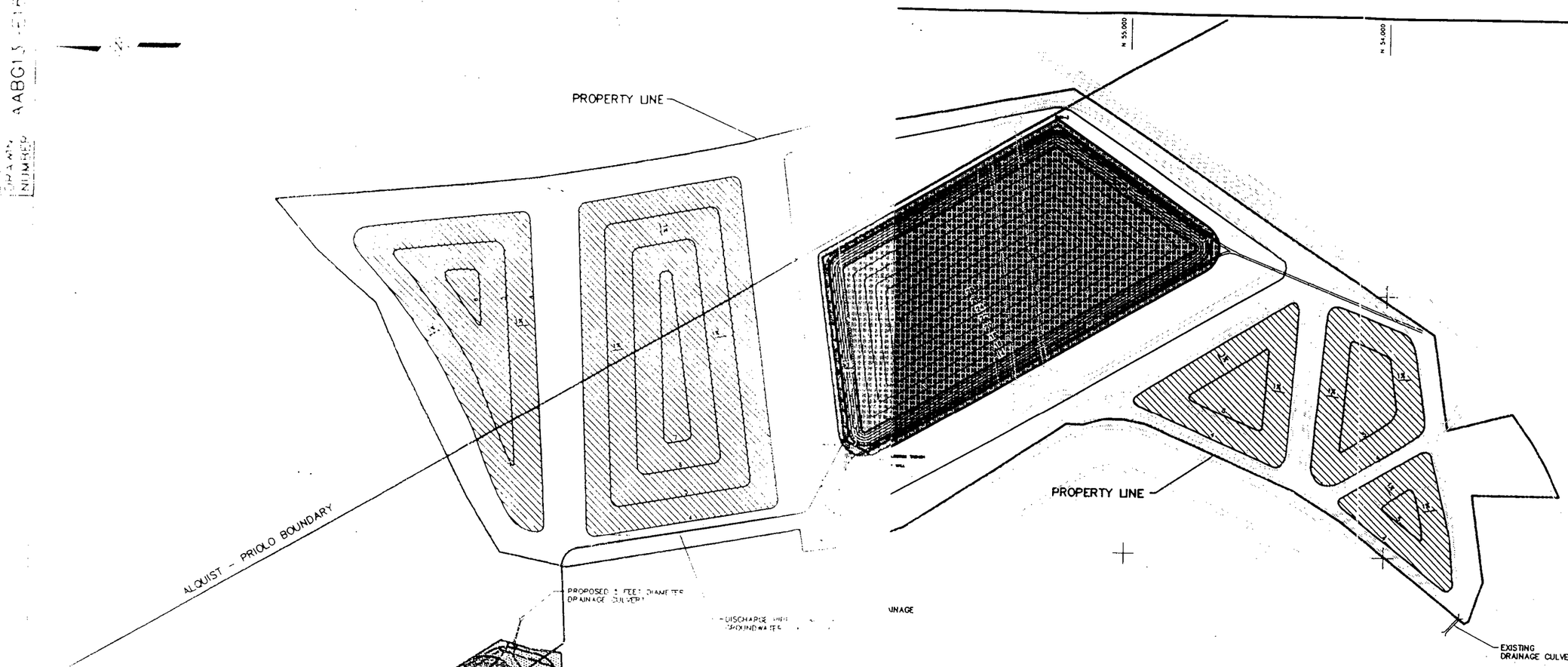
FIGURE 2-3

LOCATIONS OF TPCA COMPLIANCE 1987

IT CORPORATION VINE HILL COMPLEX

INTERNATIONAL TECHNOLOGY CORPORATION

"Do Not Scale This Drawing"



NOTES :

1) GRADING PLAN CONTOURS SHOW APPROXIMATE TOP OF CLOSURE COVER.
2) DESIGN CONTOUR LINES SHOWN DO NOT NECESSARILY REPRESENT FINAL GRADES. FINAL GRADES TO BE DETERMINED IN FIELD BASED ON ACTUAL WASTE QUANTITIES.
3) MINIMUM SLOPE OF 3% TO BE MAINTAINED AFTER SETTLEMENT.
4) ALQUIST-PRIOLO BOUNDARY REFERENCE:
   HART, EARL W., "FAULT-RUPTURE HAZARD ZONES IN CALIFORNIA, ALQUIST-PRIOLO SPECIAL STUDIES ZONES ACT OF 1972 WITH INDEX TO SPECIAL STUDIES ZONES MAPS", 1990. PREPARED FOR CALIFORNIA DEPARTMENT OF CONSERVATION, DIVISION OF MINES AND GEOLOGY.
   (COORDINATES SHOWN FOR ALQUIST-PRIOLO BOUNDARY ARE DIGITIZED ESTIMATES OF BOUNDARY ALIGNMENT)
5) ALL DISTURBED AND GRADED AREAS WILL RECEIVE COVER D HYDROSEEDING.

SCALE
0 200 400 600 FEET

REV	DATE	BY	CHK'D	APR.VD	DESCRIPTION
2	4/3/96	JAC			CHANGED 40-MIL LINER TO 80-MIL LINER C
1	9/22/93	JAC	RWS		LINER C CHANGES

FIGURE D-2

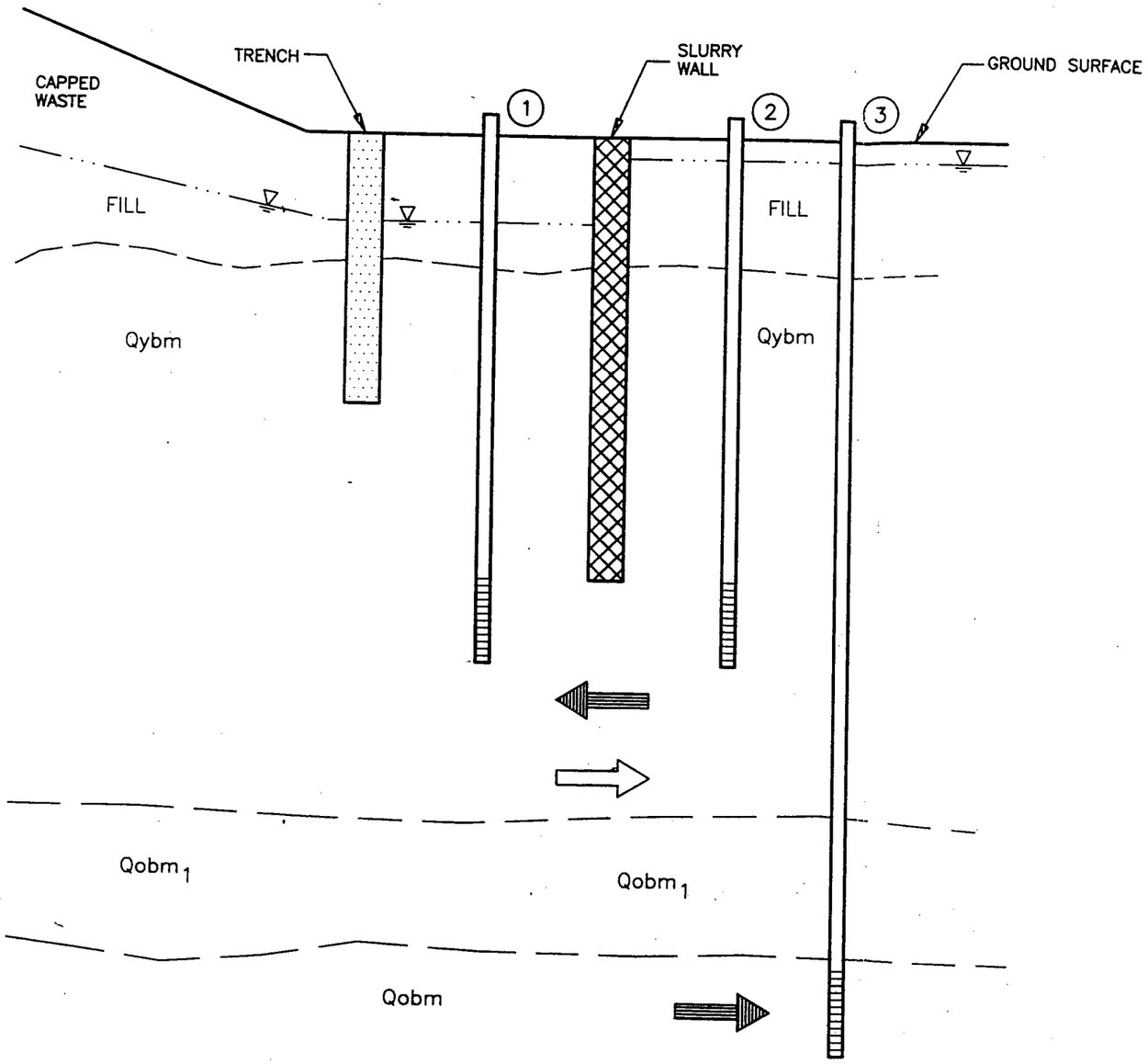
IT CORPORATION VINE HILL COMPLEX

FINAL CLOSURE CONFIGURATION OF VINE HILL COMPLEX

INTERNATIONAL TECHNOLOGY CORPORATION

DESIGNED BY	P. LOVERIDGE	CHECKED BY	PDL 7-30-91	SHEET
DRAWN BY	J. CLUGSTON	APPROVED BY	ND 7-30-91	

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
SJZ 2-15-94	N.S. 2/17/94	MEU 2.17.94	AVIN01-B15



NOT TO SCALE

EXPLANATION

GEOLOGIC CONTACT

MONITORING WELL/PIEZOMETER

SCREENED INTERVAL

(1) PIEZOMETER TO CHECK WATER LEVEL INSIDE SLURRY WALL

(2) PIEZOMETER/MONITOR WELL TO CHECK WATER LEVEL AND WATER QUALITY OUTSIDE SLURRY WALL

(3) MONITORING WELL TO MONITOR WATER QUALITY IN Qobm

PIEZOMETRIC SURFACE

LONG TERM DIRECTION OF GROUNDWATER FLOW WITH POSTCLOSURE GROUNDWATER CONTROL SYSTEM IN PLACE

SHORT TERM DIRECTION OF GROUNDWATER FLOW WITH POSTCLOSURE GROUNDWATER CONTROL SYSTEM IN PLACE

NOTE:

ANTICIPATED GROUNDWATER-FLOW DIRECTIONS FROM APPENDIX J, GROUNDWATER CONTROL SYSTEM DESIGN

FIGURE 4-2

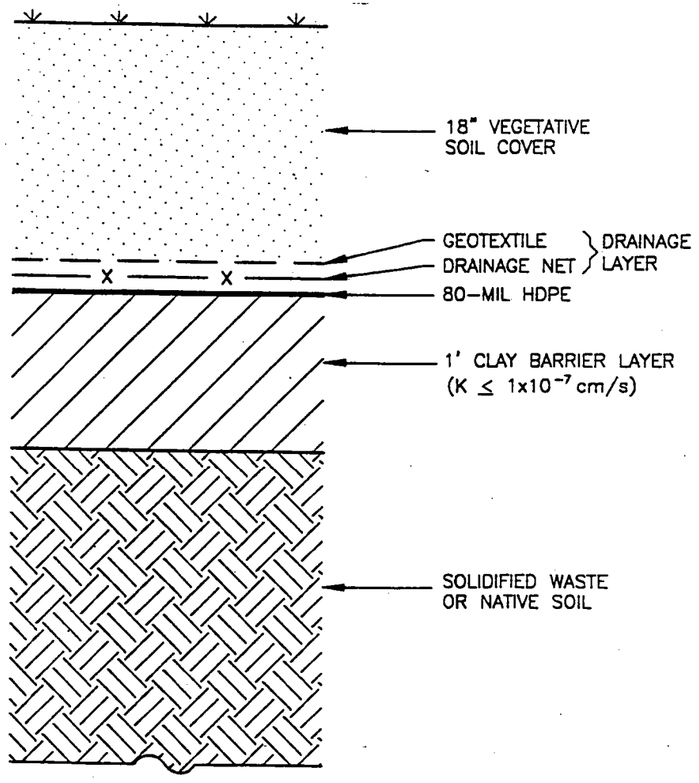
SCHEMATIC DRAWING - VINE HILL PIEZOMETER CLUSTER

IT CORPORATION VINE HILL COMPLEX

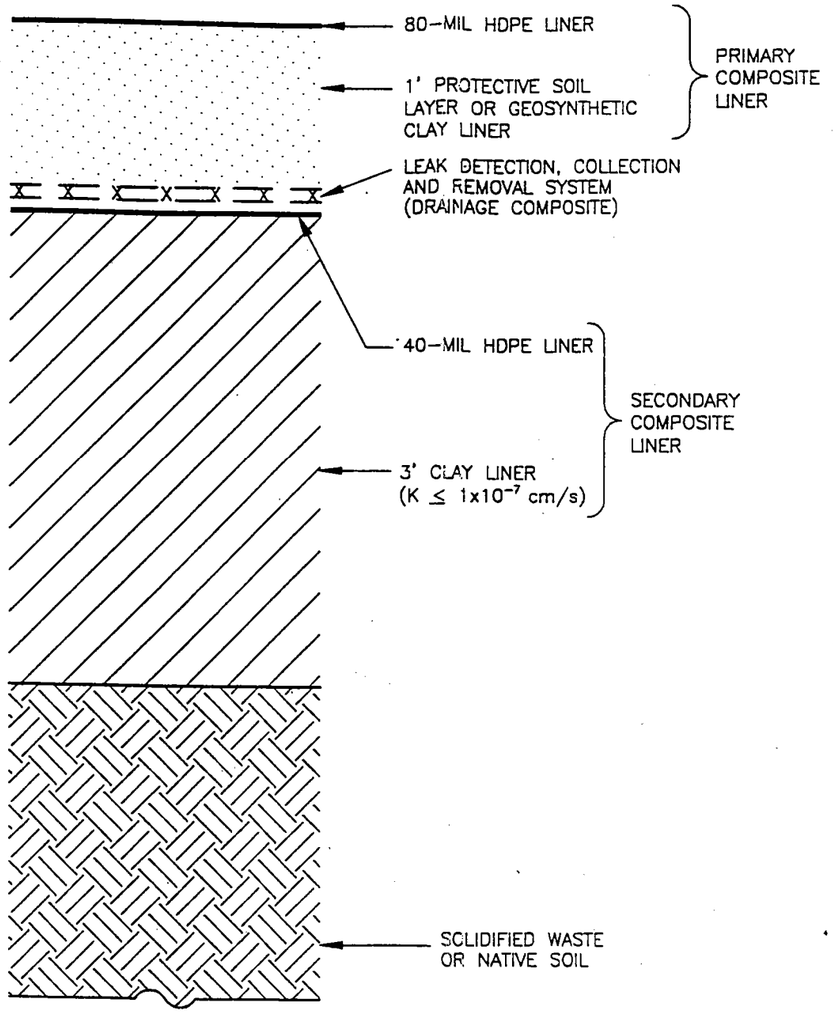
INTERNATIONAL TECHNOLOGY CORPORATION

VH-SPC(VH56)

DRAWN BY	J.A.C. 7-26-93	CHECKED BY			8-1-97	DRAWING NUMBER 760338-B90
		APPROVED BY				



COVERS A AND B
NTS



COVER/LINER C
NTS

FIGURE 3-3

TYPICAL CLOSURE COVER SECTIONS

IT CORPORATION VINE HILL COMPLEX

INTERNATIONAL TECHNOLOGY CORPORATION

7H961CCS(JUL96)

Ponding of rainwater on the final cover will be prevented and drainage will be promoted by proper grading. All cover systems will have a minimum grade of 3 percent after settlement. Adequately sized drainage channels will be constructed throughout the site to carry runoff away from the waste areas in a controlled manner. Channels will also be located on the boundaries of the waste units to preclude run-on from other areas of the site.

3.6.2 Vine Hill Cover Systems Design

The three final closure cover systems (Covers A, B, and C) to be used at Vine Hill are summarized in this section, followed by short descriptions of the system components. A typical cross section of each cover is illustrated in Figure 3-3.

Cover A

Cover A will be constructed in those areas where hazardous waste will remain in-place after closure. The cover includes the following layers (from bottom to top):

- Compacted foundation consisting of solidified waste or native soil.
- 1-foot-thick clay barrier layer having a maximum hydraulic conductivity of $1x10^{-7}$ cm/s.
- 80-mil HDPE synthetic layer.
- Drainage layer consisting of geotextile and a drainage net.
- 18-inch-thick vegetative soil cover layer.

A gas collection system will be installed after cover construction. The final cover will be graded to drain.

Cover B

Cover B will be constructed in those areas that do not receive either Cover A or C. This cover system will be used in areas in which municipal waste is left in-place. The cover will consist of the following components (from bottom to top):

- Compacted foundation.

- 1-foot-thick clay barrier layer having a maximum hydraulic conductivity of $1x10^{-7}$ cm/s
- 80-mil synthetic liner
- Drainage layer consisting of geotextile and a drainage net
- 18-inch-thick vegetative soil cover layer.

A gas collection system will be installed after cover construction.

Cover/Liner C

Cover C will be constructed in the area of the evaporation basin. This cover system will provide the required cover for any contaminants left in-place after excavation of the 200-series impoundments and will serve as the liner system for the basin. Cover C is designed to meet the minimum technology requirements of surface impoundments under 40 CFR 264.221(c) and 22 CCR 66264.221(c). The cover will consist of the following components (from bottom to top):

- Foundation layer consisting of solidified waste or native soil.
- 3-foot-thick clay liner (barrier layer) having a maximum hydraulic conductivity of $1x10^{-7}$ cm/s.
- Synthetic liner (40-mil HDPE).
- Leak detection, collection and removal system (LDCRS) consisting of a geocomposite that drains to a collection sump.
- Protective layer consisting of either a one-foot thick layer of soil or a geosynthetic clay liner (GCL).
- Synthetic liner (~~40-mil~~ 80-mil HDPE).

As discussed in Appendix J, modeling has shown that increased pore water pressure in the bay mud resulting from waste consolidation will exert pressure on the sides and bottom of the evaporation basin. To prevent uplifting of the basin liner, a blanket drain will be installed under the northern evaporation cell.

Compacted Foundation

The compacted foundation will consist of compacted select solidified waste or soil. The compaction will be sufficient to support heavy construction equipment and the final closure cover.

Clay Barrier Layers

The compacted clay layers will be constructed to have maximum hydraulic conductivities of $1x10^{-7}$ cm/s. The clay barrier layer used for closure covers will be 1 foot thick and the clay liner for the evaporation basin will be 3 feet thick. Before constructing the clay barrier layers, a series of field and laboratory tests will be conducted to establish the moisture content and density required to obtain the desired hydraulic conductivities. Specific tests and acceptance criteria are described in Appendices B and C.

Synthetic Cover Layer

A 80-mil HDPE synthetic liner will be used in conjunction with the clay barrier layer for Cover Systems A and B. A 40-mil HDPE synthetic liner will be used for the lower liner in Cover System C. This liner is of sufficient thickness and strength to withstand the stresses to which it will be subjected, including shear forces, strain due to total and differential settlement, construction loads, and penetration by rocks or other objects.

The evaporation basin will have a second, upper synthetic liner as the primary liner over the LDCRS. The second synthetic liner will ~~also~~ consist of ~~40-mil~~ 80-mil HDPE.

Gas Collection Vent Pipes

Gas vents will be provided to prevent the accumulation of gas, if any, generated from the solidified and municipal waste. The lower 3 feet of the vent pipes will be slotted and installed below the synthetic barrier layer (through the clay barrier layer and into the solidified waste, as shown in Figure 3-4). A pilot hole will be driven through the synthetic cover layer and clay barrier layer and into the solidified waste using a 2 1/2-inch-diameter steel pipe with a drive tip. Each vent pipe will be filled with 3/4-inch angular rock to provide support to the vent pipes. After installation of the vent pipe, an HDPE pipe sleeve will be banded with stainless steel bands, caulked to the vent pipe, and field-welded to the synthetic cover layer. Installation of the drainage layer and vegetative soil layer will follow the vent pipe installation.

A 5-foot-square by 6-inch-thick reinforced concrete pad will be provided to support each vent pipe. The concrete pad will also serve as a base for the installation of a gas collection system, if deemed necessary by postclosure emission sampling and analysis.

The vent pipes will be evenly distributed over the final cover such that the maximum travel distance to a vent will be 400 feet or less. Figure 3-1 shows the locations of the gas vent pipes at the VHC.

This gas venting design is consistent with EPA guidelines for passive gas control systems for landfill covers (U.S. EPA, 1991). The compacted clay layer and the perimeter slurry wall serve as a barrier to gas migration and direct gases to the multiple vent pipes. One advantage of this system is that the design does not require any additional cover layers and thus minimizes the weight of the cover. Another advantage is the flexibility that multiple vents give in the unlikely event that an active gas management system needs to be implemented (IT, 1993f).

Drainage Layer

A drainage layer consisting of geotextile overlying a synthetic drainage net will overlie the synthetic liner layer. This layer will drain any water that infiltrates the top layer of the cover during heavy rainfalls and will minimize the buildup of hydraulic head on the synthetic liner. Synthetic drainage net was selected because it has a higher hydraulic transmissivity and is easier to install than a typical sand layer drainage system. The layer of geotextile will be placed above the drainage layer to prevent soil particles from migrating into and clogging the drainage net.

Leachate Detection, Collection, and Removal System (LDCRS)

As shown in Figures 3-9 and 3-10, the LDCRS in Cover System C will consist of a geocomposite drainage net covering the bottom and sides of the evaporation basin. This layer will serve to collect liquids that leak through the uppermost synthetic liner, so that liquids can be detected and removed and thus prevent hydraulic head from building up on the lower synthetic liner. The geocomposite will be comprised of synthetic drainage net lined on both sides with geotextile. The geocomposite will slope to a collection sump filled with gravel and lined with geotextile. The collection sump will be accessed with a 10-inch slotted pipe

that will run down the side of the evaporation basin in a trench between the two synthetic liners.

Protective Layer

The protective layer will protect the underlying liner components during operation and closure of the evaporation basin. The protective cover will consist of a layer of soil one-foot thick. The protective cover will extend over the sides and bottom of the evaporation basin.

Vegetative Soil Layer

The top layer of Cover Systems A and B will consist of 18 inches of clean soils to support vegetation, resist erosion, and protect the underlying layers. The vegetative soil layer will be graded at closure so that, with allowance for settlement, the slopes of the vegetative surface will drain precipitation without ponding of water. Prior to the rainy season following completion of closure construction, grasses, appropriate for final cover systems, will be planted as part of the vegetated cover system. If practicable, the grasses will be native species.

3.6.2.1 Construction Techniques

The Vine Hill closure cover will be installed using standard earthwork techniques and several types of heavy equipment, including, but not necessarily limited to, large-capacity scrapers, compactors equipped with sheepsfoot rollers, trucks, and several types of bulldozers.

3.6.2.2 Cover Tie-ins

Each of the three cover systems has a layer of clay as one of its lower layers. Typical cross-sections and details are shown in Figure 3-5. This layer will be used as a key to tie adjacent covers together if constructed at different time periods. The clay barrier layer of each new cover will tie into the clay barrier layer of the adjacent cover. Because the cover designs for Cover System A and B are the same, construction of the two systems may be continuous or tie-ins may be made at either the clay or synthetic layers.

The clay tie-in will be accomplished by placing a continuous clay barrier layer or exposing the edge of a previously constructed clay barrier layer by removing the vegetative soil cover to expose the clay, anchoring or tying in the synthetic cover layers, and either placing a continuous vegetative soil layer for both covers or tieing the new vegetative soil into the existing vegetative soil.

Covers A and C will be tied into each other by constructing the clay barrier layers as described above. The completed surface of the 1-foot clay barrier layer of Cover A will be at the same level as the completed surface of the upper synthetic liner of Cover C. The synthetic cover layer will be installed continuously between the two covers, or the previously installed synthetic cover layer will be exposed and cleaned and the new one will be welded to it. The drainage layer of Cover A will end at a drainage ditch to allow the water to be routed off site rather than onto the surface of Cover C. The vegetative soil layer of Cover A will end where Cover C begins.

The tie-in between Covers B and C will be similar to the tie-in between Cover A and Cover C. The surfaces of the clay layers will be at the same level, and the vegetative soil layer of Cover B will end where Cover C begins.

3.7 Surface-Water Control System

The proposed system to divert, collect, convey, and manage surface-water drainage at the Vine Hill site is described in this section. The system will include ditches excavated around the edges of the closure cell and evaporation basin and a pipe to convey water from the termini of these ditches to Pacheco Creek. The system is designed both to remove surface runoff from the landfill and to prevent surface run-on from adjacent areas. No runoff will contact previously disposed waste, contaminated soils, or any material that could potentially degrade water quality.

The Vine Hill closure cover system is designed to provide a minimum 3 percent slope to facilitate surface-water drainage and to prevent ponding. The general grading plan is shown in Figure 3-2. The cover surface height varies from about +10 to +26 feet msl. Surface water will be diverted to local existing drainages. New dikes will be constructed around the perimeter of the waste consolidation area to prevent run-on of precipitation onto the final closure cover. Cover surfaces will be regraded if required as part of continuing maintenance, as provided for in the Postclosure Plan.

Appendix H contains a description and the results of the surface-water runoff analysis.

3.7.1 Engineering Design Criteria

Federal and State regulations cite different design criteria for run-on and runoff control structures for hazardous waste landfills. Federal requirements (40 CFR 265.310) for closed landfills require the owner to construct a cover that will achieve the following:

- Promote drainage and minimize erosion or abrasion of the cover
- Prevent run-on and runoff from eroding or otherwise damaging the final cover.

No specific design criteria are given to define the terms "promote," "minimize," or "prevent." However, Federal requirements for prevention of run-on and runoff from exposed wastes at active landfills cite the 25-year-recurrence interval, 24-hour duration storm as a design basis (40 CFR 265.302).

State requirements for surface-water controls at closed landfills are essentially the same as Federal regulations. State regulation 22 CCR 66265.310(a)(8) requires compliance with 22 CCR 66264.228(e) through (r). 22 CCR 66264.288(j) specifies that:

> Hazardous waste and discarded hazardous material contained in the closed facility shall be protected from washout and erosion as the result of tides or floods having a predicted frequency of once in 100 years.

23 CCR 2546 requires that drainage for Class I facilities be designed and constructed to accommodate the anticipated volume of precipitation and peak flows from surface runoff under probable maximum precipitation conditions.

Because State regulations are more stringent, they were selected to govern the design, construction, operation, and maintenance of the run-on and runoff control facilities for the closure cover system at Vine Hill.

Surface runoff water pipe outlets must be designed in accordance with Contra Costa County Flood Control District's B50 Standard Specifications .

3.7.2 Design Layout

The main elements of the drainage system are described in Appendix H and include a series of ~~V-shaped~~ trapezoidal riprap-lined ditches that border the edges of the closure cell and the

evaporation basin. Each of these ditches has been designed to handle peak flow rates from the 100-year-recurrence interval storm. The results of the design calculations to size the proposed system of ditches are summarized in Appendix H. Design flows for each ditch were estimated using the Rational Method. The minimum ditch depths required to handle these flows were calculated using Manning's equation.

All ditches will have side slopes of 2H:1V and a base 4 feet wide. The average slope of each ditch will be ~~0.26~~ 0.2 percent. The maximum velocities that would be attained in these channels under 100-year storm conditions will be less than 4 ft/s, which is below the erodible velocity for riprap/cobbles (Chow, 1988).

A 60-inch-diameter corrugated metal pipe located near the eastern tip of the triangular evaporation basin will convey the combined flows of the ditches that converge at this point to Pacheco Creek. The culvert will have a minimum slope of 1 percent. The 100-year peak rate of flow through this pipe will be 23 ft^3/s. All drainage discharge pipes will be equipped with water tide gates to prevent flooding of the Vine Hill Complex during high tide.

All elements of the surface-water drainage will be inspected and maintained on a regular basis, as described in Section 4.0.

3.7.3 100-Year Floodplain

Dikes on Pacheco and Walnut Creeks have approximately 0.5 to 2.0 feet of freeboard above the 100-year flood stage water elevations calculated by the Federal Emergency Management Agency (FEMA). Although the levees have the potential for containing the 100-year floodwaters, they do not meet the FEMA criteria of 3 feet of freeboard (see Appendix A) and therefore, the Vine Hill Complex is included in the potential 100-year floodplain.

If 100-year floodwaters exceeding the FEMA freeboard requirement were to spill over the levees, which would not be expected as the levees provide 0.5 feet of freeboard, the flooding would have no effect on the Vine Hill landfill. The engineering analysis of the hydrodynamic and hydrostatic forces resulting from such a hypothetical flood indicates that the floodwater would not inundate the landfill and that the soils are resistant to scour by this flood (IT, 1993g; DTSC, 1993c). The floodwater would accumulate in the low-lying areas between the creek and the landfill. The landfill, which at its lowest point is at an elevation of +10 feet

msl, would remain above the flood level. The overbank flow in the adjacent low-lying areas would be too shallow and slow moving to scour the surface soils.

3.7.4 24-Hour PMP Storm Event

To provide a conservative, worst-case estimate of the impact of PMP floodwaters on the closure cells, modeling was performed to determine the extent and duration of flooding at only the Baker site with the conclusions drawn for Baker directly applied to the Vine Hill site. As described in Appendix H, this approach is conservative because: (a) the elevation of the base of the Baker landfill is lower than that of the Vine Hill landfill and therefore the height of water on the Baker landfill would be greater; (b) the Baker site is located in the confluence of Pacheco and Walnut Creeks; and (c) the Baker site is bounded by levees and a railroad embankment which, collectively, will create a "basin" during PMP conditions from which the rate of drainage occurs as a function of the number and size of the culvert. The effects of the PMP floodwaters at the Vine Hill site will be significantly less; therefore, evaluation of the effects of PMP floodwaters on the Baker landfill and direct translation of these affects to the Vine Hill landfill provides a conservative estimate of impacts on the entire facility.

At the direction of RWQCB, IT modeled the Walnut Creek watershed to determine the duration and extent of floodwaters resulting from a 24-hour PMP storm and evaluated the impact of those floodwaters at the Vine Hill Complex. Using conservative methods and assumptions, the evaluation indicates that the floodwaters will reach a maximum height of 19 feet MSL, overtop the existing levees and rise 15 feet and 9 feet up the sides of the Baker and Vine Hill landfills, respectively. Floodwaters will recede from the landfills within 3 days of the peak flow. Flow temporarily will be restricted from receding more quickly due to the configuration of the levees, which will act as temporary "dams."

The effect of the PMP floodwaters on the integrity of the cover systems was evaluated. Only 15 percent of the Baker landfill and 35 percent of the Vine Hill landfill will be affected by the floodwaters. Failure of the landfill covers under the external load created by the water will not likely occur due to the strength of the underlying compacted waste as compared to the overburden pressure.

Some scouring of the vegetated soil layer may be expected, assuming the area between the creeks and the landfill acts as an open channel. While areas of the vegetated soil layer may be disturbed, the underlying waste would not be compromised as the calculated velocity (2.5

feet per second) does not exceed the permissible value for stiff clay channel materials (4.0 feet per second) for the peak discharge. Damage to the vegetated soil layer is easily repaired and will not affect the performance of the closure system.

Floodwaters would not infiltrate or penetrate into the waste. Analyses have shown that even if all of the vegetated layer and the synthetic liner were removed or damaged, infiltration of the water through the compacted clay layer would require 7.4 days, assuming a one foot layer of clay with a permeability of 1×10^{-6} cm/sec and a constant head of 15 feet being maintained over the clay layer. As the floodwaters will recede from the landfill covers within three days, infiltration is not of significant concern.

While the PMP storm event would clearly have some impact on the Vine Hill Complex, the repercussions of that impact are short-term, not significant, and easily remediated. Modeling of the Walnut Creek watershed is a very conservative and unprecedented method for evaluating the effects of a PMP event which is an extremely rare event. This evaluation has demonstrated that the current drainage system design satisfies the intent of both 22 and 23 CCR, that of maintenance of water quality, prevention of the failure of the cover system, and protection of human health and the environment.

3.8 Groundwater Control System

The groundwater control system for the Vine Hill site is described in the following sections.

3.8.1 Engineering Design Criteria

The Vine Hill groundwater control system consists of the elements discussed below and shown in Figure 3-2:

- A slurry wall extending entirely around the containment area. The purpose of the slurry wall is to control horizontal groundwater movement and to reduce groundwater inflow into the containment area.

- A groundwater collection system consisting of gravel-filled interceptor trenches will be located inside the slurry wall. The collection system will accelerate dissipation of excess pore-water pressure in the Qybm resulting from facility loading and also will prevent primarily lateral but also vertical migration of waste constituents.

- An evaporation basin located in the southeastern area of the site. The purpose of the evaporation basin is to retain and treat groundwater by solar evaporation.

Analysis of alternative control system designs and performance is presented in Appendix J. The slurry wall design is detailed in Appendix M.

3.8.2 Design Layout

The groundwater control system will be constructed around the entire perimeter of the Vine Hill site. In addition, the groundwater interceptor trench will traverse the site interior along the closure cell and in the vicinity of the bedrock high. Water will also be collected from an underdrain below the northwest side of the evaporation basin and directed to a separate trench drain. The perimeter trench and slurry wall will intercept off-site flow through the fill and Younger Bay Mud. The internal trench will prevent uplifting of the evaporation basin and will also prevent water from entering the bedrock high. The evaporation basin underdrain will also minimize the hydraulic uplift pressure on the evaporation basin.

The interceptor trench will extend 10 feet into the Younger Bay Mud, which corresponds to approximately -10 feet msl. The trench will be filled with permeable material meeting the specifications of CalTrans Class II material (Appendix B). A perforated drainage pipe wrapped with geotextile filter will be placed at the bottom of the trench to direct water to collection sumps located at ~~turning points of the trench~~ each manhole (Figure 3-2). ~~On average, the sumps are about 775 feet apart. A total of 15 sumps will be installed.~~ Groundwater sump details are presented in Figure 3-6. The sumps will be made of prefabricated manholes and will be outfitted with submersible pumps. The pumps will direct water to the evaporation basin through a 4-inch-diameter header pipe. Backflow prevention valves will be installed upstream of each sump. The pumps will operate intermittently to maintain head below 0 feet msl on the perimeter trench system and -5 feet msl along the evaporation basin.

The blanket drain below the northern evaporation basin cell (Section 3.9) will extend south to the existing dike between impoundments 203 and 204 (Figure 3-9). This drain will consist of a permeable material, consisting of drainage net or gravel. A filter fabric will be placed below the drain to prevent clogging.

3.8.3 Groundwater Control System Performance Evaluation

The groundwater control systems are designed to prevent off-site flow of groundwater that may have the potential for becoming affected by the long-term disposal of wastes. Groundwater modeling analysis was conducted to illustrate postclosure flow conditions, calculate flow rate into the system under a range of possible conditions, and investigate the fate of water that is not captured by the control system. The analysis is presented in detail in Appendix J.

The analysis of the Vine Hill system may be summarized as follows:

- The complete collection system is estimated to collect about 20 gallons per minute (gpm) initially, dropping to less than 5 gpm in the long term (Figure 3-7).

- The hydraulic head caused by the increased pore-pressure within the Younger Bay Mud induced by the consolidation and solidification of wastes will be a maximum of 37 feet msl and will dissipate during the first 20 years of the postclosure period.

- The control system will initially capture all groundwater within the saturated waste and within the upper 10 feet of the Younger Bay Mud. As settlement becomes complete and pore pressures are dissipated, the zone of influence of the system will increase.

- The system will collect over 90 percent of all horizontal flow within the fill, Younger Bay Mud, and upper Older Bay Mud.

- Although the groundwater collection system is not designed to significantly reduce vertical flow, 48 percent of the possible vertical flow in the Younger Bay Mud and the upper Older Bay Mud will be contained by the control system. The remaining 52 percent of vertical flow corresponds to a volume of less than 1 inch of water over the site in 100 years.

- The particle tracking analyses indicate that the groundwater control system will contain groundwater down to at least the depth of the slurry walls, and to 10 to 20 feet deeper in areas where the Bay Mud has higher hydraulic conductivity (IT, 1991h). Groundwater below the containment depth will remain within approximately 100 feet of the site boundaries, except for groundwater in the Qobm unit which is predicted in 100 years to move northeast up to 400 feet to a location beneath the Acme east parcel landfill. There are no beneficial uses of this water.

In conclusion, the groundwater control systems for the Vine Hill site will meet the closure performance standard goal of preventing off-site migration of waste constituents.

Slurry wall cross-sections and details are presented in Appendix M and in Figure 3-8. The wall will be constructed before the trenches to minimize groundwater inflow during interceptor trench construction. The wall will be 3 feet wide and will extend 15 feet into the Younger Bay Mud, which is 5 feet below the depth of the interceptor trench. On the outside of the bedrock high, the slurry wall will key at least 3 feet into bedrock. The maximum depth of the slurry wall is 40 feet.

3.9 Long-Term Water Management

Groundwater will be generated at Vine Hill during the closure and the postclosure care period. The water will be managed in a double-celled evaporation basin throughout the postclosure care period. The long-term water management plan presented in this section was developed using conservative estimates of flow from the groundwater collection trench (Appendix J). A detailed description of the water management budget calculations is presented in Appendix K.

3.9.1 Design Layout

The long-term water management system will consist solely of the evaporation basin. Construction of the evaporation basin is planned for the spring and summer of the second year of construction. The evaporation basin is designed to consist of two separately lined cells. The liner system for the evaporation basin will also act as the final closure cover system for waste or waste constituents left in-place after solidification and removal of the waste contained in the 200-series impoundments. The containment system for the evaporation basin was designed to meet the minimum technology requirements (MTRs) for surface impoundments under 40 CFR 264.221(c) and 22 CCR 66264.221(c), to prevent the migration of waste constituents into the underlying soils and groundwater. The liner system will consist of the following (from bottom to top):

- ***Clay Liner*** - A clay liner (lower component of the bottom composite liner) will be constructed on the bottom and side walls of the excavation and will be a minimum of 3 feet thick. The clay liner will be constructed to have a maximum hydraulic conductivity of $1x10^{-7}$ cm/s and a minimum bottom slope

of 2 percent. The clay barrier layer will be constructed in 6-inch-thick compacted lifts to the specifications provided in Appendix B.

- ***Lower Synthetic Liner*** - The upper component of the bottom composite liner will be a synthetic liner, which will be located above the clay liner and will serve to prevent downward infiltration of fluids. The synthetic liner will be 40-mil HDPE.

- ***Leak Detection, Collection and Removal System (LDCRS)*** - The LDCRS will consist of a geocomposite of drainage net covered with filter fabric that will serve as a drainage layer under the bottom and sides of the evaporation basin. The LDCRS geocomposite will be sandwiched between the lower, bottom composite liner and the upper synthetic liner. The geocomposite will slope to drain liquids to a collection sump where they can be detected and removed through a 10-inch pipe. The pipe will run down the side of the basin between the two synthetic liners.

- ***Protective Layer*** - The protective layer will consist of at least a one-foot thick soil layer over the bottom and sides of the evaporation basin to protect the bottom composite liner from potential damage. The protective layer is not an agency recommended component but rather a protective measure included at IT's discretion. The thickness may actually be increased.

- ***Upper Synthetic Liner*** - The top component of the basin liner system will be a ~~40-mil~~ 80-mil HDPE synthetic liner. This will be the primary liner that will be in contact with the collected groundwater.

The grading plan, sections and details, and a typical cross-section of the liner system for the construction of the evaporation basin are presented in Figures 3-9, 3-10, and 3-11 respectively. Appendix K presents the design requirements.

The dimensions (width, length, and depth) of the evaporation basin were determined using a short-term deterministic and long-term stochastic water balance for the site. These calculations involved determining the amount of water gained from precipitation and flow from the groundwater collection system and the amount lost via evaporation. The deterministic analyses examined the impact of consecutive 200-year annual rainfalls during the first 2 years of operation. The stochastic calculations tracked changes in the volume of water stored in the basin over the entire 30-year closure period. Monthly rainfall amounts were picked randomly from a data set with the same monthly means, variances, and

coefficients of skew for the rainfall in the Martinez area. Assumptions common to both sets of analyses included the following:

- The amount of groundwater collected over time will decline logarithmically as given in Appendix K
- The mean annual evaporation rate at the site is 59.04 inches.
- The freeboard requirement was determined to be 2.5 feet, in order to hold the 24-hour PMP storm of 15.2 inches of precipitation, plus the effects of wave runup and wind setup due to wind conditions that are likely to accompany such precipitation.

The evaporation basin has a mean annual net evaporation capacity of about 14.6 acre-feet, or about 9 gallons per minute (gpm). The groundwater control system is predicted to produce less than 9 gpm after a few years of operation (Appendix J). Until the groundwater recovery rate falls below the net annual evaporation rate, the extra groundwater production is taken up by storage in the basin.

Results of these analyses are presented in Figure 3-12. Figure 3-12 shows that, under the circumstances of two consecutive 200-year storms during the first year of operation and otherwise normal weather, the basin has enough storage capacity to fully drawdown the groundwater level in the interceptor trench starting in the first year of operation. However, if the weather is abnormally wet, it will take several years before maximum drawdown is achieved. Therefore, rather than construct an extremely large basin for the short-term, peak flows, other steps will be taken if capacity problems develop. Pumping rates from the groundwater collection system can be temporarily reduced or suspended if the depth of liquid in the basin approaches the freeboard line. Alternately, additional evaporation can be accomplished by installing a temporary thin film solar evaporator (TFSE). A TFSE is a nearly level surface of black HDPE liner, equipped with a leak detection system, over which water gently flows. The additional black surface enhances evaporation.

3.9.2 Final Closure of Long-Term Water Management System

Groundwater collection rates will decline following initial dewatering of the shallow saturated sediments and dissipation of excess pore pressures caused by loading of the Vine Hill closure cell and the ACME landfill. The lower rates may eventually allow the evaporation basin or a

These elements of the SAP are described below in Sections 4.2.3 through 4.2.11. Sampling procedures and analytical methods for the Vine Hill Complex after closure will be the same as those specified in the field sampling and analysis plan in use at the time of closure.

4.2.3 Groundwater Monitoring System

The postclosure groundwater monitoring system consists of:

- Eight piezometers to measure water levels inside the collection trench and slurry wall
- Nine "point-of-compliance" wells to monitor water quality and water levels in the uppermost aquifer outside the collection trench and slurry wall
- Five additional perimeter wells monitoring deeper aquifers for water quality and water levels outside the collection trench and slurry wall
- One interior well monitoring bedrock water quality
- Two wells to monitor background water quality.

The details and rationale of this system are described in the following sections.

As described in the Closure Plan (Section 3.0), all wastes at the Vine Hill site will be solidified and consolidated in the northeast portion of the site. A groundwater collection system including recovery trenches and a perimeter slurry wall will be installed around the entire management area. These corrective actions will result in changes to the hydrologic regime which will require changes to the existing monitoring system including the addition of some piezometers and wells. The locations of the monitoring wells and piezometers included in the proposed postclosure groundwater monitoring system are shown in Figure 4-1.

The groundwater monitoring program required at the Vine Hill site during and after closure is designed for site-specific requirements. A typical evaluation monitoring program involves monitoring the groundwater quality upgradient and downgradient of a site, then comparing upgradient and downgradient quality. However, such an ideal monitoring program cannot be implemented at the Vine Hill site for two reasons: (1) the site location and (2) the effect of the proposed groundwater control system.

through 66265.99 (22 CCR 66265.90-99). The regulations require that postclosure environmental monitoring systems be established for groundwater, surface water, and the vadose zone, if appropriate. Postclosure groundwater and surface monitoring programs are discussed in the following sections. Vadose zone monitoring is not necessary at the VHC because there is no vadose zone below the Vine Hill or Baker sites (the regulated units). The current groundwater surface is at or near the topographic surface, and all soils beneath former WMUs are saturated.

The following program addresses each aspect required under the regulations, including:

- Monitoring and response program
- Water quality sampling and analysis plan
- Groundwater monitoring system (well location and construction)
- Background monitoring wells
- Water quality protection standard
- Point of compliance
- Constituents of concern
- Monitoring parameters
- Concentration limits
- Sampling schedule
- Compliance period
- Statistics and statistical retests
- Surface water monitoring system.

4.2.1 Monitoring and Response Program

A postclosure monitoring and response program is required for Vine Hill. The purpose of the program is to detect, characterize, and respond to releases of hazardous constituents to groundwater or surface water. The regulations define two types of monitoring programs that apply singularly or together after closure at interim status facilities. These are:

- Detection monitoring to detect a release at the earliest opportunity. The detection monitoring program sets statistical criteria for defining what constitutes a release at the facility.

- Evaluation monitoring to assess the nature and extent of the release and to detect changes in the release. Data resulting from the evaluation monitoring program are used to design a corrective action program that meets the requirements of 22 CCR 66264.100 which also

APPENDIX H

SURFACE-WATER CONTROL SYSTEM DESIGN ANALYSIS

H.1.0 Introduction

The Vine Hill Complex is located in the Walnut Creek watershed, which is the largest drainage basin in Contra Costa County (Central Contra Costa County Sanitary District, U.S. Environmental Protection Agency (EPA), 1976). This watershed incorporates 94,600 acres and includes the Ygnacio and Diablo Valleys. The facility is located near the confluence of Walnut and Pacheco Creeks in the lower portions of the watershed, approximately 2 miles south of Suisun Bay.

Walnut Creek is the major contributor to flow in the channel. Walnut Creek flows northward from the city of Walnut Creek and joins Pacheco Creek about 2 miles south of Suisun Bay. Peak flows occur in January and February, with low flows occurring in the summer months. Flows are somewhat regulated by storage in the Lafayette Reservoir.

Other surface waters in the vicinity of the Vine Hill Complex include perennial and seasonal unnamed streams and drainage culverts, the Martinez Reservoir and associated Contra Costa Canal, the Mallard Reservoir, and marsh areas located north and, to a limited extent, south of the facility.

The Martinez Reservoir, located approximately 2 miles west of the site, is used to store water obtained from the San Joaquin Delta. This reservoir is the terminal reservoir of the Contra Costa Canal, which conveys water to the town of Martinez for public supply. The Mallard Reservoir also stores water from the San Joaquin Delta as transported by the Mokelumne Aqueduct.

In 1982, the Federal Emergency Management Agency (FEMA, 1987) updated the flood hazard boundaries indicating that the Vine Hill Complex was in the potential 100-year floodplain. As discussed in IT's response to NOD Item IV.B (IT, 1993a), this designation was made solely because FEMA's three-foot freeboard requirement was not met for the Corps

of Engineers' levees along Walnut and Pacheco Creeks. The levees technically provide sufficient freeboard (0.5 to 2.0 feet) to contain the 100-year floodwaters. At the request of DTSC, IT evaluated a scenario assuming that the levees were reduced by the requisite three feet. It was concluded that the overtopping floodwaters (2.5 feet maximum) would not impact the landfills. DTSC approved IT's response to this NOD item (DTSC, 1993).

The mean annual precipitation in the area of the Vine Hill Complex is 18.15 inches as determined using precipitation data from fourteen nearby stations. This is a conservative estimate, as the Contra Costa County isohyetal maps for the area show a mean annual precipitation of approximately 15 inches.

The surface-water drainage systems that will be built to effect the rapid removal of runoff from the closed waste management units at the Vine Hill and Baker sites are described in Sections ~~3.6~~ 3.7 and 7.5 of the main text. These systems, which are illustrated in Figures H-1 and H-2, will consist of a series of ~~V-shaped and~~ trapezoidal ditches that will carry runoff away from the units to culverts that discharge to Pacheco Creek. Plan and section drawings showing the transition from the ~~V-shaped and~~ trapezoidal ditches to the culverts are presented in Figure H-3.

The methodology that was used to predict the peak flows associated with the 100-year storm event and design for the ditches to manage these flows satisfactorily involved the following steps. First, the locations of the drainage system ditches were selected on the basis of the surface topography of the final closure design and the performance standards for closure. Next, distinct drainage basins were delineated at each site. Third, the Rational Method was used to estimate the peak flow from each drainage basin and at each point where drainage from two or more basins converged. Finally, drainage channels were sized using Manning's equation. This approach is well documented and widely used in civil engineering practice.

Modeling was also completed to determine the extent and duration of flooding at the Vine Hill Complex due to a 24-hour probable maximum precipitation (PMP) rainfall event over the Walnut Creek watershed and to determine what impact this flooding event would have on the two closure cells.

H.3.0 24-Hour PMP Storm Event Modeling of Walnut Creek Watershed

The purpose of this modeling effort was to determine the extent and duration of flooding at the Vine Hill Complex due to a 24-hour PMP rainfall event over the Walnut Creek watershed and to determine what impacts this flooding event would have on the two proposed landfills.

To provide a conservative, worst-case estimate of the impact of PMP floodwaters on the closure cells, modeling was performed to determine the extent and duration of flooding at only the Baker site with the conclusions drawn for Baker directly applied to the Vine Hill site. This approach is conservative because: (a) the elevation of the base of the Baker landfill is lower than that of the Vine Hill landfill and therefore the height of water on the Baker landfill would be greater; (b) the Baker site is located in the confluence of Pacheco and Walnut Creeks; and (c) the Baker site is bounded by levees and a railroad embankment which, collectively, will create a "basin" during PMP conditions from which the rate of drainage occurs as a function of the number and size of the culverts. The effects of the PMP floodwaters at the Vine Hill site will be significantly less; therefore, evaluation of the effects of PMP floodwaters on the Baker landfill and direct translation of these affects to the Vine Hill landfill provides a conservative estimate of impacts on the entire facility.

At the direction of the Regional Water Quality Control Board (RWQCB), IT modeled the Walnut Creek watershed to determine the duration and extent of floodwaters resulting from a 24-hour PMP storm and evaluated the impact of those floodwaters at the Vine Hill Complex. Using conservative methods and assumptions, the evaluation, included as Attachment H-1 (IT, 1993b), indicates that the floodwaters will reach a maximum height of 19 feet MSL, overtop the existing levees and rise 15 feet and 9 feet up the sides of the Baker and Vine Hill landfills, respectively. Floodwaters will recede from the landfills within 3 days of the peak flow. Flow temporarily will be restricted from receding more quickly due to the configuration of the levees, which will act as temporary "dams."

The effect of the PMP floodwaters on the integrity of the cover systems was evaluated. Only 15 percent of the Baker landfill and 35 percent of the Vine Hill landfill will be affected by the floodwaters. Failure of the landfill covers under the external load created by the water

will not likely occur due to the strength of the underlying compacted waste as compared to the overburden pressure. Infiltration of the water through the compacted clay layer would require 7.4 days, assuming a one foot layer of clay with a permeability of $1 \times 1C^{-6}$ cm/sec, a constant head of 15 feet, and no overlying vegetated soil or synthetic layers. As the floodwaters will recede from the landfill covers within three days, infiltration is not of significant concern.

Some scouring of the vegetated soil layer may be expected, assuming the area between the creeks and the landfill acts as an open channel. While areas of the vegetated soil layer may be disturbed, the underlying waste would not be compromised as the calculated velocity does not exceed the permissible value for stiff clay channel materials. Damage to the vegetated soil layer is easily repaired and will not affect the performance of the closure system.

While the PMP storm event would clearly have some impact on the Vine Hill Complex, the repercussions of that impact are not significant, short-term and easily remediated. Modeling of the Walnut Creek watershed is a very conservative and unprecedented method for evaluating the effects of a PMP event which occurs less than once in one thousand years. While it would be unreasonable to expect that drainage control structures could be built surrounding the landfills in order to divert outside drainage (23 CCR 2546(d)), this evaluation has demonstrated that the current drainage system design satisfies the intent of both 22 and 23 CCR, that of maintenance of water quality, prevention of failure of the cover system, and protection of human health and the environment.

7.0 Baker Closure Plan

7.1 Overview

This Closure Plan addresses the 11 impoundments at the Baker site (Figure 1-3). The Baker closure involves consolidation of the wastes and some of the underlying soils from the impoundments into a single closure cell. The location of the cell has been chosen so as to avoid impacts to the facilities (pipelines) which occupy easements crossing Baker. In addition, it is placed entirely outside the Alquist-Priolo Special Studies Zone. The remainder of the site will be closed using one of three options which are discussed below and, in more detail, in Appendix N.

This closure method is advantageous in comparison with other closure options (e.g., closure in-place over the entire area or closure by removal and transportation of the sludges to an off-site facility) in terms of increased security for the wastes, reduced potential for exposure after closure, and reduced potential for exposure and emissions during transportation. The rationale for the closure method and a description of some of the benefits inherent thereto are presented in the following sections.

Prior to closure construction activities commencing, written notification of the construction schedule will be provided to neighbors within 1/2 mile of the Vine Hill Complex. The notification will include identification of a noise disturbance coordinator. The coordinator will be responsible for responding to complaints about noise originating from the project. An answering machine or service will receive and record calls when the coordinator is unavailable. All calls will be responded to in a timely manner.

7.1.1 Baker Closure Cell

The Baker closure cell will be used to contain the consolidated sludges and portions of the underlying soils and dikes from all 11 impoundments at a single location. The location of the closure cell in Figure 7-1 was selected to avoid potential hazards resulting from faulting, and problems associated with pipelines and property rights or rights-of-way (Figures 7-1 and 1-3). The closure cell is located outside of the Alquist-Priolo Special Studies Zone (Hart, 1990) associated with the Concord Fault. This design is very conservative compared to Federal and State landfill siting requirements. The Alquist-Priolo setback is far larger than the State

7.2.3-2 Closure Cell

The performance standards will be met in the closure cell by providing a final cover and groundwater control systems. The final cover is designed and will be constructed to perform as follows:

- Minimize downward entry of water into the closed WMU for a period of at least 100 years
- Function with minimum maintenance
- Promote drainage and minimize erosion or abrasion of the cover
- Accommodate settlement and/or subsidence so that the integrity of the cover is maintained
- Have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present
- Accommodate forces generated by the maximum credible earthquake (MCE) so that the integrity of the cover is maintained
- Preclude ponding of rainfall and/or surface run-on over the closed area
- Conform with the provisions of 22 CCR 66264.228(e) through (r) and 23 CCR 2580 through 2582.

The performance specifications identified above will be achieved by the installation of Cover System A over the closure cell. The cover system is described in Section 3.5.2 shown in Figure 3-3 and Appendix D. The groundwater control system around the closure cell will prevent the off-site migration of hazardous waste constituents and leachate. The system is designed to collect all water which may come in contact with waste. The system is described in Section 7.6. Evaluation of the system with respect to closure performance standards is presented in Appendix J.

7.3 Site Preparation and Grading

Prior to construction of the final closure covers, grading work, dike construction, and consolidation of waste will be completed. Waste and approximately one foot of soil will be excavated from impoundments A1 through A5, B, D2, D3, E, and portions of C and D1 and moved to the Baker closure cell. Grading work will relate primarily to consolidating these materials and regrading the existing areas, as necessary, to facilitate positive drainage and

channels will have a grade of only 0.1 to 0.2 percent. The maximum velocities that will be attained in these ditches under 100-year recurrence interval conditions is less than 2 ft/s.

Two 24-inch-diameter, corrugated metal pipes will convey runoff from the landfill to Pacheco Creek. Both will have a minimum slope of one percent. The upstream culvert will have a maximum flow depth of 1.2 feet under 100-year storm conditions. The maximum flow depth of the downstream culvert under these same conditions will be 1.3 feet.

All drainage discharge pipes will be equipped with water tide gates to prevent flooding of the Baker site during high tide.

7.5.2 100-Year Floodplain

Based on a 1987 FEMA study, levees on Pacheco and Walnut Creeks have approximately 0.5 to 2.0 feet of freeboard above the 100-year flood stage water elevations. These dikes have the potential for containing the 100-year floodwaters, but do not meet the FEMA criteria of three feet of freeboard (also see Appendix A) and therefore the Vine Hill Complex is included in the potential 100-year floodplain. In the unlikely event that floodwaters from the 100-year storm event were to overtop the levees, which would not be expected as the levees provide at least 0.5 feet of freeboard, the floodwaters would not impact the Baker landfill (IT, 1993g; DTSC, 1993c). The overbank flow would be too shallow and slow moving to erode the surface soils.

7.5.3 24-Hour PMP Storm Event

The effects on the Vine Hill Complex of a 24-hour PMP Storm Event are discussed in Section 3.7.4.

7.6 Groundwater Control System

7.6.1 Engineering Design Criteria

The Baker groundwater control system consists of three basic elements as described below and as shown in Figures 7-2 and 7-3:

- A slurry wall extending entirely around the containment area. The purpose of the slurry wall is to reduce the volume of groundwater inflow into the containment area and to provide an additional barrier to off-site flow.

8.5 Sampling Procedure and Analytical Methods

Sampling procedures and analytical methods will be the same as those described in the most updated and approved field sampling and analysis plan in use at the time of closure. All samples will be managed with appropriate chain-of-custody documentation. Proper documentation procedures will be followed to eliminate the possibility of cross-contamination between samples or other sampling errors. Sampling duplicates, equipment rinse samples and field blanks will be collected in accordance with existing regulations and as stated in the sampling plan in use at the time of closure.

8.6 Surface Water Monitoring

The Baker closure cover system and surface-water control system is designed to prevent runoff from contacting wastes, contaminated soils, or any material that could potentially degrade surface water quality. There will be no potential for surface water (Pacheco and Walnut creeks) to become impacted via runoff. Therefore, impact of the creeks after closure could only result from subsurface migration of waste constituents. Results of groundwater modeling (Appendix J) indicate that such migration is unlikely. Potential migration of waste constituents towards either Pacheco Creek or Walnut Creek through the subsurface will be impeded by the proposed groundwater control system at the site, and will be monitored by the network of postclosure groundwater monitoring wells at the site. Potential releases would be detected at these wells before reaching the creeks. Dilution of constituents, natural fluctuations in the creeks' water quality and potential man-made upstream impacts could mask and complicate data interpretations. Therefore, a separate surface water monitoring program will not provide the earliest detection of constituent migration. The groundwater monitoring program as proposed provides this.

8.7 Fluid Recovery/Monitoring and Maintenance

As part of the postclosure maintenance at Baker, the groundwater collection system will be operated and monitored in a manner similar to the system at Vine Hill (Section 4.7). The recovered groundwater will be discharged to the Vine Hill evaporation basin for evaporation.

8.8 Postclosure Inspection and Maintenance

The postclosure inspection schedule and maintenance procedures for Baker are presented in this section and are summarized for the VHC in Tables 4-7 through 4-10.

8.8.1 Inspection

Inspection of the closed facility will be conducted at the frequencies listed in the tables. The frequency of inspections during the first year of postclosure relates to the greater probability of irregularities occurring during this period. Additional inspections will be conducted after major storms and seismic events to evaluate whether the system components are functional (Tables 4-7 through 4-10). These inspections will be performed by qualified personnel.

During the first year of postclosure, data will be collected and evaluated to determine the adequacy of the surface water drainage system to dissipate precipitation from a PMP event. In accordance with 22 CCR 66264.228(k), an annual inspection will be performed by a professional engineer registered in the State of California or a certified engineering geologist. The engineer or geologist will evaluate and document the condition of the closure covers, drainage facilities, erosion control facilities, vegetative cover, evaporation basin, and groundwater recovery and monitoring facilities. In addition, the annual topographic survey will be reviewed to provide for early detection of cover settlement to preclude interruption of adequate cover drainage.

The annual inspection will address the following:

- Access control (fences, gates, and warning signs)
- Vegetation
- Erosion
- Cracking or desiccation of covers
- Ponding of precipitation on covers
- Soft or ponded surface conditions over the cutoff wall or groundwater collection trench.
- Seepage
- Slope stability
- Disturbance due to adverse weather events
- Subsidence/settlement
- Groundwater recovery system
- Evaporation basin
- Groundwater monitoring system
- Run-on and runoff control system
- Surveyed benchmarks.

Table 4-7
Vine Hill Complex
Inspection Schedule
Closure Cover and Run-on/Runoff Control Systems

Facility or Equipment Item	Examples/Evidence of Potential Problems	Frequency of Inspection[a]	Inspection Procedures
Run-on/Runoff control system (piping and ditches)	Sediment deposition, malfunction, obstruction of channels, deterioration of channel lining, erosion/ deterioration of channel junctions, obstruction of head walls	Year 1: October to March - Monthly and MAJOR storms and seismic events; April to September - two times; Years 2-30: October to March - Bimonthly and MAJOR storms and earthquakes; April to September - one time.[b]	Visual
Facility road ditches	Clogging Excessive erosion	Same frequency of inspection as noted above for Run-on/Runoff control system	Visual
Sedimentation control structures	Damage to integrity	Same frequency of inspection as noted above for Run-on/Runoff control system	Visual
Access roads	Soft spots, ruts, large debris, inadequate gravel cover	Same frequency of inspection as noted above for Run-on/Runoff control system	Visual
Final cover	Surface erosion, cracking, slumping, soft or ponded conditions, absence of vegetation, undesirable vegetation, damage by burrowing animals; damaged gas collection and venting standpipes	Same frequency of inspection as noted above for Run-on/Runoff control system	Visual
Survey markers	Settlement, deformation	Annually	Visual and Survey
Inclinometers and settlement markers	Settlement, deformation	At a minimum, quarterly for first two years of postclosure.	Visual and Survey

[a] All inspection frequencies are suggested. More frequent inspections may be performed as deemed necessary based on environmental conditions.

[b] For purposes of inspections, "MAJOR storms" are defined as >1 inch in 24 hours; seismic events are defined as magnitudes >5 and within 6 miles, >6 and within 14 miles, >7 and within 30 miles.

Table 4-8
Vine Hill Complex
Inspection Schedule
Groundwater Monitoring and Control Systems

Facility or Equipment Item	Examples/Evidence of Potential Problems	Frequency of Inspection[a]	Inspection Procedures
Collection sump level checks	Presence and level of fluid	Quarterly	Visual
Sump pumps and flow meters	Inoperative, clogging pump, unchanged flow suspect meter readings, fluid in valve box at pipe	Quarterly	Operate, record cumulative flow volumes, visual
Groundwater monitoring wells	Inadequate/damaged surface seal	At time of sampling[b]	Visual
	Damaged well casing or protective steel casing, missing locks	At time of sampling[b]	Visual
	Inoperative sampling equipment	At time of sampling[b]	Visual
	Excessive sediment accumulation in well (>2 feet)	Biennially at time of sampling[b]	Calculation based on well sounding data
Slurry wall	Soft or ponded surface conditions	Same frequency of inspection as noted above in Table 4-3 for Run-on/Runoff control system	Visual
Groundwater collection trench	Soft or ponded surface conditions	Same frequency of inspection as noted above in Table 4-3 for Run-on/Runoff control system	Visual

[a] All inspection frequencies are suggested. More frequent inspections may be performed as deemed necessary based on environmental conditions.
[b] Well sampling frequencies are identified in Table 6-2.

Table 4-9
Vine Hill Complex
Inspection Schedule
Groundwater Evaporation Basin

Facility or Equipment Item	Examples/Evidence of Potential Problems	Frequency of Inspection[a]	Inspection Procedures
Inlet flow valves	Leaks, cracks, corrosion	Quarterly	Visual
Over topping controls	Obstruction, deterioration	Quarterly	Visual
Operating level	Sudden drop in level, inadequate freeboard	Year 1: October to March - Monthly and MAJOR storms and earthquakes; April to September - two times. Year 2-30: October to March - bimonthly and MAJOR storm and earthquakes: April to September - one time.[b]	Visual
Liner System	Accumulation of sludge, holes, tears, punctures, rips	Quarterly	Visual
Dike	Cracks, settlement, depressions, sink holes, erosion, seepage, damp areas, unusual vegetation, damage by burrowing animals	Quarterly and MAJOR storms	Visual
Bird Deterrents	Birds remaining in proximity to basin, noise makers or physical barriers damaged/nonoperational	March through May and September through November - Weekly. Monthly during remainder of year.	Visual

[a] All inspection frequencies are minimums, however, more frequent inspections may be performed as deemed necessary based on environmental conditions.

[b] Inspection frequency was developed to provide more frequent checks of cover systems during periods of rainfall when damage potential is greatest.

Table 4-10
Vine Hill Complex
Inspection Schedule
Safety, Emergency, and Security Equipment

Facility or Equipment Item	Examples/Evidence of Potential Problems	Frequency of Inspection[a]	Inspection Procedures
SAFETY AND EMERGENCY EQUIPMENT			
Portable air horns	Inadequate charge	Quarterly	Sound the alarm
Internal and external communication system (telephones and radios)	Inoperative telephone or radio, power out	Per NFPA[b]	Test
First aid equipment or supplies	Items out of stock or inoperative	Quarterly	Visual
Fire extinguishers	Inadequate gauge pressure Safety pin for retainer absent Outdated test certification Poor exterior condition	Quarterly Quarterly Quarterly Quarterly	Visual Visual Visual Visual
Portable pumps	Power, clogging	Monthly	Test
Emergency shower and eyewash	Inadequate water pressure or lack of water flow, leaking	Monthly	Visual and Test
Chemical cartridge respirator with cartridges for organic vapors and acid gase, half and full-face types	Spent chemical absorbent, seals	Weekly	Test
SECURITY EQUIPMENT			
Fence	Holes in fencing, leaning posts	Quarterly	Visual/walk around perimeter of facility

Table 4-10
Vine Hill Complex
Inspection Schedule
Safety, Emergency, and Security Equipment

Facility or Equipment Item	Examples/Evidence of Potential Problems	Frequency of Inspection[a]	Inspection Procedures
Gates and locks	Main gate - incorrect electronic operation	Quarterly	Visual
	Perimeter gate - lock tampering, inoperation, deterioration of lock, damage to fencing	Quarterly	Visual
Lighting	Burned out bulbs	Quarterly	Visual
	Damage to supports	Quarterly	Visual

[a] All inspection frequencies are suggested. More frequent inspections may be performed as deemed necessary based on environmental conditions.

[b] NFPA - National Fire Protection Association.