SOLID WASTE FACILITY PLAN MANAGEMENT
CITY OF CASA GRANDE MUNICIPAL LANDFILL

VOLUME III

CITY OF CASA GRANDE
CASA GRANDE, ARIZONA

Prepared for
City of Casa Grande

October 2003
Revised September 2003

Prepared by
HDR ENGINEERING
Phoenix, Arizona
Project No. 1127000104402

(Volumes I and II Produced in 1996)

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

REC: DEC 10 2003

PROJ.:
FILE:
DIST.:

November 5, 2003
PRU03-428

Certified Mail
Return Receipt Requested

Mr. A. J. Blaha, P.E.
Public Works Director
City of Casa Grande Municipal Landfill
510 East Florence Boulevard
Casa Grande, Arizona 85222

RE: Solid Waste Facility Plan Approval for the Casa Grande Municipal Landfill (CGML)

Dear Mr. Blaha:

The Solid Waste Plan Review Unit (PRU) has completed this solid waste facility plan approval for the Casa Grande Municipal Landfill (CGML) in response to your Type IV facility plan change request to increase the volumetric capacity of this landfill. A public notice with a 30 day comment period was required for this type change and we received no comment from the public during this time frame.

The document is a master approval and contains all prior approvals for the CGML and will be placed in the on-site facility file located at the ADEQ Records Center. This new type document is part of the PRU's effort to enhance and clarify all facility permits. In the future, any Type III or Type IV approval for this facility will generate a new master facility plan document.

Please find the enclosed original Approved Solid Waste Facility Plan. This now concludes the permit revision and approval process.

If you have any questions please call me at (602) 771-4588, or toll free in Arizona (800) 234-5677 extension 4588.

Sincerely,

A. W. Fritz (Andy)
Environmental Engineering Specialist
Solid Waste Section - Plan Review Unit

RCVD 11-7-2003

Attached: Original Approved Solid Waste Facility Plan for CGML (9 pages)

cc: Kim McDaniel, ICU
Richard Jeffries, Unit Manager, PRU
Facility File

STATE OF ARIZONA
DEPARTMENT OF ENVIRONMENTAL QUALITY

CITY OF CASA GRANDE
MUNICIPAL SOLID WASTE FACILITY
PLAN APPROVAL NUMBER 11015500.01

1.0 FACILITY INFORMATION AND APPROVAL SIGNATURE

In accordance with the provisions of Arizona Revised Statutes (ARS) Title 49, Chapter 4:

Facility Name: Casa Grande Municipal Landfill (CGML)

Owner/Operator: City of Casa Grande
Public Works Department
510 East Florence Boulevard
Casa Grande, AZ 85222

is authorized to operate with all approvals granted, and not previously amended or revoked, since the original facility plan approval under 40 CFR § 258, Subtitle D, on May 27, 1997, and specifically spelled out in the master approval that follows. This is a Type IV facility plan change which involves a significant vertical expansion and a resulting volumetric increase of the landfill. This change has resulted in the City of Casa Grande submitting a revised October 2003 solid waste facility plan and triggered the development of this master facility plan. The City of Casa Grande Municipal Landfill is a Municipal Solid Waste Landfill (MSWLF) and is located at the northwest corner of the intersection of Interstate 8 and Chuichu Road and the property is located in the northeast quadrant of Section 7, Range 6 East, Township 7 South and surrounded by unincorporated areas of Pinal County, Arizona.

Latitude	32° 19' 55" North
Longitude	111° 45' 40" West

This approval shall be deemed effective on the date of the Waste Programs Division Director's signature below, provided that the facility is operated and maintained in accordance with all the conditions described in the remainder of this approval document.

Approved on behalf of the Arizona Department of Environmental Quality:

Shannon M. Davis, Director
Waste Programs Division

Signed this 25 day of November 2003

2.0 STATUTORY PROVISIONS

City of Casa Grande shall not operate the Casa Grande Municipal Landfill (CGML) in a manner inconsistent with the Solid Waste Facility Plan as submitted in October 2003 and this approval pursuant to ARS § 49-791(A)(5) which consolidates all amendments to date.

2.1 General Provisions

This Arizona Department of Environmental Quality (ADEQ) Municipal Solid Waste Facility Plan approval, issued pursuant to ARS §§ 49-762, 762.03, 762.04 and 762.06, grants permission to operate a municipal solid waste landfill as defined in ARS § 49-701(20) at the location referenced in Part 1.0. Federal statutes governing the design and operation of landfills, codified in 40 CFR § 258, are also applicable to this approval pursuant to ARS § 49-761(B).

This approval is granted under the conditions listed herein to protect human health and the environment. The approval of this municipal landfill site has previously been made by others through the planning and zoning process.

2.2 General Limitations

a. This master facility plan approval applies only to the existing landfill elements of the date of this approval and components that have already received department approval prior to this master facility plan. Any additions to the approved facility structures and any modification to the approved facility operations plan, closure and post-closure care, corrective action and monitoring plans shall require prior approval of the department.

b. The landfill is not approved to accept the following :
   1. "Hazardous Waste" as defined in ARS § 49-921 except for "conditionally exempt small quantity generator" amounts as set forth in 40 CFR § 261.5 and ARS § 49-922(E).
   2. "Biohazardous Medical Waste" as defined in A.A.C. R18-13-1401(5).
   3. "Liquid Waste" as defined in 40 CFR § 258.28
   4. "Special Waste" as defined in ARS § 49-852.
   5. Any other waste prohibited by federal, State of Arizona statute or regulation from disposal at any municipal solid waste landfill.

2.3 Notifications

a. The CGML shall comply with ARS § 49-747 and AAC R18-13-2102 & 2103 and pay an annual registration fee.

b. The CGML shall comply with ARS § 49-836, and pay a solid waste landfill disposal fee based on the amount of waste landfilled.

c. The CGML shall submit a notification of any Type II, III, or IV changes to the approved solid waste facility plan in accordance with ARS § 49-762.06. The CGML shall not implement any Type III or IV changes prior to ADEQ approval.

d. Pursuant to ARS § 49-782(A), the ADEQ reserves the right to suspend, amend, withdraw, condition, or revoke this approval for the Solid Waste Facility Plan if it is determined that the facility is in violation of ARS Title 49, Chapter 4, or any rule adopted thereunder.

e. The following notifications are required if there is a methane gas exceedance:
   1. Within 24 hours of any methane gas exceedance where the gas concentration in facility structures exceeds 25% of the lower explosive limit or gas levels

at the landfill boundary exceed the lower explosive limit, the CGML shall notify ADEQ.

2. Within seven days of detection, CGML shall place in the operating record a description of the steps taken to protect human health. A copy of this description shall be sent to ADEQ Solid Waste Program.
3. Within 60 days of detection of any methane gas exceedance, implementation of a remediation plan shall be accomplished and a copy of the plan placed in the operating record. A copy of the plan, accompanied by a notification that the plan has been implemented shall be sent to ADEQ (40 CFR § 258.23).

2.4 Precautionary Provisions

a. This Solid Waste Plan Approval, issued pursuant to ARS § 49-762, 762.03 and 762.06 does not relieve the CGML of its responsibility to comply with federal, state, county, or local requirements, and shall not be construed as permission to create a public health hazard, environmental nuisance, or cause contamination to the environment.

b. The ADEQ reserves the right to issue administrative orders pursuant to ARS § 49-781, or to seek other legal remedies as provided by law, if the CGML creates a public health hazard, safety hazard, or environmental nuisance, if violation of State law occurs, or if the CGML is in violation of the approved Solid Waste Facility Plan.

c. For the purposes of ARS § 49-764, ADEQ considers issuance of this document as certification of all pollution control devices, machinery, or equipment described in the Municipal Solid Waste Facility Plan are necessary for collection and control at the source of any water pollutant contaminants.

d. The ADEQ reserves the right to conduct inspections of the CGML per ARS § 49-763. During the inspection the ADEQ inspector may take photographs of activities, take samples, and/or conduct other recognized monitoring activities.

e. The CGML shall not be operated in a manner inconsistent with the Solid Waste Facility Plan as referenced above, and the subsequent amendments to that plan, pursuant to ARS § 49-791(A)(5).

2.5 Financial Assurance

a. The CGML shall continue to meet closure and post-closure financial assurance requirements as per ARS § 49-770 and 40 CFR § 258, Subpart G until released by notification from ADEQ.

b. The cost estimate for landfill closure and post-closure care shall be updated yearly:
   1. by a new cost estimate sealed by an Arizona registered professional engineer or,
   2. if no changes have occurred since the preceding year's submittal, by use of an approved or demonstrated inflation factor that modifies the existing cost estimates.

c. Landfill cost estimates for closure and post-closure care shall be modified whenever a Type III or Type IV change to the solid waste facility will result in an increase in either closure or post-closure costs.

3.0 OPERATIONAL APPROVALS AND CONDITIONS

3.1 Approval of the Facility Plan

a. This ADEQ Solid Waste Facility Plan approval, issued pursuant to ARS § 49-762, 762.03, 762.04 and 762.06 grants permission to operate the CGML as set forth in the facility plan received in October 2003.

b. The following materials are permitted to be accepted at the subject facility:

- Municipal solid waste
- Construction debris
- Dead animals
- Nonfriable asbestos
- Containers (clean and perforated)
- Industrial waste (only non-hazardous solid waste)
- Wastewater treatment sludge from City plant (only if passes the Paint Filter Test)
- "Treated medical wastes" as defined in AAC R18-13-1401(37)
- "Household generator" of medical waste as set forth in AAC R18-13-1403(A)(4).
- Medical sharps which have been properly encapsulated or processed to prevent a stick hazard as set forth in AAC R18-13-1419
- Household hazardous waste as defined in ARS§ 49-701(13)
- Conditionally exempt small quantity generator waste as specified in 40 CFR § 261.4(b)(1)
- Landscaping rubble (green waste)as defined in ARS§ 49-701(17)
- Vegetative waste (green waste) as defined in ARS§ 49-701(36)

c. The following materials are permitted for recycling:

- Green waste
- Large appliances
- Lead acid batteries
- Paints
- Glass
- Plastics
- Mattresses
- Scrap metal
- Metal/tin cans
- Newspaper
- Corrugated cardboard

d. The following materials are not permitted at the subject facility:

- Tires
- Automobiles
- Petroleum contaminated soils
- Liquid waste, including septage
- Friable asbestos

e. If there should be any conflicts or inconsistencies between the facility plan and this approval, then the conditions of this approval shall govern.

f. If there should be any conflicts or inconsistencies between this approval and any prior approvals, then the conditions of this approval shall govern.

3.2 Other Approvals

a. Tarps approved as ADC in January 2002.
b. Vertical landfill expansion which is this approval

3.3 Operational Provisions

The ADEQ under ARS Title 49, Chapter 4, Article 4, requires that CGML must operate:

a. in a manner that protects public health and safety and the environment and prevents and abates environmental nuisances,
b. to control wind dispersion and other surface dispersions of the landfill materials so that they do not create a public nuisance or pose an imminent and substantial endangerment to public health or the environment. Visible materials that have dispersed beyond the boundaries of the current work face shall be collected on a regular basis,
c. by covering disposed solid waste with six inches of earthen material or approved alternative cover at the end of each operating day or more frequent as necessary to control disease vectors, fires, odors, blowing litter, and scavenging,
d. to prevent or control on-site populations of disease vectors using techniques appropriate for the protection of human health and the environment,
e. to ensure that the concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit for methane in facility structures and exceed the lower explosive limit at the property boundary,
f. to ensure that the landfill units do not violate any applicable requirements developed under a State Implementation Plan approved by the EPA Administrator pursuant to section 110 of the Clean Air Act, as amended,
g. to control public access and prevent unauthorized vehicular traffic and illegal dumping of wastes by using artificial barriers, natural barriers, or both, as appropriate,
h. to ensure that there is no discharge of pollutants into the waters of the United Stated from the landfill,
i. to ensure that bulk or non-containerized liquids are not placed in the landfill, and
j. by recording and retaining in an operating record: any location restriction demonstrations, inspection records, training procedures, gas monitoring results from monitoring, any remediation plans, design documents for placement of leachate or gas condensate, any demonstration, certification findings, monitoring, testing, or analytical data, closure and post-closure care plans, any cost estimates and financial assurance documentation.

3.4 Storm Water Management

a. The proper control of surface water drainage shall be implemented to prevent storm water from running on to the site and to prevent precipitation that falls on the landfill from ponding on the landfill surface or causing soil erosion or a "washout"in the landfill area per ARS § 49-774.
b. A drainage diversion system shall be constructed at the landfill. The drainage diversion channels must be capable of diverting surface water run-on and run-off away from both active and inactive landfill areas from a rainfall event equal to a 25-year, 24 hour storm (40 CFR § 258.26).
c. The MSWLF units shall not cause the discharge of pollutants into waters of the United States.
d. All surface water collection systems shall be constructed to resist the maximum horizontal acceleration in lithified earth at this site.

3.5 Ground Water Monitoring

Ground water monitoring shall be conducted in accordance with 40 CFR § 258.50-55 and in accordance with the Solid Waste Facility Plan Revision, Section 2.14.1 submitted in October 2003. Groundwater monitoring occurs on a semi-annual basis for the listed four on-site facility compliance wells and annually for the two off-site wells.

3.6 Landfill Gas Monitoring

a. As specified in 40 CFR Subpart D, the owners or the operators of the municipal solid waste landfill facility shall implement a routine methane monitoring program to ensure that the standards of 40 CFR § 258.23(a) are met. Such routine methane monitoring shall be designed to include (a) facility structures (excluding gas control or recovery systems) and (b) facility property boundaries.

b. The routine methane monitoring frequency must be at least quarterly (the frequency of two consecutive monitoring shall not be less than 90 days apart) or as department approved predetermined frequency based on the following conditions:
   1. Soil conditions;
   2. Type, nature and age of material accepted and its potential to generate landfill gas;
   3. Type of daily, intermediate, and final cover used;
   4. The hydrogeologic conditions surrounding the facility;
   5. The hydraulic conditions surrounding the facility;
   6. The location of facility structures and property boundaries;
   7. Adjacent land use, and any permanent enclosed structures adjoining the facility property boundaries; and
   8. After a reported landfill gas exceedance.

c. Pursuant to 40 CFR § 258.23 if a methane gas exceedance occurs at facility structures or at the facility boundaries, the owners or the operators of the MSWLF shall immediately take all necessary steps, as specified in Section 2.3 and Section 3.8 in this document, to ensure protection of human health and notify the state director.

d. The owners or the operators of the municipal solid waste landfill facility shall operate and maintain gas monitoring equipment after landfill closure for 30 years as discussed in Section 4.3, Post Closure Care and 40 CFR § 258.61(a)(4).

3.7 New Construction

a. All future construction will follow approved designs, drawings and specifications.

b. Pursuant to ARS § 49-762.06, the CGML shall submit a notification to ADEQ of any type II, III, or IV change to the existing approved solid waste facility plan. Type III and IV changes require prior approval from the Department before implementation.

c. The configuration of the final landfill slopes and elevations shall be consistent with the site zoning and the plans that are part of this approval.

3.8 Safety Issues

a. Access: This MSWLF must limit and control public access and unauthorized vehicular traffic and illegal dumping of wastes by using natural barriers, artificial barriers, or both, as appropriate to protect human health and the environment as set forth in 40 CFR § 258.25.

b. Salvaging: No material can be removed or salvaged from the work face, unless in unforseen incidents such as to remove unauthorized waste materials identified after

disposal.

c. Working face: The working face size (length, width and height) must be limited to the smallest possible area to provide: 1) easy manageability, 2) vehicle and public safety, and 3) to minimize public health nuisances.

d. Landfill gas: landfill owners and/or operators must ensure that the concentration of methane gas does not exceed:
   1. Twenty-five percent (25%) of the lower explosive limit for gasses in facility structures; and
   2. The lower explosive limit for the gases at the property boundary.

3.9 Recordkeeping

a. The Casa Grande Municipal Landfill facility shall comply with the record keeping requirements pursuant to 40 CFR § 258.29. The CGML shall submit a summary of all documents placed into the operating record annually beginning one year from the date of the Waste Programs Division Directors's signature on this Master Facility Plan Approval. The annual summary supersedes all Type II notification requirements of 40 CFR § 258, except landfill gas and groundwater exceedance, which must be reported as in accordance with 40 CFR § 258.23 or 258.54, respectively.

b. In adherence to 40 CFR § 258.29(b), the CGML shall maintain any Type I change records in the operating record to be made available for inspection during any reasonable operational time. These records shall be available for departmental personnel upon request. Additional operational records such as landfill fire, visual settlement or subsidence, injury and property damage, accidents, explosions, discharge of hazardous or other wastes not permitted at the landfill facility, flood damage or erosion, shall be placed in the same file.

4.0 CLOSURE AND POST-CLOSURE PROVISIONS

4.1 Final Closure

The following steps will occur during the landfill closure process:

a. CGML must notify ADEQ of the intent to close the landfill.

b. Closure activities for CGML must begin no later than 30 days after the date on which the MSWLF receives its known last receipt of waste or, if the landfill has remaining capacity and there is a reasonable likelihood that the MSWLF will receive additional waste, no later than one year after the most recent receipt of wastes.

c. Closure activities must follow the approved Closure Plan which is part of the Solid Waste Facility Plan.

d. Closure activities must be completed within 180 days following the beginning of closure as specified in paragraph (b) above.

e. Following the closure construction, the CGML shall notify the ADEQ through a certification document, signed and sealed by an independent registered professional engineer, that the closure has been completed in accordance with the Landfill Closure Plan and this approval.

f. Upon approval of the closure certification report by ADEQ, a letter will be written notifying the operator that the landfill is officially closed and released from future annual registration fees.

4.2 Final Cover Construction

The landfill final cover shall be a minimum of an 18-inch-thick low permeability soil layer and will have a permeability less than or equal to 1.0×10^{-5} cm/sec or an approved equivalent.

A minimum 6-inch vegetative layer will be placed above the barrier soil layer to stabilize the surface slope and provide satisfactory root space for surface vegetation.

4.3 Post-Closure Care

Post-closure care shall be provided at CGML for 30 years from the date of final closure acknowledgment by ADEQ and shall consist of:

a. maintaining the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of differential settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the final cover.

b. maintaining and operating the landfill leachate collection system in accordance with the requirements of 40 CFR § 258.40. The Director may waive this requirement if the operator demonstrates that leachate no longer poses a threat to human health and the environment.

c. maintaining and operating the gas monitoring system in accordance with the requirements of 40 CFR § 258.23.

d. maintaining and operating the groundwater monitoring system in accordance with the requirements of 40 CFR § 258.23.

4.4 Post-Closure Financial Assurance

Yearly financial assurance demonstrations for the 30 years of post-closure care will continue until notified by ADEQ that it is released from this requirement.

5.0 APPROVAL HISTORY

Date	Facility plan change
11/13/84	Notice of Disposal (pre-ADEQ Approval by EPA)
05/27/97	Municipal Solid Waste Facility Plan Approval 11015500
01/08/02	Approval for Alternative Daily Cover using Tarps
this approval	Type IV Change for vertical landfill expansion and subsequent Municipal Solid Waste Facility Plan Update - Approval # 11015500.01

6.0 REFERENCES

08/15/1994 Plan - ***City of Casa Grande Municipal Landfill, Solid Waste Facility Plan, (Volumes I & II)*** dated August 1994 prepared by Black and Veatch, submitted to ADEQ on the referenced date. (Two Plastic Comb Binders)

08/21/1996 Plan - ***ADDENDUM 3 - Operations and Closure/Post-Closure Plan, City of Casa Grande Municipal Landfill*** as revised in July 1996 and received on August 21, 1996

10/30/2002 Plan - ***City of Casa Grande Municipal Landfill, Solid Waste Facility Plan Amendment (Volume III)*** prepared by HDR for Type IV volume increase change with a consolidation of all prior changes.

02/04/2003 Letter - **Additional Information Required for Technical Review of the City of Casa Grande Solid Waste Facility Plan Amendment** by ADEQ (PRU03-036) in reference to the Plan Amendment III submitted on 10/30/02 by HDR

04/28/03	Letter - **HDR Letter Response** to the 2/4/03 ADEQ Additional Information Request by Consultants HDR to ADEQ addressing the 8 points raised.
05/22/03	Letter - **Second Additional Information Request - Drainage Plan and Details - Technical Review of the City of Casa grande Solid Waste Facility Plan - Type IV Amendment** by ADEQ with 10 points requiring resolution
09/24/03	Letter and Plan - **Response to ADEQ Drainage Plan and Details Technical Review Comments** by HDR with a red-line/strike-out draft of the final proposed version of the Revised Solid Waste Facility Plan
10/03/03	Final Plan - ***City of Casa Grande Municipal Landfill, Solid Waste Facility Plan Revision*** Final Version was submitted on October 2003 by HDR
10/07/03	Letter - **Technical Substantive Review Complete and Public Notice Commencement for a Type IV Change - City of Casa Grande Municipal Solid Waste Landfill** by ADEQ

– End of Facility Plan Approval 11015500.01 –

EXECUTIVE SUMMARY

The Casa Grande Municipal Landfill (CGML) currently operates under a permit issued by ADEQ in 1996. Based on changes to the operations and proposed changes to the design of the landfill, the City has prepared the attached Solid Waste Facility Plan Amendment. After ADEQ review and approval of this SWFP Amendment, the City will initiate the design changes.

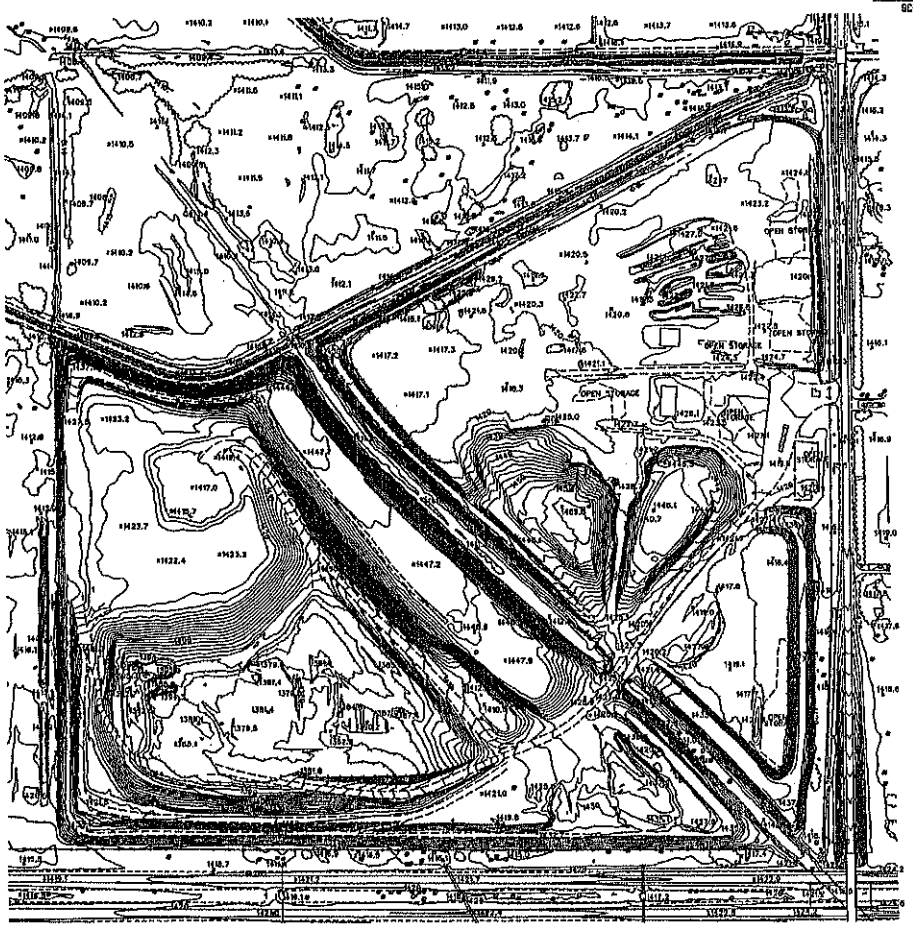
The CGML initiated landfill operations at their current site in the early 1950's. The site provides a convenient location (3 miles south of the City) to dispose of all the Casa Grande and neighboring areas waste. The landfill received their current Permit after extensive evaluations from 1994–96. At that time the City completed an Aquifer Protection Permit, and then because of Federal Rules being enacted, also completed a SWFP to meet State requirements.

In 2000 the City completed a Master Plan for the landfill. This Plan called for modifying the grades of the landfill, use of an Alternative Daily Cover (ADC), and development of a future cell at the landfill. The City conducted on-site testing of various ADC products in 2001 and selected Tarp-O-Matic for use as a daily cover. That program has now been in place since 2001. To implement the recommended design activities will require the City to submit a SWFP Amendment outlining the design changes.

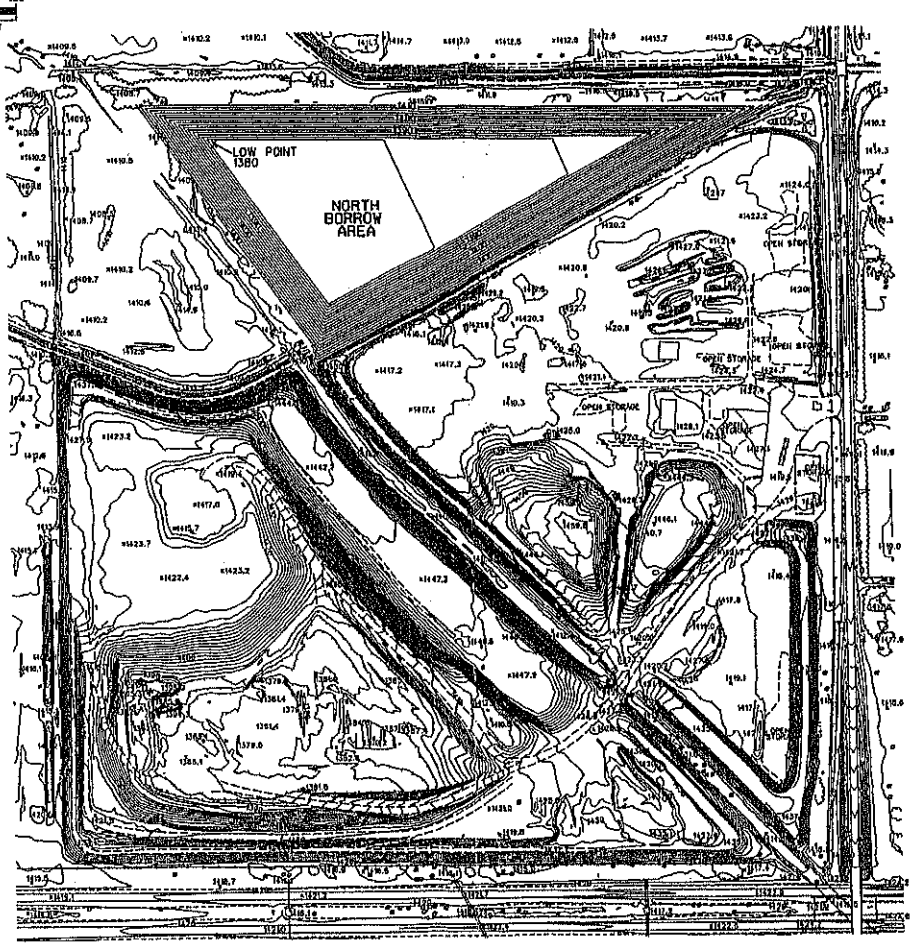
The attached SWFP Amendment updates the existing Operations Plan developed in 1996 including the use of the Alternative Daily Cover. The plan also addresses design changes including final grades of the East and West cells and development of a surface water collection system/retention basin as noted on the following figures. Also included is an updated Closure/Post-Closure Plan.

The North Borrow Area, noted on Figure 1-2, has been identified as a future expansion area for the landfill. This area could be developed by the City in 10 to 20 years depending on the volume of waste received at the landfill. If the City were to pursue this expansion, they would notify the ADEQ five years prior to preparing a SWFP Amendment meeting all Sub-title D requirements.

This document has been prepared as an Amendment to the existing SWFP developed in 1994-96. The existing SWFP has two Volumes. The SWFP Amendment will become Volume III.



EXISITING CONTOURS
JUNE, 2002



NORTH BORROW AREA EXCAVATION CONTOURS

SCALE IN FEET
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NOTE:
NORTH BORROW AREA MAY BE CONSIDERED FOR LANDFILL EXPANSION AT SOME FUTURE TIME.

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85044

Revision No.	Description	Date	Drwn.	Chkd.	Engr.	Proj. Mgr.

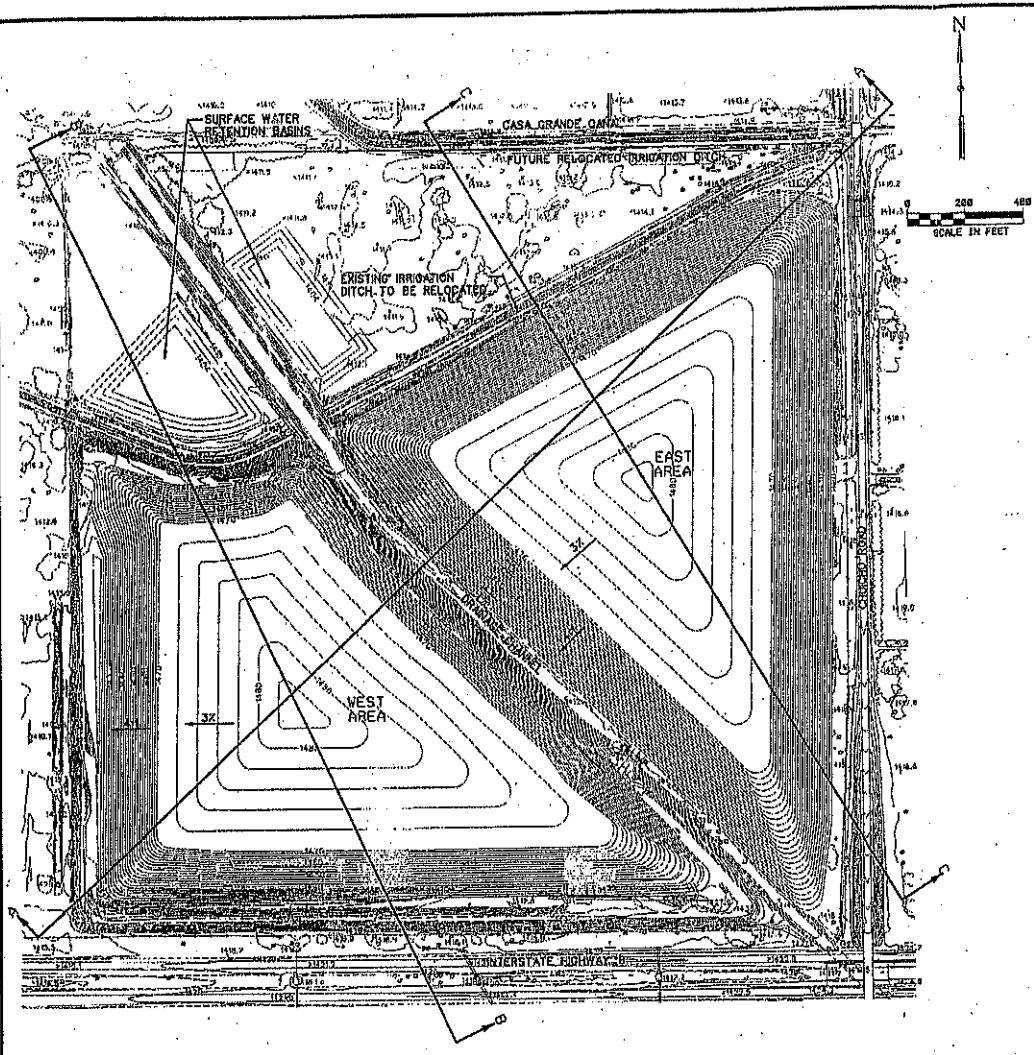
Project Manager: J. GARVIN
Architect
QA/Process
Civil: M. ODEN
Mechanical
Electrical
Structural
Designed
Drawn By: M. DEELEY

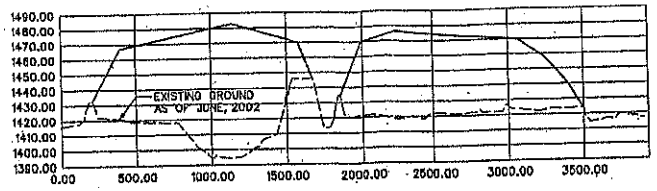
CITY OF CASA GRANDE
MUNICIPAL LANDFILL
CASA GRANDE, ARIZONA

PERMIT UPDATE

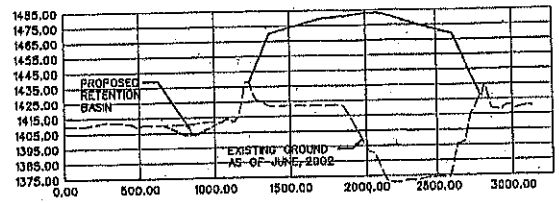
EXISTING & EXCAVATION CONTOURS

Date	Project No.	Figure No.	Issue
OCTOBER, 2002	11270-001-037	FIG 1-2	0
Scale: AS SHOWN			





CROSS SECTION A-A



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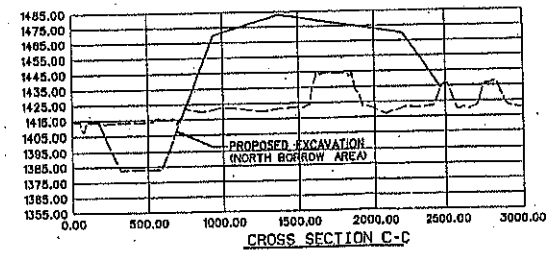

CROSS SECTION C-C

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85044

Revision No.	Description	Date	Drawn	Chkd.	Resp. Engr.	Proj. Mgr.
1	RETENTION BASIN SIZE	09/03	KG	MO	MO	JG

Project Manager: J. GARVIN
Architect | HVAC/Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By: M. DEELEY

CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

PERMIT UPDATE

FINAL CONTOURS

Date	Project No.	Figure No.	Issue
SEPTEMBER, 2003	11270-001-037	FIG 1-3	1
Scale: AS SHOWN			

City of Casa Grande

Solid Waste Facility Plan Amendment

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City of Casa Grande
Landfill Permit Update

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1.0 DESIGN CRITERIA

1.1 Engineering Design Plans and Specifications

This section documents general design considerations, specific results of analysis, and the selected configuration of key facility components of the Casa Grande Municipal Landfill (CGML). The landfill is currently divided into two areas by a drainage channel. Fill is currently taking place in the West Area. The East Area will be filled upon completion of the West Area. An aerial photo of this site is included as Figure 1-1. The landfill design is directed toward minimization of leachate production and groundwater protection, as well as the maintenance of the overall environment and aesthetic quality of the site. A topographic map showing the general conditions of the site as of June 2002 is included as Figure 1-2. This figure also shows proposed excavation grades for the soil borrow area on the north part of the East Area. A final grading plan is included as Figure 1-3. Landfill Cross Sections showing the general features of the CGML, including existing grades and final elevations are also included on Figure 1-3.

1.1.1 Engineering Design Plans and Site Drawings

A set of revised engineering design drawings, dated October 2002, is included with this document. These drawings supersede the 1994 design drawings, which depict the CGML's currently permitted configuration. The 1994 design drawings were submitted in conjunction with the August 1994 Solid Waste Facility Plan.

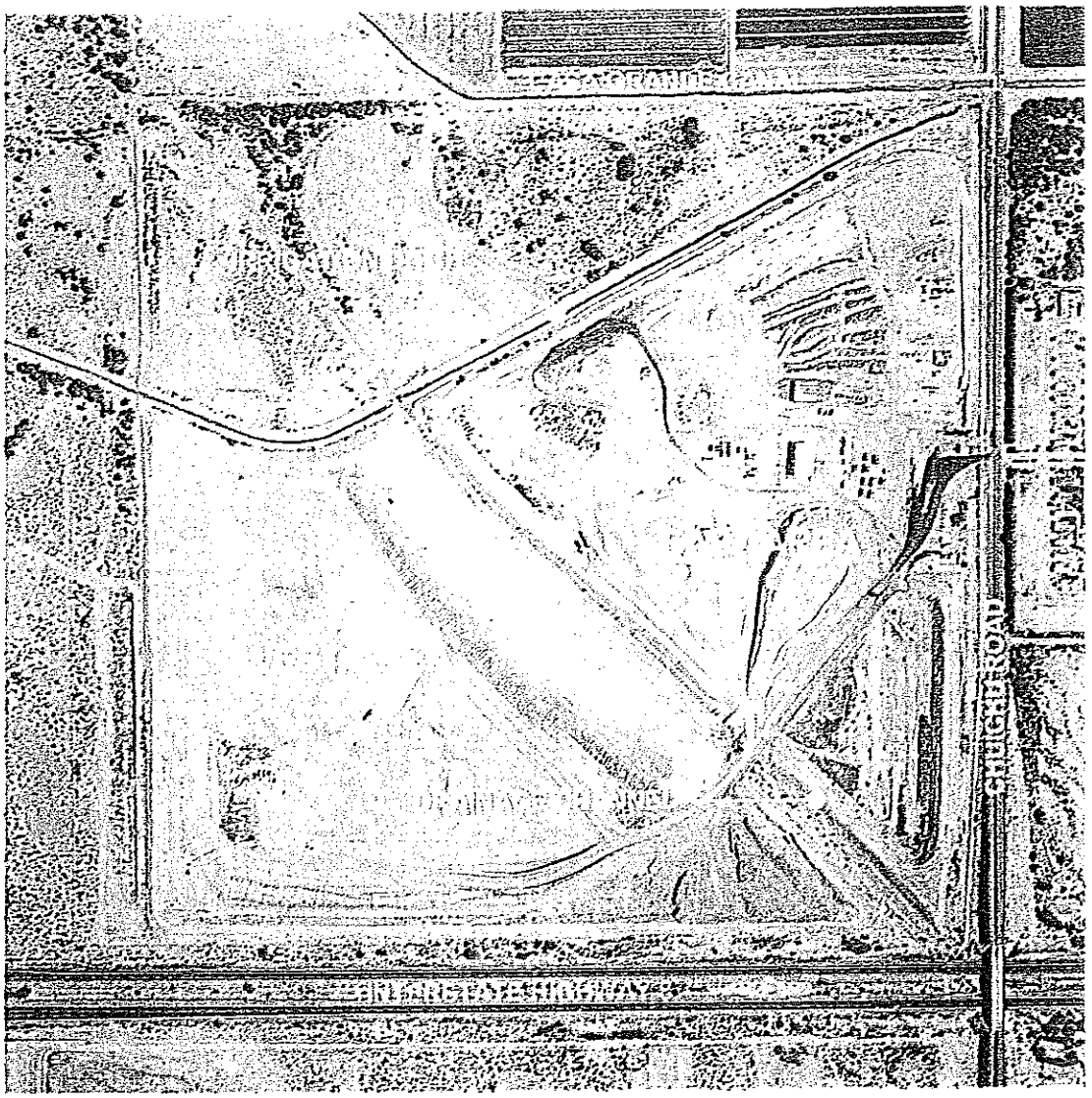
1.1.2 Topographic Mapping

The base topographic map used to show existing site conditions was provided by the City of Casa Grande (City). The elevation contours were established in April 2000 using aerial photography techniques. Updates to the map were made based on field survey performed in June 2002 in the vicinity of the fill currently taking place in the West Area. The existing contour map is included as Figure 1-2. Based on discussions with the site operator, the remainder of the site has not been substantially altered from the 2000 flyover date.

1.2 Engineering Report

This amendment to the approved CGML Solid Waste Facility Plan has been prepared in accordance with Title 40 of the Code of Federal Regulations, Part 258, Section 60 (40 CFR 258.60) and 40 CFR 258.61, also known as "Subtitle D" of the Resource Conservation and Recovery Act (RCRA). For completeness, the Plan includes items listed in the Arizona Department of Environmental Quality's (ADEQ) Municipal Solid Waste Landfill Facility (MSWLF) Checklist – June 1, 1996.

Figure 1-1: Aerial Photo



SCALE: APPROXIMATELY 1" = 500 FEET
DATE OF FLIGHT: APRIL 27, 2000

N

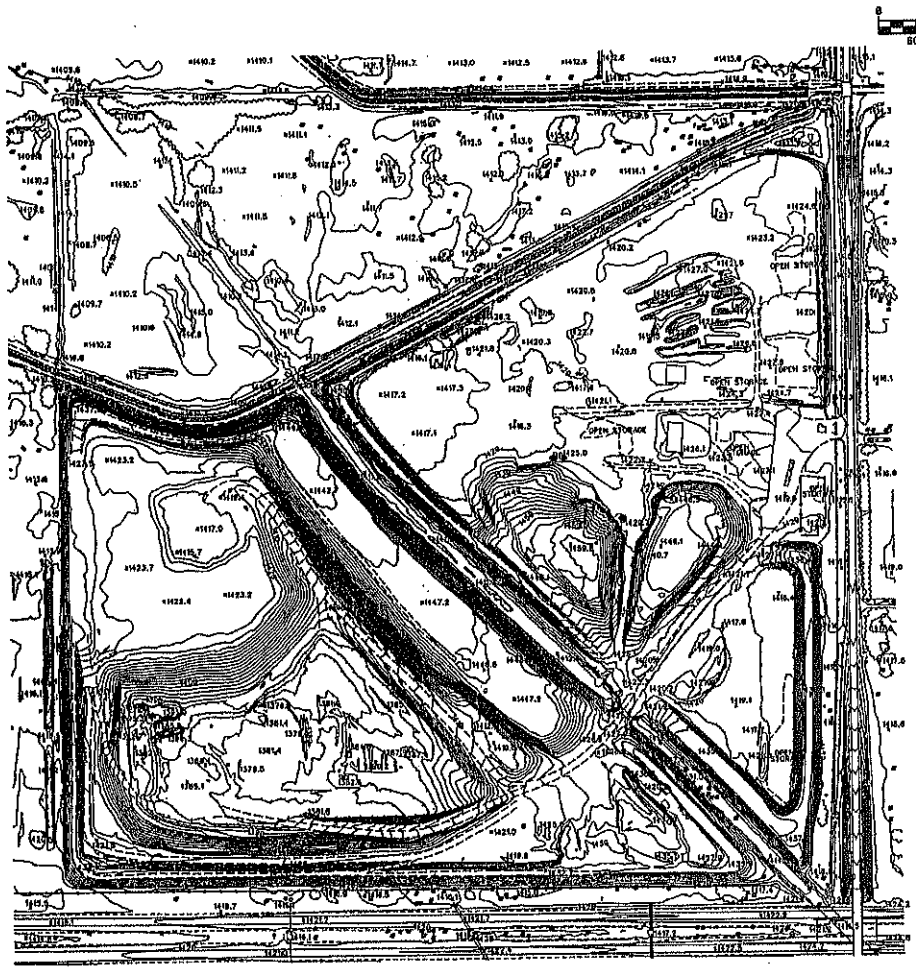
HDR

FIGURE 1-1
LANDFILL SITE

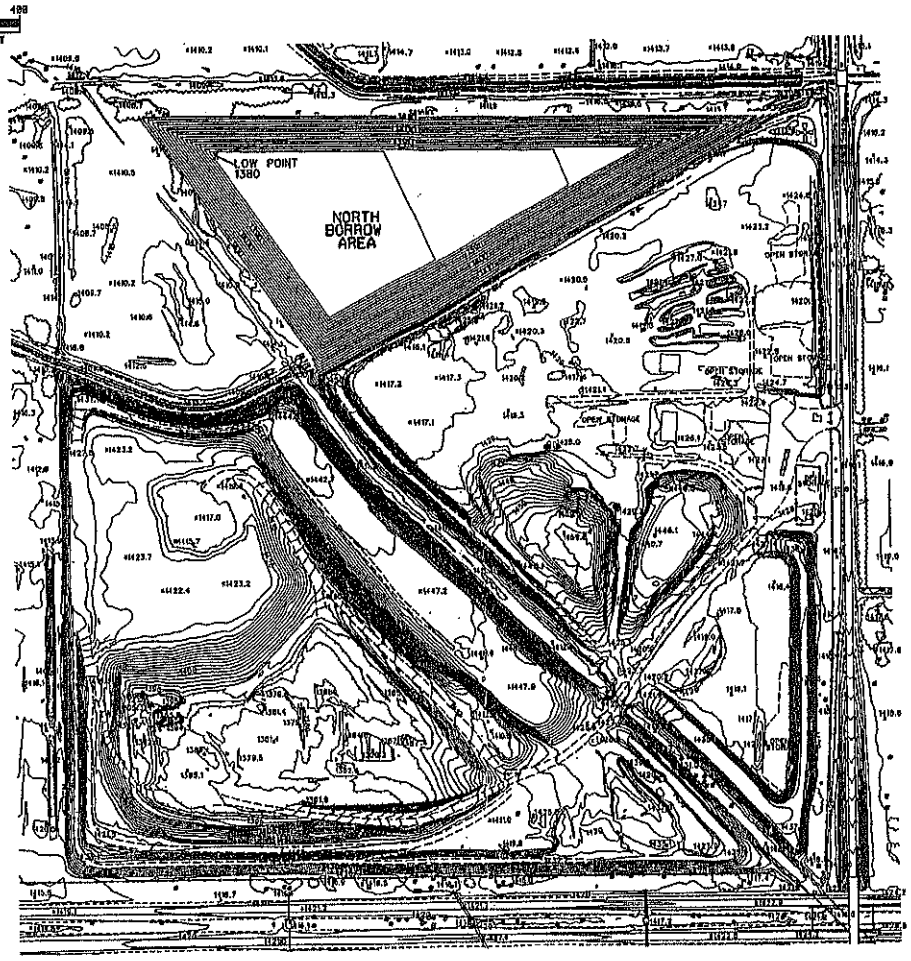
LANDFILL PERMIT UPDATE
CITY OF CASA GRANDE MUNICIPAL LANDFILL
CASA GRANDE, ARIZONA

October 2002

Figure 1-2: Existing Topography and Proposed Excavation Grades



EXISITING CONTOURS
JUNE, 2002



NORTH BORROW AREA EXCAVATION CONTOURS

NOTE:
NORTH BORROW AREA MAY BE CONSIDERED
FOR LANDFILL EXPANSION AT SOME FUTURE TIME.

HDR
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Revision No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.

Project Manager: J. GARVIN			
Architect		M/E/Process	
Civil: M. ODEN		Mechanical	
Electrical		Structural	
Designed		Drawn By: M. DEELEY	

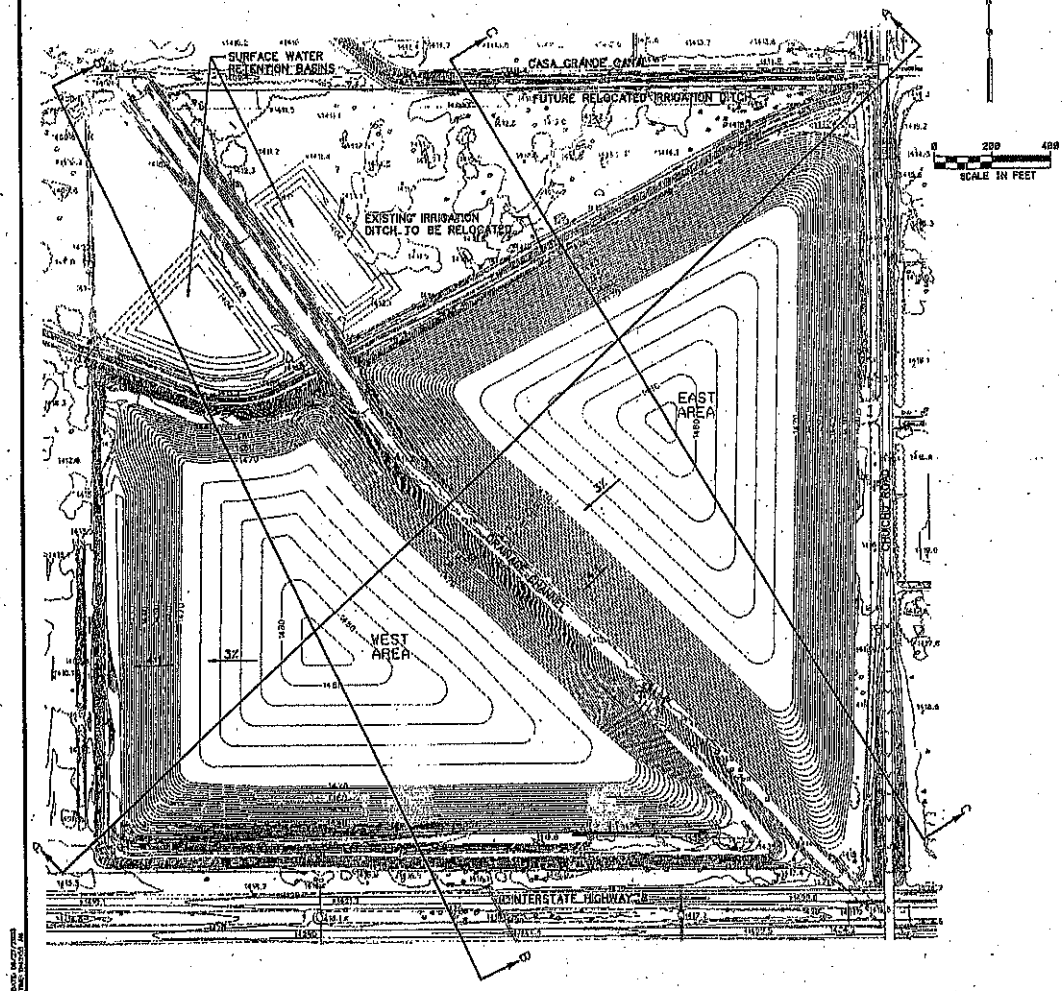
CITY OF CASA GRANDE
MUNICIPAL LANDFILL
CASA GRANDE, ARIZONA

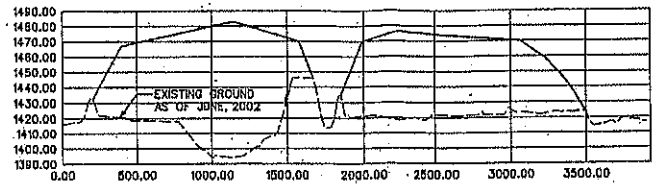
PERMIT UPDATE

EXISTING & EXCAVATION CONTOURS

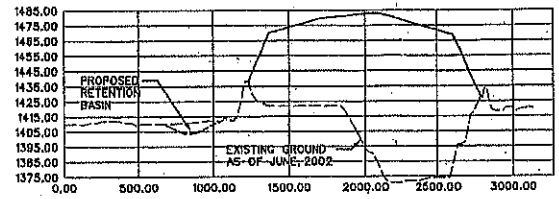
Date	Project No.	Figure No.	Issue
OCTOBER, 2002	11270-001-037	FIG 1-2	0
Scale: AS SHOWN			

Figure 1-3: Proposed Final Grades and Landfill Cross-Sections

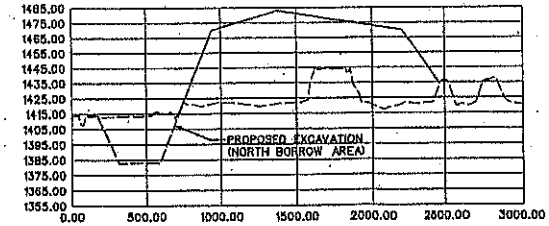




CROSS SECTION A-A



CROSS SECTION B-B



CROSS SECTION C-C

HDR

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Phoenix, Az 85044

Revision No.	Description	Date	Drawn	Chkd.	Resp. Engr.	Proj. Mgr.
1	RETENTION BASIN SIZE	09/03	KG	MO	MO	JG

Project Manager: J. GARVIN
Architect
Civil: M. ODEN
Electrical
Designed
M&E/Process
Mechanical
Structural
Drawn By: M. DEELEY

CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

PERMIT UPDATE

FINAL CONTOURS

Date	Project No.	Figure No.	Issue
SEPTEMBER, 2003	11270-001-037	FIG 1-3	1

Scale: AS SHOWN

1.2.1 Permitted Development

The landfill is owned by the City of Casa Grande, Arizona, and is located in Pinal County. Waste disposal is currently occurring in the center portion of the West Area, which comprises approximately 55 acres. The East Area contains approximately 52 acres. Approximately 23 acres north of the East Area will be used as a source of soil borrow. Ultimately, this area may be used for future disposal. If so, an updated Solid Waste Facility Plan will be submitted and approved by the ADEQ prior to its' development.

Historically, waste has been placed over the entire footprint of the West and the East Area. The general fill sequence will be to fill the West Area to final grade before proceeding to the southeast portion of the East Area. Fill will progress northwest in the East Area, avoiding the area containing the entrance facilities. This area will be filled last. Subsequent sections describe proposed design elements for the CGML.

1.2.2 Facility Capacity

A volumetric comparison of the final cover system topography (Figure 1-3) to the existing topography (Figure 1-2), utilizing Digital Terrain Modeling, yielded the following volumes.

Table 1-1: Facility Capacity
(as of June 2002)

	West Area	East Area	North Borrow Area[1]	TOTAL
Area (acres)	54.5	51.5	23.0	129
Remaining Capacity (CY)	3,497,000	2,943,000	0	6,440,000
Final Cover Soil (CY)	219,817	207,717	0	427,534
Daily/Intermediate Cover Soil (CY)	655,437	547,056	0	1,202,493
Remaining Excavation (CY)	0	0	707,200	707,200
Soil Stockpiles (CY)	0	278,900	0	278,900
West Area Retention Pond Excavation (CY)	23,411	0	0	23,411
Soil Balance/Deficit (CY)				-620,416

[1] The north 23 acres will be used as a source of soil borrow for the next 10-20 years. If this area is needed for waste disposal in the future, a meeting will be held with the ADEQ to discuss permitting requirements.

The earthwork volumes were calculated by computer using MicroStation software. The software creates 3-dimensional computer models of the terrain from site topographic maps and design contours. The software then compares the volume of one surface, such as the existing topography, with the volume of another surface, such as final cover topography, and computes the volume between the two surfaces. The above volumes are HDR's best estimate based on existing information. Compaction densities, cover soil to waste ratios, and variations in waste composition can affect these volumes significantly. The available design capacity represents the estimated air space between the top of the existing waste surface (as of June 2002) and the proposed final cover elevations.

The revised final contours submitted with this Solid Waste Facility Plan update add capacity above the currently permitted configuration. In particular, the side slopes are increased to 25% (4H:1V) to elevation 1470. The top deck is then sloped at 3% to the peak. Compaction densities of 1,200 pounds per cubic yard are typical of landfills using dedicated trash compactors, such as is being used at the CGML. Cover soil to waste ratios of 1:4, or less, are easily achievable when alternate daily covers (ADC), such as tarps, are used. The CGML currently utilizes tarps for daily cover.

Table 1-2 presents calculations of the estimated rate of waste acceptance at CGML, assuming a growth rate ranging from 1.5% to 3.5% over the life of the site and estimated waste receipts for year 2002. The Table also predicts soil usage and compaction to determine a life based on the waste receipts. Based on these assumptions, the West Area will reach final grades in the year 2018. The East Area will reach capacity in the year 2029.

1.2.3 Design Features

Because development of the North Area is undetermined, engineering drawings are not being submitted at this time. The revised design for the East and West Areas provides positive drainage and control of precipitation and runoff to minimize contact with in-place waste during operations. A standard final cover is planned over these areas.

Table 1-2: Landfill Volume and Life Estimates

Table 1-2: Waste Acceptance Rates and Landfill Life Estimates

INPUTS

Total Site Area [ACRE]	106.0			Waste Density [LB/CY]	1,200	Waste:Soil [1]	4	1
Total Volume Available [CY]	6,440,000	Total Available Soil [4] [CY]	1,009,511			Clay Cap / Cover Depth [2] [FT]	2.5	0

CALCULATIONS

Soil For Liner/Cover [CY]	427,533	Initial Airspace for Waste and Cover [CY]	6,012,467

Year	Annual Tonnage Received	Cumulative Tonnage Received	In-Place Waste Volume Received [CY]	In-Place Cumulative Waste Volume Received [CY]	Intermediate and Daily Soil Cover Volume Required [CY]	Cumulative Soil Cover Required [CY]	Airspace Consumed [CY]	Cumulative Airspace Consumed [CY]	Remaining Airspace [CY]	Remaining Life [YR]
2002	71,400	71,400	119,000	119,000	29,750	29,750	148,750	148,750	5,863,717	39.4
2003	73,800	145,200	123,000	242,000	30,750	60,500	153,750	302,500	5,709,967	37.1
2004	76,200	221,400	127,000	369,000	31,750	92,250	158,750	461,250	5,551,217	35.0
2005	78,600	300,000	131,000	500,000	32,750	125,000	163,750	625,000	5,387,467	32.9
2006	81,000	381,000	135,000	635,000	33,750	158,750	168,750	793,750	5,218,717	30.9
2007	83,400	464,400	139,000	774,000	34,750	193,500	173,750	967,500	5,044,967	29.0
2008	85,800	550,200	143,000	917,000	35,750	229,250	178,750	1,146,250	4,866,217	27.2
2009	88,200	638,400	147,000	1,064,000	36,750	266,000	183,750	1,330,000	4,682,467	25.5
2010	90,600	729,000	151,000	1,215,000	37,750	303,750	188,750	1,518,750	4,493,717	23.8
2011	93,000	822,000	155,000	1,370,000	38,750	342,500	193,750	1,712,500	4,299,967	22.2
2012	95,400	917,400	159,000	1,529,000	39,750	382,250	198,750	1,911,250	4,101,217	20.6
2013	97,800	1,015,200	163,000	1,692,000	40,750	423,000	203,750	2,115,000	3,897,467	19.1
2014	100,200	1,115,400	167,000	1,859,000	41,750	464,750	208,750	2,323,750	3,688,717	17.7
2015	102,600	1,218,000	171,000	2,030,000	42,750	507,500	213,750	2,537,500	3,474,967	16.3
2016	105,000	1,323,000	175,000	2,205,000	43,750	551,250	218,750	2,756,250	3,256,217	14.9
2017	107,400	1,430,400	179,000	2,384,000	44,750	596,000	223,750	2,980,000	3,032,467	13.6
2018	109,800	1,540,200	183,000	2,567,000	45,750	641,750	226,750	3,206,750	2,803,717	12.3
2019	112,200	1,652,400	187,000	2,754,000	46,750	688,500	233,750	3,442,500	2,569,967	11.0
2020	114,600	1,767,000	191,000	2,945,000	47,750	736,250	238,750	3,681,250	2,331,217	9.8
2021	117,000	1,884,000	195,000	3,140,000	48,750	785,000	243,750	3,925,000	2,087,467	8.6
2022	119,400	2,003,400	199,000	3,339,000	49,750	834,750	248,750	4,173,750	1,838,717	7.4
2023	121,800	2,125,200	203,000	3,542,000	50,750	885,500	253,750	4,427,500	1,584,967	6.2
2024	124,200	2,249,400	207,000	3,749,000	51,750	937,250	258,750	4,686,250	1,326,217	5.1
2025	126,600	2,376,000	211,000	3,960,000	52,750	990,000	263,750	4,950,000	1,062,467	4.0
2026	129,000	2,505,000	215,000	4,175,000	53,750	1,043,750	268,750	5,218,750	793,717	3.0
2027	131,400	2,636,400	219,000	4,394,000	54,750	1,098,500	273,750	5,492,500	519,967	1.9
2028	133,800	2,770,200	223,000	4,617,000	55,750	1,154,250	278,750	5,771,250	241,217	0.9
2029	136,200	2,906,400	227,000	4,844,000	56,750	1,211,000	283,750	6,055,000	(42,533)	-0.1
2030	138,600	3,045,000	227,000	5,071,000	56,750	1,267,750	283,750	6,338,750	(326,283)	-1.1

SOIL BALANCE [3]

(620,516) Deficit [CY]

(1) Ratio of Intermediate and Daily cover required to Volume of Waste Received. Synthetic tarps currently being used as Alternate Daily Cover.

(2) Clay Cap and Cover required over entire site.

(3) Deficit to be imported.

(4) Total available soil includes 707,200 CY from North Area, 23,411 CY from stormwater pond and 278,900 CY in existing stockpiles.

1.2.3.1 Stormwater Management

1.2.3.1.1 Stormwater Run-on Management

Stormwater run-on to the site will be minimized by diverting overland flow around the site. The majority of potential stormwater run-on is contained within a drainage channel, which currently bisects the site from southeast to northwest, separating the West and East Areas. This channel will be extended by constructing above-ground berms to the northwest property line. Since some of the off-site flow originally conveyed by this channel was diverted during the construction of Highway 8, seven-foot high berms with 3H:1V side slopes, creating a trapezoidal channel with a forty-foot bottom will contain the current estimated flow of 1,000 cubic feet per second (cfs). These berms will provide a minimum of two feet of free board above the expected water surface elevation.

1.2.3.1.2 Stormwater Runoff Management

Stormwater runoff from the CGML will be controlled by collecting the water in a series of perimeter drainage channels, constructed with berms, placed on the landfill's side slopes with let-down structures directing the flow between the intermediate berms and the perimeter channels. The perimeter drainage channels are designed to carry the peak flow from a 25-year, 24-hour storm event with a freeboard of at least 20% of channel depth. The channels will direct the stormwater to retention basins located to the north of the East and West Areas. Flow calculations, in Appendix A, have been performed for earthen conditions with a Manning's "n" value of 0.018. Due to the low velocities anticipated in the intermediate berms and perimeter channels (< 2.5 fps), lining is not required. The retention basins will have the necessary volume capacity to contain the 25-year, 24-hour storm event. No discharge from the retention basins is anticipated. Site drainage improvements are shown on Figure 1-4. Stormwater flow estimate calculations are presented in Appendix A (Drainage Calculations).

1.2.3.1.3 Stormwater Retention

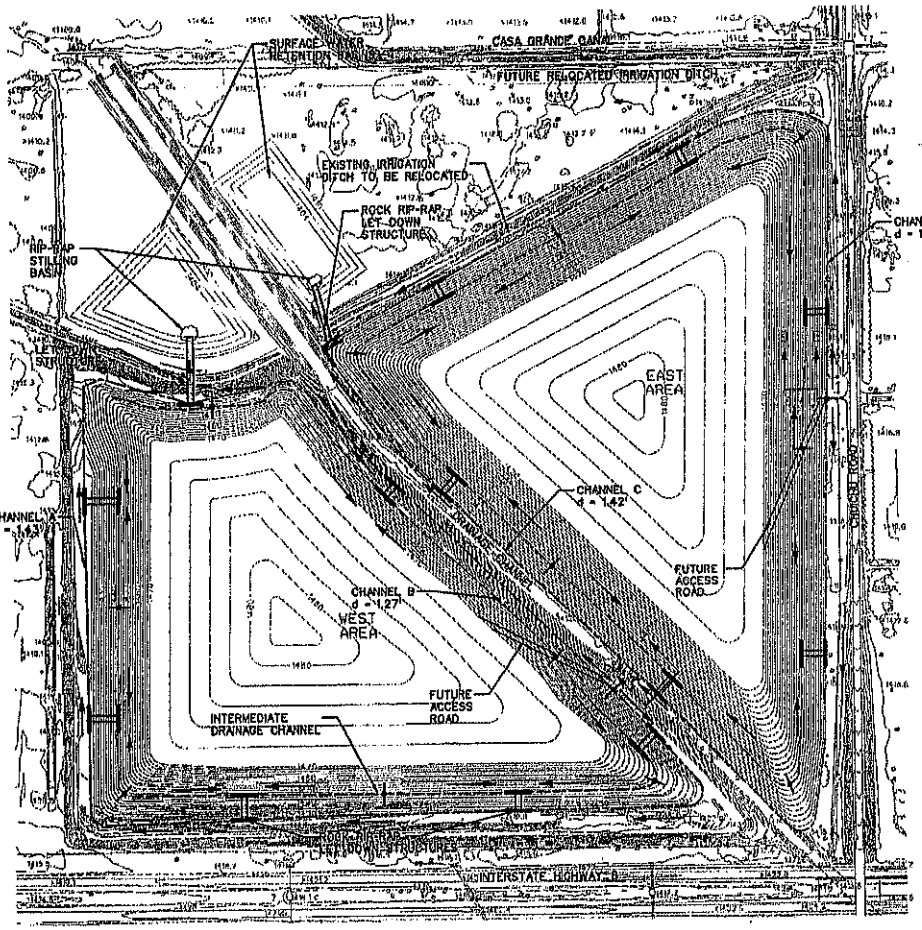
Stormwater runoff from the landfill will be collected by a series of perimeter drainage ditches constructed on the landfill sideslopes. Based on the 25-year, 24 hour storm event of 3.4 inches over the area of the landfill footprint, a runoff percentage of 80% (c=0.8), a total of 12.4 acre-

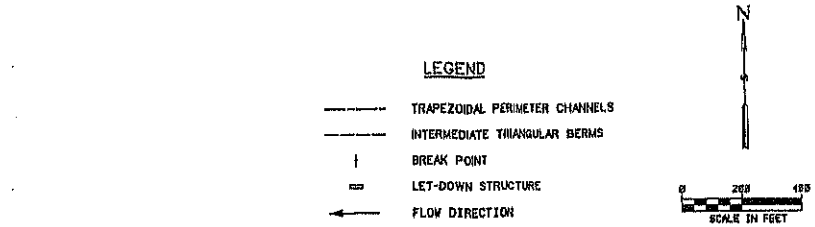
feet of storage is required for the West Area, and 11.7 acre-feet for the East Area. Calculations are provided in Appendix A. The retention pond for the West Area, as designed, provides storage of 14.5 acre-feet. The East retention pond provides over 15 acre-feet of storage. Soil borrow from north of the East Area will occur during disposal in the West Area. As such, the East Area retention pond will be excavated well in advance of disposal operations resuming in the East Area.

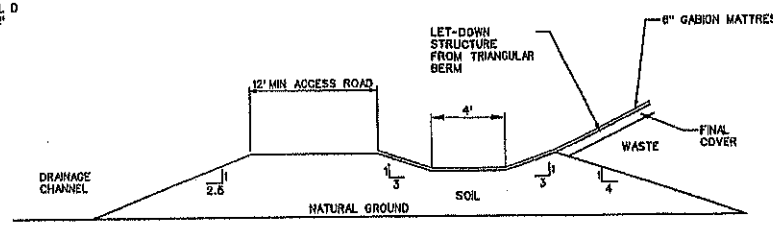
1.2.3.1.4 OFFSITE STORMWATER MANAGEMENT

Offsite stormwater runon entering the landfill will be minimal. The site is equipped with earthen berms and swales to prevent or divert offsite stormwater from entering the waste areas.

Figure 1-4: Drainage Details







SECTION A-A
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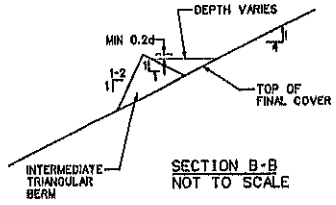

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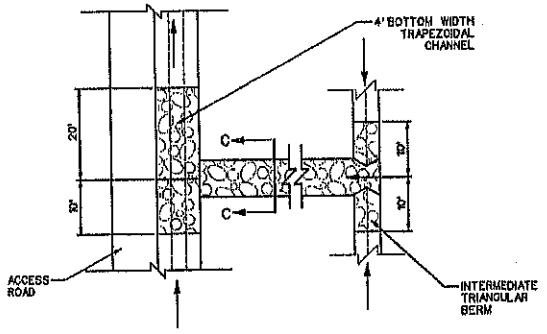

SECTION A-A - PLAN
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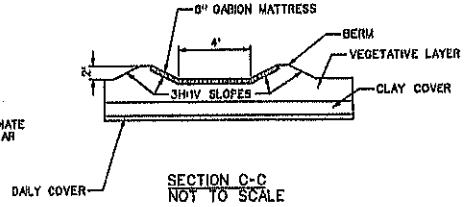


SECTION C-C
NOT TO SCALE

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85044

Revision No.	Description	Date	Drawn	Check	Resp. Engr.	Proj. Mgr.
1	REVISED DRAINAGE	09/03	KG	MO	MO	JG

Project Manager: J. GARVIN
Architect
Civil: M. ODEN
Electrical
Designed
Civil/Process
Mechanical
Structural
Drawn By: M. DEELEY

CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

PERMIT UPDATE

DRAINAGE DETAILS

Date	Project No.	Figure No.	Issue
SEPTEMBER, 2003	11270-001-037	FIG 1-4	1

Scale: AS SHOWN

1.2.3.2 Slope Stability and Seismic Considerations

A slope stability analysis is required for any facility located within a seismic impact zone. As stated in the 1994 SWFP, this facility is not located in an area with 10 percent or greater probability that the maximum horizontal acceleration in lithified earth material, as expressed as a percentage of the earth's gravitational pull, will exceed 0.10g in 250 years. Therefore the preparation of a slope stability analysis is optional for the CGML.

1.2.3.2.1 Sideslopes for New Cells

The landfill bottom (footprint) is concave in shape, with 3H:1V excavation slopes, thereby providing improved stability for the ultimate final landfill configuration. Interim side slope stability will be analyzed (to be included as Appendix B).

1.2.3.2.2 Landfill Closure Slopes

A slope stability analysis for the final landfill slopes will be performed for a generic slope with the most critical configuration. Material types for the analysis consisted of loam and solid waste. The most critical slope for long term stability would be the tallest side of the landfill. Since 4H:1V, or steeper, slopes are typically used for landfills, slope stability is not expected to be a problem.

Input Parameters

A computer program will be used to perform the analysis. Safety factors will be calculated by the modified Janbu Method. Soil and waste parameters to be used as input for this analysis are contained in the following table (Table 1-3).

Table 1-3: Slope Stability Analysis Soil Parameters

Soil Type	Dry Unit Wt. (PCF)	Total Unit Wt. (PCF)	Cohesion Intercept (PSF)	Friction Angle (Deg)
Sand	95	105	90	30
Waste	75	85	100	31

The soil and waste parameters are based on information contained in the 1994 SWFP. Since the waste and containment berm material is not saturated, no water surface was defined or used. Based on these assumed material properties, the failure surface should not extend outside the in-place waste.

This analysis will also include earthquake stability. The seismic coefficient chosen for this analysis will be 0.07g. The factors of safety obtained will reflect earthquake forces on the containment berm.

1.2.3.3 North Area Borrow Area

The North Area will be used as a source for soil. It will be excavated to a depth of approximately 60-feet to an elevation of 1350. The sides of the excavation will have 3:1 (horizontal to vertical) slopes. Excavation grades for this area can be seen on Figure 1-2.

1.2.3.4 LANDFILL CLOSURE

Site closure will involve placing final cover and establishing vegetation (see section 1.3 for vegetation). The site will be closed in phases as areas of the site reach final grade. When the CGML nears its ultimate capacity, all but the last phase will have been previously closed and covered.

The proposed final site topography is shown on Figure 1-2. The soil excavation grades for the North Area are also shown on Figure 1-2. This excavation will be necessary in order to satisfy daily and intermediate cover soil and closure soil needs. Final closure elevations and typical cross sections through the facility are shown on Figure 1-3.

Final cover over the entire site has been designed to slope at three percent on the top deck of the landfill. Landfill side slopes will be no greater than 4:1 (horizontal to vertical).

1.2.3.4.1 FINAL GRADING PLAN

A final grading plan showing the final contours of the West and East Areas is included as Figure 1-2. Typically, the landfill sideslopes will be constructed from existing ground to an elevation of 1470. The top deck of the landfill has a minimum 3% slope to elevation 1483 for both the East and West Areas.

1.2.4 Gas Management Considerations

The CGML, as currently designed, is below the maximum design capacity of 2.5 million cubic meters, which would have exempted it from the requirements of 40 CFR Part 60 entitled Standards of Performance for New Stationary Sources and Guidelines for Control of Existing Sources: Municipal Solid Waste Landfills.

This permit update will increase the capacity of the landfill and require compliance with those regulations. Once this permit update is approved, the landfill will submit design capacity reports and periodic calculations of non-methane organic compound emissions.

1.3 Landscape Plan

Prior to the 1950's, the property now occupied by the CGML was originally undisturbed desert. There is little native vegetation remaining on the property at this time, due to ongoing and past disposal activities. As the landfill is closed, the final soil cover will be vegetated with native plants. Plants will be replaced as necessary due to damage or death.

1.3.1 Soil Loss and Erosion

The final cover of the CGML has been designed to minimize soil erosion. Based on regional soil conditions and site climate conditions, a vegetative cover may be established on the surface of the landfill to prevent soil erosion. A discrete erosion control layer has been planned for this facility. The surface of the erosion control layer may be augmented with a layer of topsoil or organic mulch which will increase the moisture holding capacity of the soil to aid vegetative growth, increase evapotranspiration of rain water while retarding erosion due to water and wind. In addition, final slopes are designed to reduce soil erosion losses to an acceptable annual rate.

The Universal Soil Loss Equation (USLE) was employed using soil and climatological parameters specific to the site, to estimate erosion losses.

Climate

Climatological information was obtained from NOAA Atlas 2 isopluvial maps for the Casa Grande area.

Soils

Soil types at CGML are primarily clayey loams and sandy loams. Permeability of these soils is moderate and the available water capacity is high. The effective rooting depth is 6 inches or more. Runoff is slow to medium and the hazard of water erosion is estimated to be moderate. The final cover system will consist of 30 inches of clayey loam or sandy loam (18-inches of infiltration layer plus 12-inches of erosion layer), with an estimated permeability of 1.0×10^{-4} cm/sec, over 12 inches of foundation layer soil (intermediate cover).

Soil Loss

The Universal Soil Loss Equation (USLE) provides average soil loss as the product of four quantitative factors (slope length, slope-percent, soil-erodibility and rainfall-erosivity) and two qualitative factors (cover/management, and practice). The USLE was designed to calculate average soil loss due to rainfall runoff episodes. The USLE, developed for use on agricultural lands, only estimates sheet and rill erosion from initial mobilization, and does not account for soil losses due to gullying. The USLE also does not consider the effects of soil re-deposition.

The Universal Soil Loss Equation is defined as:

$A = RKLSCP$

Each of the terms of the equations is described below:

A = The computed soil loss per unit area, expressed in the units selected for K and for the period selected for R. R and K have been selected so that A is expressed in tons per acre per year.

R = The rainfall and runoff factor. R is the number of rainfall erosion index.

K = The soil erodibility factor. K is the soil loss rate per erosion index unit for a specified soil as measured on a unit plot, which is defined as a 72.6-foot length of uniform 9 percent slope in clean tilled continuous fallow.

L = The slope length factor. L is the ratio of soil loss from the field slope length to that from a 72.6-foot length under identical conditions.

S = The slope percent factor. S is the ratio of soil loss from the field slope gradient to that from a 9 percent slope under otherwise identical conditions.

C = The cover and management factor. C is the ratio of soil loss from an area with specified cover and management to that from an identical area in tilled continuous fallow.

P = The support practice factor. P is the ratio of soil loss with a farming support practice like contouring, strip cropping, or terracing to that with straight-row farming up and down the slope.

The values and sources for the specific terms of the USLE are presented in Appendix C. The results of the calculation for the landfill side slopes indicate an annual erosion of 10.1 tons per acre. For the top deck an estimated 1.2 tons of soil per acre will be lost due to erosion.

1.4 Quality Assurance/Quality Control Plan

Construction of the CGML closure improvements will be performed in general accordance with a QA/QC Plan prepared specifically for the site. A site specific plan will be prepared prior to initiating any closure activities.

1.5 Construction Report

A construction documentation report will be prepared after the closure of the final cap as each section is competed. This construction report will document that the cap has been installed per the specifications. The construction report will also include a certification by a Registered Professional Engineer that the installation met the construction specifications.

2 LANDFILL OPERATIONS PLAN

2.0 Introduction

2.0.1 Background

The City of Casa Grande (City) owns and operates a municipal Solid Waste Landfill (landfill) in Pinal County, Arizona. The municipal solid waste landfill occupies approximately 160 acres and is located approximately three miles south of the City of Casa Grande (City) at the northwest corner of the intersection of Interstate 8 and Chuichu Road (Figure 1-1). The property is located on the northeast quadrant of Section 7, Range 6 East, Township 7 South. The users of the landfill are limited to the City of Casa Grande and surrounding unincorporated areas within Pinal County. The landfill accepts municipal solid waste from City and private haulers and residents. The landfill has been in operation since the early 1950's.

2.0.2 Objective

This 2002 Operations Plan describes the landfill facility and presents the procedures for the operation of the landfill facility. The original Operation Plan was prepared in 1996. All landfill personnel should be familiar with the operations and procedures contained in this plan, and a copy of this plan will be kept on site and made available to all employees.

2.0.3 Scope

This Operations Plan describes daily, weekly, monthly, quarterly, and yearly landfill activities that will be performed to operate the landfill facility.

2.0.4 Responsiveness to Guidance Documentation and Application

This Operations and Closure/Post-Closure Plan has been prepared based on landfill operating requirements set forth in:

- U.S. Environmental Protection Agency, 40 CFR Parts 257 and 258, Solid Waste Disposal Facility Criteria; Final Rule, October 9, 1991.

This Operations Plan has been prepared in an attempt to limit the generation of leachate and landfill gas through accepted operating and closure/post-closure practices. The landfill does not have a bottom liner system and has been in operation for approximately fifty years. The operating practices, closure process, and post-closure care as described in this plan will not necessarily reverse or cease any generation of leachate or landfill gas that may have occurred or may be occurring.

2.0.5 Revisions to Plan

This Operations and Closure/Post-Closure Plan will be reviewed by the City annually or when significant changes in the operation of the landfill are made. Amendments or revisions to the plan or changes in operating practices will be made as needed.

2.1 Facility Description

The landfill facility name is City of Casa Grande Municipal Landfill. The landfill is located at the northwest corner of Interstate 8 and Chuichu Road. In the northeast quadrant of Section 7, Range 6 East, Township 7 South. Access to the site is from Chuichu Road.

The landfill is owned by the City of Casa Grande and operated by the Public Works Department.

- Public Works Department
- City of Casa Grande
- 510 E. Florence Blvd.
- Casa Grande, Arizona 85222
- (520) 421-8600

The City of Casa Grande purchased the property from private owners in 1949.

2.2 Facility Features

Figure 1-2 presents the landfill facility features discussed in the following sections and throughout this Operations Plan.

2.2.1 Hours of Operation

The landfill is open six days per week, Monday through Saturday except for holidays, during the hours of 7:00 a.m. to 4:30 p.m. Only one City truck hauls solid waste on Saturdays.

2.2.2 Facilities

The entrance facilities at the landfill consist of the following:

- Facility Entrance
- Gate House
- Recycling Area
- Baler
- Maintenance Area

2.2.3 Facility Entrance

The entrance to the landfill has a lockable chain-link fence gate and a facility identification sign indicating the owner, facility name, and hours of operation.

2.2.4 Gate House

A small gate house is immediately inside the entrance. All vehicles must stop at the gate house where gate keepers visually inspect their loads for hazardous or unacceptable material. There is one scale at the landfill entrance. The gate house has electricity, phone, water and sanitary services.

2.2.5 Recycling Area

The recycling area is divided into two parts, one for residents and the other for City vehicles. The recycling area is located directly inside the landfill entrance past the gate house. Residents

are directed to this area by signs and landfill personnel. Clearly marked plastic bins are available for the public. A bi-level facility is used by City trucks and consists of roll-off containers placed against a retaining wall on the lower level and an upper level to which trucks can back up to dump their loads. The following materials currently are accepted in the recycling area:

- Newspapers
- Corrugated Cardboard
- Aluminum/Tin Cans
- Clear, Green, and Brown Glass, separately
- Plastics
- Green Waste
- Scrap Metal
- Appliances
- Mattresses

The materials accepted for recycling will be evaluated annually by the City.

2.2.6 Baler

A baler is located near the gate house. It is used primarily to bale cardboard and newspaper which is hauled off site to recycling facilities. There is electric, telephone, and water services in the vicinity of the baler.

2.2.7 Maintenance Area

A fenced area approximately 100 feet by 50 feet serves as the maintenance area for maintenance, minor repair, and fueling of landfill equipment. The maintenance area is located south of the gate house. A small storage shed and two 500-gallon above-ground diesel fuel tanks are located within this area. The storage shed has water and electricity service. A septic tank with a seepage pit is also connected to the storage shed.

2.2.8 Roadways and Traffic Routing

The landfill is accessed from Chuichu Road. A paved entrance and exit road extends from Chuichu Road to, and beyond, the gate house. The gate house separates the entrance and exit lanes. On-site roads extend to the working face, most of the perimeter, the recycling area, baler, maintenance area, and stockpiles. On-site roads are constructed of crushed asphalt and covered with gravel. Traffic routing is accomplished by a combination of signs and directions from landfill personnel. Site operators at the working face direct trucks and residents. Vehicle speeds are limited to a maximum of 15 mph.

Any significant settlement of the roads is repaired by regrading the road or by placing gravel or fill on the settled area. During landfill operations, active roads will be kept passable in adverse weather. On-site roads will be watered when necessary.

2.2.9 Signing

Signs installed at the landfill facility include entrance signs, speed limit signs, traffic direction signs, restricted areas, and warning signs.

An entrance sign located near the entrance gate presents site name, ownership, fee schedule, operating hours, and gives examples of unacceptable wastes for disposal.

Permanent traffic signs are posted in the entrance area of the landfill that direct vehicles to the working face and recycling area. Temporary traffic signs are also posted along the route between the entrance area and the working face to direct solid waste haulers and residents to the appropriate unloading area when the working face is not visible from the entrance.

Warning signs prohibiting trespassing are located at the entrance gate and at the gates located where the drainage channels enter the landfill property. Signs are also posted at the recyclables drop-off area indicating the recyclables that are accepted and the appropriate containers for these materials.

2.2.10 Parking

A parking area for landfill personnel and visitors is located to the immediate north of the gate house.

2.2.11 Equipment

The following equipment is used at the landfill:

- Compactor
- Scraper
- Water truck
- Pickup truck
- Bobcat
- Chipper
- Air compressor

The following equipment is available through other City Departments, as needed:

- Grader
- Dump truck
- Front-end loader
- Backhoe
- Pickup Truck
- Bobcat

All mobile equipment except for the trucks and compressor are equipped with rollover protection, enclosed cabs, and lights. All mobile landfill equipment, including pickup trucks, have radios for communication. Fire extinguishers will be carried on all landfill equipment and will also be located at the baler.

In general, manufacturer's inspection and maintenance schedules are followed for all equipment. Equipment operators perform daily inspections and maintenance. Major repairs are performed by the City Vehicle Maintenance Division at the City garage.

Daily inspections of mobile equipment may include the following items:

- Checking for loose wires or other appurtenances that may cause sparks.
- Checking radiator area for refuse and worn hoses or fan belts.
- Checking hydraulic system for worn hoses or damaged lines.
- Checking covers and guards for wear and loose or missing bolts.
- Checking engine area for oil and fuel leaks.
- Checking fuel tank water trap and draining accumulated water.
- Checking sprockets for wear.

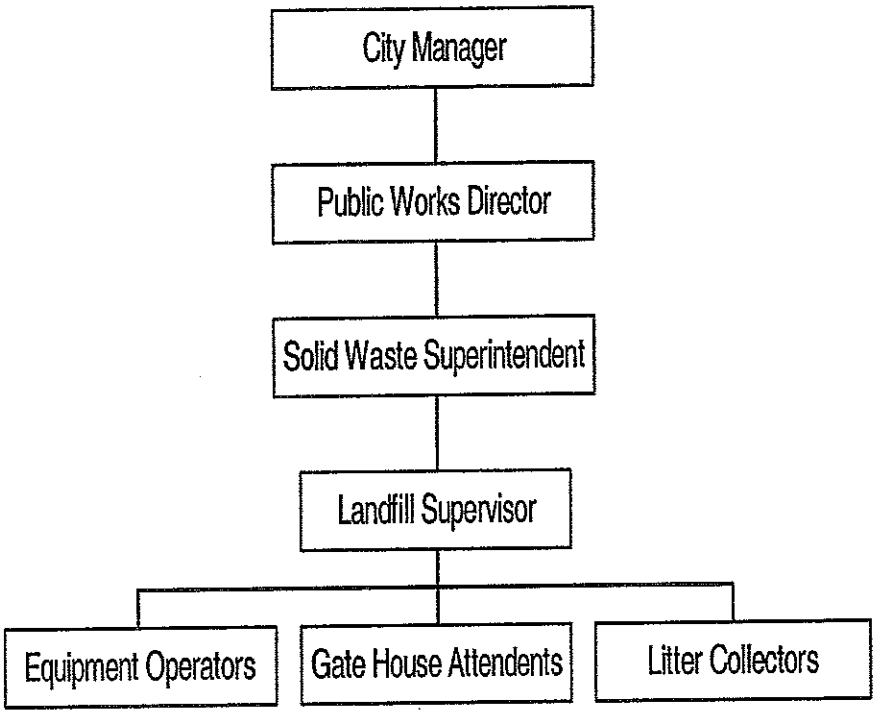
2.3 Personnel

The number of operating personnel is dependent upon the level of activity occurring at the site. The following are full-time positions at, or responsible for, the landfill:

Position	Number
City Manager	1
Public Works Director	1
Solid Waste Superintendent	1
Solid Waste Landfill Supervisor	1
Equipment Operators	4
Gate House Attendants	2

Figure 2-1 presents an organizational chart for the landfill staff. The City Manager, Public Work Director, Solid Waste Superintendent, and Landfill Supervisor have other duties and responsibilities in addition to the landfill.

Figure 2-1: Municipal Landfill Organization Chart



2.4 Site Characteristics

Hydrogeologic conditions in the vicinity of the landfill are described in the Aquifer Protection Permit (APP) or Solid Waste Facility Plan (SWFP) approved by ADEQ in 1996. Regional hydrogeology conditions, climate, and vegetation are also included. The APP and SWFP are kept in the operating record.

2.5 Hazardous Waste Identification

This section describes operating activities to implement a program for detecting and preventing the disposal of regulated hazardous waste, polychlorinated biphenyls (PCB) waste, and unacceptable wastes at the landfill. The EPA, in federal regulation 40 CFR 258.20, defines a regulated hazardous waste as "a solid waste that is a hazardous waste, as defined in 40 CFR 261.3, that is not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) or was not generated by a conditionally exempt small quantity generator as defined in 40 CFR 261.5". PCB wastes are defined in 40 CFR Part 761.

Federal regulation 40 CFR 258.20(a) requires that the following actions be taken for the identification of receipt of hazardous wastes at the landfill:

- Random inspections of incoming loads.
- Training of personnel to recognize regulated hazardous waste and PCB wastes.
- Recordkeeping of inspections.
- Notification of ADEQ if hazardous waste or PCB waste is discovered at the facility.

In addition, the following actions will be taken for the identification of receipt of hazardous wastes at the landfill:

- Inspections of suspicious loads.
- Establishment of handling procedures for hazardous waste and PCB wastes.
- Recordkeeping of personnel training.

2.5.1 Acceptable Wastes

The landfill accepts only non-hazardous residential/commercial solid wastes for disposal. As discussed below, certain solid wastes are either prohibited from disposal in the landfill (e.g. RCRA regulated hazardous wastes and PCBs), or at the discretion of the City.

2.5.2 RCRA Regulated Hazardous Wastes

The CGML does not accept RCRA Regulated Hazardous Waste. In addition, suspicious containers will be immediately investigated.

2.5.3 "Listed" Hazardous Wastes

The four lists of hazardous waste in Subpart D of 40 CFR Part 261 describe wastes that either exhibit certain characteristics or contain toxic constituents that are considered harmful to human health or the environment. The four lists contain over 400 specific hazardous wastes and include the following:

- wastes from non-specific industrial sources ("the F-list"),
- wastes from specific industrial sources ("the K-list"), and
- off-specification of unused chemicals, and spill residues of commercial chemical products (the "P" and "O" lists).

2.5.4 "Characteristic" Hazardous Wastes

A waste can also be classified as a hazardous waste if it exhibits characteristics described in Subpart C or 40 CFR 261. The four characteristics are:

- Ignitability: waste that are easily combustible or are flammable (examples include contaminant fuels, solvents, and paint thinner),
- Corrosivity: waste having low or high pH that are capable of corroding metal or other materials, or can cause burns to the skin (examples include battery acid, rust removers, and caustic solutions).
- Reactivity: waste that are normally unstable, react violently with water, or are capable of spontaneous combustion or explosion (examples include cyanide or sulfide bearing wastes, oxidizers, and explosives), and
- Toxicity: wastes that contain certain organic or inorganic constituents above regulatory levels (determined using EPA's Toxicity Characteristics Leaching Procedures, or TCLP).

2.5.5 Non-Hazardous Special Wastes

There are certain types of commercial or industrial wastes that do not meet the RCRA definition of "hazardous waste", but because their nature, the landfill does not allow for their disposal. These unacceptable wastes will be treated in the same manner as "hazardous waste".

2.5.6 PCB Containing Wastes

The CGML does not accept PCB containing wastes regulated under 40 CFR 761.

2.5.7 Containers/Drums/Cans/Buckets (Receptacles)

The CGML shall not knowingly receive receptacles that contain a hazardous material residue, vapor or gas, or that have not been triple rinsed. In addition, the CGML shall not knowingly receive receptacles that contain free liquids that will exit the container when open receptacles are inverted. A receptacle that has a non-hazardous residue on the interior surface will be accepted.

2.5.8 Other Unacceptable Wastes

Liquid wastes will not be accepted at the CGML. No bulk containerized or non-containerized liquid wastes are accepted at the landfill.

2.5.9 Wastes from Conditionally Exempt Small Quantity Generators

RCRA conditionally exempt small quantity generator waste is accepted at the CGML. These are wastes that would be classified as hazardous by 40 CFR 261.20 to 261.35 standards except that they are exempted because they are generated by households or conditionally exempt small generators, or for the other reasons as specified in 40 CFR 261.4(b), or 40 CFR 261.5.

2.6 Inspections

2.6.1 Training of Landfill Personnel

Personnel trained in hazardous waste identification and response will be on duty at all times during the landfill's scheduled operating hours. At a minimum, the following key personnel should receive hazardous waste identification and response training:

- Solid Waste Superintendent
- Landfill Supervisor
- Gate House Attendants
- Equipment Operators

Landfill operations personnel mentioned above who have the opportunity to identity hazardous or unacceptable wastes on a day-to-day basis, and who will participate in random waste screening inspections, should attend a training course on identifying such wastes. The training should be conducted by certified instructors and should consist of the following elements:

- purpose and implementation of the random inspection program at the landfill;
- an overview of the RCRA and TSCA regulations;
- the hazardous waste "listings" and "characteristics";
- PCB containing wastes and transformers;
- Identification of "free liquids;
- Identification of labels for hazardous wastes, PCBs, and DOT hazardous materials; and
- Notification of supervisory personnel in cases of discovery of hazardous or unacceptable wastes.

Additionally, the designated employee who directs and oversees the random inspections should attend a 40-hour OSHA hazardous waste operations training course and maintain the training with an annual 8-hour refresher course. Employees receiving training as part of the random inspection program will be required to sign a certification verifying completion of the required training.

2.6.2 Signage

Signs will be posted upon entrance to the facility which present the enforced policies of the landfill. The signs are intended to act as a deterrent to delivery of hazardous and unacceptable wastes to the landfill. One sign should generally indicate the acceptable and unacceptable wastes. The following is an example sign indicating wastes acceptable for disposal.

"EXAMPLE ONLY"

NOTICE!

THE LANDFILL FACILITY ACCEPTS THE FOLLOWING WASTE TYPES FOR DISPOSAL IN THE LANDFILL:

- MUNICIPAL SOLID WASTE (GARBAGE, TRASH, AND OTHER WASTE FROM HOUSEHOLDS OR COMMERCIAL FACILITIES)
- CONSTRUCTION DEBRIS (FROM DEMOLITION AND CONSTRUCTION ACTIVITIES)
- DEAD ANIMALS (PETS, FARMS, POUNDS)
- NONFRIABLE ASBESTOS
- CONTAINERS (CLEAN AND PERFORATED)
- INDUSTRIAL WASTE (ONLY NON-HAZARDOUS SOLID WASTE)
- WASTEWATER TREATMENT PLANT SLUDGE FROM CITY PLANT (ONLY IF PASSES THE PAINT FILTER TEST)
- CERTAIN MEDICAL WASTE
- HOUSEHOLD HAZARDOUS WASTE (AND "CONDITIONALLY EXEMPT SMALL QUANTITY GENERATORS")
- GREEN WASTE (IF MIXED IN WITH MUNICIPAL SOLID WASTE LOADS)

Another example sign regarding recycling is the following:

"EXAMPLE ONLY"

THE LANDFILL ACCEPTS THE FOLLOWING WASTE TYPES FOR RECYCLING:

- GREEN WASTE
- LARGE APPLIANCES (REFRIGERATORS, STOVES, ETC.)
- LEAD ACID BATTERIES
- PAINTS
- GLASS
- PLASTICS
- MATTRESSES
- SCRAP METAL
- METAL/TIN CANS
- NEWSPAPER
- CORRUGATED CARDBOARD

An example sign of items not accepted at the landfill is the following:

"EXAMPLE ONLY"

THE FOLLOWING TYPES OF WASTE ARE NOT ACCEPTED AT THE LANDFILL FACILITY:

- TIRES
- AUTOMOBILES
- PETROLEUM CONTAMINATED SOIL
- LIQUID WASTE INCLUDING SEPTAGE (PUMPINGS FROM SEPTAGE TANKS)
- FRIABLE ASBESTOS
- CERTAIN MEDICAL WASTE
- CERTAIN HAZARDOUS WASTE

Another sign should generally indicate the enforced landfill policies. An example of this type of sign follows:

"EXAMPLE ONLY"

RANDOM WASTE INSPECTION PROGRAM IS PRACTICED HERE!

WE RESERVE THE RIGHT TO INSPECT ANY LOAD OR PORTION OF A LOAD ARRIVING AT THIS FACILITY. WE WILL REJECT ALL HAZARDOUS WASTES, PCB's, LIQUIDS OR ANY OTHER MATERIALS THAT WE DETERMINE UNACCEPTABLE.

YOUR PARTICIPATION IN THIS PROGRAM IS REQUIRED AS A CONDITION FOR USING THIS FACILITY. WE REGRET ANY DELAY OR INCONVENIENCE CAUSED BY THIS PROGRAM.

2.6.3 Pre-Notification of Commercial-Industrial Haulers, Solid Waste Haulers and Customers

It is recommended that commercial and industrial customers who haul to the landfill receive notices containing the following general information:

- hazardous and certain other types of wastes, as defined in the notice, are not accepted at the landfill;
- a random waste inspection program for commercial, industrial, and residential waste is in effect at the landfill for detecting hazardous and other unacceptable wastes;
- if hazardous or unacceptable wastes are delivered to the landfill, the waste generator and/or hauler will be responsible or will be charged for cleanup, removal, and disposal of such waste at an approved facility; and
- there are severe federal and state penalties for the improper disposal of hazardous and other certain types of wastes.
- these notifications should be in compliance with City Ordinance No. 1397.08.13 (Appendix D) relating to special handling of solid waste.

2.6.4 Ongoing Inspections

The following table lists the schedule for the various inspections conducted at CGML Landfill:

Landfill Inspections for 2002

Daily	Weekly	Quarterly	Semi-annual
One load per day	• Erosion • Household hazardous waste material in waste, wood and metal recycling area, and household hazardous waste holding area • Litter control around Landfill • Stormwater issues such as litter in run off ditches, buildup in ditches from erosion, and discharges of landfill property • Spotters and operator observations concerning environmental and safety issues • Ponding	• Facility structures for landfill gas • Gas Probes	• Groundwater sampling

The site will be inspected semi-annually for maintenance. Settlement of filled areas, erosion, surface water control features, monitoring systems and cleaning systems will be checked. Repairs will be made as needed.

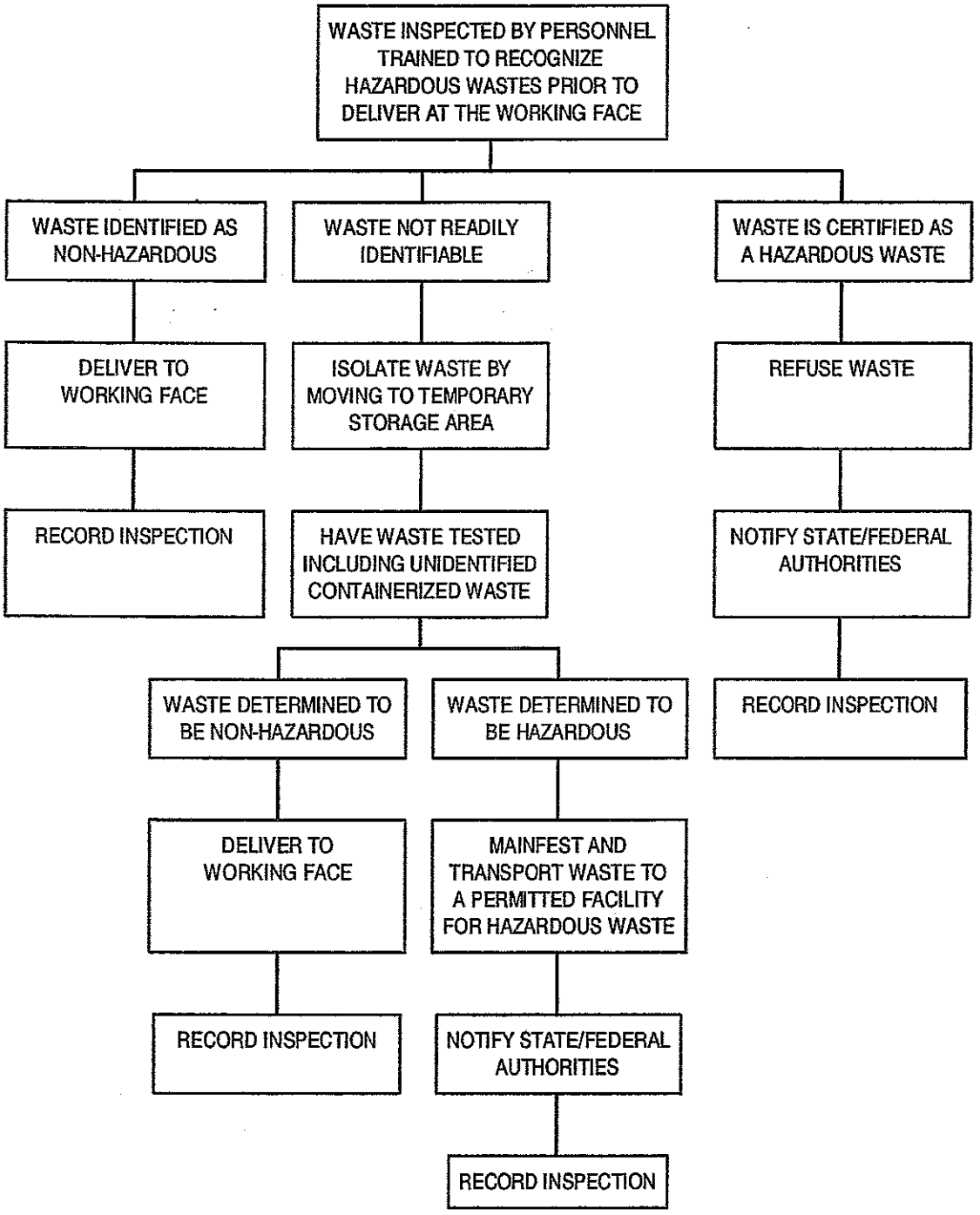
Load inspection reports will be maintained by the landfill in the operating record. Copies of the load inspection reports will be available to customers who have been subject to a random load inspection. Copies of training certificates and verification of completion of training forms will be maintained in the operating record.

Hazardous materials may be identified through three general scenarios. First, inspections may indicate that suspected hazardous materials are contained in an incoming vehicle prior to unloading. For this case, the landfill personnel will direct the hauler to leave the landfill and to take their load to an appropriate disposal facility. The hauler's name, company, and vehicle license number will be recorded by the gate house attendant or landfill personnel.

Second, suspected hazardous material may be found after unloading but while the hauler is present, either during normal operations or during a random inspection. In this case, the hauler's name, company, and vehicle license number will be recorded.

Third, suspected hazardous material may be found at the landfill working face with no responsible party present. In this case, landfill personnel will attempt to identify and locate the responsible hauler.

Figure 2.2: Hazardous Waste Inspection Decision Tree-Inspection At, Or Near Working Face



2.7 Recycling

A recyclables drop-off area is operated at the landfill for the public and City vehicles. The City has curbside pick-up of recyclables as well as a drop-off container for newspaper in the City. The materials accepted for recycling will be evaluated annually by the City.

Clear, green, and brown glass; aluminum and tin cans; newspaper; corrugated cardboard; scrap metal; green waste; plastics; mattresses; and appliances are collected in separate and clearly marked containers. These containers are located in a clearly marked area to the west of the gate house. Residents are directed to the recycling area by signs and landfill personnel. The city drop-off area is bi-level with roll-off containers on the lower level and an area for trucks to back up on the upper level. In this manner, City trucks back up the roll-offs and dump their loads of recyclables into them. To promote community participation, the recycling area is kept clean and maintained.

Green waste that contains no other solid waste is stockpiled at the landfill. The chipped green waste is then stockpiled for sale or use at the landfill. In addition, the City chips green waste at locations in the City and transports the chipped waste to the landfill for stockpiling.

The recycling program will be periodically evaluated by the City during the life of the landfill and changes in materials accepted, operating procedures, and facilities will be made as appropriate.

2.8 Disposal Method

This section describes disposal methods used at the landfill. Descriptions of excavation, stockpiles, filling progression, and waste placement, compaction, and cover procedures are provided.

2.8.1 Filling Method and Procedure

The landfill has operated and continues to operate by the area fill method in which lifts of waste are progressively placed over an area of the landfill and generally overlaid with daily cover (tarp or soil cover) at the end of the workday. **The entire areas of the east and west cells have been disturbed by landfilling operations and will not be expanded laterally, as defined in 40 CFR 258.2, without meeting the application regulations and notifying ADEQ of the City's intentions.**

The landfill cells have been constructed, and continue to be filled, by the area method. Landfill cells were excavated to approximately 35 feet below grade. The entire area of the east and west cells have been excavated for landfilling and no new cells will be excavated for landfilling without meeting the applicable regulations and notifying ADEQ of the City's intention. In areas of the east cell, where extensive settlement has occurred, the in-place waste is being excavated and placed in the west cell where it can be properly placed and compacted. A layer of caliche underlies the site and forms the bottom of the cells. Solid waste will be placed in compacted lifts approximately five feet thick. Each day, the waste and working face will be covered with a tarp or with soil creating discrete cells which comprise the lift. This process will continue above previous lifts until the closure elevation is reached or the landfill is closed.

2.8.2 Disposal Working Face Details and Conditions

Refuse will be unloaded at the working face which will be confined to as small an area as possible without causing unsafe traffic conditions or undue backup or congestion of vehicles. Loads will be directed by equipment operators to areas on the working face so as to permit disposal and compaction with an organized effort.

Systematically placing loads in small areas reduces work as well as the compactive effort. It also limits the area subject to precipitation and wind.

Compactors will be used to spread the waste piles and for waste compaction. The waste is normally unloaded at the bottom of an advancing lift. Waste will be placed in such a manner as to create a series of approximately horizontal lifts; each with a compacted height of approximately five feet and working face slope of approximately 4H:1V. Within each lift, waste will be spread by compactors into layers approximately two feet in loose thickness and then passed over several times with landfill compactors. Waste will be spread after unloading to reduce blowing litter and to keep the unloading area open for additional loads. To limit the potential for bridging of the surrounding refuse, large or bulky wastes will be placed at the bottom of the advancing lift and thoroughly crushed by compaction equipment.

Filling will proceed to reach final lift grade as soon as practicable. Intermediate sideslopes resulting from filling will be constructed at approximately a 4H:1V slope to limit the surface area exposed to precipitation. The tops of each lift will be graded to encourage precipitation run-off and limit ponding of stormwater on the surface.

The solid waste supervisor will be responsible for conducting inspections of daily landfill operations and monitoring waste unloading and compaction procedures, as well as procedures for monitoring unloaded waste for unacceptable or hazardous materials.

2.8.3 Covering the Waste

As required by federal regulation 40 CFR 248.21, a 6-inch layer of earthen material or Alternative Daily Cover (ADC) is placed over compacted waste at the end of each operating day. ADEQ approved the use of a "tarp" as an ADC at the landfill in 2001. No refuse is left exposed at the end of the operating day. The top surface will be graded in order to limit ponding of water. Daily cover material will be excavated from on-site areas or obtained from suitable off-site sources if necessary.

A 12-inch compacted soil layer will be placed over areas of compacted waste on which additional waste will not be placed for 30 days or more. The soil will be placed in one lift and compacted to promote surface water runoff, reduce the quantity of water percolating into the waste, and control vectors. The intermediate cover will be maintained by filling in or regrading low spots or ruts. Intermediate cover material will be excavated from on-site areas or obtained from suitable off-site sources if necessary.

A thicker layer of soil will be placed over these areas if significant rutting of the soil layer occurs or waste becomes exposed and increases windblown litter or attracts vectors.

Daily and intermediate cover soil will be obtained from on-site borrow areas or from stockpiled material that was previously excavated. It will be removed by scrapers which transport the soil to the working face. Alternately, a temporary soil stockpile may be maintained near the active disposal area for daily and intermediate cover.

2.8.4 Capacity of Landfill

The total volume of air space remaining in the currently permitted landfill as of June 2002 was approximately 2.4 million cubic yards. Based on the currently permitted final closure grades for the landfill and the design waste stream, the remaining life is approximately 11 to 15 years or greater.

The proposed modifications to the final grades of the East and West cells result in the following air space and life estimates:

Site Life		
Cell	Current Permit	Proposed Permit
West Cell	8 Years	15 Years
East Cell	6 Years	11 Years
Total	14 Years	26 Years

TABLE 1.1

2.8.5 Final Grade

Since waste is disposed at elevations higher than adjacent off-site natural grades in portions of the landfill, several provisions for final grade were established. Final landfill sideslopes will be 4H:1V to allow for positive drainage without causing excessive erosion of the side slope cover material. Final top grades will be 3% or greater. The final elevation, based on the conceptual final closure grades, will be approximately 1,483. Waste that forms the outer landfill sideslope will be covered with at least one foot of intermediate cover soil, before application of the final cover.

2.9 Operating Activities

This section presents descriptions of operating activities, including nuisance, drainage, erosion, and odor control.

2.9.1 Setback

No waste will be disposed within 100 feet of any property boundary, groundwater supply well, floodplain, or public roadway.

2.9.2 Traffic Control

The entrance gate for both commercial and general public access is located just west of Chuichu Road. A sign at the entrance displays the site name, fee schedule, operating hours, examples of unacceptable materials for disposal, and other information. Parking for visitor and employee vehicles is located north of the gate house.

The public is directed to pass by the gate house to the working face or the recycling area. An equipment operator will be stationed at the working face to inspect incoming waste loads and facilitate traffic flow. After unloading, vehicles will generally be directed away from the working face or recycling area and through the gate to leave the landfill facility. The working face and recycling drop-off area will be open during regular landfill operating hours.

Commercial or private haulers will be directed by the landfill staff or by signs to the active face of the landfill. The equipment operators will serve to control traffic and to supervise unloading. Loads identified as suspicious and loads selected at random by gate house attendants will be directed to an inspection pull-off area located at or near the working face for vehicle inspection for unacceptable or hazardous contents so as not to be a hindrance to traffic flow.

City trucks will use the main entrance and proceed past the gate house to either the working face or the recycling area.

2.9.3 Litter Control

A litter collection program helps reduce fire hazards, enhances the appearance of the landfill facility, and controls vectors.

To reduce the quantity of blowing litter, refuse will be spread, compacted, and covered daily. On-site and off-site trash and windblown litter will be controlled by assigning landfill personnel to collect scattered litter. Litter will also be controlled from beyond the landfill property boundary as required. Litter collected from on site and off site will be either placed in the working face and covered with soil or stored in covered containers for periodic disposal.

The solid waste supervisor will generally inspect the site and access roads at the end of each operating day to observe that litter has been picked up. Portable screens or fences will be placed around the working face of the landfill when necessary. To limit problems with vectors, the material collected on the screens will also be removed daily.

Also, City trucks will use tarps to cover their loads if they can become windblown.

2.9.4 Dust Control

Dust control measures at the landfill include prompt and careful movement of cover materials, limitation of earthwork activities during windy periods, and proper maintenance of roads. Further, haul vehicles will be encouraged to maintain low travel speeds in the vicinity of the site to reduce fugitive dust.

A water truck will be available on site and utilized as necessary to limit fugitive dust concentrations from unpaved site roads, soil stockpiles, active borrow areas, and reclaimed surfaces. Water will be obtained from the irrigation canal at the north end of the property and from a two-inch Arizona Water Company line on the landfill property.

2.9.5 Disease Control

Vectors that create nuisance conditions and health hazards at landfills include flies, rodents, and mosquitoes or other animals, including insects, capable of transmitting disease to humans. Federal regulation 40 CFR 258.22 requires the prevention and control of on-site populations of disease vectors using techniques protective of human health and the environment.

Flies and rodents are most effectively controlled by the efficient spreading, compaction, and covering of incoming waste. Daily cover discourages propagation of flies and rodents. Highly putrescible wastes will be placed in the working face and covered immediately upon unloading with waste or soil. Compaction of waste limits potential harborage for rodents. Maintenance and grading of drainage channels reduces the potential for standing water and limits the mosquito population.

Recycling containers or bins should also be covered and kept clean to avoid problems with vectors.

When additional techniques such as reproductive controls and insecticides or rodenticides are necessary, they will be protective of human health and the environment.

2.9.6 Odor Control

Odors may be generated at landfills by the wastes accepted and by the decomposition of the buried wastes. Odors can be reduced by the prompt placement of daily, intermediate, and final cover. Odorous loads will be buried or covered immediately.

Lime or other approved chemicals may be applied over loads containing dead animals, manure, or other odorous loads. Lime or chemicals applied will be protective of human health and the environment.

2.9.7 Fire Control

Procedures to discourage fires at the site include inspection of incoming loads for fires or smoldering waste, placement and compaction of soil cover over the disposed waste, and maintenance of landfill equipment.

Incoming waste loads will be inspected for smoldering or burning material. Any hot or burning material will be immediately taken to a holding area away from the working face, spread out, and soaked with water. Once cooled, the waste will be placed in the landfill.

Neither smoking nor an open flame will be allowed near the working face nor in enclosed spaces. Smoking will be allowed in authorized areas only. Landfill vehicles and equipment will be regularly inspected and maintained to prevent sparks or leaking flammable liquids.

Daily cover material will be maintained in the fill area to assist fire-fighting activities.

Landfill personnel will be informed of on-site fire fighting and communications equipment and will be trained to identify potential subsurface fires. Landfill personnel will be trained in proper fire fighting procedures. Signs of such subsurface fires may include sudden or rapid settlement of fill or smoke emissions from the fill.

Fire extinguishers will be located on all landfill heavy equipment and at the gate house, baler, and maintenance area. Fire extinguishers and other fire fighting equipment will be regularly inspected and maintained. Also, the water truck is equipped with a 2-1/2 inch fire hose, pump, and nozzle.

In the event of a fire, the solid waste supervisor will be notified and will be responsible for determining the appropriate emergency response. If necessary, the Casa Grande Fire Department will be called.

2.9.8 Access Control

Vehicle access to the landfill is controlled through an entrance road and gate, which is locked when the landfill is not open for the acceptance of waste. A perimeter fence controls unauthorized access to other areas of the landfill.

2.9.9 Surface Water Management

Contained In The By Toe Berms

Surface water control will be handled by several different methods. Confinement berms will be used to control surface water. Any surface water that comes in contact with waste will be directed to the active fill areas. Surface water which does not contact the waste will be routed to a retention basin. The purpose of the retention basin is to allow soil particles to settle from the surface water and to control peak surface water runoff. Temporary berms or drainage swales will be built on the intermediate cover sideslopes to prevent surface water runoff from entering the active fill area. This procedure is a daily operational concern and therefore the exact locations of temporary drainage ditches cannot be provided on the Design Drawings. Since the active fill area will be increasing in elevation, the location of these ditches will change with time.

2.9.10 Noise Control

Noise control at the landfill facility is required for the comfort and safety of employees and the public. The closest residential area is approximately one-quarter mile to the east across Chuichu Road. The City has not received complaints concerning noise at the landfill. To limit noise, collection vehicles and landfill operating equipment will have standard noise suppressant devices. Ear protection will be available to employees.

2.9.11 Bird Control

Daily landfill cover limits food sources for birds. In addition, confinement of landfill operations to a relatively small working face discourages bird infestation. If birds become a problem, techniques such as installation of portable overhead cables or use of distress calls to frighten the birds may be utilized.

2.9.12 Adverse Weather Conditions

During periods of high wind, special precautions will be taken to keep blowing dust and litter under control. If possible, filling will be performed at lower elevations during extremely windy weather. Water will be applied to haul roads and the area of open working face will be limited and well compacted. If the winds become strong enough to endanger haul trucks while dumping their loads, the landfill will not accept them or will allow them to dump only in an area sheltered from the wind. The solid waste supervisor has the authority to cease disposal operations during high wind conditions. In the event of a shutdown, a notice will be posted at the site entrance, directing haulers to alternate disposal locations. Also, landfill personnel will inform major haulers of the shutdown and its expected duration.

Roads will be kept passable and the working face kept accessible in wet weather. If roads become unpassable, temporary disposal locations will be available for trucks to dump. Slopes and cover will be maintained in order to prevent exposing underlying waste by stormwater runoff. The solid waste supervisor has the authority to cease disposal operations during wet weather. In the event of a shutdown, a notice will be posted at the site entrance, directing haulers to alternative disposal locations. Also, landfill personnel will inform major hauler of the shutdown and its expected duration.

2.10 Special Handling Procedures

The City adopted Ordinance No. 1397.08.13 relating to special handling of solid waste. This ordinance is shown in Appendix D.

2.10.1 Green Waste

The City chips green waste at locations throughout the City and transports the chipped green waste to the landfill. The landfill does not routinely receive green waste; when it is received, it is chipped as it arrives at the facility. Only separate loads of green waste consisting of grass, leaves, trees, and branches will be chipped on site. No separation of loads will be performed by landfill personnel. The chipped green waste will be stockpiled in an area designated by the solid waste supervisor within the waste footprint for sale or use at the landfill.

2.10.2 Large Appliances

Large appliances will be accepted at the landfill but not landfilled. They will be stored on site and sold to a recycling facility. Prior to removal from site, freon gas will be removed from appliances and recycled.

2.10.3 Dead Animals

Dead animals collected with residential solid waste will be incorporated into the working face and covered immediately with soil or other waste. Dead animals from commercial businesses, pounds, breeders, farms, ranches, or sources other than individual households will be buried in pits, and immediately backfilled with cover soil.

2.10.4 Asbestos

Asbestos-containing material (ACM) will be considered in two classifications: friable and nonfriable. Friable asbestos is defined in federal regulation 40 CFR 61.141 as any material containing more than one percent asbestos by weight that hand pressure can crumble, pulverize, or reduce to powder when dry. Examples of friable asbestos material include pipe and boiler wrap and fibrous or fluffy spray-applied materials used for fireproofing and insulation. Friable asbestos will not be accepted at the landfill.

EPA defines nonfriable asbestos material in federal regulation 40 CFR 61.141 as material containing more than one percent asbestos by area that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Nonfriable asbestos may consist of asbestos-containing packings, gaskets, floor covering, and asphalt roofing products containing more than one percent asbestos.

Waste haulers will be required to notify landfill staff of each load that contains nonfriable asbestos prior to disposing of the waste. The loads will be inspected by the gate house attendants and equipment operators for friable asbestos. Nonfriable asbestos will be disposed like other accepted solid waste, except that this material will be thoroughly wetted prior to disposal, compaction, and covering, to limit fugitive dust emissions.

2.10.5 Containers

Containers holding liquid waste will not be placed in the landfill unless:

- It is a small container similar in size to that normally found in household waste,
- It is designed to hold liquids for use other than storage, or
- The waste is household waste.

Liquid waste is defined as a waste material that is determined to contain "free liquid" as defined by Method 9095 (Paint Filter Liquids Test), as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" (EPA Pub. No. SW-846).

Drums and pails one gallon or greater in size can be disposed at the landfill provided they are empty. A container is empty when it contains less than an inch of residue if it contained non-acute hazardous waste or is triple rinsed with a solvent if it contained acute hazardous waste. Only perforated containers will be accepted.

2.10.6 Household Hazardous Waste

Household hazardous waste will not be segregated at the landfill and, if contained in a commercial or residential load, will be incorporated into the working face. However, residents will be encouraged to drop off household hazardous wastes, such as paint, at the gate house. The City will then reuse or recycle the material, or remove to a proper disposal location off-site.

2.10.7 Tires

Tires are not accepted at the landfill. However, a roll-off is located on site for tires removed from the working face. Landfill personnel will prevent haulers or residents who have tires in their loads from placing them in the landfill. Also, landfill personnel will remove tires from the

working face of the landfill and place them in the roll-off. When sufficient quantities of tires are collected on site, they will be transported to a county recycling facility. The amount of tires kept on site should be limited to reduce the risk of fires and vectors.

2.10.8 Lead Acid Batteries

Receipt of lead batteries at the landfill is not expected due to existing monetary incentives to recycle them. Lead acid batteries which are found will be removed from the landfill, properly stored, and taken to a battery recycler.

2.10.9 Wastewater Treatment Plant Sludge

Only wastewater treatment plant sludge from the City treatment plant will be accepted for landfilling provided it is not a "free liquid" as determined by Method 9095 (Paint Filter Liquids Test), as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods" (EPA Pub. No. SW-846).

2.10.10 Medical Wastes

Refer to the City adopted Ordinance No. 1397.08.13 relating to special handling of solid waste. This ordinance is shown in Appendix D.

2.10.11 Restricted Activities

Restricted activities are defined here as waste disposal activities that are prohibited.

2.10.12 Salvaging

Salvaging of waste materials by the public will be prohibited at the landfill. Landfill personnel will also be prohibited from salvaging to set a good example for members of the public.

The City may salvage provided it is supervised and strictly controlled. If performed, salvage operations should be confined to an area remote from the working face and salvaged material should be separated by type and properly stored so as not to create a nuisance or unsightly appearance.

2.10.13 Open Burning

Deliberate open burning of waste materials is prohibited at the landfill.

2.10.14 Liquid Waste Disposal

Liquid waste disposal is not permitted at the landfill. Also, mixing of bulk liquid waste with solid waste in the landfill will not be allowed.

2.11 Environmental Sampling

2.11.1 Groundwater

Groundwater sampling is required downgradient of the landfill to detect discharge or leakage of leachate from the landfill. Upgradient sampling is also required to determine background or ambient levels of the parameters tested.

There are four existing groundwater monitoring wells within the landfill property boundary: MW-1, MW-2, MW-3, and MW-4. In addition, there are two off-site supply wells: one to the east of the landfill and one to the north. Groundwater sampling will be conducted at the four on-site monitoring wells semi-annually and the two off-site wells annually.

Sampling personnel and laboratories will have their own sampling and testing program and protocols as well as a quality assurance/quality control program. Where applicable, these programs should meet the requirements of 40 CFR 258 Subpart E – Groundwater Monitoring and Corrective Action and AADEQ's Quality Assurance Project Plan. Appendix E describes Sampling Protocols.

2.11.1.1 Laboratory Records and Reporting of Results

The laboratory will record and submit to the City a report that includes the following information:

- Date on which the samples were received at the laboratory.
- Date on which each sample analysis was completed.
- Name of each individual or laboratory who performed each analysis or processing step.
- Laboratory storage and analysis records maintained at the laboratory which contain pertinent information about the samples.
- Quality assurance and quality control procedures followed by the laboratory.
- Processing steps applied to each sample including sample preparation techniques.
- Results of the sample analyses and identity of all quality control blanks.

2.11.1.2 Recordkeeping and Reporting of Data

- The following data will be maintained in the landfill operating records.
- Chain of custody reports.
- Records of dates, times, and locations of sampling events.
- Method of sampling.
- Results of static water level measurements.
- Laboratory results.

A groundwater sampling report for the point-of-compliance wells will be prepared annually within 60 days of the year's end. This report will summarize all groundwater sampling activities and analytical and field results.

2.11.2 Surface Water

Sampling of the surface water will be initiated after the retention basin is constructed in approximately 5 years. Sampling will occur if any discharge from the basin takes place.

2.11.3 Landfill Gas

EPA requires all landfill sites to monitor gas emissions. These requirements include perimeter monitoring by gas probes, and a variety of testing requirements based on the size of the landfill. In 1999 EPA enacted the New Source Performance Standards (NSPS).

The procedures presented in this section provide guidelines for the collection of data from landfill gas monitoring probes and meet the requirements of federal regulation 40 CFR 258.23 which specifies that the concentration of methane gas generated by the facility does not exceed 25 percent and 100 percent of the lower explosive limit for methane in facility structures and the property boundary, respectively, and that a routine methane monitoring program be implemented to meet these standards. To provide for collection of data which is representative of the conditions in the probes, specific sampling techniques will be implemented. Additionally, these techniques will be used as a standard by monitoring personnel. The following information will be recorded and kept in the operating record:

- Name of sampler/tester.
- Manufacturer, make, and model number of monitoring equipment.
- Date and time of testing.
- Landfill gas probes and structures tested.
- Results of all readings taken.
- Calibration records.
- Field notes taken during the testing.

2.11.3.1 Monitoring Program

The landfill currently has eight landfill gas monitoring probes near the property boundary for methane gas monitoring. Two probes are located along each side of the landfill property (north, south, east and west) and are approximately equally spaced. This allows the City to monitor for subsurface methane migration in all directions from the landfill. Landfill gas monitoring will be performed quarterly. The area around the landfill is largely undeveloped.

2.11.3.2 Facility Structures

The combustible gas indicator will be used to monitor landfill gas in facility structures. A monitoring probe or rod will be attached to the indicator and will be used to measure the concentration of oxygen and combustible gas at the high and low points and breathing zone within all facility structures occupied or use by people. Results of all readings will be recorded and kept in the operating record. The monitoring will be performed in the morning before the structures are allowed to ventilate. Monitoring will be performed quarterly.

2.12 Recordkeeping

The CGML maintains records of various activities and operations occurring at the site including the following:

- Daily inspections of incoming loads,
- Daily disposal quantities,
- Placement of daily and intermediate cover,
- Placement of final cover,
- Performance of maintenance activities, and
- Monitoring records.

Construction record drawings will be prepared upon the completion of each phase to show the progression of the filling operation. These drawings along with monitoring reports will be made available to the ADEQ on a periodic basis.

2.13 Wastes Accepted and Not Accepted (Refer to Appendix D)

The landfill facility accepts the following waste types for disposal in the landfill:

- Municipal solid waste (garbage, trash, and other waste from households or commercial facilities).
- Construction debris (from demolition and construction activities).
- Dead animals (pet, farms, pounds).
- Nonfriable asbestos.
- Containers (clean and perforated).
- Industrial waste (only non-hazardous solid waste).
- Wastewater treatment plant sludge from City plant (only if passes the Paint Filter Test).
- Certain medical waste as called out in Appendix D.
- Household hazardous waste ("conditional exempted small quantity generators").
- Green waste (if mixed with municipal solid waste loads).

The landfill accepts the following waste types for recycling:

- Green waste
- Large appliances (refrigerators, stoves, etc.).
- Lead acid batteries.
- Paints
- Glass.
- Plastics.
- Mattresses.
- Scrap metal.
- Metal/tin cans.
- Newspaper.
- Corrugated cardboard.

The following types of waste are not accepted at the landfill facility:

- Tires.
- Automobiles.
- Petroleum contaminated soils.
- Liquid waste, including septage (pumpings from septic tanks).
- Friable asbestos.
- Certain medical waste.
- Certain hazardous waste.

2.14 Contingency Plan

This section describes responses to address unforeseen circumstances which may occur at the landfill.

2.14.1 Groundwater Sampling

The City will take the following actions in the event of a statistically significant increase over a background level or an established alert level for one or more of the constituents analyzed under the groundwater detection-monitoring program:

- Within 14 days of becoming aware of an increase, the City will place a notice in the operating record indicating those constituents that have shown a statistically significant change above a background level or an established alert level, and notify ADEQ that such a notice was placed.
- Verification sampling and testing may be conducted after becoming aware of the increase. Samples will be collected only from the point(s) of compliance that indicated an increase. Verification analyses will be performed for all parameters analyzed under the ground water detection monitoring program.
- If the increase is determined to be the result of a source other than the CGML, an error in sampling, analysis, or statistical evaluation, or a natural variation in the groundwater quality, the City will prepare a report documenting the suspected cause of the increase. The report will be certified by a qualified groundwater scientist or approved by ADEQ and placed in the operating record. If a successful demonstration is made and documented, the city will continue the groundwater detection monitoring program.
- If after 90 days of becoming aware of the increase a successful demonstration cannot be made, the City will begin a groundwater assessment monitoring program, as specified in 40 CFR Part 258.55.
- Based on the results on the Assessment Monitoring Program and in accordance with the requirements of 40 CFR Part 258, the City will perform a corrective measures assessment (40 CFR Part 258.56), and establish and implement a corrective action plan (40 CFR 258.57 and 258.58).

2.14.2 Landfill Gas Migration

This section describes contingency measures for two types of landfill gas migration: (1) migration to on-site facilities and (2) off-site migration.

Federal regulation 40 CFR 258.23(c) requires the following actions be taken if the concentration of methane gas exceeds 25 percent and 100 percent of the lower explosive limit (LEL) for methane in facility structures and at the property boundary, respectively.

- Take all reasonable steps to protect human health and notify ADEQ;
- Within seven days of detection, place in the operating record the methane gas levels detected and a description of the steps taken to protect human health; and
- Within 60 days of detection, implement a remediation plan for the methane gas release, place a copy of the plan in the operating record, and notify ADEQ that the plan has been implemented. The plan will describe the nature and extent of the problem and the proposed remedy.

In addition, the following actions will be taken in the event methane gas concentrations exceed the allowable limits.

2.14.3 On-Site Facilities

If combustible gas readings indicate methane concentrations in excess of 25 percent of the LEL in facility structures, the structure will be evacuated and ventilated. Ventilation will consist of opening two or more doors or windows and using an explosion-proof fan. After ventilating the structure for 15 minutes, another combustible gas measurement will be made inside the structure.

If the methane concentration in the structure has dropped to acceptance levels, the structure may be reoccupied.

Any time that allowable limits are exceeded, the combustible gas testing frequency will be increased to twice per day for one week. If the allowable limit is not exceeded in the week, monitoring of the structure will be decreased to once per week. If during the initial two weeks of monitoring, gas levels remain within allowable limits, monitoring will be decreased to once per quarter at the monitoring probes.

If concentration limits are exceeded repeatedly, a continuous monitor and alarm will be considered, as will increasing air flow in landfill structures by installing ventilation systems.

2.14.4 Off-Site Migration

If landfill gas monitoring conducted at the landfill property boundary demonstrate exceedance of the LEL, the measurement instruments used will be inspected for accuracy and recalibrated if necessary. If further tests confirm methane concentrations in excess of allowable limits, an investigation and gas migration control program will be instituted. The control program may include passive landfill gas venting, active landfill gas collection, or both. Other control measures may be instituted, including construction of slurry walls or venting systems.

2.14.5 Release of Hazardous Materials

The landfill will not accept hazardous materials; thus, any appearance of these materials at the landfill facility comprises a contingency. Once a hazardous waste or PCB waste has been identified, caution will be taken to protect the safety of the landfill personnel, public, and the environment. The following response and handling procedures will be conducted by landfill personnel if hazardous waste is found in the working face or in a load that was dumped for inspection:

- Approach the waste cautiously from up wind.
- Attempt to identify the substance from a distance based on identifying container markings and physical characteristics, e.g., solid, liquid, or gas; smoking or smoldering.
- Secure and isolate the potential danger area by roping off the area and allowing no one near it except emergency personnel.
- Notify the City of Casa Grande Fire Department at 911 to request a hazardous material response team to determine the waste characteristics and appropriate response. A hazardous waste hauler with an EPA ID number may be required to manifest and arrange transportation of the waste to an approved RCRA hazardous waste management facility.
- Remain on the scene until the material is properly removed from the landfill.
- Thoroughly clean the area in which the hazardous or unacceptable waste was found. Cleaning agents and contaminants may also have to be collected in containers for disposal off site.
- Attempt to determine the generator or hauler of the hazardous waste and initiate action to recover handling, transportation, and disposal costs when the responsible party is determined.
- Notify ADEQ and the Arizona Attorney General's office.

Haulers who have been found attempting to deliver hazardous wastes to the landfill will be subject to interrogation or inspections during future trips. At the discretion of the solid waste supervisor, repeat offenders will be banned from continued use of the landfill.

It may be necessary to temporarily store hazardous or unacceptable wastes at the landfill. In this case, the wastes should be protected from the elements (rain, wind, etc.), secured against tampering or unauthorized removal, and isolated from other wastes and activities.

In order to continue operation of the landfill during the removal of the hazardous waste, waste will be placed away from the contingency activities. Another working face will be established, if necessary.

2.14.6 Fire

In the event of a serious fire, the City of Casa Grande Fire Department will be summoned. Fire Station No. 1 is located 3.4 miles from the landfill and the response time is 4 to 5 minutes depending on the time of day and weather and traffic conditions. Two means of communication exist for notifying the Fire Department. One is through the use of two-way radios that are in use at the landfill and part of the overall City communications system. The second means is by calling 911 and notifying the Casa Grande Police Department.

2.14.7 Exposed Fire

Should a fire occur in any of the structures or areas of the landfill facility, landfill personnel will call the City of Casa Grande Fire Department. Meanwhile, the landfill personnel will proceed with the following actions if the character of the fire does not endanger personnel safety.

- Should the fire be localized in a fill area, the equipment operators will proceed to excavate the burning refuse to separate it from the rest of the fill, and proceed to cover it with on-site soil or extinguish the fire with fire extinguishers. Only if considered necessary, water from on-site water trucks will be used.
- Should the fire be localized to a buffer zone surrounding the fill area, the equipment operators will excavate the necessary fire breaks in an attempt to prevent the fire from reaching any fill area and will water down the area between the fire break and the refuse area using on-site water trucks.
- Should the fire be localized to an on-site structure, the solid waste supervisor will direct the use of on-site fire extinguishers, water trucks, or fire hoses to control the fire as much as possible, will construct fire breaks, and water the areas surrounding the fire.

Upon arrival at the site, the Fire Department will be in charge of the necessary actions and, on their completion, will report the conditions at the site. The solid waste supervisor will conduct a field investigation to determine the origin and extent of the damages to the containment and other structures, its impact on the landfill operations, temporary and permanent repairs and changes in operations considered necessary to reduce the risk of similar occurrences.

Excavating burning or smoldering waste is a dangerous procedure and caution should be taken. Water will be sprayed on those parts of operating machinery that come into contact with hot wastes. After all burning waste has been excavated and fires have been extinguished, the waste

will be landfilled according to usual procedure. Burned waste will not be disposed until certified as completely extinguished by a Fire Department representative. The area where the burned waste is landfilled will be monitored for several working days to verify that the fire has not restarted.

2.14.8 Buried Refuse Fire

A buried refuse fire can result from several sources, including a burning or smoldering load that was landfilled or from air intrusion into the landfill. Entrained air or air intrusion causes the buried refuse to decompose, producing carbon dioxide, water vapor, residual nitrogen, carbon monoxide, and heat. The following phenomena may indicate that air has mixed with buried refuse and a fire has started:

- Significant settlement in a limited area.
- Surface cracks with smoke emission.
- Surface cracking in a radial pattern.

If a buried refuse fire is suspected, the solid waste supervisor will be notified. The landfill cover will then be visually inspected to find any obvious sources of air entering the landfill, such as surface cracks or settled areas. Cracks in the cover will be monitored for the presence of landfill gas and carbon monoxide to protect personnel and to determine the extent of the refuse fire. If landfill gas is present or suspected, personnel will be required to wear respiratory protection. The burning waste will be excavated and spread out in an isolated area or otherwise isolated from the rest of the buried refuse. Fire extinguishers, covering the burning waste with soil, and spraying the burning waste with water are generally acceptable means of extinguishing the fire. After it has been determined that the fire is out, the waste will be placed in a cell and covered with six inches of cover material.

2.14.9 Personnel Safety

2.14.9.1 General

Each employee will contribute to safety of the work environment by periodically analyzing jobs, work areas, and procedures from a safety standpoint so that potentially hazardous conditions will be recognized and avoided. When a hazard is noted, immediate corrective action will be taken. Where appropriate, warning signs will be posted, safety devices installed, and safety procedures established. Periodic safety inspections by outside staff personnel may help identify correctable hazards.

All equipment will be maintained in good working order and will carry fire extinguishers. All mobile equipment will be operated with audible back-up signals. Dust masks, eye protection, and hearing protection will be available to the landfill personnel.

2.14.9.2 Maintenance Area

Numerous safety conditions will be observed in the operation of the maintenance area, including adhering to the following safety procedures:

- All welding gas bottles will be secured with chains to either a bottle cart or a bulkhead. All gas bottles without regulators will have steel protective covers over the bottle stem.

- Vehicles being maintained or repaired, as well as parked vehicles, will have their tires blocked.
- When personnel are working under any vehicle, jackstands will be used to secure the vehicle.
- Oil spills will be removed immediately using oil absorbents.

2.14.9.3 Gate House and Facilities Building

The following safety requirements will be met by personnel working in the gate house:

- No unauthorized persons will be allowed in the gate house or other facility structures without being escorted by, or having the permission of, authorized personnel.
- Manufacturer's safety recommendations for gate house and facilities and will be followed.

2.14.10 Working Face

Landfill personnel assigned to the working face will follow these safety requirements:

- Equipment operators will maintain regular contact with the office, immediately notifying the solid waste supervisor of any emergencies that occur at the working face.
- Equipment operators will visually inspect solid waste to help identify unacceptable and hazardous materials so they are not disposed in the landfill.
- Equipment operators or spotters will escort salvagers off the landfill premises.
- Drivers will be directed to unload and leave the working face in a safe and expedient manner.

2.14.11 Ambulance and Hospital Availability

A 911 service is available at the landfill facility. In addition, all radio communications are monitored by a central dispatcher who also dispatches the police and fire departments. Equipment operators will summon the police and fire departments in this manner. City of Casa Grande Fire Department ambulance service and hospital services of the Casa Grande Regional Medical Center (520-426-6300) will be utilized when necessary for persons injured at the landfill. This hospital is approximately three driving miles from the landfill facility.

2.14.12 Communications

Contact between landfill personnel and outside individuals and agencies is typically maintained through the use of telephone services. Communications at the landfill will be maintained through the use of two-way radios carried by the solid waste supervisor and solid waste superintendent and located in the gate house. Each piece of equipment and sanitation vehicle also contains a radio. The radios are part of the overall City communications system. A telephone is located in the gate house.

2.14.13 Emergency Coordinators

Table 2-1 presents various contacts for emergencies that may arise at the landfill. A copy of the Operations Plan will be provided to the Casa Grande Police and Fire Departments to familiarize them with the layout of the facility, properties of the waste accepted, and operating practices. For all emergencies occurring at the landfill, the City personnel to be contacted are noted in Table 2-1.

Table 2-1: Emergency Contacts

Contact	Position	Work Phone Number	Home Phone Number
David Johnson	Solid Waste Superintendent	520-421-8600 ext. 471	520-421-0484 (Pager)
Tonya Stager	Solid Waste Supervisor	520-421-8600 ext. 471	520-560-3854
Greg Stanley	Public Works Director	520-421-8600	
Fire	Casa Grande Fire Department	911	
Personal Injury	Ambulance	911	
Hazardous Materials	Casa Grande Fire Department	911	
	Arizona State Hazardous Waste Hotline	602-207-2330	
	Arizona Attorney General	602-628-6504	
	Pinal County Attorney	602-868-6271	
	Casa Grande Attorney	602-421-8600	
Trespassing	Casa Grande Police Department	911	
Killer Bees	Arizona Department of Agriculture District Office	602-255-4933	
	Arizona Department of Agriculture	602-542-4373	

This list will be posted in the gate house and updated as required. One of the above-listed City personnel will contact ADEQ when an event occurs that requires emergency response measures or implementation of a contingency action in response to an endangerment to the public health or environment.

2.14.14 Emergency Equipment

Emergency equipment provided at the landfill facility will include fire extinguishers and first aid kits. Also, the water truck may be used to extinguish fires that may occur.

2.14.15 Equipment Failure

In the event of equipment failure, three procedures will be followed. First, remaining on-site equipment will be reallocated to continue with normal landfill operations. Second, short-term replacement landfill equipment will be acquired from other City operations. Third, long-term replacement equipment will be provided through purchase or lease. Failed equipment will be repaired as soon as is practicable and returned to operation. Equipment will be repaired by the City's Vehicle Maintenance Division.

2.14.16 Facility Shutdown

The landfill is designed for all-weather access and portions of the site will be developed for use during inclement weather. In the unlikely event of facility shutdown, a notice will be posted near the site entrance, directing haulers to alternate disposal locations. Additionally, landfill personnel will inform major haulers of the shutdown and its expected duration.

2.14.17 Unusual Traffic Conditions

The landfill facility is located in a relatively isolated area. Therefore, hauler traffic should not disrupt local traffic flows. If necessary, haulers will form a queue from the entrance to the gate house. If necessary, particularly prior to opening, haulers will be permitted to form a queue along

the shoulder of Chuichu Road directly in front of the entrance gate provided they do not pose a traffic hazard.

2.14.18 Evacuation Plan

If excessive landfill gas concentrations are detected in facility structures, the evacuation procedures described in Subsection 2.14.3 will be followed. In case of fire in landfill facilities, employees will be evacuated to a reasonably remote location from the fire. If the fire occurs in conjunction with finding evidence of landfill gas migration, all landfill personnel will be evacuated from the landfill facility. If an evacuation of the entire landfill facility is necessary, the following actions will be initiated by the Emergency Coordinator:

- An alarm will be given through the communications system.
- Access and haul roads will be cleared of obstructions.
- Personnel and public will exit the property using the landfill entrance road.
- Emergency response agencies will be notified.

2.15 Landscaping

As the landfill is closed, the final soil cover will be vegetated with native plants with no irrigation. Plants will be replaced as necessary.

City of Casa Grande

Landfill Permit Update

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List of Tables

3.0 CLOSURE AND POST-CLOSURE

3.1 Closure Schedule

Each phase of landfill development will receive final cover and be revegetated upon reaching final grades. Closure will be completed in phases. The West Area will be filled to final grade and closed first. The East Area will then be filled and closed.

3.2 Closure Plan

The following items provide the general events that will be accomplished when closing the West and East portions of the site.

- At least 90 days prior to closure, the owner shall notify the ADEQ of the intent to close the site.
- The site shall be covered with a minimum of 18-inches of compacted soil with a permeability no greater than 1 x 10^{-5} cm/sec, sloped to provide for runoff; surface runoff must be diverted or conveyed through drainage ditches, and/or diversion swales. An additional 12-inch minimum layer of soil suitable to support native vegetation will be placed on top of the compacted soil infiltration layer.
- Completed disposal areas shall be seeded with native vegetation within 90 days after closure to establish vegetative growth.
- The site shall be inspected and maintained as open space, or for other uses, as determined by the City of Casa Grande and approved by the ADEQ.
- Upon completion of closure activities, the City will give written notice to the ADEQ.

3.2.1 Discharge Control Technologies

Discharge control at the Casa Grande Municipal Landfill (CGML) is achieved through a combination of operating procedures, control technology, and site characteristics, as summarized below.

- Site Characteristics

- Stable area
- Distance of at least 10 feet from groundwater table to bottom of landfill
- Precipitation rate, 8.7 in/year (Western Regional Climate Center, South Phoenix Station)
- Evapotranspiration rate up to 10 times the precipitation rate.
- Soil characteristics which allow attenuation of leachate constituents

- Control Technologies
  - Soil liner on base and excavation sideslopes
  - Soil cover and vegetative layer on top and above grade sideslopes
  - On-site surface water diversion and containment

- Operating Procedures
  - Placement of daily and intermediate cover
  - Restriction of liquids from the landfill

Overall, the factors above minimize the potential for leachate generation.

3.2.2 Closure Activities

The proposed final grade for the landfill provides for 4:1 (horizontal to vertical) sideslopes from the surrounding grade up to a elevation of 1470 feet, and then three percent slopes up to the highest point of the landfill (1,483 feet).

Site closure will involve placing the final cover and establishing vegetation in phases as final grades are reached. When the landfill site nears its full capacity, all but the last phase will have been previously closed and covered.

3.2.2.1 Final Cover

The placement of final cover soils is intended to limit surface water infiltration, support plant growth, and in general provide a barrier between the refuse and the environment. For the East

and West Areas, the final cover will consist of 18 inches of infiltration control material (native soil) and 12 inches of topsoil.

As the landfill is closed, the final soil cover will be vegetated with native plants. Plants will be replaced as necessary due to damage or death.

Documentation of the 18-inch soil cap should be performed before the 12 inches of topsoil is placed. The following testing, analyses, and documentation will be performed for the final cover over the entire site.

- Survey the final grades and document elevations on a 100-foot grid pattern.
- Document the cap thickness on a 100-foot grid pattern. A minimum of 18 inches of soil cap thickness shall be provided. Obtain three vertical Shelby tube samples per acre, one within each 6-inch lift of the cap. Perform laboratory tests on the Shelby tube samples to determine permeability, density, natural moisture content, P200, clay content (0.002 mm), grain size distribution curve, Atterberg limits, and USGS soil classification. Perform one lab moisture-density test for every two acres.
- Document nutrient content and necessary pH adjustments for the topsoil.

In general, permeability of the clay cap shall be 1 x 10^{-5} cm/sec or less. The density shall be 90 percent of the standard Proctor compaction curve or greater for the cap. If these specifications are not met for a group of tests in a given location, the area shall be scarified, recompacted, and retested.

3.2.2.2 Site Drainage and Structures

Final drainage and erosion control structures will be designed to remain functional following maximum settlement expected as a result of natural decomposition of the fill or other causes. The final drainage and erosion control structures will be inspected and maintained at least annually, or as deemed necessary during the post-closure period.

3.2.3 Final Cover Area

The West Area's waste footprint is 54.5 acres. The East Area's disposal footprint is 51.5 acres. Therefore the total area to receive final cover would be 106 acres.

3.3 Closure And Certification And Deed Restriction

A third party registered professional engineer (CQA Engineer) will be retained by the City of Casa Grande to certify that the landfill has been closed in accordance with the construction quality control plan. The CQA engineer shall prepare a weekly certification report during closure activities which will contain the following items.

1. A summary of all construction activities.
2. Any laboratory test results.
3. Observation and test data sheets.
4. Sampling and testing location plans.
5. A description of significant construction problems and the resolution of those problems.
6. A list of changes from the construction drawings and specifications, and the justification for these changes.
7. A certification statement signed and sealed by a registered professional engineer.

The CQA engineer shall prepare and submit a final certification report at the completion of closure activities. This report will be suitable for submittal to the ADEQ, and will include all necessary information for approval of final closure of the CGML.

The CQA engineer shall observe the installation of the final cover section and certify that the installation complies with the approved Closure Plan. This certification will be included with the final certification report. An estimate to perform closure of the entire site is included in Table 3-1.

In addition, a deed restriction will be placed on the CGML's entire site. This deed restriction will state that this property has been utilized as a waste disposal facility.

Table 3-1: Closure Costs

City of Casa Grande Solid Waste Disposal Facility

Description	Quantity	Unit	Unit Costs	Total Costs
Engineering				
Final Closure Design and Permitting				
Topographic Survey	1	LS	$ 10,000	$ 10,000
Boundary Survey	40	HR	$ 80	$ 3,200
Development of Plans	1	LS	$ 150,000	$ 150,000
Closure Testing	1	LS	$ 200,000	$ 200,000
Final Cover Evaluation Report	1	LS	$ 50,000	$ 50,000
Engineering Total				$ 413,200
Construction				
Pre-Subtitle D Area (106 acres)				
Erosion Control Layer	148,000	CY	$ 5.00	$ 740,000
Clay Cap (Infiltration Layer)	222,000	CY	$ 5.50	$ 1,221,000
Re-vegetation	106	Acres	$ 1,000	$ 106,000
Site Grading and Drainage/Stormwater Controls	106	Acres	$ 1,500	$ 159,000
Construction Total				$ 2,226,000
Subtotal				$ 2,639,200
Contingency 15%				$ 395,880
Closure Total				$ 3,035,080

* Closure cost estimates are based on 2002 dollars and assumes entire site is closed at the same time.

3.4 Post-Closure Plan

3.4.1 Maintenance Program

The purpose of the post-closure maintenance program is to maintain the integrity and effectiveness of the final cover, and the drainage structures, throughout the post-closure maintenance period. The post-closure maintenance program for the facility will continue and the associated post-closure financial assurance mechanism will be maintained for 30 years, or until it is demonstrated that the facility no longer poses a threat to the environment. Following completion of post-closure care for the facility, a certification, signed by an independent registered engineer, verifying that post-closure care has been completed in accordance with the approved post-closure plan, will be submitted to ADEQ for review and approval.

Modifications to the post-closure maintenance program may be proposed if the following conditions exist.

- The proposed modifications are to enhance environmental control at the Facility; and
- If the proposed modifications are to reduce the amount of necessary environmental control (provided that documentation showing that the current level of control is no longer necessary is furnished by City of Casa Grande and the ADEQ concurs and approves such documentation).

The proposed post-closure maintenance program will continue until written permission to discontinue the program is granted by the ADEQ. Maintenance activities will commence within 90 days following final approval of the closure certification report. Maintenance activities should be carried out by qualified City of Casa Grande personnel or designees.

The following summarizes the post-closure maintenance program that will be implemented after closure.

- Final cover grading

  The final grading plan was designed to reduce the potential for ponding and infiltration to occur. If evidence of ponding is noted on site during the annual inspection, low areas will

be regraded to compensate for local differential settlement. Procedures and processes for final cover maintenance and repair will be in accordance with the approved Final Post-closure Plan. Necessary maintenance will be performed within 90 days.

The City of Casa Grande will implement a maintenance program to preserve the integrity and effectiveness of the final cover. The landfill will be visually monitored and inspected for areas of differential settlement, subsidence, and erosion.

Cover maintenance will consist of filling and compacting cracks and eroded areas with materials compatible to the original cover system. During adverse weather, temporary berms, ditches and straw mulch will be used to limit erosion damage until weather conditions permit replacement of eroded soil and reseeding. Localized depressions will be filled with the appropriate type of final cover material and graded to drain.

- Drainage control systems

  Annual landfill maintenance may include correcting differential settlement effects along drainage ways to provide proper runoff control and keep drainage ditches clear and clean of accumulated debris or blockages.

- Security measures

  Post-closure maintenance and security of the facility will include the regular repair of fences, signage, vandalism, and any survey monuments. Any areas that need repair or maintenance will be corrected within 90 days.

- Vector and nuisance control

  Proper maintenance of the final cover should prevent the attraction of vectors at the site. However, should the presence of nuisance vectors be noted, a qualified commercial pest control specialist will be retained to address the problem.

3.4.2 Settlement

Surface settlement that will occur with time is the most significant geotechnical concern in terms of site development. Surface settlement results from compression of loosely placed waste and from organic decomposition. Disposal sites should be designed, constructed and maintained to account for the resulting settlement.

Analytical methods for closely estimating potential settlement have not been developed. Previous experience with existing disposal facilities indicates ultimate compression generally ranges from 5 to 15 percent of the overall landfill thickness. Based on the estimated maximum landfill thickness of 100 feet, it is possible that maximum total settlements of approximately 15 feet could occur over a long period of time.

The City of Casa Grande will monitor for settlement by visually inspecting the cover system for cracks, eroded areas, and localized depressions. Inspections will be performed annually. Settlement may also be monitored by re-surveying the surface of the final cover using the survey monuments previously established at the site.

3.4.3 Drainage System

Drainage channels will be visually inspected during scheduled annual inspections. Inspections will focus upon areas where the bank vegetation has overgrown into drainage channels, and where soil has washed into the channels. Maintenance will include cleaning channels, culverts, and let-down structures, regrading channel flow lines, reseeding slopes, or if-necessary, relining damaged portions of the channels.

3.4.4 Slope Protection And Erosion Control

Slopes will receive organic mulch or fertilizer to encourage vegetative growth, which will reduce the erosion potential. The vegetative cover will be visually inspected annually. Slopes and eroded areas will be repaired by replacing and reseeding with available native seed, as necessary. Harmful plant growth and plants with deep root systems will be sprayed with herbicide.

The site will be inspected for the presence of burrowing animals annually. Burrowing animals onsite should be eradicated, and the burrows filled with soil.

3.4.5 Groundwater Monitoring

Post closure groundwater monitoring is proposed for this facility. Groundwater monitoring after the application of the final cover system will be performed on a semi-annual basis.

3.4.6 Post-Closure Use

The landfill will be returned to native desert uses after completion of the Post-Closure monitoring period. No activities will be allowed that would be detrimental to the integrity of the final cover system or drainage controls.

Should an alternative end use be contemplated at some time in the future, the ADEQ will be consulted prior to implementation.

3.4.7 Post-Closure Certification

The end of the 30-year post-closure period will be certified by a Registered Professional Engineer. This certification will state that post-closure activities have been successfully completed. An estimate of the cost to perform Post-Closure monitoring and care over the 30-year period is included in Table 3-2.

Table 3-2: Post-Closure Care Costs

City of Casa Grande Solid Waste Disposal Facility

Description	Quantity	Unit	Unit Costs	Total Costs
Annual Costs*				
Site Inspections and Report	40	HR	$100	$4,000
Site Monitoring Groundwater (4 wells – semi annual)	8	EA	$2,000	$16,000
Site Monitoring Gas (8 probes - quarterly)	32	EA	$100	$3,200
Maintenance **	1	LS	$20,000	$20,000
Subtotal				$43,200
Contingency 15%				$6,480
Post-Closure Total				$49,680
30-year Post-Closure Total ***				$859,067

* Post Closure Care Costs are developed based on 2002 dollars.

** Maintenance may include leachate collection system repairs, mowing, gate/fence repair, erosion and access control, surface water control and seeding.

*** 30-year Post-Closure Total assumes a 4% discrete compounding inflation rate [P = $49,680 (P|A 4,30)].

Appendix A

Drainage Calculations

for

City of Casa Grande

Revised September 2003

Calculations for Retention Basin Size

HDR | ONE COMPANY *Many Solutions*™

Project: Casa Grande		Computed: KOG	Date: 08/12/03
Subject: Stormwater		Checked:	Date:
Task: Retention Basin	Page: 1	of: 2	
Job #:		No:	

West Area = 54.5 acres

C = 0.8 - runoff coefficient

25-year, 24-hr storm depth = 3.4" (See sheet 2)

$\forall = (54.5 \text{ acres})(0.8)(3.4"/12) = 12.35 \text{ acre-feet}$

West Retention Basin Volume > 14 acre-feet

East Area = 51.5 acres

$\forall = (51.5 \text{ acres})(0.8)(3.4"/12) = 11.67 \text{ acre-feet}$

East Retention Basin Volume = 12.2 acre-feet

(More available as soil is excavated and used)

Both basins adequately sized

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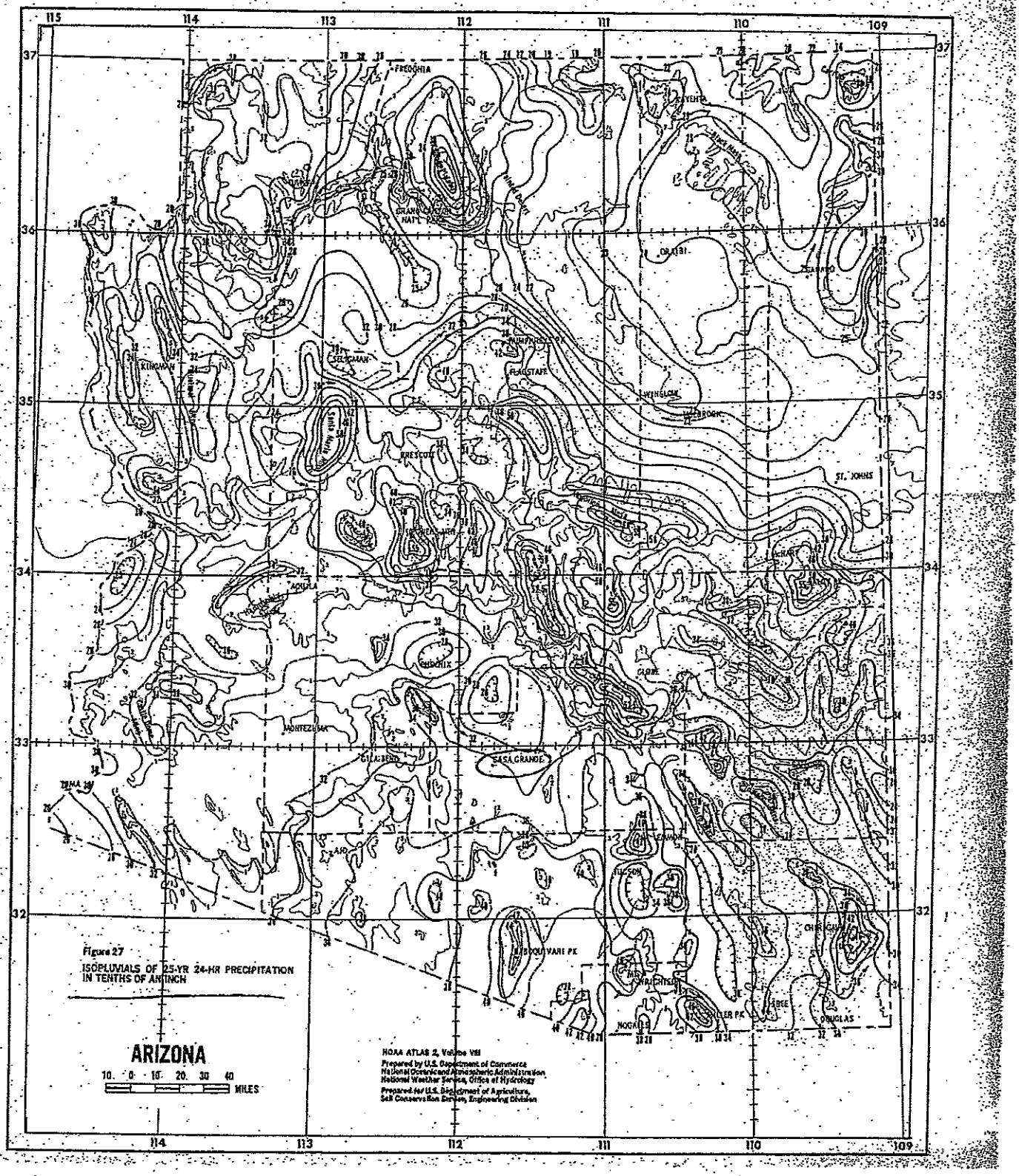


Figure 27
ISOPLUVIALS OF 25-YR 24-HR PRECIPITATION
IN TENTHS OF AN INCH

$\frac{34}{10} = 3.4$"

Depth Calculation for Drainage Channel Carrying Off-site Flow

Casa Grande Landfill Permit Update
Worksheet for Trapezoidal Channel

Mannings Coefficient	0.022		
Slope	0.001200	ft/ft	
Depth	3.88	ft	
Left Side Slope		0.33	V : H
Right Side Slope		0.33	V : H
Bottom Width	40.00	ft	
Discharge	1,000.00	cfs	
Flow Area	200.9	ft²	
Wetted Perimeter		64.77	ft
Top Width	63.53	ft	
Critical Depth	2.51	ft	
Critical Slope	0.005556	ft/ft	
Velocity	4.98	ft/s	
Velocity Head	0.38	ft	
Specific Energy		4.27	ft
Froude Number		0.49	
Flow Type	Subcritical		

Casa Grande Landfill Permit Update
Worksheet for Trapezoidal Channel

Mannings Coefficient	0.018		
Slope	0.001200	ft/ft	
Depth	3.47	ft	
Left Side Slope	0.33	V : H	
Right Side Slope	0.33	V : H	
Bottom Width	40.00	ft	
Discharge	1,000.00	cfs	
Flow Area	175.2	ft^2	
Wetted Perimeter	62.14	ft	
Top Width	61.02	ft	
Critical Depth	2.51	ft	
Critical Slope	0.003719	ft/ft	
Velocity	5.71	ft/s	
Velocity Head	0.51	ft	
Specific Energy	3.97	ft	
Froude Number	0.59		
Flow Type	Subcritical		

Depth Calculations for Landfill Perimeter Ditches

Job No. | No.

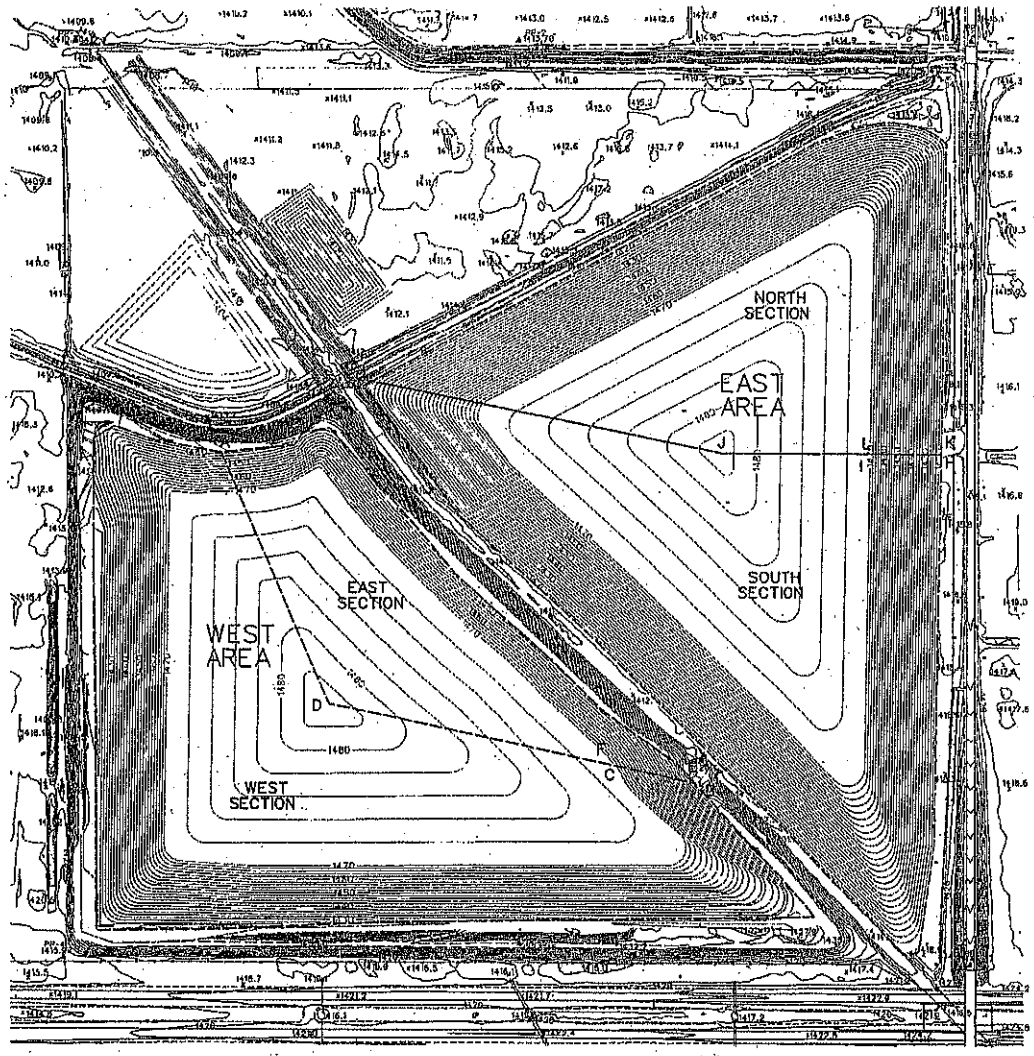
HDR Computation

HDR

Project	Casa Grande	Computed KDG	Date 08/08/03
Subject	Stormwater Ditches	Checked	Date
Task	Drainage Areas	Sheet 1	Of 16

Divide East and West Areas into two drainage areas each such that perimeter berm/ditches are approximate equal length. For West Area, down chute to be in center of north perimeter. For East Area, down chute to be in western corner. See Sheet 2 for drainage areas.

Microstation used for all area calculations.



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N

HDR

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85044

Revision No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Prof. Engr.

Project Manager: J. GARVIN
Architect | M.C./Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By

CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

PERMIT UPDATE

Date	Project No.	Figure No.	Issue
AUGUST, 2003	11270-001-037	C	0
Scale: AS SHOWN			

Job No. | No.

HDR Computation

HDR

Project	Casa Grande	Computed KDG	Date 8/08/03
Subject	Stormwater Ditches	Checked	Date
Task	Drainage Areas	Sheet 3	Of 16

East Area

$A_{NORTH} = 960,003.5\ ft^2 = 22.04$ acres

$A_{SOUTH} = 1,283,097.98\ ft^2 = 29.46$ acres

$A_{TOTAL} = 960,003.5\ ft^2 + 1,283,097.98\ ft^2 = 2,243,101.48\ ft^2$

$= 51.5$ acres

West Area

$A_{EAST} = 935,947.97\ ft^2 = 21.49$ acres

$A_{WEST} = 1,437,972.29\ ft^2 = 33.01$ acres

$A_{TOTAL} = 935,947.97\ ft^2 + 1,437,972.29\ ft^2 = 2,373,920.26\ ft^2$

$= 54.5$ acres

Job No. | No.

HDR Computation

HDR

Project Casa Grande	Computed KDG	Date 08/08/03
Subject Stormwater Ditch	Checked	Date
Task Tc & Rainfall Intensity	Sheet 4	Of 16

Use ADOT method to estimate Tc.

See sheet 5 $T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$

T_c = time of concentration (hours)
L = length of longest flow path (miles)
K_b = watershed resistance coefficient = 0.10 (from Table 2-1, Sheet 6)
S = slope of longest flow path (ft/mile)
i = average rainfall intensity

For grade breaks in flow path

$S = 5{,}280 (d/j)^2$ in ft/mile

$d = 5280 * L$ (feet)

$j = \sum \left(\frac{d_i^3}{H_i} \right)^{1/2}$

d_i = incremental length (ft)
H_i = incremental change in elev. (ft)

For West Area, West Section

$L(A-B) = 4404.05' = .8341$ miles $= d_{A-B}$	$S_{A-B} = .001$
$L(B-C) = 239.98' = .0455$ miles $= d_{B-C}$	$S_{B-C} = .25$
$L(C-D) = 847.61' = .1605$ miles $= d_{C-D}$	$S_{C-D} = .03$

$\Delta H_{A-B} = 4404.05'(.001) = 4.40'$
$\Delta H_{B-C} = 239.98'(.25) = 60.0'$
$\Delta H_{C-D} = 847.61'(.03) = 25.43'$

rainfall intensity (i) is obtained from an intensity-duration-frequency (I-D-F) graph. Two methods can be used for obtaining I-D-F information: 1) two generalized I-D-F graphs are provided that can be used for any site in Arizona, and 2) a site-specific I-D-F graph can be developed, if desired. The two generalized I-D-F graphs are shown in Figure 2-1 for Zone 6, and Figure 2-2 for Zone 8, respectively. The delineation of the two rainfall zones for Arizona is shown in Figure 1-1 of Chapter 1 - Rainfall. Procedures for developing a site-specific I-D-F graph are described in Chapter 1.

The intensity (i) in Equation 2-1 is the average rainfall intensity for rainfall of a selected return period from an I-D-F graph for a rainfall duration that is equal to the time of concentration (T_C) as calculated according to the procedure described below. A minimum rainfall duration of 10 minutes is to be used if the calculated T_C is less than 10 minutes. The Rational Method should not be used if the calculated T_C is greater than 60 minutes.

2.2.5 Estimation of Time of Concentration (T_C)

Time of concentration (T_C) is to be calculated by Equation 2-2:

$$T_C = 11.4\ L^{0.5}\ K_b^{0.52}\ S^{-0.31}\ i^{-0.38} \qquad (2\text{-}2)$$

Note: Reference Papadakis and Kazan, 1987.

where
- T_C = the time of concentration, in hours,
- L = the length of the longest flow path, in miles,
- K_b = the watershed resistance coefficient,
- S = the slope of the longest flow path, in ft/mile, and
- i = the average rainfall intensity, in inches/hr, for a duration of rainfall equal to T_C (the same (i) as Equation 2-1) unless T_C is less than 10 minutes, in which case the (i) of Equation 2-1 is for a 10-minute duration).

The longest flow path will be estimated from the best available map and the length (L) measured from the map.

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TABLE 2-1
RESISTANCE COEFFICIENT (K_b) FOR USE WITH THE RATIONAL METHOD T_c EQUATION

DESCRIPTION OF LANDFORM	K_b Defined	
	Drainage Network	Overland Flow Only
Mountain, with forest and dense ground cover (overland slopes - 50% or greater)	0.15	0.30
Mountain, with rough rock and boulder cover (overland slopes - 50% or greater)	0.12	0.25
Foothills (overland slopes - 10% to 50%)	0.10	0.20
Alluvial fans, Pediments and Rangeland (overland slopes - 10% or less)	0.05	0.10
Irrigated Pasture [a]	---	0.20
Tilled Agricultural Fields [a]	---	0.08
Urban		
Residential, L is less than 1,000 ft [b]	0.04	---
Residential, L is greater than 1,000 ft [b]	0.025	---
Grass; parks, cemeteries, etc. [a]	---	0.20
Bare ground; playgrounds, etc. [a]	---	0.08
Paved; parking lots, etc. [a]	---	0.02

Notes: a - No defined drainage network.
b - L is length in the T_c equation. Streets serve as drainage network.

Job No. | No.

HDR Computation

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Project Casa Grande | Computed KDG | Date 08/08/03

Subject Stormwater Ditch | Checked | Date

Task T_c & Rainfall Intensity | Sheet 7 | Of 16

$$j = \left(\frac{4404.05^3}{4.4}\right)^{1/2} + \left(\frac{239.98^3}{60}\right)^{1/2} + \left(\frac{847.61^3}{25.43}\right)^{1/2}$$

$$= 139{,}332.4' + 479.94' + 4893.5' = 144{,}705.9'$$

$$d = 4404.05' + 239.98' + 847.61' = 5491.6' = 1.04 \text{ miles}$$

$$S = 5{,}280\left(\frac{5491.6'}{144{,}705.9'}\right)^2 = 7.6 \text{ ft/mile}$$

$$T_c = 11.4(1.04)^{0.5}(.10)^{0.52}(7.6)^{-0.31} i^{-0.38}$$

$$T_c = 1.87\, i^{-0.38}$$

Trial T_c	i	calc T_c
45 min	2.485	1.32 hrs = 79.4 min
60 min	1.91	1.46 hrs = 87.74 min
90 min	1.495	1.61 hrs = 96.6 min
105 min	1.288	1.69 hrs = 101.4 min
100 min	1.357	1.66 hrs = 99.91 min OK

for $C = 0.65$ $\quad Q = CiA$

$$Q = (0.65)(1.357 \text{ in/hr})(33.01 \text{ acres})$$

= 29.12 cfs for the West area, West Section - Channel A

8/16

ARIZONA DEPARTMENT OF TRANSPORTATION
HYDROLOGIC DESIGN DATA

Project No. City of Casa Grande TRACS No. _____
Project Name Casa Grande LF Date 5/10/96
Location/Station On-site perimeter channels
Designer BCS Checker _____

FIGURE 1-3
RAINFALL INTENSITY-DURATION-FREQUENCY (I-D-F) WORKSHEET

Divide each rainfall depth from the D-D-F Worksheet (Figure 1-2 Part E) by each corresponding duration, in hours; and tabulate below:

Duration	Rainfall Intensity, in Inches/Hour Frequency, in Years						
	2	5	10	25	50	100	500
5-min.	4.32	5.29	6.00	7.08	7.86	8.64	
10-min.	3.24	4.02	4.56	5.34	6.00	6.60	
15-min.	2.60	3.32	3.84	4.52	5.08	5.64	
30-min.	1.72	2.22	2.56	3.06	3.44	3.82	
1-hour	1.05	1.37	1.59	1.91	2.15	2.39	
2-hour	.57	.77	.90	1.08	1.23	1.37	
3-hour	.40	.54	.64	.78	.88	.99	
6-hour	.22	.30	.36	.44	.51	.57	
12-hour	.12	.17	.21	.26	.30	.33	
24-hour	.06	.10	.12	.15	.17	.19	

Note: 5" denotes 5 minutes, etc.; 1' denotes 1 hour, etc.

From 1994 CGML SWFP

Job No. ____ No. ____

HDR Computation

HDR

Project Casa Grande | Computed KDG | Date 08/08/03
Subject Stormwater Ditch | Checked | Date
Task Tc & Rainfall Intensity | Sheet 9 | Of 16

West Area - East Section

$L_{A-E} = 3302.03' = .6254$ miles $= d_{A-E}$ $S_{A-E} = .001$
$L_{E-F} = 239.98' = .0455$ miles $= d_{E-F}$ $S_{E-F} = .25$
$L_{F-D} = 847.61' = .1605$ miles $= d_{F-D}$ $S_{F-D} = .03$

$\Delta H_{A-E} = 3302.03'(.001) = 3.3'$
$\Delta H_{E-F} = 239.98'(.25) = 60'$
$\Delta H_{F-D} = 847.61'(.03) = 25.43'$

$$j = \left(\frac{3302.03^3}{3.3}\right)^{1/2} + \left(\frac{239.98^3}{60}\right)^{1/2} + \left(\frac{847.61^3}{25.43}\right)^{1/2}$$

$= 104{,}451.5' + 479.94' + 4893.5' = 109{,}824.9'$

$d = 3302.03' + 239.98' + 847.61' = 4389.6' = .8314$ miles

$$S = 5{,}280\left(\frac{4389.6'}{109{,}824.9'}\right)^2 = 8.43 \text{ ft/mile}$$

$T_c = 11.4(.8314)^{0.5}(.10)^{0.52}(8.43)^{-0.31} i^{-0.38}$

$T_c = 1.62 i^{-0.38}$

Trial T_c	i	calc T_c
90 min	1.495	1.39 hrs = 83.43 min
80 min	1.633	1.34 hrs = 80.67 min
81 min	1.619	1.35 hrs = 80.93 min OK

Job No. | No.

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Task Tc & Rainfall Intensity | Sheet 10 | Of 16

for C = 0.65 $Q = CiA$

$Q = (0.65)(1.619\ in/hr)(21.49\ acres)$

Q = 22.62 cfs for the West area, East Section - Channel B

For East Area - South section

$L(G-H) = 3836.2' = .727$ miles $= d_{G-H}$ $S_{G-H} = .001$
$L(H-I) = 207.5' = .0393$ miles $= d_{H-I}$ $S_{H-I} = .25$
$L(I-J) = 438.5' = .083$ miles $= d_{I-J}$ $S_{I-J} = .03$

$\Delta H_{G-H} = 3836.2'(.001) = 3.84'$
$\Delta H_{H-I} = 207.5'(.25) = 51.88'$
$\Delta H_{I-J} = 438.5'(.03) = 13.16'$

$$j = \left(\frac{3836.2^3}{3.84'}\right)^{1/2} + \left(\frac{207.5^3}{51.88}\right)^{1/2} + \left(\frac{438.5^3}{13.16}\right)^{1/2}$$

$= 121,251.3 + 414.98 + 2531.2 = 124,197.4'$

$d = 3836.2' + 207.5' + 438.5' = 4482.2' = .849$ miles

$$S = 5280\left(\frac{4482.2}{124,197.4}\right)^2 = 6.87\ ft/mile$$

Job No. _____ No. _____

HDR Computation

HDR

Project Casa Grande | Computed KDG | Date 08/08/03
Subject Stormwater Ditch | Checked | Date
Task Tc & Rainfall Intensity | Sheet 11 | Of 16

$$T_c = 11.4(0.85)^{0.5}(.10)^{0.52}(6.87)^{-0.31} i^{-0.38}$$

$$T_c = 1.75\, i^{-0.38}$$

Trial T_c	i	calc T_c
100 min	1.357	1.56 hrs = 93.5 min
90 min	1.495	1.50 hrs = 90.1 min OK

for C=0.65 $Q = CiA$

$$Q = (0.65)(1.495\ in/hr)(29.46\ acres)$$

Q = 28.63 cfs for the East Area, South section - Channel C

For East Area - North section

L(G-K) = 2856.63' = .541 miles = d_{G-K}
L(K-L) = 207.5' = .0393 miles = d_{K-L}
L(L-J) = 438.5' = .083 miles = d_{L-J}

$S_{G-K} = .001$
$S_{K-L} = .25$
$S_{L-J} = .03$

$\Delta H_{G-K} = 2856.63'(.001) = 2.86'$
$\Delta H_{K-L} = 207.5'(.25) = 51.88'$
$\Delta H_{L-J} = 438.5'(.03) = 13.16'$

Job No. | No.

HDR Computation

HDR

Project Casa Grande	Computed KDG	Date 08/08/03
Subject Stormwater Ditch	Checked	Date
Task Tc & Rainfall Intensity	Sheet 12	Of 16

$$j = \left(\frac{2856.63^3}{2.86}\right)^{1/2} + \left(\frac{207.5^3}{51.88}\right)^{1/2} + \left(\frac{438.5^3}{13.16}\right)^{1/2}$$

$$j = 90281.3' + 414.98' + 2531.2' = 93,227.52'$$

$$d = 2856.63' + 207.5' + 438.5' = 3502.6' = .6634 \text{ miles}$$

$$S = 5280\left(\frac{3502.6}{93227.52}\right)^2 = 7.45 \text{ ft/mile}$$

$$T_c = 11.4(.66)^{0.5}(.10)^{0.52}(7.45)^{-0.31} i^{-0.38}$$

$$T_c = 1.5\, i^{-0.38}$$

Trial T_c	i	calc T_c
60 min	1.91	1.17 hrs = 70.4 min
70 min	1.77	1.21 hrs = 72.4 min
73 min	1.728	1.22 hrs = 73.1 min OK

for $C = 0.65$ $\quad Q = CiA$

$$Q = (0.65)(1.728 \text{ in/hr})(22.04 \text{ acres})$$

Q = 24.76 cfs for the East Area, North Section - Channel D

Trapezoidal Channel A - Earth

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Manning's Coefficient	0.018	
Slope	0.0010	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Bottom Width	4.00	ft
Discharge	29.12	cfs

Results		
Depth	1.43	ft
Flow Area	11.88	sf
Wetted Perimeter	13.06	ft
Top Width	12.59	ft
Critical Depth	0.93	ft
Critical Slope	0.0057	ft/ft
Velocity	2.45	fps
Froude Number	0.44	
Flow Type	Subcritical	

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Trapezoidal Channel B - Earth

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning's Coefficient	0.018
Slope	0.0010 ft/ft
Left Side Slope	3.00 H:V
Right Side Slope	3.00 H:V
Bottom Width	4.00 ft
Discharge	22.62 cfs

Results	
Depth	1.27 ft
Flow Area	9.87 sf
Wetted Perimeter	12.01 ft
Top Width	11.60 ft
Critical Depth	0.81 ft
Critical Slope	0.0059 ft/ft
Velocity	2.29 fps
Froude Number	0.44
Flow Type	Subcritical

Trapezoidal Channel C - Earth

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Manning's Coefficient	0.018	
Slope	0.0010	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Bottom Width	4.00	ft
Discharge	28.63	cfs

Results		
Depth	1.42	ft
Flow Area	11.73	sf
Wetted Perimeter	12.98	ft
Top Width	12.52	ft
Critical Depth	0.92	ft
Critical Slope	0.0057	ft/ft
Velocity	2.44	fps
Froude Number	0.44	
Flow Type	Subcritical	

Trapezoidal Channel D - Earth

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Manning's Coefficient	0.018
Slope	0.0010 ft/ft
Left Side Slope	3.00 H:V
Right Side Slope	3.00 H:V
Bottom Width	4.00 ft
Discharge	24.76 cfs

Results	
Depth	1.32 ft
Flow Area	10.55 sf
Wetted Perimeter	12.37 ft
Top Width	11.94 ft
Critical Depth	0.85 ft
Critical Slope	0.0058 ft/ft
Velocity	2.35 fps
Froude Number	0.44
Flow Type	Subcritical

Depth Calculation for Landfill Intermediate Berms

Job No. | No.

HDR Computation

HDR

Project Casa Grande | Computed | Date
Subject Stormwater Ditches | Checked | Date
Task Drainage Areas | Sheet 1 | Of 11

The triangular intermediate berm is designed to carry the largest flow that will run-off the Casa Grande landfill. The flow will be calculated by using the rational method:

$$Q = CiA$$

Q = flow in channel (cfs)
C = run-off coeffcient
i = rainfall intensity (in/hr)
A = contributing area (acres)

To calculate contributing area, divide east and west areas into several sub-areas. There should be two sub-areas between each set of let-down structures. Use Microstation to find all areas. (See page 2 for sub-area layout).

A_1 and A_2 are predicted to produce the largest run-off based on size of contributing area and

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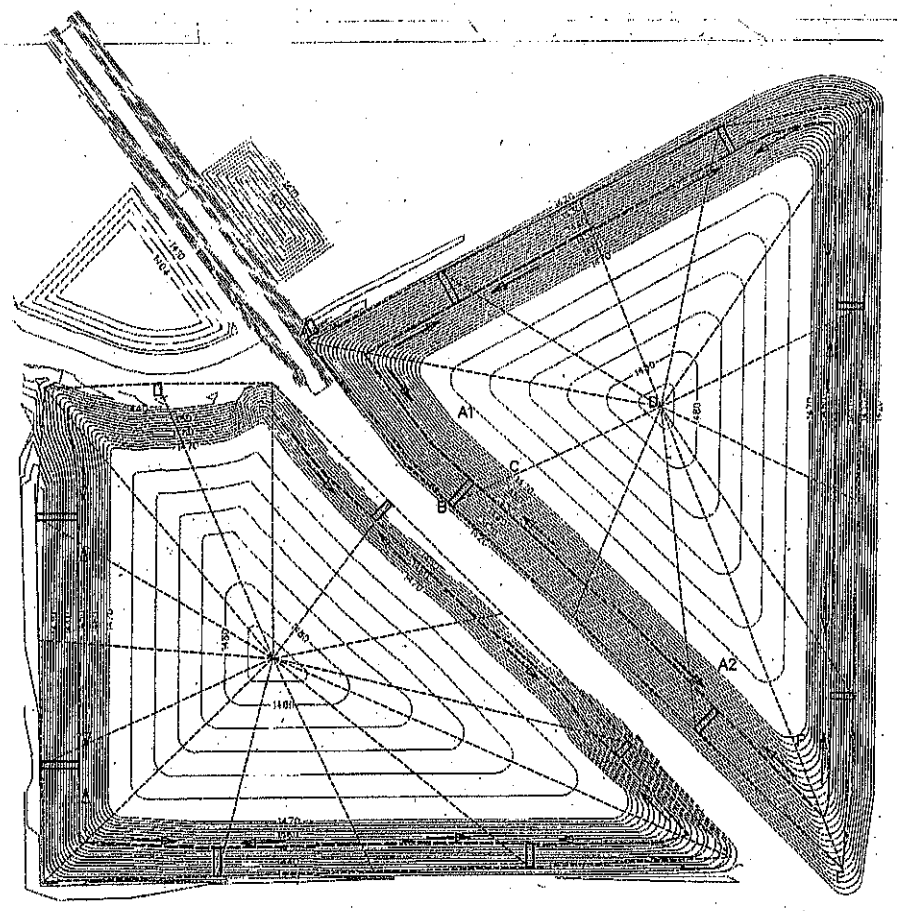

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Revision No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Final Sign.

Project Manager: J. GARVIN
Architect | HDR/Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By

CITY OF CASA GRANDE
MUNICIPAL LANDFILL
CASA GRANDE, ARIZONA

PERMIT UPDATE

DRAINAGE SUB-AREAS

Date	Project No.	Figure No.	Issue
AUGUST, 2003	11270-001-037	C	0
Scale: AS SHOWN			

Job No. | No.

HDR Computation

HDR

Project Casa Grande | Computed | Date

Subject Stormwater Ditches | Checked | Date

Task Drainage Areas | Sheet 3 | Of 11

length of flowpath.

Using Microstation:

$A_1 = 207,499.76\ ft^2$

$= 4.76$ acres

$A_2 = 185,041.66\ ft^2$

$= 4.25$ acres

Job No. | No.

HDR Computation

HDR

Project Casa Grande	Computed KDG	Date	
Subject Stormwater Ditch	Checked	Date	
Task Tc & Rainfall Intensity	Sheet 4	Of 11	

Use ADOT method to estimate T_c

See Sheet 5 $T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$

T_c = time of concentration (hours)
L = length of longest flow path (miles)
K_b = watershed resistance coefficient = 0.10 (from Table 2-1, sheet 6)
S = slope of longest flow path (ft/mile)
i = average rainfall intensity

For grade breaks in flow path

$S = 5{,}280(d/j)^2$ in ft/mile

$d = 5{,}280 * L$ (feet)

$j = \sum \left(\frac{d_i^3}{H_i}\right)^{1/2}$

d_i = incremental length (ft)
H_i = incremental change in elev. (ft)

For A_1,

$L(A\text{-}B) = 664.43' = .1258$ miles $= d_{A-B}$ $\quad S_{A-B} = .001$
$L(B\text{-}C) = 210.82' = .0399$ miles $= d_{B-C}$ $\quad S_{B-C} = .25$
$L(C\text{-}D) = 482.43' = .0914$ miles $= d_{C-D}$ $\quad S_{C-D} = .03$

$\Delta H_{A-B} = 664.43'(.001) = .664'$
$\Delta H_{B-C} = 210.82'(.25) = 52.7'$
$\Delta H_{C-D} = 482.43'(.03) = 14.47'$

rainfall intensity (i) is obtained from an intensity-duration-frequency (I-D-F) graph. Two methods can be used for obtaining I-D-F information: 1) two generalized I-D-F graphs are provided that can be used for any site in Arizona, and 2) a site-specific I-D-F graph can be developed, if desired. The two generalized I-D-F graphs are shown in Figure 2-1 for Zone 6, and Figure 2-2 for Zone 8, respectively. The delineation of the two rainfall zones for Arizona is shown in Figure 1-1 of Chapter 1 - Rainfall. Procedures for developing a site-specific I-D-F graph are described in Chapter 1.

The intensity (i) in Equation 2-1 is the average rainfall intensity for rainfall of a selected return period from an I-D-F graph for a rainfall duration that is equal to the time of concentration (T_C) as calculated according to the procedure described below. A minimum rainfall duration of 10 minutes is to be used if the calculated T_C is less than 10 minutes. The Rational Method should not be used if the calculated T_C is greater than 60 minutes.

2.2.5 Estimation of Time of Concentration (T_C)

Time of concentration (T_C) is to be calculated by Equation 2-2:

$$T_C = 11.4\ L^{0.5}\ K_b^{0.52}\ S^{-0.31}\ i^{-0.38} \qquad (2\text{-}2)$$

Note: Reference Papadakis and Kazan, 1987.

where T_C = the time of concentration, in hours,
L = the length of the longest flow path, in miles,
K_b = the watershed resistance coefficient,
S = the slope of the longest flow path, in ft/mile, and
i = the average rainfall intensity, in inches/hr, for a duration of rainfall equal to T_C (the same (i) as Equation 2-1) unless T_C is less than 10 minutes, in which case the (i) of Equation 2-1 is for a 10-minute duration).

The longest flow path will be estimated from the best available map and the length (L) measured from the map.

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TABLE 2-1
RESISTANCE COEFFICIENT (K_b) FOR USE WITH THE
RATIONAL METHOD T_C EQUATION

DESCRIPTION OF LANDFORM	K_b Defined	
	Drainage Network	Overland Flow Only
Mountain, with forest and dense ground cover (overland slopes - 50% or greater)	0.15	0.30
Mountain, with rough rock and boulder cover (overland slopes - 50% or greater)	0.12	0.25
Foothills (overland slopes - 10% to 50%)	0.10	0.20
Alluvial fans, Pediments and Rangeland (overland slopes - 10% or less)	0.05	0.10
Irrigated Pasture [a]	---	0.20
Tilled Agricultural Fields [a]	---	0.08
Urban		
Residential, L is less than 1,000 ft [b]	0.04	---
Residential, L is greater than 1,000 ft [b]	0.025	---
Grass; parks, cemeteries, etc. [a]	---	0.20
Bare ground; playgrounds, etc. [a]	---	0.08
Paved; parking lots, etc. [a]	---	0.02

Notes: a - No defined drainage network.
b - L is length in the T_C equation. Streets serve as drainage network.

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HDR Computation

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Subject Stormwater Ditch	Checked	Date	
Task Tc & Rainfall Intensity	Sheet 7	Of 11	

$$j = \left(\frac{664.43^3}{.664}\right)^{1/2} + \left(\frac{210.82^3}{52.7}\right)^{1/2} + \left(\frac{482.43^3}{14.47}\right)^{1/2}$$

$$= 21{,}017.9' + 421.7' + 2{,}785.6' = 24{,}225.2$$

$$d = 664.43' + 210.82' + 482.43' = 1{,}357.68' = .2571 \text{ miles}$$

$$S = 5{,}280\left(\frac{1{,}357.68'}{24{,}225.2'}\right)^2 = 16.58 \text{ ft/mile}$$

$$T_c = 11.4\,(.2571)^{0.5}(.10)^{0.52}(16.58)^{-0.31} i^{-0.38}$$

$$T_c = .73 i^{-0.38}$$

Trial Tc	i	calc Tc
10 min	5.34	.386 hr = 23.17 min
30 min	3.06	.477 hr = 28.64 min
28 min	3.25	.467 hr = 27.99 min OK

for $C = 0.65$ $\quad Q = CiA$

$$Q = (0.65)(3.25 \text{ in/hr})(4.76 \text{ acres})$$

$$= 10.06 \text{ cfs for } A_1$$

8/11

ARIZONA DEPARTMENT OF TRANSPORTATION
HYDROLOGIC DESIGN DATA

Project No. City of Casa Grande TRACS No. _____
Project Name Casa Grande LF Date 5/10/96
Location/Station On-site perimeter channels
Designer BCS Checker _____

FIGURE 1-3
RAINFALL INTENSITY-DURATION-FREQUENCY (I-D-F) WORKSHEET

Divide each rainfall depth from the D-D-F Worksheet (Figure 1-2 Part E) by each corresponding duration, in hours, and tabulate below:

Duration	Rainfall Intensity, In Inches/Hour Frequency, In Years						
	2	5	10	25	50	100	500
5-min.	4.32	5.29	6.00	7.08	7.86	8.64	
10-min.	3.24	4.02	4.56	5.34	6.00	6.60	
15-min.	2.60	3.32	3.84	4.52	5.08	5.64	
30-min.	1.72	2.22	2.56	3.06	3.44	3.82	
1-hour	1.05	1.37	1.59	1.97	2.15	2.39	
2-hour	.57	.77	.90	1.08	1.23	1.37	
3-hour	.40	.54	.64	.78	.88	.99	
6-hour	.22	.30	.36	.44	.51	.57	
12-hour	.12	.17	.21	.26	.30	.33	
24-hour	.06	.10	.12	.15	.17	.19	

Note: 5" denotes 5 minutes, etc.; 1' denotes 1 hour, etc.

From 1994 CGML SWFP

Job No. | No.

HDR Computation

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Project Casa Grande	Computed KDG	Date	
Subject Stormwater Ditch	Checked	Date	
Task T_c & Rainfall Intensity	Sheet 9	Of 11	

For A_2,

$L(A\text{-}E) = 2220.52' = .4206$ miles $= d_{A\text{-}E}$ $\quad S_{A\text{-}E} = 0.001$
$L(E\text{-}F) = 349.60' = .0662$ miles $= d_{E\text{-}F}$ $\quad S_{E\text{-}F} = 0.25$
$L(F\text{-}D) = 1091.69' = .2068$ miles $= d_{F\text{-}D}$ $\quad S_{F\text{-}D} = 0.03$

$\Delta H_{A\text{-}E} = 2220.52'(.001) = 2.22'$
$\Delta H_{E\text{-}F} = 349.60'(.25) = 87.4'$
$\Delta H_{F\text{-}D} = 1091.69'(.03) = 32.8'$

$$j = \left(\frac{2220.52^3}{2.22}\right)^{1/2} + \left(\frac{349.60^3}{87.4}\right)^{1/2} + \left(\frac{1091.69^3}{32.8}\right)^{1/2}$$

$$= 70{,}227.23 + 699.20 + 6298.14 = 77{,}224.57$$

$$d = 2220.52' + 349.60' + 1091.69' = 3661.81' = .6935 \text{ miles}$$

$$S = 5{,}280\left(\frac{3661.81'}{77224.57'}\right)^2 = 11.87 \text{ ft/mile}$$

$$T_c = 11.4(.6935)^{0.5}(.10)^{0.52}(11.87)^{-0.31} i^{-0.38}$$

$$T_c = 1.33\, i^{-0.38}$$

Trial T_c	i	calc T_c
60 min	1.91	1.04 hr = 62.4 min
63 min	**1.87**	1.05 hr = 62.9 min OK

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Project Casa Grande	Computed KDG	Date	
Subject Stormwater Ditch	Checked	Date	
Task Tc & Rainfall Intensity	Sheet 10	Of 11	

for $C = 0.65$ $Q = CiA$

$Q = (0.65)(1.87\ in/hr)(4.25\ acres)$

$= 5.17\ cfs$ for A_2

Since the run-off flow from A_1 is greater than the run-off flow from A_2, the flow for A_1 will be used to size the triangular intermediate berm.

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Triangular Intermediate Channel - Earth

Project Description	
Worksheet	Triangular Channel-1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Manning's Coefficient	0.018	
Slope	0.0010	ft/ft
Left Side Slope	1.00	H:V
Right Side Slope	4.00	H:V
Discharge	10.06	cfs

Results		
Depth	1.43	ft
Flow Area	5.15	sf
Wetted Perimeter	7.95	ft
Top Width	7.17	ft
Critical Depth	1.00	ft
Critical Slope	0.0068	ft/ft
Velocity	1.95	fps
Froude Number	0.41	
Flow Type	Subcritical	

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Project: Casa Grande	Computed:	Date:	
Subject: let-down structures	Checked:	Date:	
Task: Tc & Rainfall Intensity	Page: 1	of: 10	
Job #:	No:		

It is proposed that the Casa Grande landfill has a intermediate triangular berm on the sideslopes, with 12 let-dow structures to direct flow from the berm to the trapezoidal perimeter ditches. The area contributing to each let-down structure is half the area between it and its adjacent let-down structure on each side. See sheet 2 for the sub-areas.

$A_1 = 344710.39\ ft^2 = 7.91\ ac$

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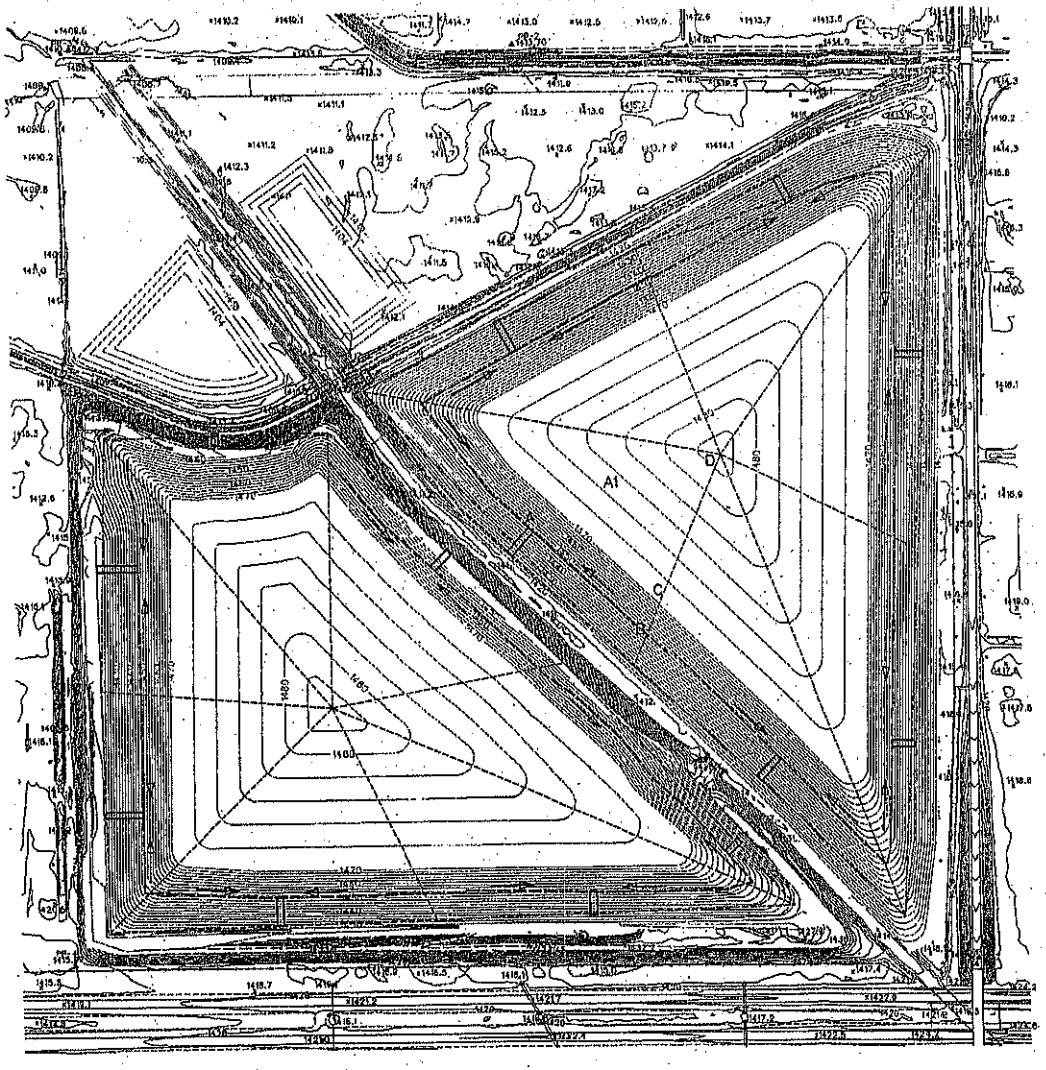

N

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Revision No.	Description	Date	Drawn	Chkd.	Resp. Engr.	Prof. Engr.

Project Manager: J. GARVIN
Architect | HDR/Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By

CITY OF CASA GRANDE
MUNICIPAL LANDFILL
CASA GRANDE, ARIZONA

PERMIT UPDATE

LET-DOWN STRUCTURE
SUB-AREAS

Date	Project No.	Figure No.	Issue
AUGUST, 2003	11270-001-037	C	0

Scale: AS SHOWN

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Project: Casa Grande	Computed:	Date:	
Subject: Let-down structures	Checked:	Date:	
Task: Tc & Rainfall Intensity	Page: 3	of: 10	
Job #:	No:		

Use ADOT method to estimate T_c.

$$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$$

For A_1,

$L(A\text{-}B) = 462.29' = .0876$ miles $= d_{A\text{-}B}$ $\quad S_{A\text{-}B} = .001$
$L(B\text{-}C) = 104.49' = .0198$ miles $= d_{B\text{-}C}$ $\quad S_{B\text{-}C} = .25$
$L(C\text{-}D) = 472.73' = .0895$ miles $= d_{C\text{-}D}$ $\quad S_{C\text{-}D} = .03$

$\Delta H_{A\text{-}B} = 462.29'(.001) = .462'$
$\Delta H_{B\text{-}C} = 104.49'(.25) = 26.12'$
$\Delta H_{C\text{-}D} = 472.73'(.03) = 14.18'$

$$j = \left(\frac{462.29^3}{.462}\right)^{1/2} + \left(\frac{104.49^3}{26.12}\right)^{1/2} + \left(\frac{472.73^3}{14.18}\right)^{1/2}$$

$$= 14{,}623.48 + 208.99 + 2729.49 = 17{,}561.96$$

$d = 462.29' + 104.49' + 472.73' = 1039.51' = .197$ miles

$$S = 5{,}280\left(\frac{1039.51'}{17561.96}\right)^2 = 18.5 \text{ ft/mile}$$

$$T_c = 11.4\,(.197)^{0.5}(.10)^{0.52}(18.5)^{-0.31} i^{-0.38}$$

$$T_c = .619\, i^{-0.38}$$

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Project: Casa Grande	Computed:	Date:	
Subject: let-down structures	Checked:	Date:	
Task: T_c & Rainfall Intensity	Page: 4	of: 10	
Job #:	No:		

Trial T_c	i	calc T_c
20 min	4.03	.364 hr = 21.86 min
22 min	3.84	.371 hr = 22.27 min ∴ OK

for $C = 0.65$ $\quad Q = CiA$

$Q = 0.65(3.84\ in/hr)(7.91\ acres)$

$Q = 19.74$ cfs for A_1

The run-off from A_1 will be used to design all let-down structures because it is the largest contributing area to a single let-down structure.

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Trapezoidal Let-Down Structure - Lined

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapedzoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Bottom Width	4	ft
Manning's Coefficient	0.045	
Slope	0.2500	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Discharge	19.74	cfs

Results		
Depth	0.45	ft
Flow Area	2.4	sf
Wetted Perimeter	6.84	ft
Top Width	6.70	ft
Critical Depth	0.75	ft
Critical Slope	0.0374	ft/ft
Velocity	8.22	fps
Froude Number	2.42	
Flow Type	Subcritical	

There are 2 additional let-down structures (one for East Area and one for West Area) that need to be sized to carry run-off from their entire respective areas.

To calculate the peak flow for each let-down structure, the longest time of concentration for each area will be used.

For West Area, $T_c = 100$ minutes $\Rightarrow i = 1.357$ in/hr

for $C = 0.65$ $\quad Q = CiA$

$$Q = .65(1.357 \text{ in/hr})(54.5 \text{ acres})$$

$$= 48.07 \text{ cfs}$$

For East Area, $T_c = 90$ minutes $\Rightarrow i = 1.495$ in/hr

for $C = 0.65$ $\quad Q = CiA$

$$Q = .65(1.495 \text{ in/hr})(51.5 \text{ acres})$$

$$= 50.05 \text{ cfs}$$

Top Portion of Trapezoidal Let-Down Structure (East Area) - Lined

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapedzoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data	
Bottom Width	4 ft
Manning's Coefficient	0.045
Slope	0.0400 ft/ft
Left Side Slope	3.00 H:V
Right Side Slope	3.00 H:V
Discharge	50.05 cfs

Results	
Depth	1.18 ft
Flow Area	8.95 sf
Wetted Perimeter	11.49 ft
Top Width	11.11 ft
Critical Depth	1.24 ft
Critical Slope	0.0328 ft/ft
Velocity	5.59 fps
Froude Number	1.10
Flow Type	Subcritical

Bottom Portion of Trapezoidal Let-Down Structure (East Area) - Lined

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapedzoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Bottom Width	4	ft
Manning's Coefficient	0.045	
Slope	0.4579	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Discharge	50.05	cfs

Results		
Depth	0.63	ft
Flow Area	3.73	sf
Wetted Perimeter	8	ft
Top Width	7.79	ft
Critical Depth	1.24	ft
Critical Slope	0.0328	ft/ft
Velocity	13.43	fps
Froude Number	3.42	
Flow Type	Subcritical	

9/10

Top Portion of Trapezoidal Let-Down Structure (West Area) - Lined

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapedzoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Bottom Width	4	ft
Manning's Coefficient	0.045	
Slope	0.1600	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Discharge	48.07	cfs

Results		
Depth	0.82	ft
Flow Area	5.27	sf
Wetted Perimeter	9.16	ft
Top Width	8.90	ft
Critical Depth	1.22	ft
Critical Slope	0.0330	ft/ft
Velocity	9.13	fps
Froude Number	2.09	
Flow Type	Subcritical	

Bottom Portion of Trapezoidal Let-Down Structure (West Area) - Lined

Project Description	
Worksheet	Trapezoidal Channel-1
Flow Element	Trapedzoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Bottom Width	4	ft
Manning's Coefficient	0.045	
Slope	0.1000	ft/ft
Left Side Slope	3.00	H:V
Right Side Slope	3.00	H:V
Discharge	48.07	cfs

Results		
Depth	0.92	ft
Flow Area	6.24	sf
Wetted Perimeter	9.83	ft
Top Width	9.53	ft
Critical Depth	1.22	ft
Critical Slope	0.0330	ft/ft
Velocity	7.71	fps
Froude Number	1.68	
Flow Type	Subcritical	

Appendix B

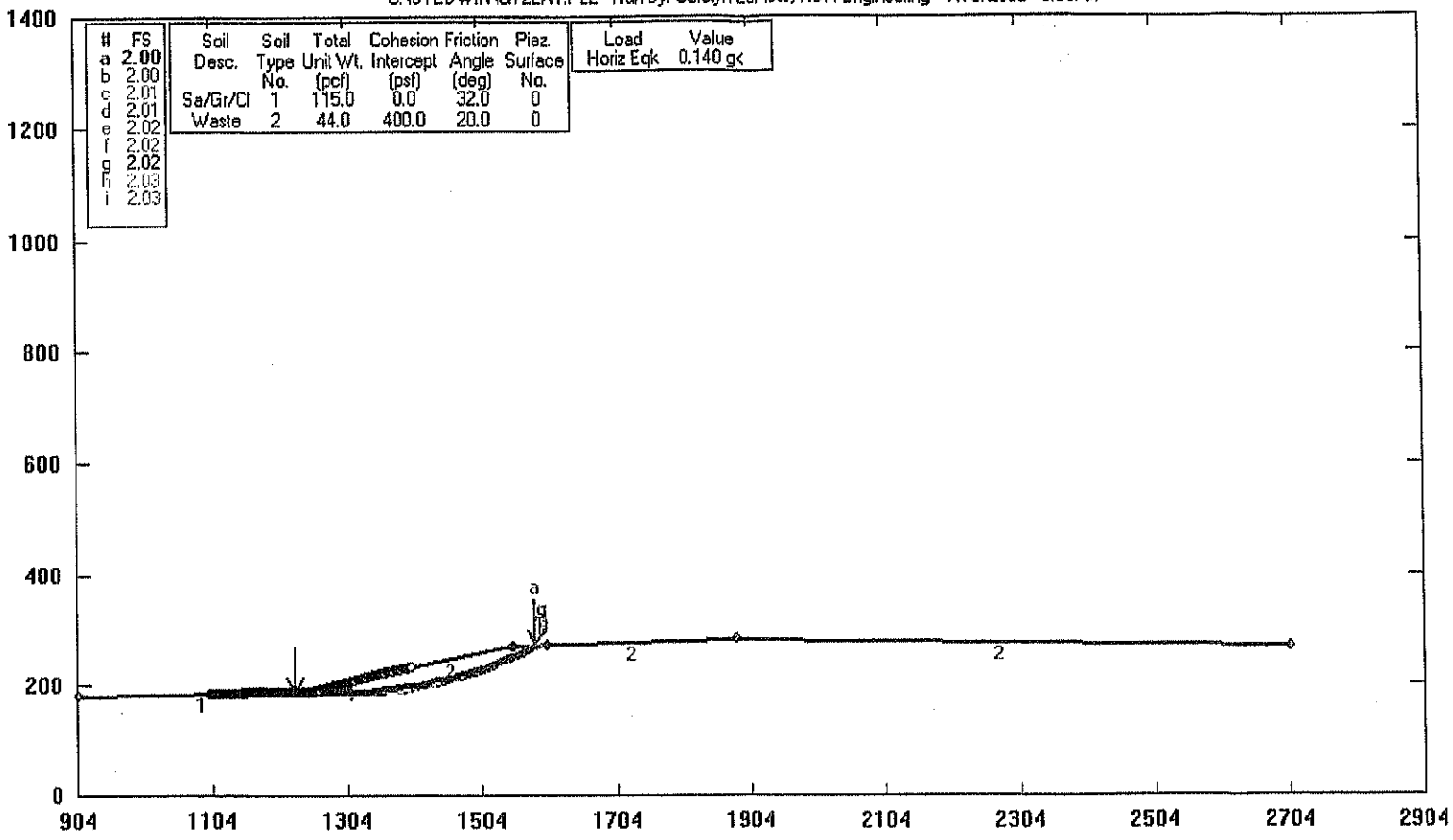
Slope Stability Calculations

for

City of Casa Grande

Casa Grande Municipal Landfill East Area North Perimeter Berm

C:\STEDWIN\G72EX1.PL2 Run By: Carolyn LaFleur, HDR Engineering 11/6/2002 5:39PM



GSTABL7 v.2 FSmin=2.00

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

```
                              ***  GSTABL7  ***
                        ** GSTABL7 by Garry H. Gregory, P.E. **
    ** Original Version 1.0, January 1996; Current Version 2.0, September 2001 **
                  (All Rights Reserved-Unauthorized Use Prohibited)
*******************************************************************************
                        SLOPE STABILITY ANALYSIS SYSTEM
          Modified Bishop, Simplified Janbu, or GLE Method of Slices.
          (Includes Spencer & Morgenstern-Price Type Analysis)
          Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
          Nonlinear Undrained Shear Strength, Curved Phi Envelope,
          Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
          Surfaces, Pseudo-Static Earthquake, and Applied Force Options.
*******************************************************************************
Analysis Run Date:          11/6/2002
Time of Run:                5:39PM
Run By:                     Carolyn LaFleur, HDR Engineering
Input Data Filename:        C:g72ex1.in
Output Filename:            C:g72ex1.OUT
Unit System:                English
Plotted Output Filename:    C:g72ex1.PLT
PROBLEM DESCRIPTION:  Casa Grande Municipal Landfill
                      East Area North Perimeter Berm
BOUNDARY COORDINATES
     Note: User origin value specified.
     Add 904.00 to X-values and 0.00 to Y-values listed.

    5 Top   Boundaries
    5 Total Boundaries
Boundary     X-Left      Y-Left     X-Right     Y-Right     Soil Type
   No.         (ft)        (ft)        (ft)        (ft)     Below Bnd
    1        904.00      180.00     1254.00      188.00         1
    2       1254.00      188.00     1350.00      220.00         1
    3       1350.00      220.00     1550.00      270.00         2
    4       1550.00      270.00     1880.00      283.00         2
    5       1880.00      283.00     2705.00      270.00         2
ISOTROPIC SOIL PARAMETERS
 2 Type(s) of Soil
Soil  Total  Saturated  Cohesion Friction   Pore   Pressure   Piez.
Type Unit Wt. Unit Wt. Intercept   Angle  Pressure Constant Surface
 No.  (pcf)     (pcf)      (psf)     (deg)    Param.    (psf)     No.
  1   115.0      0.0        0.0      32.0    0.00       0.0       0
  2    44.0      0.0      400.0      20.0    0.00       0.0       0
A Horizontal Earthquake Loading Coefficient
Of0.140 Has Been Assigned
A Vertical Earthquake Loading Coefficient
Of0.000 Has Been Assigned
Cavitation Pressure =    0.0(psf)
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
500 Trial Surfaces Have Been Generated.
  1 Surfaces Initiate From Each Of500 Points Equally Spaced
Along The Ground Surface Between  X =1100.00(ft)
                                  and  X =1400.00(ft)
Each Surface Terminates Between   X =1550.00(ft)
                                  and  X =1600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =     10.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Modified Bishop Method * *
      Total Number of Trial Surfaces Evaluated =   500
      Statistical Data On All Valid FS Values:
         FS Max =   7.111   FS Min =   2.002   FS Ave =   3.037
         Standard Deviation =    0.929   Coefficient of Variation =   30.58 %
      Failure Surface Specified By 39 Coordinate Points
```

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1225.65	187.35
2	1235.62	186.58
3	1245.60	185.97
4	1255.59	185.53
5	1265.59	185.26
6	1275.59	185.16
7	1285.59	185.23
8	1295.59	185.46
9	1305.58	185.87
10	1315.56	186.44
11	1325.53	187.18
12	1335.49	188.08
13	1345.43	189.16
14	1355.36	190.40
15	1365.26	191.81
16	1375.13	193.38
17	1384.98	195.12
18	1394.80	197.02
19	1404.58	199.10
20	1414.33	201.33
21	1424.04	203.73
22	1433.70	206.29
23	1443.32	209.01
24	1452.90	211.90
25	1462.42	214.94
26	1471.90	218.15
27	1481.31	221.51
28	1490.67	225.04
29	1499.97	228.71
30	1509.21	232.55
31	1518.38	236.54
32	1527.48	240.68
33	1536.51	244.98
34	1545.46	249.43
35	1554.34	254.02
36	1563.15	258.77
37	1571.87	263.66
38	1580.50	268.70
39	1584.91	271.38

Circle Center At X = 1276.6 ; Y = 779.6 and Radius, 594.4

Factor of Safety

*** 2.002 ***

Individual data on the 41 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.0	574.3	0.0	0.0	0.0	0.0	80.4	0.0	0.0
2	10.0	1628.7	0.0	0.0	0.0	0.0	228.0	0.0	0.0
3	8.4	2043.6	0.0	0.0	0.0	0.0	286.1	0.0	0.0
4	1.6	493.8	0.0	0.0	0.0	0.0	69.1	0.0	0.0
5	10.0	5515.5	0.0	0.0	0.0	0.0	772.2	0.0	0.0
6	10.0	9563.3	0.0	0.0	0.0	0.0	1338.9	0.0	0.0
7	10.0	13416.8	0.0	0.0	0.0	0.0	1878.4	0.0	0.0
8	10.0	17071.9	0.0	0.0	0.0	0.0	2390.1	0.0	0.0
9	10.0	20524.5	0.0	0.0	0.0	0.0	2873.4	0.0	0.0
10	10.0	23771.0	0.0	0.0	0.0	0.0	3327.9	0.0	0.0
11	10.0	26808.3	0.0	0.0	0.0	0.0	3753.2	0.0	0.0
12	10.0	29633.6	0.0	0.0	0.0	0.0	4148.7	0.0	0.0
13	9.9	32244.0	0.0	0.0	0.0	0.0	4514.2	0.0	0.0
14	4.6	15645.0	0.0	0.0	0.0	0.0	2190.3	0.0	0.0
15	5.4	7214.4	0.0	0.0	0.0	0.0	1010.0	0.0	0.0
16	9.9	13711.2	0.0	0.0	0.0	0.0	1919.6	0.0	0.0
17	9.9	14102.9	0.0	0.0	0.0	0.0	1974.4	0.0	0.0
18	9.8	14413.2	0.0	0.0	0.0	0.0	2017.8	0.0	0.0

19	9.8	14642.7	0.0	0.0	0.0	0.0	2050.0	0.0	0.0
20	9.8	14791.8	0.0	0.0	0.0	0.0	2070.8	0.0	0.0
21	9.7	14861.0	0.0	0.0	0.0	0.0	2080.5	0.0	0.0
22	9.7	14850.8	0.0	0.0	0.0	0.0	2079.1	0.0	0.0
23	9.7	14762.3	0.0	0.0	0.0	0.0	2066.7	0.0	0.0
24	9.6	14596.5	0.0	0.0	0.0	0.0	2043.5	0.0	0.0
25	9.6	14354.6	0.0	0.0	0.0	0.0	2009.6	0.0	0.0
26	9.5	14037.5	0.0	0.0	0.0	0.0	1965.3	0.0	0.0
27	9.5	13647.0	0.0	0.0	0.0	0.0	1910.6	0.0	0.0
28	9.4	13184.8	0.0	0.0	0.0	0.0	1845.9	0.0	0.0
29	9.4	12652.2	0.0	0.0	0.0	0.0	1771.3	0.0	0.0
30	9.3	12051.3	0.0	0.0	0.0	0.0	1687.2	0.0	0.0
31	9.2	11384.0	0.0	0.0	0.0	0.0	1593.8	0.0	0.0
32	9.2	10652.5	0.0	0.0	0.0	0.0	1491.4	0.0	0.0
33	9.1	9859.0	0.0	0.0	0.0	0.0	1380.3	0.0	0.0
34	9.0	9006.0	0.0	0.0	0.0	0.0	1260.8	0.0	0.0
35	9.0	8095.7	0.0	0.0	0.0	0.0	1133.4	0.0	0.0
36	4.5	3758.9	0.0	0.0	0.0	0.0	526.2	0.0	0.0
37	4.3	3284.7	0.0	0.0	0.0	0.0	459.9	0.0	0.0
38	8.8	5401.3	0.0	0.0	0.0	0.0	756.2	0.0	0.0
39	8.7	3634.4	0.0	0.0	0.0	0.0	508.8	0.0	0.0
40	8.6	1842.0	0.0	0.0	0.0	0.0	257.9	0.0	0.0
41	4.4	242.0	0.0	0.0	0.0	0.0	33.9	0.0	0.0

Failure Surface Specified By 39 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1240.08	187.68
2	1250.01	186.52
3	1259.97	185.56
4	1269.94	184.78
5	1279.92	184.20
6	1289.91	183.81
7	1299.91	183.61
8	1309.91	183.60
9	1319.91	183.78
10	1329.90	184.16
11	1339.88	184.73
12	1349.85	185.49
13	1359.81	186.44
14	1369.74	187.58
15	1379.65	188.92
16	1389.54	190.44
17	1399.39	192.15
18	1409.21	194.05
19	1418.99	196.14
20	1428.72	198.42
21	1438.42	200.88
22	1448.06	203.53
23	1457.65	206.37
24	1467.18	209.38
25	1476.66	212.58
26	1486.07	215.96
27	1495.41	219.53
28	1504.69	223.27
29	1513.89	227.18
30	1523.01	231.28
31	1532.05	235.55
32	1541.01	239.99
33	1549.89	244.60
34	1558.67	249.38
35	1567.36	254.33
36	1575.95	259.45
37	1584.44	264.73
38	1592.83	270.17
39	1595.22	271.78

Circle Center At X = 1305.3 ; Y = 704.3 and Radius, 520.7

Factor of Safety

*** 2.003 ***
Failure Surface Specified By 43 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1195.59	186.66
2	1205.51	185.41
3	1215.45	184.32
4	1225.41	183.40
5	1235.38	182.64
6	1245.36	182.04
7	1255.35	181.60
8	1265.35	181.33
9	1275.35	181.22
10	1285.35	181.28
11	1295.35	181.50
12	1305.34	181.88
13	1315.32	182.43
14	1325.30	183.14
15	1335.26	184.01
16	1345.21	185.05
17	1355.13	186.25
18	1365.04	187.61
19	1374.92	189.13
20	1384.78	190.82
21	1394.61	192.66
22	1404.41	194.67
23	1414.17	196.84
24	1423.89	199.17
25	1433.58	201.65
26	1443.22	204.30
27	1452.82	207.10
28	1462.38	210.06
29	1471.88	213.17
30	1481.33	216.44
31	1490.72	219.87
32	1500.06	223.45
33	1509.34	227.18
34	1518.56	231.06
35	1527.71	235.09
36	1536.79	239.27
37	1545.80	243.60
38	1554.75	248.08
39	1563.61	252.70
40	1572.40	257.47
41	1581.11	262.38
42	1589.74	267.43
43	1597.02	271.85

Circle Center At X = 1276.9 ; Y = 791.8 and Radius, 610.6

Factor of Safety
*** 2.011 ***
Failure Surface Specified By 43 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1191.38	186.57
2	1201.34	185.69
3	1211.32	184.96
4	1221.30	184.37
5	1231.29	183.93
6	1241.29	183.63
7	1251.28	183.47
8	1261.28	183.46
9	1271.28	183.60
10	1281.28	183.88
11	1291.27	184.31
12	1301.25	184.88
13	1311.23	185.60
14	1321.19	186.46

15	1331.14	187.46
16	1341.07	188.61
17	1350.99	189.90
18	1360.89	191.34
19	1370.76	192.92
20	1380.61	194.64
21	1390.44	196.51
22	1400.23	198.52
23	1410.00	200.67
24	1419.73	202.96
25	1429.43	205.39
26	1439.09	207.96
27	1448.72	210.68
28	1458.30	213.53
29	1467.85	216.52
30	1477.34	219.65
31	1486.80	222.91
32	1496.20	226.32
33	1505.55	229.86
34	1514.85	233.53
35	1524.10	237.34
36	1533.29	241.28
37	1542.42	245.36
38	1551.49	249.57
39	1560.50	253.90
40	1569.45	258.37
41	1578.33	262.97
42	1587.14	267.70
43	1594.44	271.75

Circle Center At X = 1256.9 ; Y = 872.9 and Radius, 689.5

Factor of Safety

*** 2.013 ***

Failure Surface Specified By 38 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1248.50	187.87
2	1258.42	186.68
3	1268.37	185.68
4	1278.34	184.89
5	1288.33	184.31
6	1298.32	183.93
7	1308.32	183.76
8	1318.32	183.79
9	1328.31	184.03
10	1338.30	184.47
11	1348.28	185.12
12	1358.25	185.98
13	1368.19	187.04
14	1378.11	188.30
15	1388.00	189.77
16	1397.86	191.43
17	1407.69	193.31
18	1417.47	195.38
19	1427.21	197.65
20	1436.90	200.13
21	1446.53	202.80
22	1456.11	205.67
23	1465.63	208.73
24	1475.08	212.00
25	1484.47	215.45
26	1493.78	219.10
27	1503.01	222.93
28	1512.17	226.96
29	1521.24	231.17
30	1530.22	235.57
31	1539.10	240.16
32	1547.90	244.92

33	1556.59	249.87
34	1565.18	254.99
35	1573.66	260.29
36	1582.03	265.76
37	1590.29	271.40
38	1590.57	271.60

Circle Center At X = 1311.7 ; Y = 670.2 and Radius, 486.5

Factor of Safety

*** 2.015 ***

Failure Surface Specified By 37 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1259.92	189.97
2	1269.91	189.55
3	1279.91	189.29
4	1289.91	189.20
5	1299.91	189.27
6	1309.90	189.51
7	1319.90	189.91
8	1329.88	190.47
9	1339.85	191.19
10	1349.81	192.08
11	1359.76	193.14
12	1369.68	194.35
13	1379.59	195.73
14	1389.47	197.27
15	1399.32	198.97
16	1409.15	200.83
17	1418.94	202.86
18	1428.70	205.04
19	1438.42	207.38
20	1448.10	209.89
21	1457.74	212.55
22	1467.34	215.37
23	1476.88	218.34
24	1486.38	221.47
25	1495.83	224.76
26	1505.21	228.20
27	1514.55	231.80
28	1523.82	235.54
29	1533.03	239.44
30	1542.17	243.49
31	1551.25	247.69
32	1560.25	252.04
33	1569.18	256.53
34	1578.04	261.17
35	1586.82	265.96
36	1595.53	270.88
37	1597.18	271.86

Circle Center At X = 1290.6 ; Y = 799.2 and Radius, 610.0

Factor of Safety

*** 2.020 ***

Failure Surface Specified By 39 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1238.88	187.65
2	1248.76	186.14
3	1258.68	184.83
4	1268.62	183.74
5	1278.58	182.85
6	1288.55	182.18
7	1298.54	181.72
8	1308.54	181.47
9	1318.54	181.43
10	1328.54	181.60
11	1338.53	181.99
12	1348.51	182.59

13	1358.48	183.39
14	1368.43	184.41
15	1378.35	185.64
16	1388.25	187.08
17	1398.11	188.73
18	1407.94	190.59
19	1417.72	192.65
20	1427.46	194.93
21	1437.15	197.40
22	1446.78	200.09
23	1456.36	202.97
24	1465.87	206.06
25	1475.31	209.35
26	1484.68	212.84
27	1493.98	216.53
28	1503.19	220.41
29	1512.33	224.48
30	1521.37	228.75
31	1530.32	233.21
32	1539.17	237.86
33	1547.93	242.70
34	1556.57	247.72
35	1565.12	252.92
36	1573.54	258.30
37	1581.86	263.86
38	1590.05	269.59
39	1592.92	271.69

Circle Center At X = 1315.3 ; Y = 653.4 and Radius, 472.0

Factor of Safety

*** 2.024 ***

Failure Surface Specified By 40 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1223.85	187.31
2	1233.73	185.80
3	1243.65	184.50
4	1253.59	183.39
5	1263.54	182.49
6	1273.52	181.79
7	1283.51	181.30
8	1293.50	181.01
9	1303.50	180.93
10	1313.50	181.05
11	1323.50	181.37
12	1333.48	181.90
13	1343.46	182.63
14	1353.41	183.57
15	1363.35	184.71
16	1373.26	186.05
17	1383.14	187.60
18	1392.98	189.34
19	1402.79	191.29
20	1412.56	193.44
21	1422.28	195.78
22	1431.95	198.33
23	1441.57	201.07
24	1451.13	204.00
25	1460.62	207.14
26	1470.06	210.46
27	1479.42	213.98
28	1488.70	217.69
29	1497.91	221.58
30	1507.04	225.67
31	1516.08	229.94
32	1525.04	234.39
33	1533.90	239.03
34	1542.66	243.84

35	1551.32	248.84
36	1559.88	254.01
37	1568.34	259.35
38	1576.68	264.87
39	1584.91	270.55
40	1586.11	271.42

Circle Center At X = 1302.6 ; Y = 670.2 and Radius, 489.3

Factor of Safety

*** 2.026 ***

Failure Surface Specified By 42 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1191.98	186.58
2	1201.93	185.53
3	1211.89	184.65
4	1221.86	183.92
5	1231.85	183.36
6	1241.84	182.97
7	1251.84	182.73
8	1261.84	182.66
9	1271.84	182.76
10	1281.83	183.01
11	1291.82	183.44
12	1301.81	184.02
13	1311.78	184.77
14	1321.74	185.68
15	1331.68	186.75
16	1341.60	187.99
17	1351.50	189.38
18	1361.38	190.94
19	1371.23	192.66
20	1381.05	194.54
21	1390.84	196.59
22	1400.60	198.79
23	1410.32	201.15
24	1419.99	203.67
25	1429.63	206.34
26	1439.22	209.18
27	1448.76	212.17
28	1458.25	215.32
29	1467.69	218.62
30	1477.08	222.07
31	1486.40	225.68
32	1495.67	229.44
33	1504.87	233.35
34	1514.01	237.41
35	1523.08	241.63
36	1532.08	245.98
37	1541.01	250.49
38	1549.86	255.14
39	1558.64	259.93
40	1567.33	264.87
41	1575.95	269.95
42	1577.83	271.10

Circle Center At X = 1261.1 ; Y = 794.0 and Radius, 611.4

Factor of Safety

*** 2.030 ***

Failure Surface Specified By 41 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1204.01	186.86
2	1213.89	185.35
3	1223.81	184.05
4	1233.75	182.93
5	1243.70	182.01
6	1253.68	181.28
7	1263.66	180.75

8	1273.66	180.41
9	1283.66	180.26
10	1293.66	180.32
11	1303.65	180.56
12	1313.64	181.00
13	1323.62	181.64
14	1333.59	182.47
15	1343.53	183.49
16	1353.46	184.71
17	1363.36	186.12
18	1373.23	187.73
19	1383.07	189.52
20	1392.87	191.51
21	1402.63	193.69
22	1412.34	196.06
23	1422.01	198.61
24	1431.63	201.36
25	1441.19	204.29
26	1450.69	207.41
27	1460.13	210.71
28	1469.50	214.19
29	1478.81	217.86
30	1488.04	221.71
31	1497.19	225.74
32	1506.26	229.94
33	1515.25	234.32
34	1524.15	238.88
35	1532.96	243.61
36	1541.68	248.50
37	1550.30	253.57
38	1558.82	258.81
39	1567.24	264.21
40	1575.55	269.77
41	1577.43	271.08

Circle Center At X = 1286.0 ; Y = 693.3 and Radius, 513.0

Factor of Safety

*** 2.038 ***

**** END OF GSTABL7 OUTPUT ****

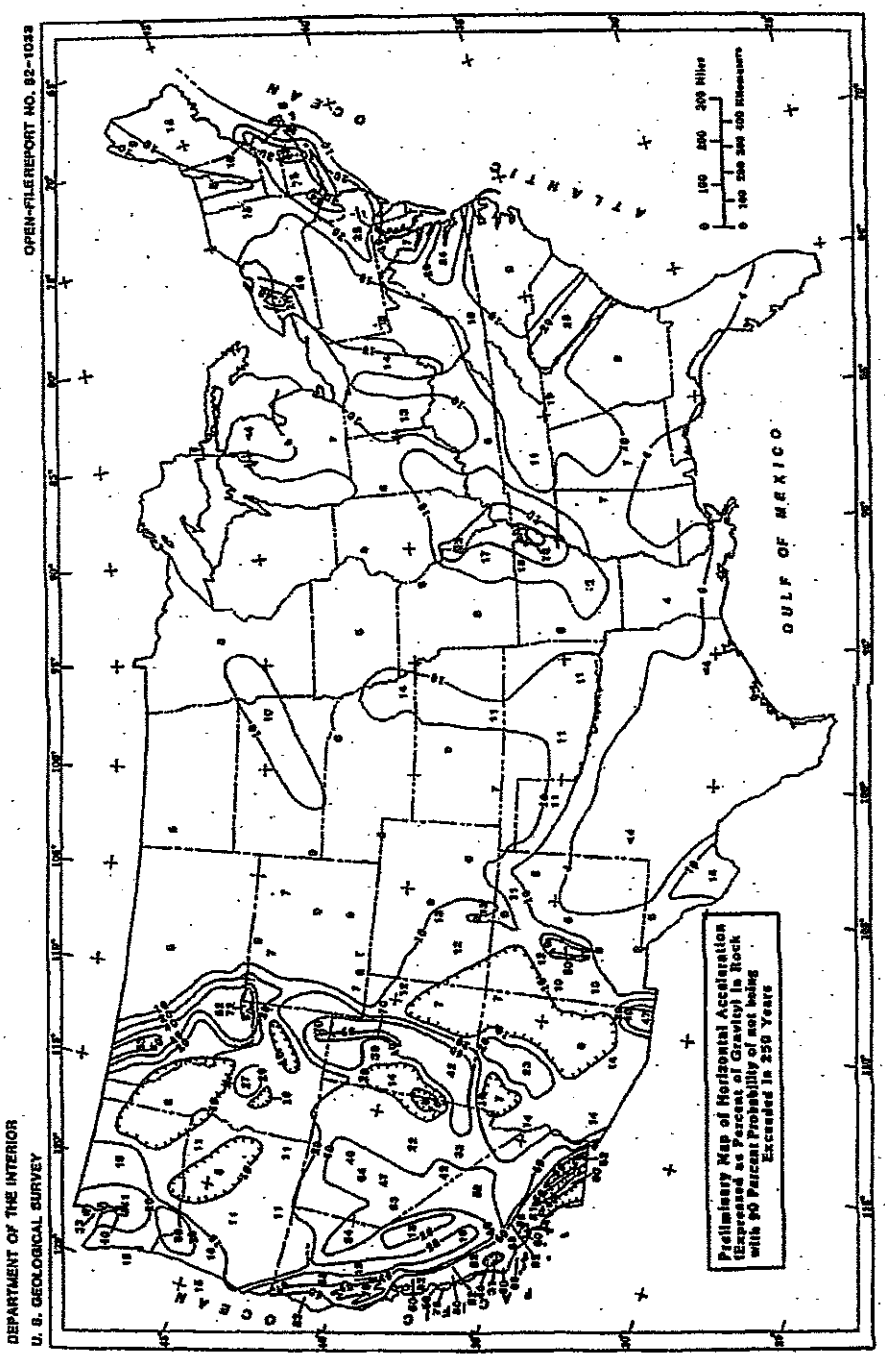
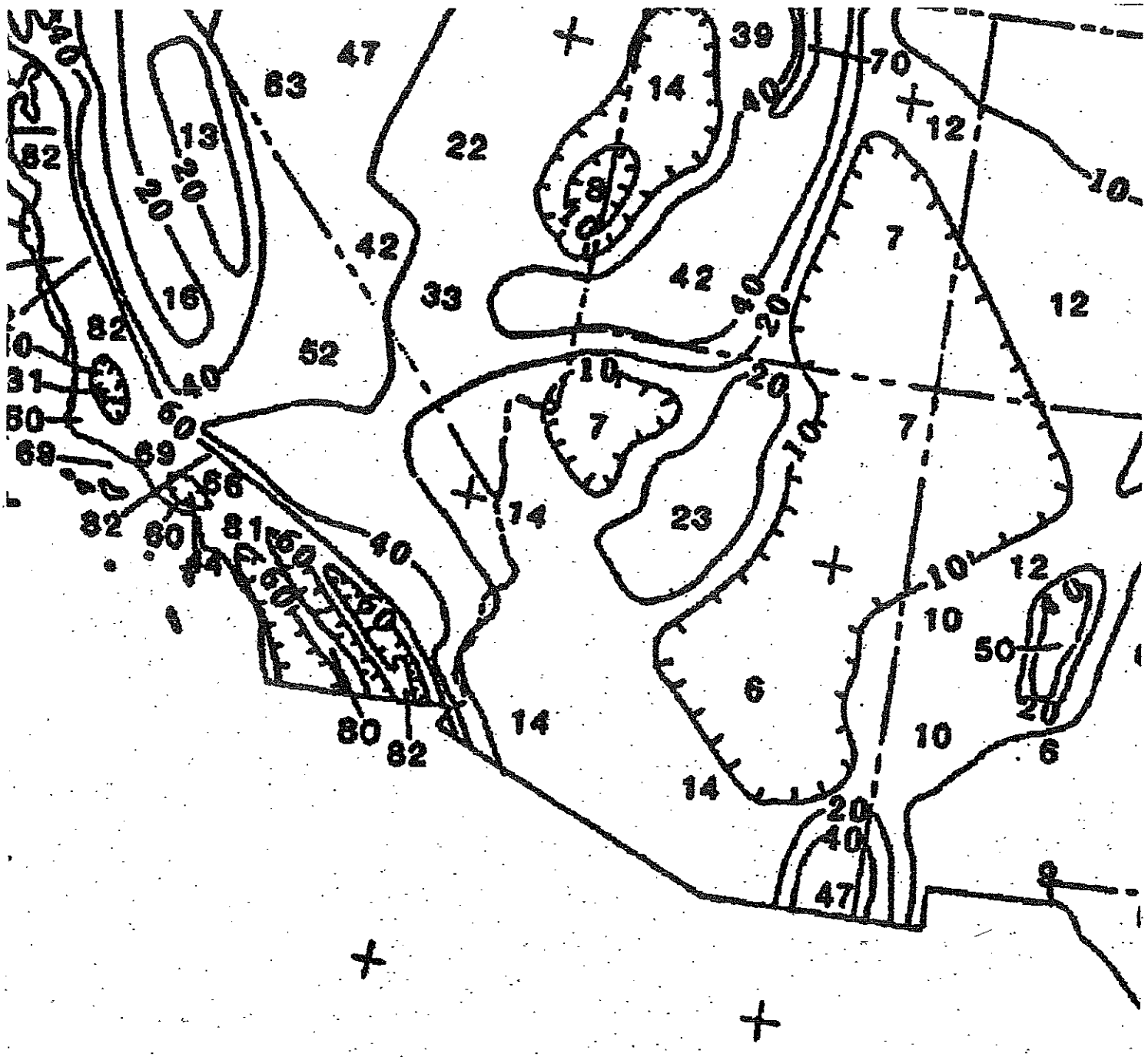


Figure 9-1-5. Plate 3 – 2,400-year Return Period – United States

figure1.max



Preliminary Map of Horizontal Acceleration (Expressed as Percent of Gravity) in Rock with 90 Percent Probability of not being Exceeded in 250 Years

figure.max

Appendix C

Universal Soil Loss Equation

for

City of Casa Grande

Universal Soil Loss Equation

Determination of R

The R value is based on the Wischmeier equation;

$$R = 27.38\ \rho^{(2.17)}$$

Where the value for ρ is the total rainfall resulting from a 2-year return period, 6-hour duration storm for the site. Based on information obtained from the NOAA Atlas 2 isopluvial map for the Casa Grande Area, the 2-year, 6-hour precipitation depth, was estimated to be 1.3 inches. Accordingly:

$$R = 27.38(1.3)^{(2.17)}$$
$$R = 27\ (1.77)$$
$$R = 48.4$$

An R value of 48 will be used to calculate the final cover soil loss.

Determination of K

The permeability of the erosion layer soil, based on information provided in the 1994 SWFP for soils at the site, will be (1.0×10^{-4} cm/sec) .14 in./hr. This permeability rate is considered slow to moderate. The percentage silt and very fine sand is approximately 60% and the percentage coarse sand (0.10 - 2.0 mm) is estimated to be 15%. Although soils at the site have very little organic matter, it is assumed that 2% organic matter will be incorporated into the erosion layer to aid in establishing vegetation. From the soil erodibility nomograph, the value for K was determined to be 0.31. This is a reasonable value for the soil type anticipated to be used for construction of the erosion control layer.

Determination of C

Currently, the landfill slopes consist of a continuous bare soil surface with a C value of 0.50. A final closure condition consisting of continuous annual grass cover over the entire surface of the landfill, would have a C of 0.01. A C value of 0.10 was used for the CGML. This value assumes that the grass cover will be continuous, some bare soil areas will be present after closure, and the entire area will have no appreciable tree canopy.

Determination of P

P value of 1.0 reflects a no cultivation scenario. The value of 1.0 also reflects a loose, disced plow layer, which is conservative for the final closure condition.

Computation of LS

Of the terms in the USLE, only the slope length factor, L, and the slope percent factor, S, remain as unknowns.

For the landfill final cover conceptual design, values were obtained for both the sideslopes and top deck to calculate erosion losses from the final cover for the entire landfill site. The design slope for the final closure condition is 4:1 horizontal to vertical side slope (14°). The CGML's top deck will have the minimum 3% slope. Long term settlement may reduce this slope somewhat.

L = slope length factor = $(\lambda/72.6)^m$

λ = horizontal projection of slope length
m = $\beta/(1+\beta)$
β = $(\sin\theta/0.0896) / [3.0(\sin\theta)^{0.8} + 0.56]$
θ = slope angle

sideslope θ = 14° (25%)
top deck θ = 1.7° (3%)

Slope length factor for the Sideslopes

θ = 14°
β = $(\sin 14°/0.0896) / [30(\sin 14°)^{0.8} + 0.56]$ = 1.77
m = 1.77 / 2.77 = 0.64

λ_{max} = 200
L = $(200 / 72.6)^{0.64}$ = 1.91

Slope length factor for the Top Deck

θ = 1.7°
β = (sin 1.7° / 0.0896) / [3.0 $(\sin 1.7°)^{0.8}$ + 0.56 = 0.45
m = 0.45 / 1.45 = 0.31
λ = 1300
L = $(1300 / 72.6)^{.31}$ = 2.45

S = slope steepness factor

for slopes < 9% $s = 10.8 \sin\theta + 0.03$
for slopes ≥ 9% $s = 16.8 \sin\theta - 0.50$

sideslope $s = 16.8 (\sin 14°) - 0.50 = 3.56$
top deck $s = 10.8 (\sin 1.7°) + 0.03 = 0.35$

Employing the USLE with the terms of the values given above:

A = R K L S C P
A = (48)(O.31)(1.91)(3.56)(0.10)(1.0)
A = **10.1 ton/acre/year soil loss (Side Slopes)**

A = R K L S C P
A = (48)(0.31)(2.45)(0.35)(0.10)(1.0)
A = **1.2 ton/acre/year soil loss (Top Deck)**

Since the value of A computed for the landfill top deck is less than 2 tons/acre/year the rate of soil erosion from the landfill closure conceptual design is acceptable and should require minimal maintenance.

However, the side slopes of the landfill will need to be maintained on a more frequent basis than the top deck. Soil accumulated in the drainage channels will need to be removed and re-applied to the slopes as part of postclosure maintenance. An increase in vegetation coverage will also reduce the amount of soil lost due to erosion from the sideslopes.

Appendix D

Casa Grande Ordinance 1397.08.13 – Special Handling of Solid Waste

for

City of Casa Grande

ORDINANCE NO. 1397.08.13

AN ORDINANCE OF THE COUNCIL OF THE CITY OF CASA GRANDE, ARIZONA, AMENDING TITLE 8, CHAPTER 8.08, OF THE CASA GRANDE MUNICIPAL CODE, RELATING TO SPECIAL HANDLING OF SOLID WASTE; ESTABLISHING A PENALTY FOR VIOLATIONS; ESTABLISHING AN EFFECTIVE DATE; AND ESTABLISHING SEVERABILITY OF COMPONENTS OF ORDINANCE.

WHEREAS, A.R.S. §49-744 and Arizona Administrative Regulation R18-13-312(1)(g) require salvaging by third parties at the Municipal Landfill be rigidly controlled; and

WHEREAS, Arizona Administrative Regulation R18-13-312(1)(f) requires that the City provide suitable equipment and operating personnel shall be provided at its Municipal Landfill; and

WHEREAS, A.R.S. §49-704 allows local municipalities to establish ordinances, resolutions or other policies relating to solid waste regulation or solid waste services; and

WHEREAS, unique procedures need to be established to protect the City employees from unacceptable risk in handling Specially Handled Solid Waste, as defined herein; and

WHEREAS, unique procedures need to be established to protect the City from unacceptable liability in accepting Specially Handled Solid Waste; and

WHEREAS, Specially Handled Solid Waste, as defined herein, potentially exposes the City to unacceptable liability from Landfill salvagers without special procedure in place; and

WHEREAS, Specially Handled Solid Waste requires additional handling by Landfill personnel and additional usage of Landfill equipment to dispose of it safely and efficiently;

NOW, THEREFORE, BE IT ORDAINED BY THE COUNCIL OF THE CITY OF CASA GRANDE, ARIZONA, as follows:

SECTION 1. Amendment

The below-specified sections of Chapter 8.08 of Title 8, Casa Grande Municipal Code, regarding special handling of solid waste, are hereby amended to read as follows:

8.08.010 Definitions.

A. "Collector" wherever herein used means the city or its authorized representative.

B. "Garbage" means and includes all putrescible waste, except sewage and body waste, including waste accumulated of animal, food or vegetable matter, and including waste that attends the preparation, use, cooking, dealing in or storing of meat, fish, fowl, fruit and vegetable, and shall include all of such wastes or accumulations or vegetable matter of residences, restaurants, hotels and places where food is prepared for human consumption. The term "garbage" shall not include recognized industrial byproducts.

C. "Encapsulate" means either of the following two methods:

1. placement of medical sharps in a rigid, puncture proof, leak proof container with a locking cap after rendering them incapable of creating a stick hazard by using an encapsulation agent or any other process that renders them incapable of creating a stick hazard; or

2. grinding such that the medical sharps are incapable of creating a stick hazard and are unrecognizable.

D. ——"Inspector" means the authorized employee or employees of the city having the duty of the enforcement of this chapter.

E. "Landfill" means the Casa Grande Municipal Landfill at it present and any future locations.

F. "Landfill user" or "user," which terms shall be used interchangeably, shall mean each owner or occupant subject to this chapter or a person who disposes refuse or causes to be disposed refuse in the Landfill.

G. "Medical Sharps" shall mean discarded sharps used in animal or human patient care, medical research, or clinical laboratories. This includes hypodermic needles; syringes; pipettes; scalpel blades; blood vials; needles attached to tubing; broken and unbroken glassware; and slides and coverslips

H. ——"Owner" and "occupant," which terms ~~erever~~ herein are used ~~may be used~~ interchangeably and mean every person in possession, charge or in control of any dwelling, flat, roominghouse, or any eating place, shop, place of business, manufacturing or business establishment where garbage or other refuse is created or accumulated.

I. ——"Refuse" means solid wastes, including garbage and rubbish.

J. ——"Roll on/roll-off" means that method of container hauling where large capacity refuse containers are loaded into the transporting vehicle by tipping the rear rails, hauling the container onto rails by a cable pulley system and tipping the rear rails back to the horizontal position.

K. ——"Rubbish" means refuse other than garbage, tin cans, bottles, ashes, paper, pasteboard, cardboard, or wooden boxes, brush, leaves, weeds, and cuttings from trees, lawns, shrubs, and gardens or other waste materials produced in the normal course of everyday living.

L. ——"Specially Handled Solid Waste" means and includes solid waste defined as Medical Waste, Biohazardous Medical Waste, and Special Waste in Arizona Revised Statutes ("A.R.S.") Title 49, Chapter 4 and the Arizona Administrative Code, Title 18, Chapter 13.

M. ——"Waste" means unwanted solid, liquid or gaseous materials.

8.08.070 Use of collection system.

A. ——Every owner and occupant of premises within the prescribed limits of this chapter shall use the refuse collection and disposal system herein provided and shall deposit or cause to be deposited in accordance with this chapter all rubbish and garbage which is accumulated on the premises that is of the nature that it is perishable, or may decompose, or may be scattered by wind or otherwise, unless authorized by the city to do his own collecting and permitted to dispose at the ~~sanitary~~ Landfill.

B. Every user shall, in addition to compliance with this chapter, demonstrate, upon request of the Inspector, compliance with the appropriate state laws or Arizona Administrative regulations in the user's storage, handling, treatment, or disposal of the refuse for which it wishes to deposit or cause to be deposited in accordance with this chapter. Compliance with state laws or Arizona Administrative regulations shall include possession of the appropriate permits and approval of appropriate plans required by the various federal or state regulatory agencies.

8.08.080 Refuse containers—Provision and maintenance—Placement—Contents.

A. On new residential construction each lot or combination of lots shall be supplied with a refuse container, at the expense of the developer or subdivision, to be owned and maintained by the city, as approved by the public services director.

B. On existing residences the city shall provide and maintain the container.

C. On new and existing commercial and industrial facilities, the owner shall be responsible for the initial purchase and following maintenance of the containers as approved by the public services director. The public services director may have the container maintained and pass any cost on to the owner of the property.

D. All garbage shall, before deposit in any refuse container, be wrapped in paper or other material so as to prevent the escape of liquids therefrom.

E. All refuse containers shall be kept in a place accessible to the collector, as determined by the public services director;

F. No tires shall be mixed in with other refuse~~, but arrangements shall be made with the public services director for special containers or pickup as per sanitation fees schedule~~.

G. The public services director may at times, for the convenience of the city, assign a larger container to the owner at no extra cost to the owner.

H. The public services director shall designate the type of service and container size to be utilized by each user.

I. Specially Handled Solid Waste shall be containerized or properly packaged as mandated by the most stringent of the following regulations or laws:

1. Arizona Revised Statutes, Title 49, Chapter 4;

2. Arizona Administrative Code, Title 18, Chapter13; or

3. This chapter of the Casa Grande Municipal Code.

J. The user shall encapsulate Medical Sharps prior to their disposal at the Landfill or in a container designated for deposit in the Landfill.

8.08.100 Collection fee schedule.

A. ~~Residential Rate~~ Monthly Collection Fees rates for residences within the City limits are as follows and include two collections each week of (ninety gallon or three hundred gallon plastic

containers ~~two pickups per week plus brush trucks~~):

1. Single-family, ~~$9.35~~9.85;

2. Two houses or trailers on same lot, ~~$18.31~~19.70;

3. Multifamily units, ~~$9.35~~9.85 per unit;

4. Mobile homes in trailer park, ~~$9.35~~9.85 per space or commercial rate;

5. Mobile homes or trailers on lot, ~~$9.35~~9.85.

B. ~~Commercial Rate~~ Single Pickup Collection Fee rates for non-residential users within the City limits are as follows (~~includes~~for ninety gallon or three hundred gallon plastic containers, metal containers filled with loose refuse, roll-on/roll-off containers loose or compacted. The following non-residential rates, ~~but~~ does not ~~include brush trucks~~authorize the City's collection of uncontainerized rubbish or the full rate for disposal of Specially Handled Solid Waste):

1. 90-gallon plastic container, ~~$1.58~~1.65;

2. 300 gallon plastic container, ~~$3.16~~3.32;

3. 1-1/2 cubic yard metal container, ~~$3.16~~3.32;

4. 2 cubic yard metal container, ~~$5.53~~5.80;

5. 3 cubic yard metal container, ~~$7.46~~7.83;

6. 3-1/2 yard metal container, ~~$8.28~~8.70;

7. 4 cubic yard metal container, ~~$9.05~~9.50;

8. 6 cubic yard metal container, ~~$11.09~~11.65;

9. 8 cubic yard metal container, ~~$14.25~~14.95;

10. Customer-owned roll-on/roll-off container per ~~pickup~~collection, ~~$88.00~~92.00 plus the appropriate Llandfill fee;

11. City-leased roll-on/roll-off container per ~~pickup~~collection, ~~$110~~115.00 plus the appropriate ~~l~~Landfill fee.

12. Compacted volume removal shall be at three times the loose refuse rate as established in §8.08.100(B);

13. ~~B~~non-residential brush trucks service shall be charged in accordance with the loose refuse volumes listed in subsection B of this section~~;~~

C. Landfill Usage Fee by Permit:

1. Landfill disposal~~, except tire disposal,~~ is free to residential users who reside in the city.

2. ~~Commercial and industrial~~Non-residential facilities, except those disposing of Specially Handled Solid Waste, within the city limits shall pay the following landfill user fees:

a. Car or small pickup truck, $5.00 per load;

b. Full-size pickup truck and non-pickup truck less than~~under~~ three cubic yards, $7.00 per load;

c. Truck, three cubic yards or more, $8.00 per load;

d. Truck refuse compactor, to twenty- nine cubic yards, $15.00 per ton;

e. Roll-off compactor box to thirty yards, $43.85;

f. Roll-off compactor box thirty yards to thirty-nine yards, $58.45;

g. Roll-off compactor box over thirty- nine yards, $73.07;

h. Loose roll-off containers under twenty yards, $29.24;

i. Loose roll-off containers to thirty yards, $43.85;

j. Loose roll-off containers over thirty yards, $58.74;

3. Residential users or non-residential facilities ~~who live~~ outside the city limits ~~or commercial or industrial facilities located outside the city limits~~ shall pay for landfill usage pursuant to the following landfill user fee:

a. Minimum fee, $6.00 per load (including cars);

b. Pickup truck $10.00 per load;

c. All non-pickup trucks, $20.00 per ton;

d. Truck refuse compactor to twenty-non cubic yards, $20.00 per ton;

e. Roll-off compactor box, $20.00 per ton;

f. Loose roll-off containers, $20.00 per ton;

g. Appliances, $6.00 each.

~~B.~~14h. Roll-off service outside the city limits will be charged a ten percent surcharge over and above that charged inside the city limits plus the appropriate Landfill fees.

4. The ~~landfill~~Landfill will not accept tires or Specially Handled Solid Waste from residential users or non-residential facilities ~~who live~~ outside the city ~~limits or from commercial or industrial facilities located outside the city limits.~~ —

5D. The above fees shall be billed and paid monthly.

E. Specially Handled Solid Waste from residential or non-residential users within the City limits shall pay the base charge according to §8.08.100(B) plus the relevant rate established below for

the type of Specially Handled Solid Waste being deposited at the Landfill

1. Actual costs of any remediation if impossible to separate Specially Handled Solid Waste that was improperly deposited at the Landfill because of user's non-compliance with this chapter.

2. Actual costs of for any staff time for collection, Landfill observation, and special covering; and actual costs for the equipment time for special covering activities at Landfill.

~~D~~E. Vacancy Credits:

1. Trailer parks, except those which elect to be charged the commercial rates, and multifamily units shall be charged the monthly residential rate collection fees for all trailer spaces or units; however, a credit may be applied for from the finance director for unoccupied spaces or units during any particular month. Unoccupied spaces or units are defined as those spaces or units which were not occupied for at least sixteen consecutive days during any month for which the credit was requested. Credits must be applied for by the fifteenth day of the month following the month for which the credit is requested in order to qualify for such credits. Trailer parks that elect to be charged under the commercial rates may not receive credit for unoccupied spaces;

2. Vacancy credits for single-family residences may be approved by the finance director, but only if the residence is vacant for more than ninety consecutive days;

~~E~~G. Sanitation service fees and ~~landfill~~Landfill fees shall be due and payable at the office of the finance director when the monthly statement is rendered and shall be delinquent twenty calendar days thereafter. If the total bill for any such charges is not paid within five calendar days after the date of delinquency, a penalty of one and one -half percent of the unpaid balance, but in no event less than fifty cents, shall be charged each month of delinquency to be collected in addition to the amount then due. Sanitation service fees shall be payable in advance on a monthly, quarterly, semi-annual or annual basis.

~~F~~H. The sanitation division will make metal containers available for lease at a charge of five dollars per week with a minimum charge of five dollars.

~~G~~I. All sanitation charges are the responsibility of the property owners. If a tenant does not pay a charge when rendered, the property owner will be notified of the tenant's nonpayment and be required to pay the amount due.

~~H~~J. City-owned six and eight cubic yard front load metal containers and roll-on/roll-off metal containers will only be rented to contractors or ~~commercial~~non-residential ~~customer~~users on a short-term or project basis. ~~Commercial~~Non-residential customers who have a continuing need for a container will be required to purchase or lease a suitable container from a private enterprise.

8.08.110 Residential rubbish and Specially Handled Solid Waste requiring special handling.

A. ——Rubbish consisting only of cardboard, wooden boxes, brush, furniture, appliances, weeds, cuttings from trees, or shrubs from residences within the City limits may be kept separately without depositing in such containers. ~~B~~Such bulk materials, such as leaves and lawn clippings, if not placed in containers, shall be in a sack or receptacle for ease of loading. Compost piles may be maintained on the users' private property for fertilization purposes, and matter used for fertilization purposes only may be transported, kept or used. Nothing in this section shall be construed so as to permit the violation of any

provision of this code, any ordinance, or any rule or regulation of the fire department.

B. Specially Handled Solid Waste

1. Upon collection from the user, the user shall, if requested by the inspector, show compliance with §8.08.070(B);

2. Owners/Occupants may only deposit or cause to be deposited Specially Handled Solid Waste at the Landfill when sufficient Landfill staff is available to timely collection the Specially Handled Solid Waste so that Landfill personnel can appropriately locate an suitable location at the Landfill, witness the dumping of the Specially Handled Solid Waste to ensure compliance with this chapter, and to appropriately cover the Specially Handled Solid Waste after it is deposited;

8.08.120 Business route collection.

A. The inspector shall designate premises such as, but not limited to, restaurants and grocery stores, hospitals and butcher shops wherein large accumulations of garbage occur and shall notify the owner of the premises of the designation. From and after the notification by the inspector, all rubbish and garbage accumulated upon the premises shall be deposited separately, in approved containers for garbage as provided in Section 8.08.080 of this chapter.

B. ~~B.~~ The city may enter into a contract for the collection of the garbage and other refuse. It is unlawful for any person, except the collector, to collect, or to haul or transport garbage and other refuse from any premises so designated under the provisions of this section except as permitted under Section 8.08.030.

C. Specially Handled Solid Waste will only be picked up by appointment at least two business days in advance of the anticipated collection with the office of the public services director or his designee.

SECTION 2: Addition of Code Sections and Penalty

The below-specified sections are added to Chapter 8.08 of Title 8, Casa Grande Municipal Code, regarding special handling of solid waste:

8.08.200

Nothing herein this chapter shall imply or mandate that the Casa Grande Municipal Landfill accept or retain refuse, garbage, solid waste, rubbish, or Specially Handled Solid Waste that is it otherwise prohibited or not permitted to take in accordance with state statutes or regulations.

8.08.200 , Violations, Enforcement

A. The City may refuse to collect or may return refuse from users who do not comply with the requirements of this chapter.

B. If the City has refused collection or returned of a particular locations' refuse, three times in any 180 day period, for non-compliance with the requirements of this chapter, the City may suspend the users ability to use the Landfill until user shows sufficient and relevant evidence of compliance with this chapter such that the City can be reasonably assured that non-compliance will not re-occur. Upon resumption of the suspension use of Landfill for repeated violations, upon resumption, if any, of pick ups, must post fin assurance

C. Upon ten days written notice to the user of intent to revoke Landfill privileges and of a time for a meeting with the public services director, the City may revoke user's Landfill rights after more than two suspensions of Landfill privileges within any eighteen-month time period.

8.08.210 Criminal penalty

A. In addition to any enforcement action or penalty assessments against an user as established in §8.08.200, a person who commits a violation of this Chapter may be charged and convicted in Casa Grande Municipal Court of a class two misdemeanor.

D. Upon conviction of a non-enterprise person of a violation of this Chapter, the Court may impose a sentence of incarceration not to exceed four months in jail or a fine not to exceed seven hundred, fifty dollars, exclusive of surcharges prescribed by law, or both.

E. Upon conviction of an enterprise, as defined in Casa Grande Municipal §8.12.010(A), of a violation of this Chapter, the Court may impose a fine not to exceed ten thousand dollars, exclusive of surcharges prescribed by law, or both.

F. Every action or proceeding under this chapter shall be commenced and prosecuted in accordance with the laws of the State of Arizona relating to criminal misdemeanors and the Arizona Rules of Criminal Procedure.

8.08.220 Alternative enforcement measures.

Nothing in this Chapter shall preclude the public services director or the inspector from seeking voluntary compliance with the provisions of this Chapter or from enforcing this Chapter through notices of violation, warnings, or other informal devices designed to achieve compliance in the most efficient and effective manner under the circumstances.

SECTION 3: Effective Date

The effective date of the amendments and additions to Chapter 8.08 of Title 8, Casa Grande Municipal Code are effective as of the 4th day of September, 2002.

SECTION 4: Severability

If any section, subsection, sentence, clause, phrase or portion of this chapter is for any reason held to be invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions thereof.

PASSED AND ADOPTED by the Mayor and Council of the City of Casa Grande, Arizona, this 5th day of August, 2002.

Mayor

ATTEST:

City Clerk

CITY OF CASA GRANDE INCORPORATED 1915 CASA GRANDE, ARIZONA

APPROVED AS TO FORM:

City Attorney

Appendix E

Groundwater Sampling Protocols

for

City of Casa Grande

Appendix E

Sample Collection

The procedures presented in this section provide suggested guidelines for the collection and analysis of groundwater samples. Subcontractors and personnel used for groundwater sample collection should follow these guidelines in addition to their own in-house sampling program, requirements, and protocols.

- The well cap and lock will be inspected for any evidence of damage or vandalism. Any evidence of forced entry will be recorded in the field log book. The air space around the well cap will be scanned with an organic vapor analyzer (OVA). The reading will be recorded in the field log book.

- Groundwater elevations will be measured prior to purging in each well each time groundwater is sampled. The static water level will be measured to the nearest 0.01 foot using a steel tape or calibrated electronic sounding device. The water level measurements will be recorded in the field log book. The electronic sounding device will be rinsed with distilled, deionized water between wells to avoid the possibility of cross-contamination. The groundwater elevations will be used to determine the rate and direction of groundwater flow each time groundwater is sampled. Groundwater elevations in wells will be measured within a period of time short enough to avoid temporal variations in groundwater levels which could affect accurate determination of groundwater flow rate and direction. Depths to water surface should be converted to elevation above mean sea level. The total depth of the well will also be measured as a check on the condition of the well and in order to determine the well volume.

- Standing water in a well will be removed prior to sampling so that fresh formation water will be sampled. Standing water should be removed from a point above the screen in the uppermost part of the water column to allow fresh formation water to move upward to displace the standing water. Each well will be purged of at least three well volumes of water or until field measurements of pH, temperature, and specific conductance are stable, whichever constitutes the greatest volume. pH, temperature, and specific conductance will be measured at regular intervals during purging and the measurements will be recorded. (The volume of standing water is calculated by multiplying the difference between the total depth of the well and depth to water by the cross-sectional area of the well, which is the square of the radius multiplied by π.) Purging will be considered complete if the well has been purged dry. Wells will be purged at rates below those used to develop to recover to 80 percent of its original elevation prior to sampling. Wells will not be pumped dry if water cascades down the sides of the screen during recharge. Dedicated submersible pumps will be used to purge and sample the wells.

- Measurements of in-stu parameters consisting of pH, temperature, and specific conductance will be measured and recorded in the field log book. Field measurements will be made on unfiltered water after all containers comprising a

sample have been filled. Water for the field measurements will be placed in a disposable bottle that will not be submitted to the laboratory for analysis. Monitoring probes will not be submitted to the laboratory for analysis. Monitoring probes will not be placed in sample containers containing groundwater sample for laboratory analysis. The equipment used to measure the field parameters will be calibrated according to the manufacturer's instructions before measuring the parameters at each sampling location, and will be noted in the field log book. The equipment will be rinsed between measurements and between wells with distilled, deionized water.

- The required sample containers, preservatives, and holding times for each chemical analysis will be provided and specified by the approved analytical laboratory for groundwater analysis. Sampling equipment will be constructed of inert material that will not alter analyte concentrations or react with, sorb, or desorb the analytes. Sampling equipment will be constructed or inert material that will not alter analyte concentrations or react with, sorb, or desorb the analytes. Sampling equipment will be allowed to dry in a dust-free environment before use. Sample containers from the laboratory will be new and have had the appropriate preservatives added. Generally, polyethylene containers are used for inorganic parameter analysis and glass containers for organic parameter analysis. Amber-tinted glass containers are recommended. At the time of delivery, container lot numbers will be noted in the field log book for future reference.

- Clean surgical gloves and other appropriate protective clothing will be worn during sample collection when handling sample containers and equipment and will be discarded after each sampling location. During sampling, water will be carefully added from the discharge point directly into the prepared sample bottles. Samples will never be composited in a common container in the field and the split. The sample will not be allowed to overflow the bottle. The flow from the pump will be controlled to produce smooth, continuous flow to reduce agitation or aeration of the sample. When collecting samples for analysis of volatiles using a positive gas displacement bladder pump, the pumping rate should not exceed 100 mL/min. Equipment and procedures will be used to keep sample agitation and contact with the atmosphere to a minimum during sample transfer. Container cups will be handled with care to reduce the risk of sample contamination. Sample containers will be filled completely and the caps securely tightened, allowing no head space in VOC samples. Groundwater samples will not be field-filtered prior to laboratory analysis.

- Samples will be collected in order of decreasing volatilization sensitivity as follows:

    1. In-sti parameters.
    2. Volatile organic compounds (VOCs).
    3. Extractable organics.
    4. Pesticides/herbicides.

5. Metals.
6. Phenols.
7. Nitrate and ammonia.
8. Sulfate and chloride.

- Precautions will be taken during field sampling to limit the risk of sample contamination. Procedures include the following:

  - No storage of preservatives or sample containers in areas that could potentially cause contamination of the samples.

  - Thorough purging of wells prior to sampling.

  - Thorough decontamination of all sampling devices, testing equipment, and cables prior to use and between sampling points.

  - Keeping decontaminated sampling equipment off of the ground and other potentially contaminated surfaces prior to insertion into the well.

  - Sampling from upgradient background wells downgradient wells.

Sample Identification

A sample numbering system is required for correlation to field records and for accurate retrieval of information on each uniquely numbered sample. The sample identification number will be used on all documentation associated with the sample, including field log books, sample identification labels, and chain-of-custody records. The numbers will also be used to reference sample data in reports.

The following format for the sample numbers will be used:

GW – YY: 000

Sample Storage and Shipment

All samples will be cooled to 4 C as soon as possible after sampling and maintained in that condition until received at the laboratory. Shipments to the laboratory will be completed within 48 hours. The sampling and shipments will be scheduled so that samples do not arrive at the laboratory after 4:00 p.m. on Friday or over the weekend. The laboratory will be informed as to when the samples were shipped.

For shipment to the analytical laboratory, sample containers will be placed in clear sealable plastic bags and packaged to reduce the risk of a release of materials to the environment. Samples will be shipped in an insulated cooler with sufficient collant and packing material to keep samples cool and intact until they arrive at the laboratory. The sample will be delivered the same day or shipped overnight as required by the laboratory for specific test procedures. If a sample cannot be shipped the same day, it will be refrigerated at 4 C in the dark and shipped the following day.

The following procedure will be used to prepare samples for overnight delivery:

1. Affix appropriate adhesive sample label to each container.

2. Wrap each container with bubble wrap or foam.

3. Place approximately two inches of packing material on the bottom of the cooler. Commonly used materials are bubble wrap, vermiculite, and polystyrene foam.

4. Place self-contained coolant such as Blue-Ice or equivalent in the cooler. Dry ice will not be used.

5. Place samples in cooler so none are within two inches of the sides or top.

6. Fill remainder of cooler with packing material.

7. Seal pertinent information and paperwork in a plastic bag and tape to the inside lid of the cooler. This information will include the name, address, and telephone number of the testing laboratory and the name of the person to contact at the laboratory.

8. Tape cooler drain shut.

9. Close lid and latch cooler. Tape cooler shut on both ends, making several revolutions with the shipping tape.

10. Affix custody seal over lid openings. Cover seals with clear tape.

11. Sign chain-of-custody form and indicate the time and date the cooler is relinquished to the shipper. The chain-of-custody form will include the number of samples submitted, origin of the samples, the requested analyses for each sample included in the shipment, and the name and phone number of the person to contact at the landfill and laboratory. Keep copies of the chain-of-custody form and all other paperwork associated with the shipment.

12. Telephone the laboratory and provide the following information:

    - Name and title person that relinquished the samples to the shipper
    - Project name
    - Name of shipper
    - Confirmation number of shipment as provided by shipper
    - Number of coolers and samples to be delivered
    - Date and estimated time of delivery.

Sample Documentation and Chain-of-Custody

Validity of sample results will be confirmed through careful field documentation and sample chain-of-custody procedures.

All measurements, observations, and information pertinent to the sampling activities will be recorded in the field log book. At a minimum, the following information will be recorded:

- Date, time, and location of sample collection or measurement
- Name of individual performing sampling or measurement.
- Well identification.
- Well depth.
- Static water level and measurements made during purging.
- Time and duration well was purged.
- Recovery time after purging.
- Procedures and equipment used for sample collection.
- Well sampling sequence.
- Types, volumes, and numbers of sample collection.
- Types of sample containers used and sample identification numbers, including duplicates and trip blanks.
- Sample preservation methods.
- Parameters requested for analysis.
- Observations made during sampling (e.g., visual appearance or odor of water, climate, temperature).
- Decontamination procedures.
- Well number corresponding to samples.
- Laboratory delivery information.

Sample custody will be maintained through the use of sample labels, duplicate field forms, sample custody seals, and chain-of-custody records.

A sample label will be placed on each sample container submitted for analysis. Legible labels written in waterproof link will be affixed to each sample container submitted for analysis. Legible labels written in waterproof ink will be affixed to each sample container prior to filling with a sample. The labels will not be affixed to the container lids or caps. Each label will clearly contain the following information:

- Company name.
- Site name and location.
- Sample identification number.
- Sampling location.
- Date and time of sample collection.
- Name and signature or initials of sampler.
- Analysis requested (unless otherwise specified on container).
- Preservative included in the sample.

A sample deal will be placed over the lid or cap of each sample container to indicate the integrity of the sample from the time it is collected until the time it is received by the laboratory. The following information will be clearly indicated on each seal:

- Sample number.
- Date and time of sampling.
- Name and title of sampler.
- Signature of sampler.

A chain-of-custody record will accompany every sample shipment to the laboratory. A copy of the record will be kept at the landfill. The record will contain the following information:

- Sample identification number.
- Signature of sampler.
- Date and time of sample location.

- Media sampled (i.e., groundwater).
- Sample type.
- Sampling location/well identification.
- Number of containers.
- Parameters requested for analysis.
- Signature of each person involved in the chain of possession and times of each possession.
- General remarks concerning the chain-of-custody or relay information to the laboratory.

A sample analysis request form or laboratory work order will also accompany the samples to the laboratory and will identify which sample containers have been designated for each requested parameter and the preservation methods used. This will also enable the laboratory to determine the number and types of containers needed and establish the methods and detection limits required. The form will contain the following information:

- Name of person receiving the sample.
- Date of sample receipt.
- Laboratory sample number, if different from field numbers.
- Analyses to be performed including analytical method and practical quantitation limit.
- General remarks or comments that may be useful to the laboratory.

Data Analysis

The constituents to be tested for include those required by the EPA as listed in Appendix I of 40 CFR 258 and 15 additional constituents required by the state. The constituents to be monitored for will be reviewed periodically by the City to determine if changes are warranted based on the results.

Sampling Frequency

Sampling and testing of each monitoring well will occur on a semi-annual basis. The City currently samples the two off-site wells on an annual basis. The sampling

frequency will be reviewed periodically by the City to determine if the frequency needs to be adjusted.

Quality Assurance Quality Control

For reliability and validity of field and analytical laboratory data, the laboratory will be required to have and follow a quality assurance/quality control (QA/QC) program. This will include the use of blanks and duplicates. Sample blanks and duplicates will be labeled and handled in such a manner as to make them indistinguishable from other samples by the laboratory personnel. Field sampling forms and a chain of custody record will be completed for each duplicate and blank sample. Shipment procedures will be the same as for the actual samples.

Three types of QC blanks will be collected to verify the precision of sampling and laboratory procedures: trip, equipment, and field blanks.

Trip blanks are useful for detecting contamination during field handling, shipment, or in the laboratory. Each time a group of sample containers is prepared in the laboratory for sample collection, one type of each container will be selected from the batch and filled with distilled, deionized water. These containers will be transported to the sampling site and returned unopened to the laboratory in an identical manner to the samples. These trips blanks will be tested in the same manner as the samples. One trip blank per sampling event is recommended.

Equipment blanks are collected to determine the effectiveness of the field decontamination procedures. After a piece of field equipment has been decontaminated, distilled, deionized water will be poured over the field equipment and collected in a sample container. The sample will be handled in an identical manner to the samples and undergo the same analyses as the groundwater samples. A minimum of one equipment blank for each day of groundwater sampling is recommended.

Field blanks are taken to determine potential contamination in the water used in the field. Field blanks will be taken by pouring distilled, deionized water into sample bottles in the field. They will then be transported to the laboratory and subjected tot eh same analyses as the groundwater samples. One field blank is recommended for each sampling event.

The presence of contaminants in the blanks does not necessarily mean they are present in the groundwater samples. Their presence can be attributed to the following:

- Interaction between the container and sample.
- Contaminated rinse water.
- Handling or laboratory procedures that alter the sample analysis results.

The concentration levels of any contaminants found in a blank will not be subtracted from the groundwater test results. The contaminant levels will be recorded. If the contaminant levels of a blank are within an order of magnitude when compared to the field sample results, the groundwater will be resampled. If contaminants are found in blanks, the source of contamination will be identified and evaluated.

To check for sampling and analytical reproducibility, one duplicate sample will be collected for every ten samples and submitted for identical analyses as the samples. The

duplicate sample will be taken at the same time, and preserved in the same manner, as the original sample. The duplicate sample will be labeled in the same manner as the original and the sample identification number will be marked such that it is not distinguishable from the other samples.

All field equipment to be used during the groundwater sampling will be calibrated prior to field use and recalibrated in the field measuring each sample.

Garvin, James

From: Gregory Stanley [GStanley@ci.casa-grande.az.us]
Sent: Wednesday, December 04, 2002 2:06 PM
To: Scott Bender
Subject: Landfill Application

Scott - I had a call from Barbara Waterbury of ADEQ (602-771-4120). She is reviewing our Landfill Amendment, and said she is lacking some information from previous versions that she needs to see. She specifically said Appendix G of Vol II, and Addendums 1 & 2. She needs those to complete her review.

Do you have those?

She would like us to mail to the same address, but put to her Attention.

LISA: PLEASE MAKE A COPY OF NOTED ITEMS NEED BY FRIDAY, 12/6 - NOON

FILE

Vendor No: 21.0 AZ ...T. ... ENVI... MENT ...col No:

INVOICE	DATE	DESCRIPTION	PAYABLE	DISCOUNT	AMOUNT PAID
AZDEQ 10-7	10/07/02	PLAN REVIEW FEE	766.00	.00	766.00

HDK

REC.: OCT 3 1 2002

PROJ.: _____

FILE: _____

CITY OF CASA GRANDE Check# 60858 10/10/02 TOTAL $766.00

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Received _____

Company Name City of Casa Grande

Receipt for 766.00 Solid Waste Landfill Permit

Received by Sandra Cano

transmittal

HDR

Attention Scott Bender Date 11/13/02 Job No.

To City of Casa Grande Phone

510 East Florence Boulevard

Casa Grande, AZ 85222

Regarding Landfill

We are sending you: ☒ **Attached** ☐ **Under separate cover via _____ the following items**

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ☒ Other Plan Amendment

Copies	Date	No.	Description
2	October		Solid Waste Facility Plan Amendment, Cit of Casa Grande Municipal Landfill; Volume III

These are transmitted as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review/comment ☐ Other _____

☐ For bids due _____ ☐ Prints returned after loan to us

Remarks **Scott:** **Attached are 2 copies of the Landfill SWFP Amendment which was delivered to ADEQ on 11/12. We should get review comments in January.**

Copy to

Signed Jim Garvin

If enclosures are not as noted, please notify us at once

HDR Engineering, Inc.
Employee-owned

8550 W. Bryn Mawr Avenue, Suite 900
Chicago, IL 60631-3223

Telephone (773) 380-7900
Fax (773) 380-7979

transmittal

HDR

Attention Mike Oden Date 11/13/02 Job No.

To HDR Engineering

17111 Preston Road, Suite 200

Dallas, TX 75248-1232

Regarding Landfill

We are sending you: ☒ **Attached** ☐ **Under separate cover via _____ the following items**

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
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☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review/comment ☐ Other _____

☐ For bids due _____ ☐ Prints returned after loan to us

Remarks **Mike:** **Attached are 2 copies of the Landfill SWFP Amendment which was delivered to ADEQ on 11/12 and 2 copies sent to Scott Bender at the City of Casa Grande on 11/13. We should get review comments in January.**

Copy to

Signed Jim Garvin

If enclosures are not as noted, please notify us at once

HDR Engineering, Inc.
Employee-owned

8550 W. Bryn Mawr Avenue, Suite 900
Chicago, IL 60631-3223

Telephone (773) 380-7900
Fax (773) 380-7979

September 24, 2003

Mr. A.W. Fritz (Andy)
Environmental Engineer Specialist
Solid Waste Section – Plan Review Unit
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, AZ 85007

Re: City of Casa Grande Solid Waste Facility Plan
Response to ADEQ Drainage Plan and Details Technical Review Comments

Dear Mr. Fritz:

The following items are submitted in response to your Technical Review of the City of Casa Grande Solid Waste Facility Plan letter dated May 22, 2003, which is attached. To make your review easier, we have included the "redline" changes made to Chapters 1 and 3 and have included the revised drainage calculations.

1) Figure 1-4 has been updated to reflect changes to the drainage design which are clearly labeled. All channels and ditches are designed with earthen surfaces. Due to the small slope used and resulting low velocity, lining is not required except at the let-down structures (side slope flumes). There will be a trapezoidal channel around the entire base of each section of the landfill, as well as a triangular berm extending around the landfill at the middle of the sideslope. The break points of flow for the East and West areas are clearly labeled. The beginning of the channel for each area is at its respective break-point and the end is located at the let-down structure to its respective retention basin.

2) All corners on the East and West areas have been rounded, making it easier for the flow to make the turns in the channel without causing an erosion problem. In addition, the total vertical drop was divided in half by the placement of an intermediate berm halfway up the sideslope and then placing a perimeter ditch at the bottom of the sideslope. There will be 12 let-down structures between the intermediate berm and the perimeter ditch that will be lined with a 6-inch gabion mattress. Additional lining will be placed in the channel to absorb the energy of the run-off when exiting or entering the let-down structures. However, lining will not be required for the remainder of the perimeter ditches or the intermediate triangular berms.

3) The soil used at the Casa Grande site will be sandy loam soil. The slope along the channel has been reduced to 0.1% to reduce the velocity of the flow traveling through the channels. The new velocities calculated range from 1.95 fps to 2.45 fps. For clear water traveling through an open channel constructed of sandy soil, these velocities are not anticipated to cause an erosion problem. Therefore, lining will not be required for the perimeter ditches or for the intermediate triangular berms.

4) There will be no lining in the triangular or the trapezoidal channels except in the vicinity of each drop structure. The intermediate berms will be installed to break up

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Biltmore Commerce Center
3200 East Camelback Road
Suite 350
Phoenix, Arizona 85018

Phone: (602) 522-7700
Fax: (602) 522-7707
www.hdrinc.com

the 4:1 slope and to help control flow velocities, which will help avoid any erosion problems even though this site has historically never had an erosion problem. Details shown on Figure 1-4.

5) A 12-foot access road will be constructed parallel to the perimeter ditches around the East and West areas. The road that will run along the perimeter of the landfill will be a dirt road ranging from 9 to 11 feet in width. This road will be accessible during storm events, so the repair crews will not need to wait for the surface to dry out following a rainfall event. There will also be an access road to the top of each landfill cell. The location of these roads are shown on Figure 1-4. The roads will not cross any lined channels. Maintenance equipment will be able to pass over the perimeter ditch at the high points to the top of the landfill. The remainder of the landfill can then be accessed from the top.

6) A trapezoidal channel will extend around the entire base of both the East and West landfill areas. The bottom width is 4 feet with a depth of 2 feet. The maximum depth of flow has been calculated at 1.43 feet, leaving at least 0.57 feet of freeboard. Since the highest velocity is 2.45 fps, concrete lining will not be needed. Cross-sections of the channels are included on the figure where they are relevant.

7) There is a triangular berm that extends around the entire landfill halfway up the sideslope. In addition, there is a trapezoidal channel that extends around the entire landfill along the base. There will be 12 lined let-down structures that will direct flow from the intermediate berms to the perimeter ditch, as well as 2 additional let-down structures directing flow from each of the two perimeter ditches into their respective retention ponds. All run-off from the landfill will drain to the retention ponds via the trapezoidal channel.

8) The "side-slope flumes" or let-down structures will direct the run-off from the higher triangular channels to the lower trapezoidal channels. They will be constructed as trapezoidal channels with a bottom width of 4 feet and an 3:1 slope of each side. They were designed for the largest calculated flow that one let-down structure would experience in a 25-year storm to be conservative. The maximum flow was calculated to be 19.74 cfs. The exit velocity is calculated at 8.22 fps. Therefore, the let-down structures will be lined with a 6-inch gabion mattress to dissipate the energy generated from the 20-30 foot drop. In addition, a 6-inch gabion mattress will be placed in the triangular and trapezoidal channels at least 10 feet in each direction of the entrance and exit of the let-down structure. Details are included on the figures.

9) The larger basin has been reduced in size as well as depth, so there is now a 6-foot initial drop instead of a 40-foot initial drop. The 6-foot initial drop will not create enough energy to extensively damage the basin; therefore, the basin will not require lining. The let-down structure will be extended to the bottom of each surface water retention basin. The channel from the landfill to the bottom of the basin will be a lined trapezoidal channel with a bottom width of 4 feet and 3:1 sideslopes. The let-down channels will widen where it crosses the perimeter access road for the landfill and will concrete lined to support heavier traffic.

the 4:1 slope and to help control flow velocities, which will help avoid any erosion problems even though this site has historically never had an erosion problem. Details shown on Figure 1-4.

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10) Figure 1-3 and 1-4 have been included as full size drawings.

If you have any questions, please do not hesitate to call me at (602) 508-1670.

Sincerely,

HDR ENGINEERING, INC.

James W. Garvin, P.E.

Enclosures
- 5/22/03 ADEQ Letter
- 9/9/03 Revisions to Casa Grande SWFP

c: A.J. Blaha, P.E., Public Works Director, City of Casa Grande Municipal Landfill (Letter only)
Scott Bender, City of Casa Grande (Letter with all attachments)
Michael Oden, HDR (Letter with all attachments)

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

May 22, 2003
PRU03-220

Certified Mail
Return Receipt Requested

Mr. James W. Garvin, P.E.
HDR Engineering, Inc.
Park One
2141 East Highland Avenue
Suite 250
Phoenix, Arizona 85016-4792

RE: Second Additional Information Request - Drainage Plan and Details
Technical Review of the City of Casa Grande Solid Waste Facility Plan
Type IV Amendment

Dear Mr. James Garvin:

The modified Figure 1-4 "Drainage Details" which was sent has been received and it is apparent that there are some changes to the drainage design. These changes are welcome but the information provided is currently insufficient. The changes have generated additional questions and need to be resolved. As the drainage design is presently understood, there is a need for additional support information and design justification.

The following items require further explanation and attention:

1) It seems that several design components have been added to Figure 1-4 without labels and cross-section details. Please include cross-section details for each type of Triangular Channel both "earthen" and "lined" and clarify areas where these channels begin and end.

2) Please explain why there are "earthen" channels as opposed to a "lined" channels. Both earthen and lined channels many need rip-rap or other means to adsorb energy as the water moves down the total 50 foot vertical drop. Of concern, for example is the Chanel D hair-pin bend at the northern portion of the East Area. Such directional changes could present a major control problem if a smooth surface lined channel is used and no rock or concrete gabions employed to control erosion.

3) The velocity of the triangular channels is calculated from 3.76 to 5.36 fps and we find this excessive for a "earthen channel" even if it is very well packed. Since rainfall here is not normally sufficient to create a "swale" or grassed channel then this type of channel must be further justified. This is especially true if any sandy soils will be used which lend themselves to increased erosion. Due to uncertainty of the soils used and the erosion capabilities of flowing water on an earthen channel additional support information will be required to justify the use of an earthen channel.

4) If lined triangular channels are to be used what type of liner material and thickness will be used and what type of measures will be included in the design to control flow velocities. Also what design measures will be used to avoid perpendicular undermining and washout of this bench channel along with sediment and silt fouling of the channel. Were erosion mats considered or any of the variety of soil stabilizers? What is planned for the side slopes to control erosion and what type of erosion problems are experienced currently.

5) Has there been any provision for maintenance access on all these channels such as a road and what type surface will this road have? Will it be accessible during storm events or will the repair crews with the equipment have to wait for the surface to dry out. Do you plan to repair the drainage channels and perform all the required landfill maintenance without the help of any equipment using all manual labor? With no apparent access road to the top of each landfill cell then the only alternative would involve running across the "earthen" or "lined" triangular channels with the excavation equipment. Alternatively, they could be used as "roads" since they are from 9 to 11 feet wide according to the "Triangular Report " Table. Will the lined triangular channels have a thick enough liner to support such heavy equipment?

6) The initial and modified Figure 1-4 does not show the whereabouts of the "trapezoidal channel" this may be the drainage channel between the East and West landfill areas but we are not sure. Hopefully this "trapezoidal channel" is a channel which extends around the entire base of both the East and West Landfill Areas. If this is not the case then how will the drainage water find its way to the surface retention ponds if there is no drainage at the base of the East Area along Chuichu Road and also at the South side of the West Area along Interstate Highway 8. We have noted that the bottom width is calculated as being 40.00 ft with a depth of 3.88 feet. Will this channel which will have water moving at 5 fps with 1000 cfs be constructed of concrete? Please include cross-sections with dimensions of all "trapezoidal channels" and specific details on where they are and how the flow will be handled around the landfill corners which are generally greater than 90 degrees.

7) If there is no "trapezoidal channel" around the base of each landfill then the design as shown on the drawing would be that each of the two landfill areas have two triangular channels approximately 2 feet deep and 10 feel wide meeting respectively at the "rock Rip-Rap let down structure". Then from this structure the water will then be diverted perpendicularly down to each of the retention ponds. There will also be an area without drainage below Channel D on the east side of the East Area between the landfill and Chuichu Road.

8) The rectangular shapes on the modified figure 1-4 are assumed to be the "side-slope flumes" to direct runoff from the higher triangular stormwater to lower triangular channels (not the trapezoidal channels?). It appears that there are two on each side of both landfill areas. Please confirm this and label them in the drawing as such. The 12 side-slope flumes seem to drain into the triangular channels after a vertical drop of 20 to 30 feet depending on the component. As shown on the drawing the energy from such drops mentioned above will be handled by the "rock rip-rap let down structures". Design details of these drainage components (materials of construction) as well as how the energy from the 20 to 30 foot drop will be integrated into the triangular channels needs to be fully explained and shown as a drawing detail. Calculations for exit velocities and maximum flow rates for each of the 12 side-slope flumes need to be done for each case since they appear to be of different lengths and vertical drops.

9) The "let down structure" into the "surface water retention basin" does not look like it extends to edge of the basin. Please give details and show how this flow will get to the basin and not extensively damage the basin. Will the basins be lined? For example the larger basin has an initial 40 foot drop how will this be handled..

10) Finally, we would ask you to submit a larger size drawing at least 11x17 and preferably larger because there has been considerable difficulty in seeing all the design features on the 8x14 drawing of which only half is used for the actual Figure 1-4 drawing. Please use a separate sheet for the details and cross-sections if need be.

The Licensing Time Frame for substantive review continues to be suspended until all items have been answered adequately according to ARS § 41-1075. If you have any questions concerning this letter please call me at (602) 771-4588, or toll free in Arizona (800) 234-5677 extension 4588.

Sincerely,

A. W. Fritz (Andy)
Environmental Engineer Specialist
Solid Waste Section - Plan review Unit

cc: File
Richard Jefferies, Manager, Plan Review Unit
Mr. A. J. Blaha, P.E.
Public Works Director
City of Casa Grande Municipal Landfill
510 East Florence Boulevard
Casa Grande, Arizona 85222

feet in each direction of the entrance and exit of the let-down structure. Details are included on the figures.

9) The larger basin has been reduced in size as well as depth, so there is now a 6-foot initial drop instead of a 40-foot initial drop. The 6-foot initial drop will not create enough energy to extensively damage the basin; therefore, the basin will not require lining. The let-down structure will be extended to the bottom of each surface water retention basin. The channel from the landfill to the bottom of the basin will be a lined trapezoidal channel with a bottom width of 4 feet and 3:1 sideslopes. The let-down channels will widen where it crosses the perimeter access road for the landfill and will concrete lined to support heavier traffic.

If you have any questions, please do not hesitate to call me at (602) 508-1670.

Sincerely,

HDR ENGINEERING, INC.

James W. Garvin, P.E.

Enclosures
- 5/22/03 ADEQ Letter
- 9/9/03 Revisions to Casa Grande SWFP

c: Kristin D. Farmer, HDR
Richard Jefferies, Manager, Plan Review Unit, City of Casa Grande
A.J. Blaha, P.E., Public Works Director, City of Casa Grande Municipal Landfill
Scott Bender, City of Casa Grande

City of Casa Grande

HDR

REC.: OCT 3 1 2002

PROJ.: _____

FILE: _____

October 30, 2002

Mr. Dick Jeffries, P.E.
Manager, Plan Review Unit, Solid Waste Section
Arizona Department of Environmental Quality
3033 North Central Avenue, T3011A
Phoenix, Arizona 85012-2809

Re: CITY OF CASA GRANDE MUNICIPAL LANDFILL
SOLID WASTE FACILITY PLAN AMENDMENT

Dear Mr. Jeffries:

Enclosed please find two (2) copies of the City of Casa Grande's Municipal Landfill Solid Waste Facility Plan Amendment. This Plan Amendment is being submitted for approval of the revised design of the landfill to provide long-term disposal capacity for the City of Casa Grande and surrounding communities.

Should you have any questions regarding this submittal require additional information, please contact me at 520-421-8625 or Jim Garvin at 602-508-6670 / jgarvin@hdrinc.com.

Respectfully,

A. J. Blaha

A.J. Blaha, P.E.
Interim Public Works Director

enc

c: Scott Bender
Jim Garvin

G:\09000001\JGarvin\Casa Grande\Letters\Jeffries.doc

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

May 13, 2003
PRU03-205

Certified Mail
Return Receipt Requested

RECEIVED

CITY OF CASA GRANDE
ENGINEERING DIVISION

Mr. A. J. Blaha, P.E.
Public Works Director
City of Casa Grande Municipal Landfill
510 East Florence Boulevard
Casa Grande, Arizona 85222

RE: Additional Information Required for Technical Review of the City of Casa Grande Solid Waste Facility Plan Type IV Amendment

Dear Mr. A. J. Blaha, P.E.:

On April 30, 2003 the response was received from a Mr. James W. Garvin with HDR Engineering concerning the eight (8) items requiring clarification. There is still one item which will need additional explanation and is not adequately addressed in the response.

On the second number 2 (numbered incorrectly) the following is the comment:

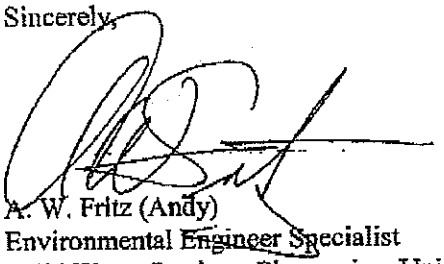
2) As mentioned in **Section 2.8.5 - Final Grade** the final landfill design shows a total vertical rise of approximately 50' to the elevation of 1483 giving the runoff down these sides an expected high velocity given the 4:1 slope ratio. One way to reduce the velocity is to design in a bench in such a situation. The slope used for the runoff calculation was 0.005 which is one foot vertical drop for every 200 feet horizontal which is quite different than a slope of .25 or one foot drop for every four feet lateral. Please resolve this inconsistency. How will runoff velocities will be controlled over the 50' drop at a 4:1 over the entire perimeter of the East and West sections of the landfill.

It seems that you have interpreted this as meaning the perimeter drainage around the East Area and West Area of the landfill based on the answer. The ADEQ concern is not the perimeter drainage but the drainage down the landfill face which has a total vertical drop of approximately 50 vertical feet.

The Licensing Time Frame for substantive review continues to be suspended until all items have been answered adequately according to ARS § 41-1075.

If you have any questions concerning this letter pleasc call me at (602) 771-4588, or toll free in Arizona (800) 234-5677 extension 4588.

Sincerely,



A. W. Fritz (Andy)
Environmental Engineer Specialist
Solid Waste Section - Plan review Unit

cc: File
Richard Jefferies, Manager, Plan Review Unit

TO: JIM GARVIN 602-508-6606

FROM: SCOTT BENDER

5 PAGES, INCLUDING COVER

April 28, 2003

Mr. A.W. Fritz
Environmental Engineer Specialist
Solid Waste Section, Plan Review Unit
Arizona Department of Environmental Quality
1110 West Washington Street
Phoenix, Arizona 85007

Re: City of Casa Grande SWFP Amendment

Dear Mr. Fritz:

On behalf of the City of Casa Grande we have reviewed your letter of February 4, 2003 and have provided additional information related to the SWFP Amendment submitted by the City on October 10, 2002. Your letter contained eight items to be clarified. Our responses follow the order of your questions, which are attached for reference.

1. Section 2.9.9-SURFACE WATER MANAGEMENT- The wording in this section will be modified as follows: "The use of toe-berms near the working face and the application of daily cover will limit the amount of surface water that comes in contact with the active fill area."

2. The existing Casa Grande Landfill has been permitted with the Drainage channel separating the East Area and West Area for a number of years. During this time, no leachate seeps have been observed in the channel or elsewhere on site. The annual precipitation can easily be absorbed by the waste at the active face, even during times of heavy rain. Additionally, there is a significant (10 to 15 feet) soil wedge between the channel and any waste buried adjacent to it. This soil wedge has proven more than adequate in preventing water in the channel from entering the landfill and containing any leachate that may exist within the landfill.

2. *Note: Letter was numbered incorrectly.*
As shown on Figure 1-4, stormwater interceptor berms have been designed on the 4H:1V sideslopes to collect rainfall from the top and sideslopes of the landfill and direct it to the detention ponds. The slope of the berms, toward the ponds, is 0.5% or 0.005 feet per foot. The slope results in a velocity that will reduce erosion of the berms. We have prepared the attached detail showing benches and sideslope flumes to direct runoff to the primary stormwater ditches. These benches will minimize erosion (See calculations in Appendix A).

3. The final volume of the revised Casa Grande landfill can be found in Table 1-1. For the East Area, a final volume of 2.9 million cubic yards (including daily, intermediate, and final cover) has been calculated. The West Area has 3.5 million cubic yards, for a total of approximately 6.4 million cubic yards. Given a pre-amendment remaining volume of 2.4 million cubic yards, the percent increase is calculated at 167%. The supporting data detailing the capacity as designed can be found in Table 1-1.

HDR Engineering, Inc.

Park One
2141 East Highland Avenue
Suite 250
Phoenix, AZ 85016-4792

Phone: (602) 508-6600
Fax: (602) 508-6606
www.hdrinc.com

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.adeq.state.az.us

Stephen A. Owens
Director

February 4, 2003
PRU03-034

Certified Mail
Return Receipt Requested

RECEIVED
FEB 0 6 2003
CITY OF CASA GRANDE
ENGINEERING DIVISION

Mr. A. J. Blaha, P.E.
Public Works Director
City of Casa Grande Municipal Landfill
510 East Florence Boulevard
Casa Grande, Arizona 85222

RE: Additional Information Required for Technical Review of the City of Casa Grande Solid Waste Facility Plan Amendment

Dear Mr. A. J. Blaha, P.E.:

The following items are required to complete the technical review of the Amendment to the Landfill Operating Plan:

1) In Section **2.9.9 - Surface Water Management** has the sentence:

"Any surface water that comes in contact with waste will be directed to the active fill areas."

This sentence is unclear in that it sounds like runoff will be directed to the open face if it has come into contact with any waste outside the open face but since waste should have daily cover over it except at the working face then there should be no water which falls into this category. Rainwater which falls on the open face is unrecoverable and will flow into the landfill. It is up to the operator to determine when this becomes excessive and daily cover be applied during a storm situation. Surface water run on and runoff needs to be controlled with berms as mentioned in this section to avoid contact with waste or covered portions of the landfill to minimize water intrusion and seepage into the landfill. This is especially important in an unlined landfill.

Please either modify or clarify this sentence.

2) It is a concern as to how the Drainage Channel between the landfill East Area and the West Area will be addressed so that water will not seep into either landfill during precipitation events or conversely, how will leachate be kept from seeping laterally out into this culvert.

2) As mentioned in **Section 2.8.5 - Final Grade** the final landfill design shows a total vertical rise of approximately 50' to the elevation of 1483 giving the runoff down these sides an expected high velocity given the 4:1 slope ratio. One way to reduce the velocity is to design

PLANNING & DEVELOPMENT SERVICES

PLANNING-ZONING-ADDRESSING-ENFORCEMENT

April 10, 2003

SCOTT BENDER
CITY OF CASA GRANDE
510 E. FLORENCE BLVD.
CASA GRANDE, AZ 85222

Dear Scott:

Casa Grande Landfill - Chuichu Road & I-8

After consulting with Planning staff, as well as Bob Davis, Director of Public Works, regarding height limitations for a landfill in Pinal County, it is my understanding that Pinal County has no height restrictions and that the height is determined by ADEQ. In addition, my understanding is that ADEQ regulates the slope/runoff conditions.

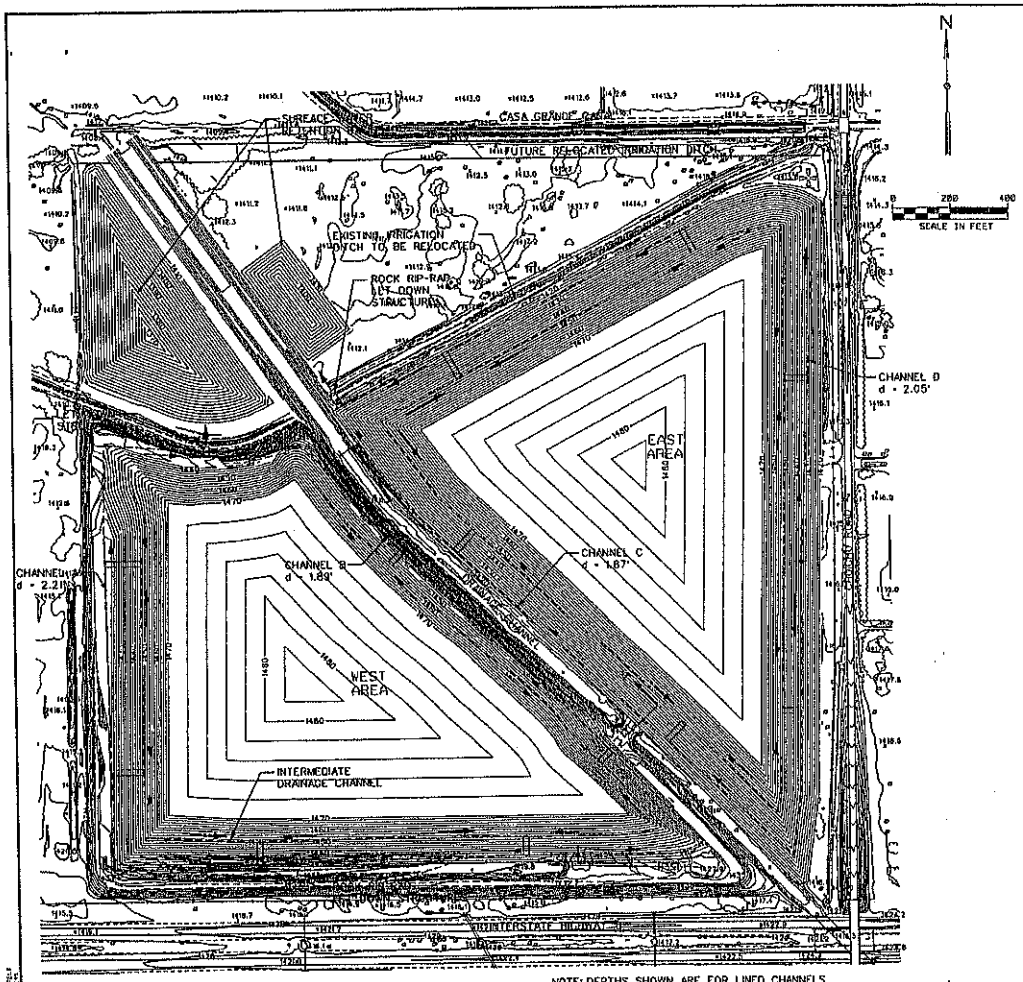
If I can be of further help, please call me at (520) 866-6450.

Sincerely,

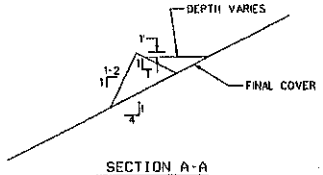
David Kuhl, AICP
Planning Director

pr\MISC\CASA GRANDE LANDFILL.CG

POST OFFICE BOX 2973 31 N. PINAL ST. FLORENCE, AZ 85232 (520) 866-6442 FAX (520) 866-6530 TDD (520) 866-6379



NOTE: DEPTHS SHOWN ARE FOR LINED CHANNELS



SECTION A-A

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85014

Revision No.	Description	Date	Drawn	Check	Resp. Engr.	Proj. Mgr.

Project Manager: J. GARVIN
Architect | HVAC/Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By: M. DEELEY

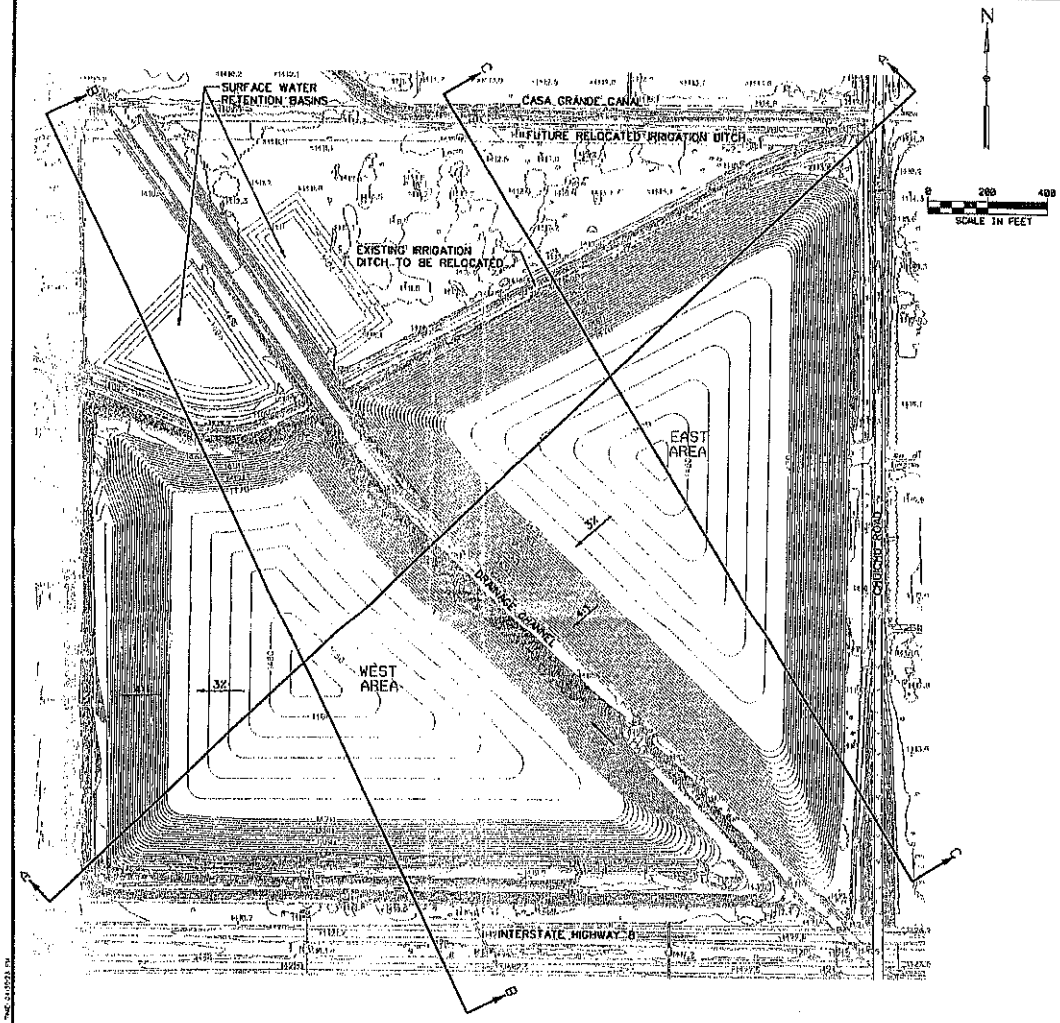
CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

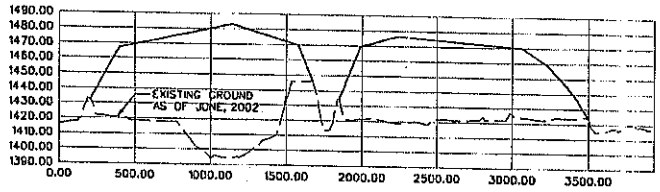
PERMIT UPDATE

DRAINAGE DETAILS

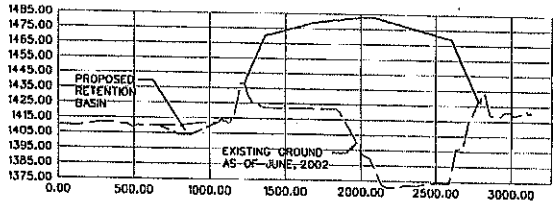
Date	Project No.	Figure No.	Issue
APRIL, 2002	11270-001-037	FIG 1-4	0

Scale: AS SHOWN

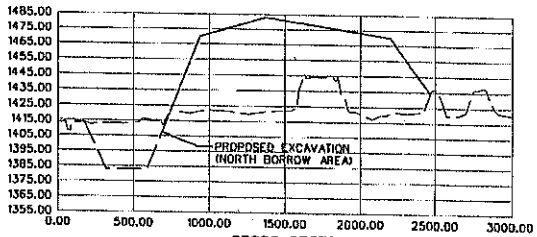




CROSS SECTION A-A



CROSS SECTION B-B



CROSS SECTION C-C

HORIZ. 0 400 800
VERT. 0 40 80

HDR Engineering, Inc.
2141 East Highland Ave.
Suite 250
Phoenix, Az 85044

Revision No.	Description	Date	Drwn.	Chkd.	Resp. Engr.	Proj. Mgr.
1	RETENTION BASIN SIZE	09/03	KG	MO	MO	JG

Project Manager: J. GARVIN
Architect | QC/Process
Civil: M. ODEN | Mechanical
Electrical | Structural
Designed | Drawn By: M. DEELEY

CITY OF CASA GRANDE MUNICIPAL LANDFILL CASA GRANDE, ARIZONA

PERMIT UPDATE

FINAL CONTOURS

Date: $(HDR_SM_DATE)
Scale: AS SHOWN
Job No.: 10170-001-037
Figure No.: FIG 1-3
Sheet: 1