C Field Notes and Boring Logs

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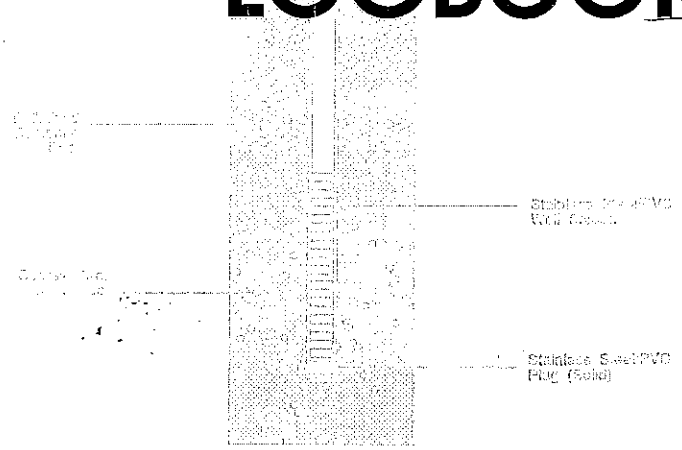
#1

GEOTECHNICAL LOGBOOK



PROJECT NUMBER: 001096.0X75.01

CLIENT/SITE NAME: CA BLM

DRILLING COMPANY: Test America Drilling

DATE OF FIELD ACTIVITIES: 4-23-10 thru

HOLES LOGGED IN BOOK: 01SMMW -

RCRA FIELD BORING LOG CHECKLIST

(Adapted from RCRA Groundwater Monitoring Technical Enforcement Guidance Document, 1986)

Introduction

The field boring log checklist, which follows on this page, contains items which are deemed important to record per RCRA when installing monitoring wells, piezometers, and/or soil borings. A complete boring log contains these checklist items. This Geotechnical Logbook has been designed to help ensure that each borehole logged by E&E meets or exceeds the criteria for a complete technical record of the boring.

General

- Project name
- Hole name/number
- Date started and finished
- Geologist's name
- Driller's name
- Sheet number
- Hole location; map and elevation
- Rig type
- Bit size/auger size
- Petrologic lithologic classification scheme used (Wentworth, Unified Soil Classification System)

Information Columns

- Depth
- Sample location/number
- Blow counts and advance rate
- Percent sample recovery
- Narrative description
- Depth to saturation

Narrative Description

Geologic Observations:

- Soil/rock type
- Color and stain
- Gross petrology
- Friability
- Moisture content
- Degree of weathering
- Presence of carbonate
- Fractures
- Solution cavities
- Bedding
- Discontinuities e.g., foliation
- Water bearing zones
- Formational strike and dip
- Fossils
- Depositional structures
- Organic content
- Odor
- Suspected contaminant

Drilling Observations:

- Loss of circulation
- Advance rates
- Rig chatter
- Water levels
- Amount of air used
- Air pressure
- Drilling difficulties
- Fractures
- Solution cavities
- Bedding
- Discontinuities e.g., foliation
- Formation strike and dip
- Fossils
- Depositinal structures
- Organic content
- Odor
- Suspected contaminant

Other Remarks:

- Equipment failures
- Possible contamination
- Deviations from drilling plan
- Weather

Notes:

- All depths within this logbook are recorded in feet below ground surface (BGS) unless otherwise noted
- TOIC = Top of Inside Casing

CLIENT: CA BLM

JOB NUMBER: 001096.0X75.01

SITE NAME: Contact/Sonoma Mine EE/CA

DRILLER: Test America Drilling

LOCATION: CITY/TOWN: Pine Flat Rd. Near Healdsburg, CA

STATE: California

PROJECT MANAGER: Zander Whitman / Dale Thrush

FIELD TEAM LEADERS: Mark Longtine / Bryan Ciecko

SITE SAFETY OFFICER(S): Bryan Ciecko / Andy Unvrg

TEAM MEMBERS:

JOB START/FINISH DATE: 4/23/10 /

BOOK 1 OF

E&E CORPORATE: (716) 684-8060 FAX (716) 684-0844

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PROJECT/CLIENT CONTACT(S)	AFFILIATION	PHONE

For inquires regarding the distribution, scope, and/or organization of the Geotechnical Logbook please contact: Manager, Environmental Services Division, Buffalo Corporate Office. Your comments and suggestions are welcomed and will be considered in future revisions.

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4-24-10 Sonoma mine 001096.0X75.01 1

0955 this log book continues from log book 1. Drillers are currently in starting well 01SMMW.

1015 currently Buck has nothing to do. he requested a lowboy to transport the D6 to Contact, however, it will not be available until tomorrow morning I did not allow him to drive on the road with the dozer.

Note: Innovex model α-4000S S/N 8580

1026 Hydrate the 2' bentonite chip seal.

1040 Drillers Demob from 01SMMW & mob to 02SMSB

1100 Zero PDR1000 S/N 4049. Zero ok: action level : 2.5 mg/m³

1105 Drillers are onsite at 02SMSB.

1112 Begin drilling at 02SMSB

1312 drillers complete borehole 02SMSB and begin to pull auger in prep for abandonment.

Note: Mark Longtime arrived on site ~1200, we discussed the situation w/ Buck & the lowboy not available until tomorrow, Mark did not approve driving the D6 on the road, and that we can wait for the lowboy. Mark & I plan on going to scout out boring locations at Contact while drillers complete well 01SMMW.

1445 Mark & I had some concerns about road building at contact, we ~~&~~ called Dale & discussed these issues, we decided to re-walk the proposed access road w/ Dave M & Buck.

1530 head from Sonoma to Contact w/ Buck & Dave M. Mark went home

1730 finish walking proposed road. Dave M & Buck maintain its doable but there are variables... there was one wash out in particular that concerns me. It is below the large terrace near the calcine pile. it will likely take Buck some time to cut & fill.

1735 Debrief Buck & drillers & depart site.

end of Day

R[illegible]
4-24-10

4-25-10 Sonoma/Contact EE/CA 001096.0X75.01

0600 depart Hotel & Head to Sonoma mine
0700 meet drillers & Buck at site
Weather: Clear/Sunny Low 45° High 78° winds calm
Objectives: Complete Hand auger well/boring at 04SMMW and 05SMSB
- Buck to work on Road building/Repair at Contact mine
0710-0720 H&S meeting w/ Buck Freeman, Dave M., Joe F., Talon D., and Dave H. + Daily objectives mtg. Dave M. & Joe F. to Finish monument & begin to develop 01SMMW.
Dave H. & Talon D to build path & install hand auger boring/wells.
0730 begin H/A at 04SMMW
0800 I cannot get the pump on the Lumex to work, I'll call Lumex on Monday to troubleshoot. For now we will rely on XRF data
0930 after reaching a depth of 11.5' BGS at 04SMMW, we hit water & let it rest to ~~see if~~ (BC) get a feel for flow rate. Meanwhile, Test auger moved down gradient to an area near 06SMMW in red soil or Tails near the creek.
1045 after Hand augering to 5.5' at 06SMMW, refusal was encountered, no water was found. One sample was collected.
I think there is sufficient water in 04SMMW for a well. There was 1-1.5' of water in the bottom of 04SMMW. I instructed drillers to go down to ~~13~~ BC 12' and screen well from 12-7'.
1050 I go w/ Dave M to scout location 07SMMW
1130 drillers reached 12'3" at 04SMMW, we discuss goals for afternoon and take lunch. Dave M will call locates tomorrow for 07SMMW and 01CMMW. Aside from 07SMMW, the rest of the boreholes/wells will be hand augered. holes remaining at Sonoma: 07, 8, 9, finish 5. While I was overseeing & logging Hand auger Holes, Dave M & Joe built the Monument at 01SMMW.
1345 Drillers completed 05SMSB to 12'6", Seemed to be good water, per marks not on the flagging, I instructed Drillers that we install a well here we are now heading down to locate & hand auger 09SMMW.
The drillers informed me that the 6" hand auger won't be here for a couple days, so actual installation of wells will wait until then
1425 drilling at 09SMMW resulted in plenty of water for a well, however the drillers are having difficulty getting past 4' over →

2

[signature] 4-25-10

4-25-10 Contact/Sonoma RECA 001096.0X75.01

continued 1425. the location is ~ 15' west of Anna Bekner Ck downgradient from the site. The drillers will not be able to get a generator to this site for development w/a pump, instead bailers will be used.

1450 after several attempts, drillers cannot get past 4', Dave M has some ideas to try tomorrow.

1515 mob to 08SMSB, Hand auger.

1615 reach 12'6" BGS w/Hand auger before refusal in bed rock

1650 While drillers chip up 08SMSB, I head up to contact to check on Buck's progress

1700 Buck is ~ 3/4 of the way to the top of the calcine pile at Contact. I told Buck the plan for tomorrow and told him to stop work for today and after he re-fueled the DG, I instructed him to park it so that it prevented access to the new access Road. I headed back down to Sonoma, told the drillers the plan for tomorrow & asked for locates to be called in first thing in the morning and to see if they could be done ASAP. We plan to meet at 0700 tomorrow goals include:

- install borehole 02CMSB
- Develop 01SMMW

if locates occur:

- drill 07SMMW and 01CMMW

Work completed today:

- Hand auger: 04SMMW - 12.5'
  - 05SM~~MW~~SB - 12.5'
  - 06SMMW - 5.5'
  - 09SMMW - 4'
  - 08SMSB - 13'
- Place monument at 01SMMW
- Road work at Contact; Buck is 3/4 of the way to the calcine pile

Depart Site

1800 Return to Hotel. End of Day

4-25-10

4-26-10 Contact | Sonoma EECA 001096.0X75.01

Weather: Partly Cloudy, High's in the 60's West winds 5-15 mph

Goals: Install Borehole 02CMSB, develop 01SMMW, If locates occur; Install wells: 07SMMW and 01CMMW.

0600 depart Hotel for site

0700 arrive at site (Sonoma) discuss todays objectives & hold HBS Mtg. Attendees: Buck Freeman, Dave M., Dale H. Talon D. Joe

additional goals include a 2nd attempt at 06SMMW, and an attempt to hand auger in the calcines East of the retort.

0730 head out w/drillers to find a place for 2nd attempt of 06SMMW

0900 after reaching a depth of 13' and encountering 2 water ~~bearing~~ bearing zones, drillers demob. we will install a well screened from 6'-12' with a sump to 13'. this screened interval covers both water bearing zones. location 06SMMW is ~150' down gradient from 06SMMW(A), and not within red soils.

0905 drillers begin to hand auger at location 05SMSB-B. this location is ~75' East of 05SMSB(A), and East of D-Retort on top of suspected calcines.

0950 Drillers reached a depth of 5.5'. my opinion is that from 0-3.5' is a combination of ash and calcines. there is a sharp transition at 3.5' from the red and grey material to a brown material, however ~~[illegible]~~ A chunk of concrete was encountered at ~4.5', it was a small (2") chunk. at ~4.5' we encountered a stiff lt Brown Clay. I assumed this was native material & had the drillers stop at 5.5'

The drillers are currently abandoning boreholes ~~[illegible]~~ 06SMMW(A) and 05SMSB-B. NOTE: I fixed up the lumex last night and it worked I need to catch up on XRFing & Lumexing yesterdays samples. these samples include, those from locations 09, 08, 06-B, and 05-B for XRF and 04, 05(A+B), 06(A+B), 08, and 09 for lumex, headspace.

1209 after catching up on field screening, I informed the Drillers to mob up to 02CMSB. I proceeded up the hill in search of cell service → no luck. I will contact ~~[illegible]~~ Dale & Mark tonite.

1235 Drillers take lunch

1315 Drillers resume drilling 02CMSB.

1430 drillers reach 35' in 02CMSB. it has been difficult to distinguish between mine waste and native, wx'd bedrock. however, I think ~~[illegible]~~ it changed from mine waste to wx'd bedrock at ~20', — Brown Clay ——

4-26-10 Contact/Sonoma EECA 001096-0X75-01

Continued from previous page. Water was encountered ~24', ~~and~~ BC

1500 the drillers went down to Sonoma to bring clean equipment & supplies to Contract

I checked on Buck's progress. he is to the switchback below the top of the calcines. I advised him to make a call to Dale to discuss the terms of a contract extension. after that, I headed upslope of location ~~02SB~~ BC 02CMSB and discovered a retort, collapsed adit, and some other mining equip, along with several small calcine piles. Every thing was located upgradient of the site and SE of 02CMSB.

1545 I checked the DTW at 02CMSB, it had raised to 25.2' BGS. The Drillers will abandon it next.

1645 Drillers have abandoned/Grouted 02CMSB & mobed to 03CMMW we will start drilling there tomorrow.

1700 Depart site. End of Day

4-26-10

4-27-10 Contact/Sonoma EECA 001096.0X75.01
0600 Depart Hotel and head to contact site.
0700 Arrive at Contact Mine site. It rained hard last night, and continues to do so. The road is very muddy with overland flow. ~~Drilling~~ BC
0715 H&S Mtg: Buck F, Dave M, Joe, Talon D. (Dave H. not on site yet) after mtg, I drove up to the top of the hill to attempt calls to Mark L & Dale T. Calls failed.
0745 Discuss the days objectives w/Dave M. We will start Drilling ~~at~~ 03CMMW and make an assessment on if we can move the rig or not. The 5" hand auger bucket should be on site ~1000. We can begin to install wells at Sonoma after that. Buck is working on Drainage control. I told him not to build any new roads until things dry out.
0815 Begin Drilling 03CMMW. If Air rotary is needed, we cannot proceed.
1103 Drillers reach 50' & no water, I want to check w/ Dale about how far to drill before giving up. I asked the drillers to stop & move to hand augering now that the 5" bucket is here. Buck had warning lights on his dash appear, I think he went down the hill to call the dealer on what they mean. Meanwhile the rain is still falling & our road is getting very messy.
1130 Drillers decide to call it a day due to safety concerns & conditions
1200 Depart site. Note: Buck stayed on site to meet a repair man for the DG.
1600 Conf call w/ dale & Mark
1700 Call Summary: ~~02C~~ BC 03CMMW: - Check for water tomorrow, If dry, pull out & move ~30' East & retry; If wet, Monitor water level for changes; if steady water level make well, if still fluctuating, continue to monitor.
Drill 04CMSB (if Davey feels its safe to move there)
remember Shelby tubes at least 4' from 5-9' in all SB's at Contact & Helen.
Install wells at Sonoma: 04, 06, 09, (07, when conditions permit)

4-27-10

4-28-10 Contact/Sonoma EECA 00096.0075.01

0600 Depart Hotel for site

0700 Arrive at ~~site~~ [BC] contact mine, meet Drillers & Buck. Hold H&S mtg
Buck F. Dewey M, Joe, Dave H, Talon D.

Weather: Cloudy/foggy, low 37 high 48 winds 5-15 from SW.

Goals: Install wells at Sonoma: 04, 06, 09. if time & conditions allow install well at 03CMMW

0715 head down to 03CMMW & check bore hole for water.

0730 water in 03CMMW at 10.5' Bgs. Drillers bail 30 gallons & rechecked water again, water at 18' & recharging. We will let it rest for the morning. Drillers head down to Sonoma to attempt to hand install wells.

1030 Hand installation of wells failed, hit refusal due to rocks at 04SMMW. ~~and~~ [BC] at 06SMMW-B the water mixed w/clay made the material too thin to lift out w/ Hand auger. I talked w/ Dewey about renting a power auger, but it is so ~~slick~~ [BC] slick due to the rain, Dewey is concerned about hauling the power auger down the hill. We decide to attempt to install the well at 03CMMW.

Note: I attempted to place a call on the Sat phone however a message reading "Invalid Account" flashes.

1230 rain, hail, and snow showers continue. Drillers take lunch after filling 03CMMW to 24' w/bentonite chips. after lunch, they will install the well. Screened from 11-21' w/sump to 22', Sand to 23'.

1600. Conditions have been very muddy, making traveling difficult. 03CMMW is almost complete it is screened from 21-11' w/ sand (2/16) from 24-7' and Seal from 7'-5'. We tried to move the rig to 04CMSB, however, it was too muddy to get on location. Buck kept busy all day helping to 'un-stick' the forklift & drill rig, as well as continued road maintenance. Drillers are currently decon-ing Auger.

1610 Dave H. & Dewey M. Leave Site

1620 Buck leaves site

1630 Depart Site; Joe & Talon are still decon-ing auger, but will be done shortly. End of day

4-28-10

4-29-10 Sonama/Contact EECA C001096.0X75.01

0600 Depart Hotel

0700 arrive on site at Contact mine. Hold H&S mtg w/ Buck Freeman, Dave Harp, Davey M., Talon Dunsford, Joe.

0710 Discuss Days objectives & Obstacles: complete & develop well 03CMMW. Stay off road w/ vehicles & Dozer to allow it to dry out. Continue to develop 01SMMW. attempt to Hand auger (again) 04SM, & 06SM. Davey & talon went back to Rancho Cordova to p/u another rig (CME75) to install upgradient wells (01CMMW & 07SMMW). to allow maximum time for the road to dry. Buck had no work today & went home.

1030 Drillers complete monument at 03CMMW. & mob down to Sonoma to develop 01SMMW.

1220 Drillers Bailed out 01SMMW, water was still very silty. we will try to pump tomorrow. Driller move to 04SMMW and re-try to install well w/ Hand auger

1530 After re-trying 04SMMW, there was no success, so Drillers & I improved road to 06SMMW, so it will be easier to haul the power auger down here.

1545 Drillers fill up 05SMSB up w/ Bentonite chips

1600 Drillers re-surge & bail 25 gallons from 01SMMW. the water is still very silty/clayey.

1630 depart site. End of Day

4-29-10

4-30-10 Sonoma/Contact EECA 001096.0X75.01

0600 Depart Hotel for Site

0700 Arrive on site, Hold H&S mtg w/ Buck Freeman, Joe, Dave Hugo. Davey & Talon are not yet onsite. They went back to Rancho Cordova yesterday to p/u another drill rig, a CME 75, and equipment for installing Hand auger wells.

Weather: low 45° high 70° winds 5-10 from South

Goals: either install hand auger wells at Sonoma (04, 06, 09) or use the 75 (when it arrives) to install 07SMMW & 01CMMW.

0720 Joe & Dave Begin to prep the drill site for 07SMMW.

0814, Davey & Talon Arrive at Sonoma.

0900 Dave H & I continue to develop 01SMMW while Talon, Davey & Joe work with the power auger to get 04SMMW.

1200 after pumping ~13 gallons from 01SMMW, the water is still grey w/ turbidity @ <500 NTU. The well does not appear to be clearing.

The others are making slow but steady progress at 04SMMW.

1230 Dave H & I head up to 03CMMW to develop.

1430 Similar to 01SMMW, the water in ~~04SMMW~~ 03CMMW is thick and very turbid... we bailed it empty & left it to recharge.

drillers reach 13' at 04SMMW & move to 06SMMW.

1700 drillers reach 13' depth at 06SMMW & call it a day.

Buck reached the bottom of the calcines at contact & dozed a pad for the rig at 01CMMW. Buck will continue to develop and stabilize the road tomorrow.

I talked to Mark L. & Dale T about difficulty with well development. They said they will work with Dhan from Test America to get the right materials.

1730 Drillers & I Depart Site End of day

4-30-10

5-1-10 @ Cortez / Sonoma EECA 001096.0X75.01

0600 Depart hotel for site

0700 arrive on site (Sonoma) Hold H&S Mtg w/ Buck Freeman, Davey Marocchi, Talon Danforth, Joe Fisher and Dave Harp.
Discuss Days objectives: Buck: Continue work on the road at Contract. Take standby time if needed.
Drillers: Continue to install Hand auger holes w/6" diameter. hold off on well building untill the details of well construction are finalized by Mark Layton, Dale Thrush and John Large (TestAmerica). When finished w/ hand auger wells. use the CME75 to ~~install~~ Drill 07SMMW & 01CMMWS.

Weather: Clear, Sunny. High of 76° Low 48° winds 5-10 from W.

0730 Call Dale Thrush to discuss well construction & Buck's future work.
out come of phone call: Buck will mobilize another Dozer for Helen.
Buck will be on site for 12 hrs/day on either regular hrs or standby.

0900 Drillers mob to 09SMMW, They are just staging equipment, they have to wait for the Casing to finish hand augering the holes.

1400 Drillers have been working on 09SMMW & making some progress. the casing helped, but they met refusal at 5.7' I informed them to just build the well there. the refusal was likely on bedrock.

1415 Cortney frank arrives on site. we had a H&S mtg, then I showed her around.

1530 The Drillers are constructing the well at 09SMMW, Cortney & I leave site & Head to Helen mine to show Cortney around.

1800 Arrive at Helen mine & discuss boring locations & Road building issues

1915 depart Helen Mine & Head back to Healdsburg

2000 arrive at Healdsburg end of Day.

BC
~~5-10~~
5-1-10

815

5-2-10 Sonoma/contact EECA 001096.0X75.01

0600 depart Hotel for site

0700 arrive on site. Hold H&S meeting & discuss ~~the~~ daily objectives. ~~Complete~~ attendees: Buck Freeman, Bryan Ciecko, Courtney Funk, Davey M. Joe Fisher, Talon DeGrote, Dave Harp.

Objectives: Complete monument at 09SMMW. Install borehole @ 07SMMW & 01CMMW. we will not build wells until we hear back from Mark L. or Dale T. on construction variations due to lithology, so auger will be left in the ground.

Note: I will be leaving the ~1530 today. I will transfer this logbook to Courtney at that time.

Weather: Clear/Sunny Low 45 high 75 winds increasing in the afternoon from W.

0815 Drillers begin drilling at 07SMMW

1001 Drillers reach 25' depth, water @ ~18', we will let it rest & check water level later. Drillers mob to 01CMMW.

1040 Begin drilling at ~~07SM~~ 01CMMW

* Note: 03CMMW still needs to be screened w/ Lumex & XRF *

* note at ~0745 today the XRF stopped working. I will call Field & leave message to send Replacement.

1125 drillers reach 22' w/ H_2O ~ 10' drillers are prepping to mob @ 04CMSB

1230 Begin drilling 04CMSB at top of calcines.

1330 Drillers take lunch.

1345 Drillers resume drilling & drive Shelby tube

Note: ambient Mercury vapor concentrations on calcine pile ~6.0 ug/m3 or ~1/2 of the action level.

1410 Drillers push Shelby tube from 5-7' in 04CMSB. only 50% recovery.

1508 Drillers reach 19' depth & make it through calcines @ ~14'. Drillers grout ~~SB~~ 04CMSB.

1535 drillers, Buck & E&E call it a day. this logbook will be relinquished to Courtney Funk. 5-2-10

1700 C. Funk arrive at hotel and troubleshoot XRF unsuccessfully. Finished work for the day.

5/2/10

5-3-10 Contact | Sonoma EECA .001096.0X75.01

0600 Depart hotel for site

0700 Arrive on-site (Contact) hold H+S meeting with Buck Freeman, Dave Marocchi, Talon Danforth, Joe Fisher and Dave Harp

Discuss days objectives: Buck: Standby in case drillers have trouble on bottom flat. Drillers: work on 05CM-MW, 06CM-SB, and 07CM-MW

Rebecca Jarvis and Andy Uhrig expected at approximately ~~2~~ 1400.

Weather: clear, sunny, 65° expected

0700 Call Dale Thrush to follow-up about wells and bringing someone out for sample processing.

0733 Drillers mob to 05CM-MW. May need assistance from Buck to get down to third flat. Difficult turns on the road may cause issues.

0759 Drill rig stuck in soft area within the bottom flat using dozer to pull out of spot

0815 Drill rig on location at 05CMMW. Note: XRF is still not responding so will not be used today. ~~Road needs stabilization so Lumex will not be used until damp area~~ 5-3-10

0850 Begin drilling @ 05CMMW - See boring log for more details

0902 Drillers having difficulty finding an interval due to cobbles + bolders - drilling further down for better interval 5 foot interval will be logged but contains very poor recovery

Note: drillers having a very difficult time keeping the rig running Dave M. says ~~there~~ it could be due to previous rain. It is causing work to go very slowely

1005 Waiting to see if hole fills with water before drilling deeper based on water table observations made at previous well locations — will call dale to find out latest

1036 Checked to see if water is in hole - does not look wet or have signs of groundwater so we will continue drilling

Note: Drillers are also developing the two wells today. They will submit two daily logs. — Photos 1-3 - 05CMMW

1115 Boring going crooked need to replace teeth - Note while while straightening auger, encountered wet soil at 6 feet bgs it is believed that no wet soil was encountered previously because of auger position

1135 Break for lunch

1205 Return to work

RFunk 5-3-10

-10 Contact | Sonoma 001096.0X15-01

08 tower down at this location. Leave hole open for later monitoring well installation. Water confirmed @ 6 feet bgs
bilize to 06CM-SB.

846 Drill rig on location at 06CM-SB - See boring log for more details.

1326 Shelby tube did not have any recovery. It looks like the shelby tube is becoming deformed while being driven down

349 Spoke to Dale Thrush about difficulty driving Shelby at this location and we agreed to abandon Shelby at this location due to large rocks that are deforming the Shelby sampler before a soil sample is able to be collected.

hotos 4-8 - Water drainage from adit photo #s 113-0449-0452

hotos 1-3 camera photo #s are 113-0446-0448

38 Get on location @ 07CM-MW

te 07CM-MW is further north then expected due to accessibility ssues. The new location is just off of the road. See boring log for more details.

50 Attempting to dig ~~some~~ a drainage ditch near the ollapsed mine due to the proximity to 07CM-MW

00 Start drilling on 07CM-MW

00 Finish boring 07CM-MW complete monitoring well tommorrow. Note: R. Jarvis and A. Uhrig arrived on-site at approximately 1430.

40 Depart site and return to ~~site~~ hotel for sample processing.

30 Finish sample processing end of project activities for the day

M

5/4/10 Contact/Sonoma/Helen Mine Sites

Weather: Warm, sunny, breezy

Team: Andy Uhrig, Rebecca Jarvis, Courtney Funk

Agenda: • Conduct Recon at Helen mine
• Mark road locations for ~~excavator~~ AU bulldozer op
• Install test well using finer grained sand

Ø6ØØ - Field team meets in ~~Hotel~~ ~~ø~~ AU lobby.
Ø615 - Field team leaves for Helen mine site
Ø73Ø - met with bulldozer operator at entrance to Helen mine site.
Ø8ØØ - arrived at Helen mine site, parked at the "flat"
- Discussed road options with bulldozer operator (Buch).
- Recommed site for well, boring, and surface soil locations.
- Decided to build road below adit because of safety concerns of driving above the adit and possibly collapsing it
- Decided to back-blade the stream crossing to prevent material from going into creek.
Ø93Ø - Head back to Middletown to make phone calls to Dale Thrush
11ØØ - Arrived at Middletown
- ~~team~~ AU Andy Uhrig leaves middletown to head to Contact/Sonoma to meet drillers
12ØØ - Arrive at Contact/Sonoma
- meet with drillers
- Drillers have fine sand to construct test well
1245 - Water in 04-SMMW has a chocolate milk consistency and hole is partially filled since hand auguring.
- Davey (driller) recommends to construct first fine-grained sandpack well 01-CMMW where well was drilled using the auger rig and water will be cleaner.
1330 - Begin constructing well 01-CMMW using fine grained sandpack
1515 - Completed subsurface construction of well 01-CMMW
1520 - Phone conference with Dale Thrush and Mark Longtine about results of well construction. They decided it would be best that we see the results of the water samples from 01-CMMW prior to constructing more wells.

[signature] 5/4/10

5-3 12 MC

~~1615~~ AU 5/4/10 Contact/Sonoma/Helen mine sites
Weather: Windy, warm, sunny
1615 - Begin development of well AU 01-CMMW
- Purged 20 gal of water and used surge block for 2-15 min sessions
1720 - leave site for day
1815 - Arrive at Hotel

AU

5/4/10

5/5/10
Weather: Windy, Cool, Sunny
Team: Andy Uhrig + 3 drillers
Agenda: construct wells at contact/Sonoma mines
0600 - leave hotel for site
0700 - Arrive at site
- Safety meeting
0715 - Begin construction of well 07SM-MW
- Well 01CM-MW from previous day provided some clear water this morning. The #1C sand may have helped develop the well better. One of the drillers is going to continue developing the well this morning.
- Ground water was a 2.5 ft bgs
- when auger was being extracted during installation the flights were ~~caked~~ AU caked in a brown/gray mud.
0842 - Completed subsurface installation of well 07SM-MW
0900 - Bailed Mud out of 04SM-MW
0915 - Mobilize supplies to 06SM-MW
0930 - Begin installation of 06SM-MW
1030 - Finished installation of 06SM-MW
1045 - Mobilize to 07-CMMW to install well AU
- Plan is to finish well installation of 05CM-MW and 07CM-MW and get drill rig up the hill. If drill rig can't get up hill the dozer operator will be mobilized to the site tomorrow morning to assist.
1115 - Lunch for drillers
1200 - Begin installation of 07-CMMW
- Water was not in borehole

5/5/10
Weather: Sunny, warm, breezy
1230 - Drillers removed augers from 07CM-MW to allow water to recharge into borehole. Moving to 05CM-MW to construct well.
1245 - Borehole 05CM-MW was installed crooked. Will redrill adjacent (~6 ft towards hill slope) prior to well construction.
1330 - Completed redrilling 05CM-MW
- Heading back to 07CM-MW to check water level.
1408 - Begin abandonment of initial borehole to 05CM-MW (crooked).
- backfilling borehole with hydrated bentonite grout.
- also working on channeling water from adit, so that the drill rig can get up the hill.
1500 - Mobilize back to 04SM-MW
~~1000~~ AU
AU
1640 - Completed installation of 04SM-MW
1700 - leave site for day
AU

5/6/10
Weather: Cool, clear, Sunny
Team: Andy Uhrig, Courtney Funk, Rebecca Jarvis
Agenda: Install wells 05CM-MW and 07CM-MW at contact mine and begin mobilizing to Helen.
0600 - leave hotel
0700 - Arrive at contact site
0715 - Safety Meeting
0730 - Inspected boreholes for 05CM-MW and 07CM-MW and they had not recovered from day before. 05CM-MW was completely dry and 07CM-MW was moist at bottom.
- Spoke with Dale Thrush and Mark Longtime and they recommended to set ~~the~~ AU well 05CM-MW based on the previous 5.5 ft bgs static water level that was recorded and set well 07CM-MW based on moisture content in boring.
0800 - Drillers are beginning to mobilize drill rig up the hill later the bulldozer's contract ~~B up~~ AU has ended.
0900 - Begin install well 07CM-MW

5/6/10

Weather: Sunny, breezy, warm

Ø947 - finished constructing well 07CM-MW

Ø950 - Begin constructing well 05CM-MW

- Drillers had to make 2 separate trips up the hill to the staging area to get supplies.

1115 - Finished installing well 05CM-MW

- Drillers taking lunch

~~5/5/10~~ AU

~~Weather: Sunny, warm, breezy~~ AU

~~1230 - Driller are removing augers left in hole to see if ~~well~~ AU borehole~~ AU
~~recharges with water. Moisture was present on augers when they~~ AU
~~were removed. Soil caught in auger flights looked like clay.~~ AU
~~- Moving to OBCM-MW5 to install well.~~ AU ☆Skipped Page☆

001096.0275.01 Photo Log

Date	Time	Description	Dir.	Taken by
4/24	1009	Drillers setting well at 01SMMW	SW	BC
	1112	Drillers beginning 02SMSB	SW	
4/25	0817	Soils from ~~01SMMW~~ (80) 02SMSB	—	
	0821	SAA		
	1009	Red soil/URor Talls at 06SMMW	S	
	1112	old furnace/retort at Sonoma	N	
	1123	SAA	SW	
	1123	Hand augering at 04SMMW	SW	
	1156	old processing Equipment downslope from D-Retort	N	
	1449	hand augering at 04SMMW, Near Anne Belcher Ck	SW	
4/26	0758	mottled Soil from 06SMSB-B	—	
	0954	Soil at location 05SMSB-B	~~NE~~ E	
		SAA, w/Retort in Background	W	
	1219	beginning drilling at 02CMSB	N	

BOREHOLE RECORDS

12,580
12.5

BOREHOLE NO. 01SMMW

Borehole Record for 01SMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 01SMMW

Project Name Sonoma mine

Site Location

Date Started/Finished 4/23/10 / 4/24/10

Drilling Company Test America

Driller's Name Dave M

Geologist's Name B. Cicco

Geologist's Signature

Rig Type (s) CME 85

Drilling Method (s) HSA

Bit Size (s) Auger Size (s) 8"

Auger/Split Spoon Refusal —

Total Depth of Borehole Is 28' (29.2 TIOC)

Total Depth of Corehole Is —

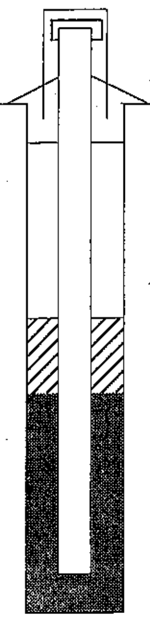
Water Level (TOIC)		
Date	Time	Level(Feet)
4/23/10		18
4/30/10	0900	11.73 TIOC

Well Location Sketch

N

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL



Stick-up ______ ft

Top of Grout 0 ft

Top of Seal at 12 ft

Top of Sand Pack 14' ft

Top of Screen at 16' ft

Bottom of Screen at 26' ft

Bottom of Hole at 28' ft

Bottom of Sandpack at 27

Lock Number ______

Inner Casing Material PVC

Inner Casing Inside Diameter 2 inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ______

Cement ______

Borehole Diameter 8 inches

Cement/ Bentonite ______

Grout ______

Screen Slot Size .010

Screen Type ______

☒ PVC ______

☐ Stainless Steel ______

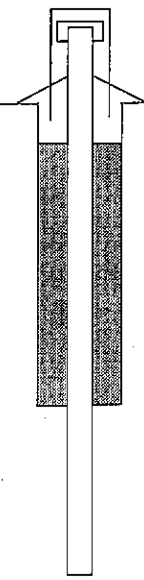
Pack Type/Size:

☒ Sand #2/16

☐ Gravel ______

☐ Natural ______

OPEN-HOLE WELL



Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ inches

Outer Casing Diameter ______ inches

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13				
14		○	○	○
15		○	○	○

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
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27											
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38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
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42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
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67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
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64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
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97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
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97				
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99				
100				
101				
102				
103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________

LOCATION ______________________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2(0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
~~21/2~~	~~0.255~~	~~0.0341~~	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

11/30/10

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm) mS/cm	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					
1100	0	0	—	—	—	—	
1105	~~4~~ 2.5		6.18	~~0.9~~ 0.9	17.10	448	
1110	5		6.51	0.9	~~3~~ 17.51	79.3	
1115	6		6.68	0.90	18.05	333.1	
1120	7		6.70	0.90	19.07	475	
1129	8		6.91	0.99	18.96	439	
1133	9		7.12	0.9	19.68	999+	
1138	10		7.21	0.9	20.41	897	

DEVELOPED BY:

DATE

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ____________________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 02SM53

Borehole Record for 02SMSB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 02SMSB

Project Name: Contact/Sonoma

Site Location:

Date Started/Finished: 4/24 - 4/24 -10

Drilling Company: Test America

Driller's Name: Dave M

Geologist's Name: Bryan Ciecko

Geologist's Signature: [signature]

Rig Type (s): CME 85

Drilling Method (s): HSA

Bit Size (s): ______ Auger Size (s): 8"

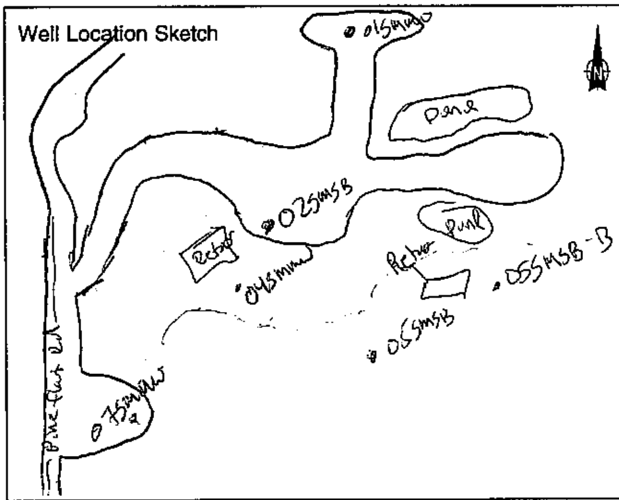
Auger/Split Spoon Refusal:

Total Depth of Borehole Is: 20.5'

Total Depth of Corehole Is:

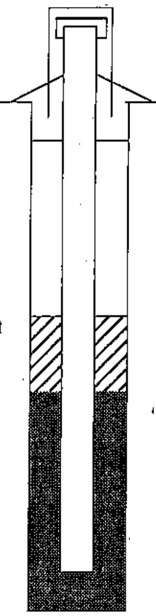
Water Level (TOIC)		
Date	Time	Level(Feet)
4/24	1312	1' ~ 14 ft BGS

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex mg/m³ ~~Fracture Sketch~~	~~HNu/OVA~~ (ppm)	Immever XRF Comments Cr, As, Hg
1											
2											
3											
4	02SMSB 3.5-4.5	5	5		1130		50%		.8		Test#5 Cr, 3151ppm As, ND Hg 314
5		8	9								
6											
7											
8		5	6								T#6 Cr 1711
9	02SMSB 8.5-10.5	6	17		1144		50%		.7		As 10
10											Hg 278
11	02SMSB 10-12	7	8		1153		60%		3.4		T=7 Cr 515
12		9	15								As ND
13											Hg 134
14											
15		7 / 17	8 / 29		1204		0				

SCREENED WELL



Stick-up ________ ft

Top of Grout ________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ________ ft

Bottom of Screen at ________ ft

Bottom of Hole at ________ ft

Bottom of Sandpack at ________

Lock Number ________

Inner Casing Material ________

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ________

Cement ________

Borehole Diameter ________ inches

Cement/ Bentonite ________

Grout ________

Screen Slot Size ________

Screen Type ________

☐ PVC ________

☐ Stainless Steel ________

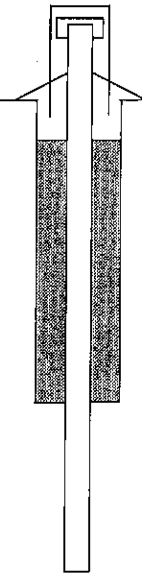
Pack Type/Size:

☐ Sand ________

☐ Gravel ________

☐ Natural ________

OPEN-HOLE WELL



Stick-up ________ ft

Inner Casing Material ________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ________ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ________

Bottom of Corehole ________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1				
2				
3	3.5-5.5 Dark reddish brown gravelly clay w ~50% silt/clay			
4	30% coarse gravel (up to 1" Diameter) and 20% medium gravel. Moist		X	
5				
6				
7				
8	8.5-10.5 gravelly clay Dk Brown w/ Reddish 'Chunks' ~ 70% clay			
9	w/20% med-fine angular gravel & 10% coarse gravel. Moist-wet		X	
10	10-12 SAA Moist.			
11			X	
12				
13				
14				
15	NR			

B1

Complete up to 12'

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Lumex ug/m3 ~~Fracture Sketch~~	~~HNu/OVA (ppm)~~	XRF ~~Comments~~
												~~#8~~
16	025HBH 15-17					1215		50%		0.4		Hg 13
17												As 16
18		14	32			1312				~~#~~.5		Cr ND
												As 7
19	025HSB 0 18.5-20.5	29	50/4					40%				Cr ND
20												Hg ND
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
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34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16	8c 15-15.1 ~~15-16~~ SAA moist			
17	15.1-17 Dark grey wxd Bedrock, fine-Very fine sandstone/siltstone		●	
18	18.5-20.5 SAA			●
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
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36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
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69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
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97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
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97				
98				
99				
100				
101				
102				
103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________________

LOCATION ______________________ WELL NO. ______________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. [illegible]

Borehole Record for 04SMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 04SMMW

Project Name Contact/Sonoma Mine EECA

Site Location Sonoma Mine

Date Started/Finished 4/25/10

Drilling Company Test America

Driller's Name Talon D.

Geologist's Name Bryan Ciccko

Geologist's Signature [signature]

Rig Type (s) NA

Drilling Method (s) Hand auger

Bit Size (s) ______ Auger Size (s) ______

Auger/Split Spoon Refusal ______

Total Depth of Borehole Is 12' 3"

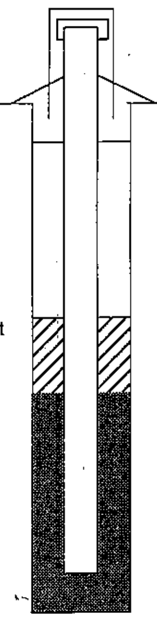
Total Depth of Corehole Is ______

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ug/m³ ~~Fracture~~ Sketch	HNu/OVA (ppm)	XRF ~~Comments~~
1										
2	04SMMW 2-5							0.2		#2 Cr 1068 ppm
3		/		0753	–	–		/		Hg 157
4										As ND
5										#3
6								0.2		Cr 800
7	04SMMW 7-9			0817	–	–				Hg 67
8										As 7
9										
10										
11										
12										
13										
14										
15										

* Screen from ~~7~~ 12' 1' sump -13' TD



SCREENED WELL

Stick-up 2 ft

Top of Grout 0 ft

Top of Seal at ~~3~~ AM 2 ft

Top of Sand Pack ~~5~~ AM 4 ft

Top of Screen at ~~7~~ AM 5 ft

Bottom of Screen at ~~4~~ AM 10 ft

Bottom of Hole at ~~4~~ AM 11 ft

Bottom of Sandpack at ~~13~~ 11

Lock Number ______

Inner Casing Material ______

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets 1 bucket (5gal)

Cement ______

Borehole Diameter ______ inches

Cement/Bentonite ______

Grout ______

Screen Slot Size ______

Screen Type ______

☐ PVC ______

☐ Stainless Steel ______

Pack Type/Size:

☒ Sand #2C 3bags

☐ Gravel ______

☐ Natural ______

OPEN-HOLE WELL

Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ inches

Outer Casing Diameter ______ inches

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0-5 Moist Dark Brown clay with gravel. ~65% clay w/25% med			
2	gravel and 10% coarse sand. reddish chunks of gravel may be			
3	ore or waste rock.		●	
4				
5	5-8 SAA moist.			
6	at ~8' lithology changes to grayish Blue clay w/ rock fragments		●	
7	possibly serpentinite.			
8				●
9	9.5' Hit some water, not much, But wet.			●
10	8-12'3" Grey/Blue wx'd bed rock, clayey, possibly serpentinite moist			●
11			●	
12			●	
13				
14				
15				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
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30											
31											
32											
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34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
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39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
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72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
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101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ____________________ DATE ____________________

LOCATION ____________________ WELL NO. ____________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (In)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ____________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________ DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ____________________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

Borehole Record for 06SMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR O6SMMW

Project Name Sonoma/contact EE/CA

Site Location Sonoma mine

Date Started/Finished 4/25/10

Drilling Company Test America

Driller's Name Dave H

Geologist's Name B. Ciecko

Geologist's Signature [signature]

Rig Type (s) —

Drilling Method (s) Hand Auger

Bit Size (s) ________ Auger Size (s) 4"

Auger/Split Spoon Refusal 5.5'

Total Depth of Borehole Is ~~5.5~~ (BC)

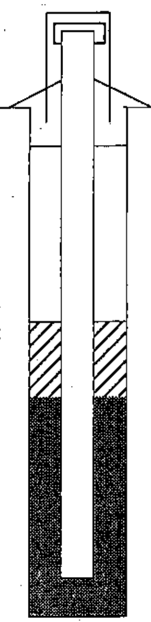
Total Depth of Corehole Is

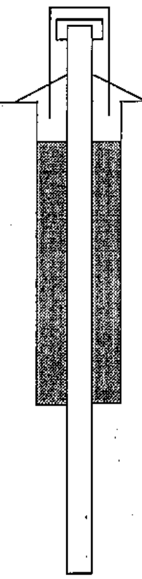
Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex (ng/m³) ~~Fracture~~ Sketch	HNu/OVA (ppm)	Comments
1								16.1		Cr 3762 ppm
2	O6SMMW			1002						Hg 238
3	0-4									As 7
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL	**OPEN-HOLE WELL**





Lock Number ________

Inner Casing Material ________

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ________

Cement ________

Borehole Diameter ________ inches

Cement/ Bentonite ________

Grout ________

Screen Slot Size ________

Screen Type ________

☐ PVC ________

☐ Stainless Steel ________

Pack Type/Size:

☐ Sand ________

☐ Gravel ________

☐ Natural ________

Screened Well

Stick-up ________ ft

Top of Grout ________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ________ ft

Bottom of Screen at ________ ft

Bottom of Hole at ________ ft

Bottom of Sandpack at ________

Open-Hole Well

Stick-up ________ ft

Inner Casing Material ________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ________ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ________

Bottom of Corehole ________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0–5.5 reddish Brown, red very well Graded Clay to cobbles. difficult to tell	○	○	○
2	whether or not these are tailings or just red soil. ~20% cobbles, 20%	○	○	○
3	Coarse to fine gravel, 60% Clay/silt.	○	○	○
4	Refusal @ 5.5' due to continued cobble collapse	○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

I Dont Believe this material is mining related. I interprate it to be native material ~~rall 5.~~

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
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41											
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43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17				
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24				
25				
26				
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42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
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75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
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74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
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103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________________________

LOCATION ______________________________ WELL NO. ______________________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419 x 10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________ DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 05S#5B

Borehole Record for 05SMSB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 05 SMSB

Project Name Sonoma/contract EECA

Site Location Sonoma mine

Date Started/Finished 4/25/10

Drilling Company Test America

Driller's Name Dave H / Talon D.

Geologist's Name Bryan Cicchi

Geologist's Signature [signature]

Rig Type (s) —

Drilling Method (s) Hand Auger

Bit Size (s) ______ Auger Size (s) ______

Auger/Split Spoon Refusal ______

Total Depth of Borehole Is ______

Total Depth of Corehole Is ______

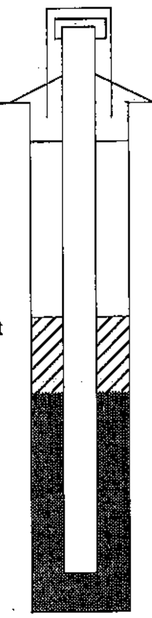
Water Level (TOIC)		
Date	Time	Level (Feet)
4/25/10	1255	9' 7"

Well Location Sketch

N

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex mg/m³ ~~Fracture~~ Sketch	HNu/OVA (ppm)	XRF (PPM) ~~Comments~~
1	05SMSB 0-1			1248				0.0		Cr 1349 Hg 162 As ND
2										
3										
4										
5										
6	05SMSB 5-7			1250				0.0		Cr 427 Hg ND As 8
7										
8										
9										
10	05SMSB 9-11			1258						Cr 169 Hg ND As 9
11										
12	05SMSB 11.5-12.5			1321				0.0		Cr 181 Hg ND As 4
13										
14										
15										

SCREENED WELL



Stick-up ________ ft

GROUND SURFACE

Top of Grout ________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ________ ft

Bottom of Screen at ________ ft

Bottom of Hole at ________ ft

Bottom of Sandpack at ________

Lock Number ________

Inner Casing Material ________

Inner Casing Inside Diameter ____ inches

Quantity of Material Used:

Bentonite Pellets ________

Cement ________

Borehole Diameter ________ Inches

Cement/ Bentonite ________

Grout ________

Screen Slot Size ________

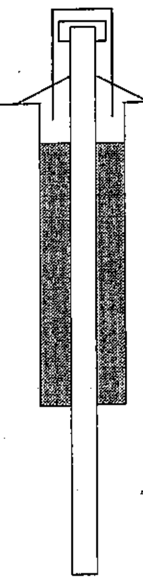
Screen Type ________

- ☐ PVC ________
- ☐ Stainless Steel ________

Pack Type/Size:

- ☐ Sand ________
- ☐ Gravel ________
- ☐ Natural ________

OPEN-HOLE WELL



Stick-up ________ ft

Inner Casing Material ________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ________ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ________

Bottom of Corehole ________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	0-1 Dark Brown to Black very well graded clay to gravel moist			
1	~40% ~~40%~~ Clay 20% Course Sand 20% fine gravel & 20% 1/2-1" gravel		X	
2	1-8 Brn - dark Brn very well graded clay to gravel ~60% Clay		X	
3	~30% Coarse to fine gravel 10% med sand.		X	
4			X	
5				
6				
7	8-12 Brown - Dk Brown well graded gravelly Clay / Clayey gravel			
8	~45% Clay & 45% gravel, med-coarse 10% med sand.			
9	Wet			
10				X
11				X
12				X
13				
14				
15				

Not sure if any of this is pre WR or tails, likely just fill. Just to be safe, combine entire hole

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
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39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
16		○	○	○
17		○	○	○
18		○	○	○
19		○	○	○
20		○	○	○
21		○	○	○
22		○	○	○
23		○	○	○
24		○	○	○
25		○	○	○
26		○	○	○
27		○	○	○
28		○	○	○
29		○	○	○
30		○	○	○
31		○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
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68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
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94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
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92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________

LOCATION ______________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
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5	1.020	0.1364	12.670	12.670×10^{-3}
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6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419 x 10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 09SMMW

Borehole Record for 04SMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 09SMMW

Project Name Contact/Sonoma EECA

Site Location Sonoma mine

Date Started/Finished 4-25-10

Drilling Company Test America

Driller's Name Talon D

Geologist's Name Bryan Ciecko

Geologist's Signature [signature]

Rig Type (s) —

Drilling Method (s) Hand Auger

Bit Size (s) ______ Auger Size (s) ______

Auger/Split Spoon Refusal ______

Total Depth of Borehole Is ______

Total Depth of Corehole Is ______

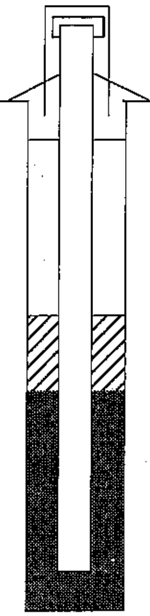
Water Level (TOIC)

Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	~~Fracture~~ Lumex ug/m3 Sketch	HNu/OVA (ppm)	~~Comments~~ XRF (ppm)
1	09SMMW 0-4			1416						Cr 808
2								0.1		As 6
3										Hg 26
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

SCREENED WELL



Stick-up 2' ft

Top of Grout 0 ft

Top of Seal at 1'2" ft

Top of Sand Pack 2'2" ft

Top of Screen at 2'8" ft

Bottom of Screen at 5'8" ft

Bottom of Hole at 5'8" ft

Bottom of Sandpack at 5'8"

Lock Number ____

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ____

Cement ____

Borehole Diameter ____ inches

Cement/ Bentonite ____

Grout ____

Screen Slot Size ____

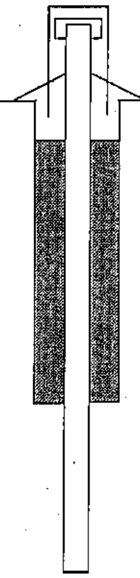
Screen Type ____

- ☐ PVC ____
- ☐ Stainless Steel ____

Pack Type/Size:

- ☐ Sand ____
- ☐ Gravel ____
- ☐ Natural ____

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

Outer Casing Diameter ____ inches

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Outer Casing ____ ft

Bottom of Inner Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0-6" Dk Brown Gravelly silt w/ cobble up to 4" — ~~BBB~~ fine sand/silt	○	○	○
2	20% gravel (fine-coarse) 10% cobble	○	○	○
3	6"-6' SAA, but no cobbles	○	○	○
4		○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

All appears to be native material, however, more contamination in the form of Bricks is nearby

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
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34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
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62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
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71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
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95											
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97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________________

LOCATION ______________________ WELL NO. ______________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon watar weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ____________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 08SM5B

Borehole Record for 08SMSB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 08SMSB

Project Name Contact/Sonoma EE/CA

Site Location Sonoma Mine

Date Started/Finished 4-25-10

Drilling Company Test America

Driller's Name Talon D.

Geologist's Name Bryan Ciecko

Geologist's Signature B Cie

Rig Type (s) —

Drilling Method (s) Hand Auger

Bit Size (s) ______ Auger Size (s) ______

Auger/Split Spoon Refusal ______

Total Depth of Borehole Is ______

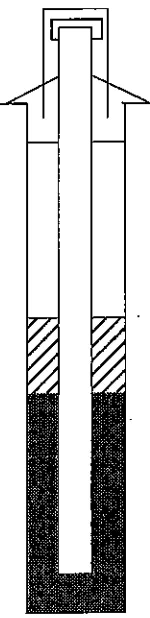
Total Depth of Corehole Is ______

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ng/m3 ~~Fracture~~ Sketch	HNu/OVA (ppm)	XRF (ppm) ~~Comments~~
										Test 4 4/26
1	08SMSB 0-4									Cr 126
2				1519				0.0		Hg ND
3										As 8
4										
5	08SMSB 4-8									#5
6				1526						Cr ND
7								0.0		Hg ND
8										As 16
9	08SMSB 8-12			1553						#10
10								1.2		Cr 489
11										As 8
12										Hg ND
13										
14										
15										

SCREENED WELL



Lock Number ________

Inner Casing Material ________

Inner Casing Inside Diameter ____ inches

Stick-up ________ ft

GROUND SURFACE

Top of Grout ________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ________ ft

Bottom of Screen at ________ ft

Bottom of Hole at ________ ft

Bottom of Sandpack at ________

Quantity of Material Used:

Bentonite Pellets ________

Cement ________

Borehole Diameter ________ inches

Cement/ Bentonite ________

Grout ________

Screen Slot Size ________

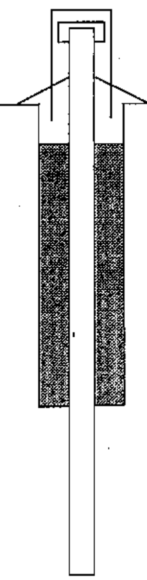
Screen Type ________

- ☐ PVC ________
- ☐ Stainless Steel ________

Pack Type/Size:

- ☐ Sand ________
- ☐ Gravel ________
- ☐ Natural ________

OPEN-HOLE WELL



Stick-up ________ ft

Inner Casing Material ________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ________ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ________

Bottom of Corehole ________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0-4' lt Brn/yellow Brown Clay w/ fine gravel Moist		●	
2	~85% Clay/silt ~15% fine gravel/course sand		●	
3			●	
4			●	
5	4-8 Dk Brn ~~poorly graded~~ BC red mottled. poorly graded clay		●	
6	w/ silt & ~10% course sand		●	
7	wet at ~8' at contact between wxd bedrock & overlying soil.		●	
8	8-12 Gray/ ~~green~~ BC blue wxd bedrock, likely serpentinite.			●
9			●	
10			●	
11			●	
12				
13				
14				
15				

Combine Samples to 8'

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
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42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16				
17				
18				
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22				
23				
24				
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42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
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67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
46				
47				
48				
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69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
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104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
77				
78				
79				
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85				
86				
87				
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103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ____________________ DATE ____________________

LOCATION ____________________ WELL NO. ____________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419 x 10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ____________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. B62MW-B

Borehole Record for 06SMMW-B

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 06SMMW-B

Project Name: Sonoma/Contract EECA
Site Location: Sonoma Mine

Date Started/Finished: 4/26/10.
Drilling Company: T4
Driller's Name: Talon D
Geologist's Name: Bryan Circle
Geologist's Signature:
Rig Type (s): —
Drilling Method (s): Hand Auger
Bit Size (s): ______ Auger Size (s): ______
Auger/Split Spoon Refusal: ______
Total Depth of Borehole Is: ______
Total Depth of Corehole Is: ______

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	~~Fracture~~ Lumex mg/m^3 Sketch	HNu/OVA (ppm)	XRF (PPM) ~~Comments~~
1–3	06SMMW-B 1-3		0745 →					0.0		As 10, Cr 1517, Hg 15
4–6	06SMMW-B 4-6		0757 →					0.0		Cr 385, As ND, Hg ND
7.5–9.5	06SMMW-B 7.5-9.5		0814 →					0.2		Cr 766, Hg ND, As ND
11–13	06SMMW-B 11-13		0853 →					0.1		Cr ND, Hg ND, As 12
14										
15										

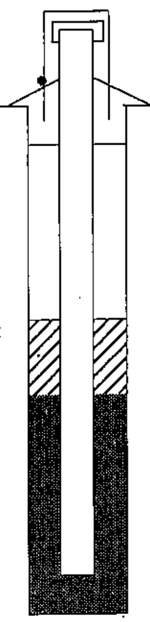
~~6-12 : 6' Screen w/ 1' Sump~~ ~~TD - 13'~~

~~6.5 - 11.5 5' Screen~~ 12.5 w/ sump

DTW - 5.5 Rbgs

chips from 2.5 → 1.0

SCREENED WELL



Stick-up 2 ft

GROUND SURFACE

Top of Grout ______ ft

Top of Seal at 2.5 ft

Top of Sand Pack 2.5 ft

Top of Screen at 4.5 ft

Bottom of Screen at 9.5 ft

Bottom of Hole at 11 ft

Bottom of Sandpack at 11

Lock Number ______

Inner Casing Material ______

Inner Casing Inside Diameter ____ inches

Quantity of Material Used:

Bentonite Pellets 1/2 - 5 gal bucket

Cement ______

Borehole Diameter ______ inches

Cement/ Bentonite ______

Grout ______

Screen Slot Size 0.010

Screen Type ______

☒ PVC ______

☐ Stainless Steel ______

Pack Type/Size:

☒ Sand #2C 3 bags

☐ Gravel ______

☐ Natural ______

OPEN-HOLE WELL

Stick-up ______ ft

Inner Casing Material ______

Inner Casing Inside Diameter ______ inches

Outer Casing Diameter ______ inches

Borehole Diameter ______ ft

Bedrock ______ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ______ ft

Corehole Diameter ______

Bottom of Corehole ______ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	0-6" ~~Bo~~ Cobbles, colluvium.		●	
1	6"-3.5' light brown/yellow Brown Mottled clay w traces of Char		●	
2	and Red fine gravel		●	
3	3.5 to dark gray / Dark Brown / white mottled clay (See photo 108)		●	
4	6.5 to w/ some coarse sand, no gravel		●	
5	6.5 - 7.5 Brown gravelly silt, wet w 1/2" - 2" sub rounded gravel		●	
6	~35% gravel 65% silt/clay		●	
7	7.5 - 8.5 lt brown very stiff clay, Poorly graded. little to			●
8	no color variation			●
9	8.5 - 11 lt yellow Brown to lt gray mottled very stiff clay 90%		●	
10	~~S~~ silt/clay ~10% very fine sand		●	
11			●	
12	11 - 12 Brown/gray clay w/ silt & gravel, ~~wet~~ ~20% 1/2" - 2" angular			●
13	gravel w/ ~~80~~ 75% silt/clay and 5% coarse sand			
14	12-13 Gray/Blue wx'd bedrock, serpentinite		●	
15				

Combine samples to 6'

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
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45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
16				
17				
18				
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22				
23				
24				
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43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
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72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
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103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
77				
78				
79				
80				
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97				
98				
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100				
101				
102				
103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________

LOCATION ______________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________ DATE ______________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

SOIL AND SEDIMENT CLASSIFICATION

GRAIN-SIZE SCALE (Modified Wentworth Scale)

phi	mm	inches	U.S. Standard Sieve Series	Grade Name		
-12	4096	161.3				
				very large		
-11	2048	80.6				
				large		
-10	1024	40.3			Boulders	
				medium		
-9	512	20.2				
				small		
-8	256	10.1				
				large		
-7	128	5.0			Cobbles	
				small		GRAVEL
-6	64	2.52	63 mm			
				very coarse		
-5	32	1.26	31.5 mm			
				coarse		
-4	16	0.63	16 mm			
				medium	Pebbles	
-3	8	0.32	8 mm			
				fine		
-2	4	0.16	No. 5			
				very fine		
-1	2	0.08	No. 10			
				very coarse		
0	1	0.04	No. 18			
				coarse	Sand	SAND
+1	0.500		No. 35			
				medium		
+2	0.250		No. 60			
				fine		
+3	0.125		No. 120			
				very fine		
+4	0.062		No. 230			
				coarse		
+5	0.031				Silt	
				medium		
+6	0.016					
				fine		
+7	0.008					MUD
				very fine		
+8	0.004					
				coarse		
+9	0.002					
				medium		
+10	0.001					
				fine		
+11	0.0005					
				very fine		CLAY SIZE
+12	0.00025					

PROPORTIONS USED IN DESCRIBING SOILS

Trace - Particles are present but estimated to be less than 5%
Few - 5 to 10%
Little - 15 to 25%
Some - 30 to 45%
Mostly - 50 to 100%

i.e.: Sand with a trace of silt = .95% Sand, <5% Silt

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to relatively small sample diameter.)

Soil Density from Standard Penetration Test (ASTM D1586)

Granular Soils	Cohesive Soils
0 - 10: Loose	0 -4: Soft
10 - 30: Medium Dense	4 - 8 : Medium Stiff
30 - 50:Dense	8 - 15 : Stiff
Over 50: Very Dense	15 - 30 : Very Stiff

CLASSIFICATION CHART(United Soil Classification System)

MAJOR DIVISIONS		
GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures,little or no fines
	GP	Poorly graded gravels or gravel-sand mixtures little or no fines
	GM	Silty gravels, gravel-sand-silt mixture
	CC	Clayey gravels, gravel-sand-clay mixtures
SANDS (More than 1/2 of coarse fraction < No. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
	SP	Poorly graded sands or gravelly sands, little or no fines
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand clay mixtures
SILTS AND CLAYS LL< 50	ML	Inorganic silts, and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays, of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic clays of low plasticity
SILTS AND CLAYS LL> 50	MH	Inorganic silts, micaceous or diatamaceous, fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils

ASTM CRITERIA FOR DESCRIBING SOIL

Criteria for Describing Angularity of Coarse-Grained Particles

Description	Criteria
Angular	Particles have sharp edges and relatively plane side with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved side and no edges

Criteria for Describing Dilatancy

Description	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

Criteria for Describing Toughness

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit . The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

Criteria for Describing Dry Strength

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and shard surface

Criteria for Describing Structure

Description	Criteria
Stratified	Alternating layers of varing material or color with layers at least 6 mm thick; note thickness.
Laminated	Alternating layers of varying materials or color with the layers less than 6 mm thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout.

CRITERIA FOR DESCRIBING SOIL (Cont.)

Criteria for Describing the Reaction with HCl

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

Criteria for Describing Consistency

Description	Criteria
Very Soft	Thumb will penetrate soil more than 1 inch (25 mm)
Soft	Thumb will penetrate soil about 1 inch (25 mm)
Firm	Thumb will indent soil about 1/4 inch (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Criteria for Describing Cementation

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

Criteria for Describing Particle Shape

The particle shape shall be described as follows where length, width, and thickness refer to greatest, intermediate, and least dimensions of a particle, respectively (see page 104).

Flat	Particles with width/thickness ratio > 3
Elongated	Particles with length/width ratio > 3
Flat and Elongated	Particles meet criteria for both flat and elongated

Criteria for Describing Plasticity

Description	Criteria
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Identification of Inorganic Fine-Grained Soils from Manual Tests

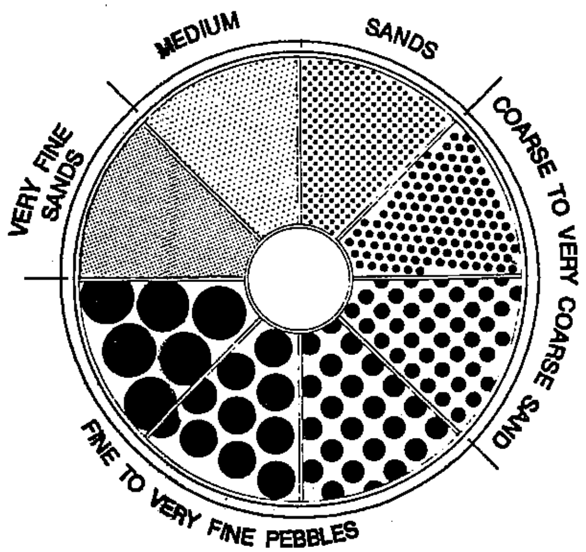
Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

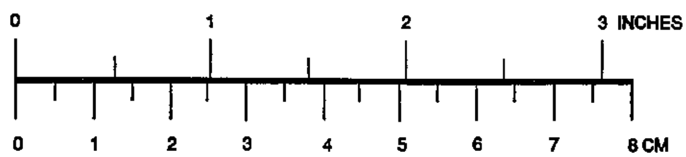
Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

SEDIMENT PARTICLE SIZE AND SHAPE ESTIMATES

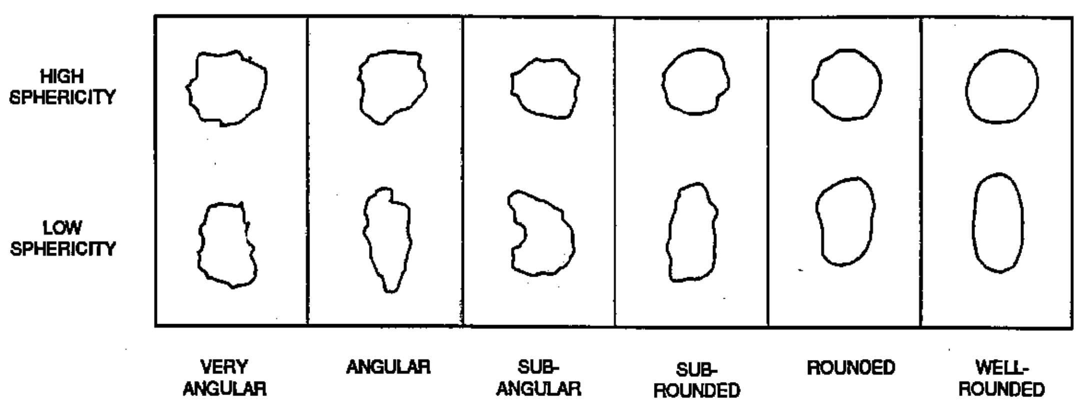
GRAPH FOR DETERMINING SIZE OF SEDIMENTARY PARTICLES





COBBLES RANGE FROM 6.4 TO 25.6 cm (~ 2.5 TO 10.1 INCHES)
BOULDERS ARE LARGER THAN 25.6 cm (>10.1 INCHES)

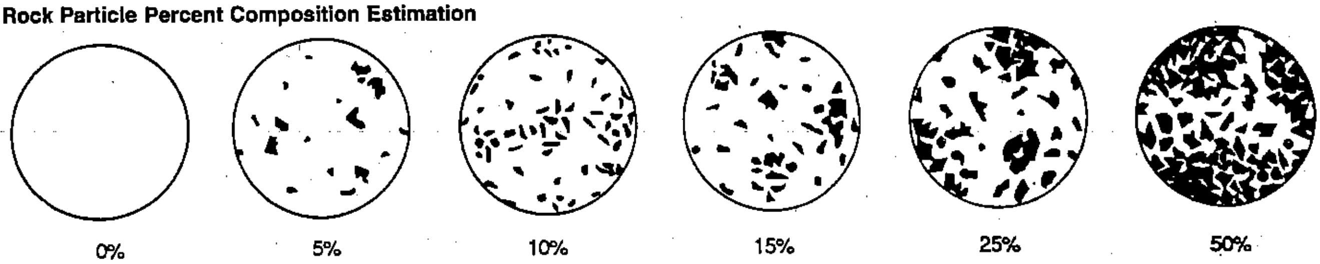
SEDIMENT PARTICLE SHAPES



ROCK DESCRIPTIVE TERMS

Term		Defining Characteristics	
Hardness	Soft Medium Hard Hard Very Hard	Scratched by fingernail Scratched easily by penknife Difficult to scratch with a penknife Cannot be scratched by penknife	
Weathering	Fresh	Rock is unstained. May be fractured, but discontinuities are not stained.	
	Slighty	Rock is unstained. Discontinuities show some staining on the surfaces of rocks, but discoloration does not penetrate rock mass.	
	Moderate	Discontinuity surfaces are stained. Discoloration may extend into rock along discontinuity surfaces.	
	High	Individual rock fragments are thoroughly stained and may be crumbly.	
	Severe	Rock appears to consist of gravel-sized fragments in a "soil" matrix. Individual fragments are thoroughly discolored and can be broken with fingers.	
Bedding Planes	Laminated	< .04 in.	< 1 mm
	Parting	.04 in. - .24 in.	1mm - 6mm
	Banded	.24 in. - 1in.	6 mm - 3 cm
	Thin	1 in. - 4 in.	3 cm - 9.1 cm
	Medium	4 in. - 12 in.	9.1 cm - 30.5 cm
	Thick	12 in.- 36 in.	30.5 cm - 1m
	Massive	> 36 in.	> 1 m
Joints and Fracture Spacing	Very close	< 2 in.	< 5.1 cm
	Close	2 in. - 1ft.	5.1 - 30.5 cm
	Moderately close	1ft. - 3 ft.	30.5 cm - 91.4 cm
	Wide	3 ft. - 10 ft.	91.4 cm - 3 M
	Very wide	> 10 ft.	> 3 M
Voids	Porous	Smaller than a pinhead. Their presence is indicated by the degree of absorbency.	
	Pitted	Pinhead size to a 1/4 inch. If only thin walls separate the individual pits, the core may be described as honeycombed.	
	Vug	1/4 inch to the diameter of the core. The upper limit will vary with core size.	
	Cavity	Larger than the diameter of the core.	

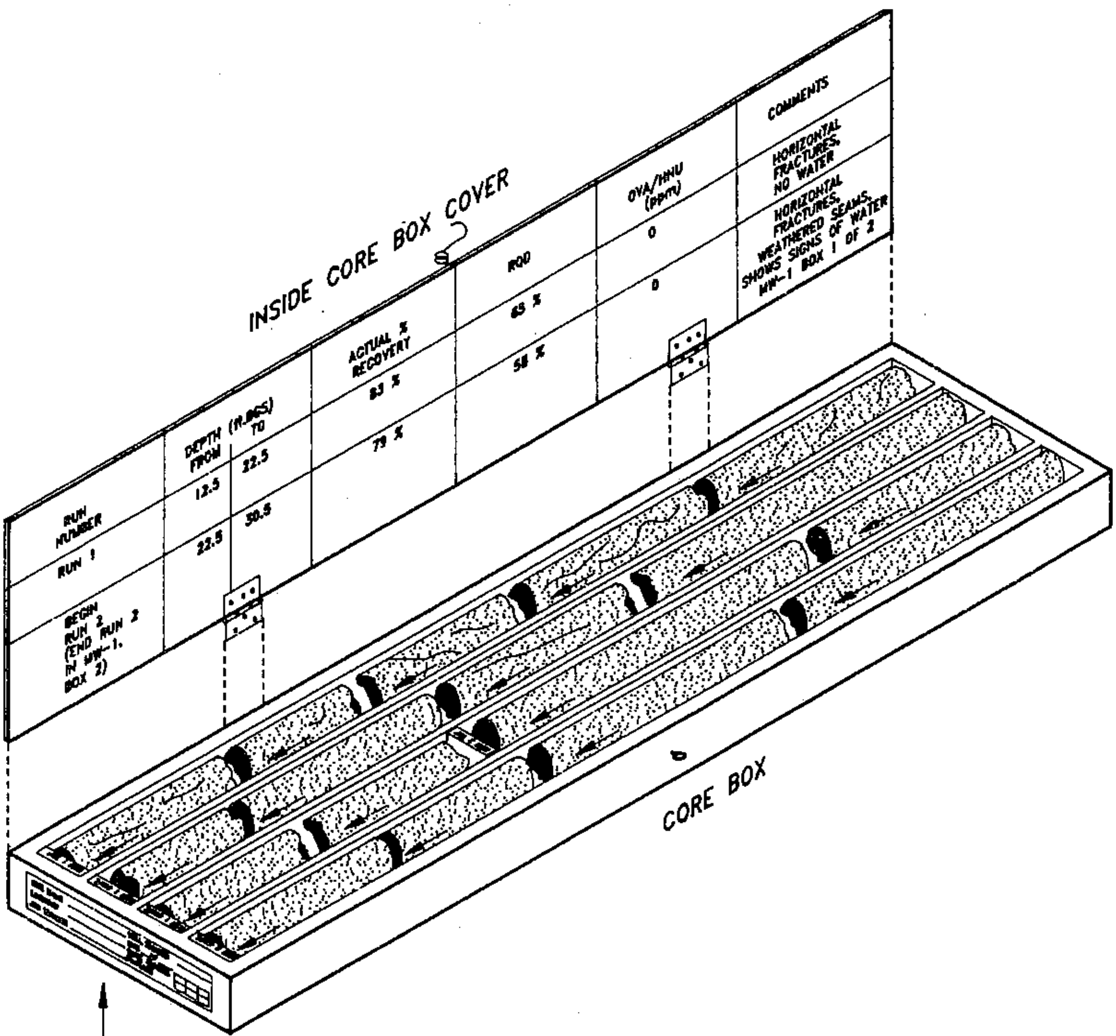
Rock Particle Percent Composition Estimation



ABC LANDFILL
SYRACUSE, NEW YORK
XA-6022

MONITORING WELL MW-1
BOX 1 OF 2
CORE RUN 1 12.5'-22.5'
BEGINNING CORE RUN 2 22.5' - 30.5'

EXAMPLE: OUTSIDE CORE BOX COVER



RECORD THIS INFORMATION ON EACH END PANEL

SITE NAME ____________ WELL NUMBER ________
LOCATION ____________ BOX ___ OF ___
JOB NUMBER ____________ CORES #
FOOTAGE

SIDE PANELS

COREBOX DETAIL

ROCK CORE HANDLING AND COREBOX PACKING

NOTES:

1. HANDLING OF CORE – THE TOP OF THE CORE SHALL BE PLACED AT THE BACK LEFT CORNER OF THE CORE BOX. THE REMAINING CORE SHALL BE PLACED TO THE RIGHT OF THE PRECEDING SECTION. THE CORE BOX SHALL BE FILLED IN THIS MANNER MOVING TO THE FRONT SECTIONS OF THE BOX AS NEEDED. THE BEGINNING OF EACH RUN SHALL BE MARKED ON THE CORE AND ALSO NOTED WITH A MARKED WOODEN BLOCK.

2. CORE LABELING – THE TOP OF THE CORE WILL BE SHOWN ON EACH PIECE OF CORE WITH AN ARROW WRITTEN IN A BLACK WATERPROOF MARKER. THE ARROW WILL INDICATE WHICH END OF THE CORE IS NEARER GROUND SURFACE.

   OTHER MARKS MADE ON CORES MAY INCLUDE:
   - MECHANICAL BREAKS
   - DRILLING FOOTAGES

3. CORE LOSS – MISSING SECTIONS OF CORE WILL BE SHOWN BY WOODEN SPACER BLOCKS. THE SITE GEOLOGIST WILL INSERT THE SPACER INTO THE COREBOX IN PLACE OF THE MISSING SECTION. THE SPACER SHOULD INDICATE THE RUN NUMBER AND FOOTAGE OF THE MISSING CORE.

4. CORE BOX LABELING – INCLUDE THE FOLLOWING:

   OUTER CORE BOX COVER

   TOP LEFT: PROJECT NAME
   CITY, STATE
   PROJECT NUMBER

   LOWER RIGHT: MONITORING WELL (MW1)
   (EXAMPLE) BOX 1 OF 2
   CORE RUN 1 12.5'–22.5'
   BEGINNING CORE RUN 2 22.5' – 30.5'

   BOTH OUTSIDE PANELS

SITE NAME ________	WELL NUMBER ________			
LOCATION ________	BOX __ OF __			
JOB NUMBER ________	CORE #			
	FOOTAGE			

   INSIDE CORE BOX COVER

   THE FOLLOWING COLUMNS WILL BE RECORDED ON THE INSIDE CORE BOX COVER.

RUN NUMBER	DEPTH (FT. BGS)		ACTUAL % RECOVERY	RQD	OVA/HNU (ppm)	COMMENTS
	FROM	TD				

   ONE ROW REGARDING THE ABOVE INFORMATION WILL BE RECORDED FOR EACH CORE RUN OR PARTIAL CORE RUN CONTAINED WITHIN THE COREBOX.

5. CORE BOX STORAGE – CORE BOXES FROM ALL SITE WELLS WILL BE MOVED FROM WELLHEADS ON A REGULAR BASIS AND STORED IN A DESIGNATED AREA. THIS LOCATION SHOULD BE IN AN AREA WHERE THE CORE BOXES WILL BE UNDISTURBED. WHEREVER POSSIBLE, THE COREBOX STORAGE AREA SHOULD BE INDOORS.

CORE BOX LOGGING DETAIL

ROCK QUALITY DESIGNATION AND FRACTURE FREQUENCY

Core borings are a useful means of obtaining information about the quality of rock mass. The recoverable core indicates the character of the intact rock and the number and character of the natural discontinuities.

Another quantitative index that has proved useful in logging NX core is a rock quality designation (RQD) developed by Deere (1963). The RQD is a modified core recovery percentage in which all the pieces of sound NX core over 4 inches long are counted as recovery. The length of the core run is the distance to the nearest tenth of a foot from the corrected depth of the hole at the end of the previous run to the corrected depth of the hole at the end of subject run. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. The RQD is a more general measure of the core quality than the fracture frequency. Core loss, weathered and soft zones, as well as fractures, are accounted for in this determination. The RQD provides a preliminary estimate of the variation of the in situ rock mass properties from the properties of the "sound" portion of the rock core. Thus, a general estimate of the behavior of the rock mass can be made. An RQD approaching 100 percent denotes an excellent quality rock mass with properties similar to that of an intact specimen. RQD values ranging from 0 to 50 percent are indicative of a poor quality rock mass having a small fraction of the strength and stiffness measured for an intact specimen.

RQD (Rock Quality Designation)

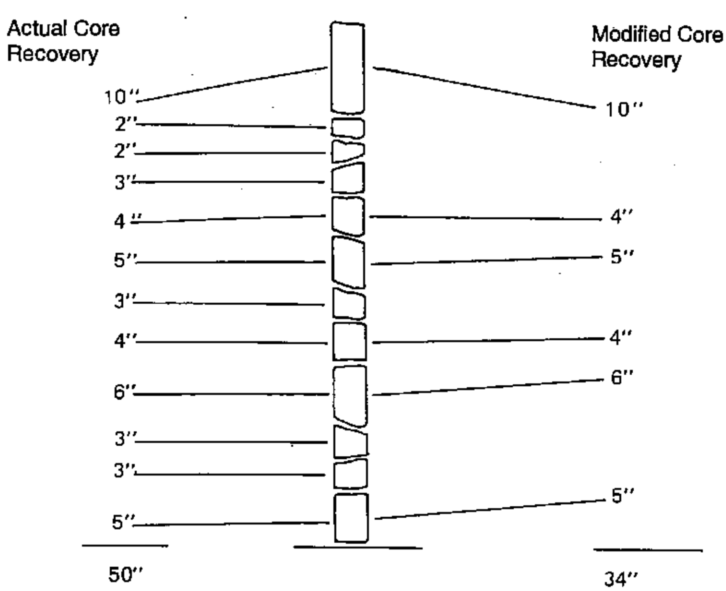
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

An example of determining the RQD from a core run of 60 inches measured from corrected depth to corrected depth is given in diagram below. For this particular case, the core recovery was 50 inches and the modified core recovery was 34 inches. This yields an RQD of 57 percent, classifying the rock mass in the fair category.

Problems arise in the use of RQD for determining the in situ rock mass quality. The RQD evaluates fractures in the core caused by the drilling process, as well as in natural fractures previously existing in the rock mass. For example, when the core hole penetrates a fault zone or a joint, additional breaks may form that, although not natural fractures, are caused by natural planes of weakness existing in the rock mass. These fresh breaks occur during drilling and handling of the core and are not related to the quality of the rock mass. The skill of the driller will affect the amount of breakage and the core loss that occurs. Poor drilling techniques will "penalize" the rock by lowering its apparent quality. It is difficult to distinguish between drilling breaks and those natural and incipient fractures that reflect the quality of the rock mass. In certain instances, it may be advisable to include all fractures when estimating RQD. Obviously, some judgment is involved in core logging.

Another problem with the use of the RQD index is that the determinations are not sensitive to the tightness of the individual joints, whereas in some instances, the in situ deformation modulus may be strongly affected by the average joint opening.

RQD OF A SINGLE CORE RUN



Core Run 60" (Corrected depth to corrected depth)

$$\frac{34"}{60"} \times 100\% = 57\% = \text{Fair}$$

Typical calculation of RQD of a single core run. Note that the run is calculated from corrected depth to corrected depth.

CEMENT AND GROUT MIXTURES, ANNULAR SPACE, AND CONVENIENT CONVERSION FACTORS

CEMENT MIX PER ONE - NO. 94 CEMENT SACK				
MIXING WATER		VOLUME OF SLURRY		DENSITY
gal	ft^3	gal	ft^3	g/cm^3
5.2 *	.70	8.8	1.2	1.9
6	.80	9.7	1.3	1.8
7	.94	10.5	1.4	1.7

Table values reflect the cement mixture obtained using one 94 lb sack of API Class A/Portland Type I cement (one cubic foot) with specified volume of water.

The addition of bentonite to cement requires that the amount of water also be increased. 5.3 % water by weight should be added for each 1.0% of bentonite by weight added.

* This is the minimum volume of water needed to hydrolize one 94 lb. sack of cement (neat cement slurry).

ANNULAR VOLUME

ANNULAR VOLUME FORMULA (gallons)

$$V = (d_2^2 - d_1^2)(D)(.041)$$

V = Volume (gallons)

d_2 = Diameter of borehole (inches)

d_1 = Casing O.D. (inches)

D = Depth of drilled hole to fill (feet)

ANNULAR VOLUME CHART (cubic feet/linear feet)*

Casing (I.D)	Borehole Diameter (O.D.) 6"	7"	8"	9"	10"
2"	.17	.24	.32	--	--
4"	--	.16	.24	.33	--
6"	--	--	.11	.20	.31

Note: Add extra cement/grout to account for seepage or loss due to voids around drill hole.

GENERAL INFORMATION

CONVERSION FACTOR

Multiply	By	To Obtain
Cubic feet	7.4805	Gallons (U.S.)
Gallons	0.1337	Cubic feet

CEMENT - ONE SACK

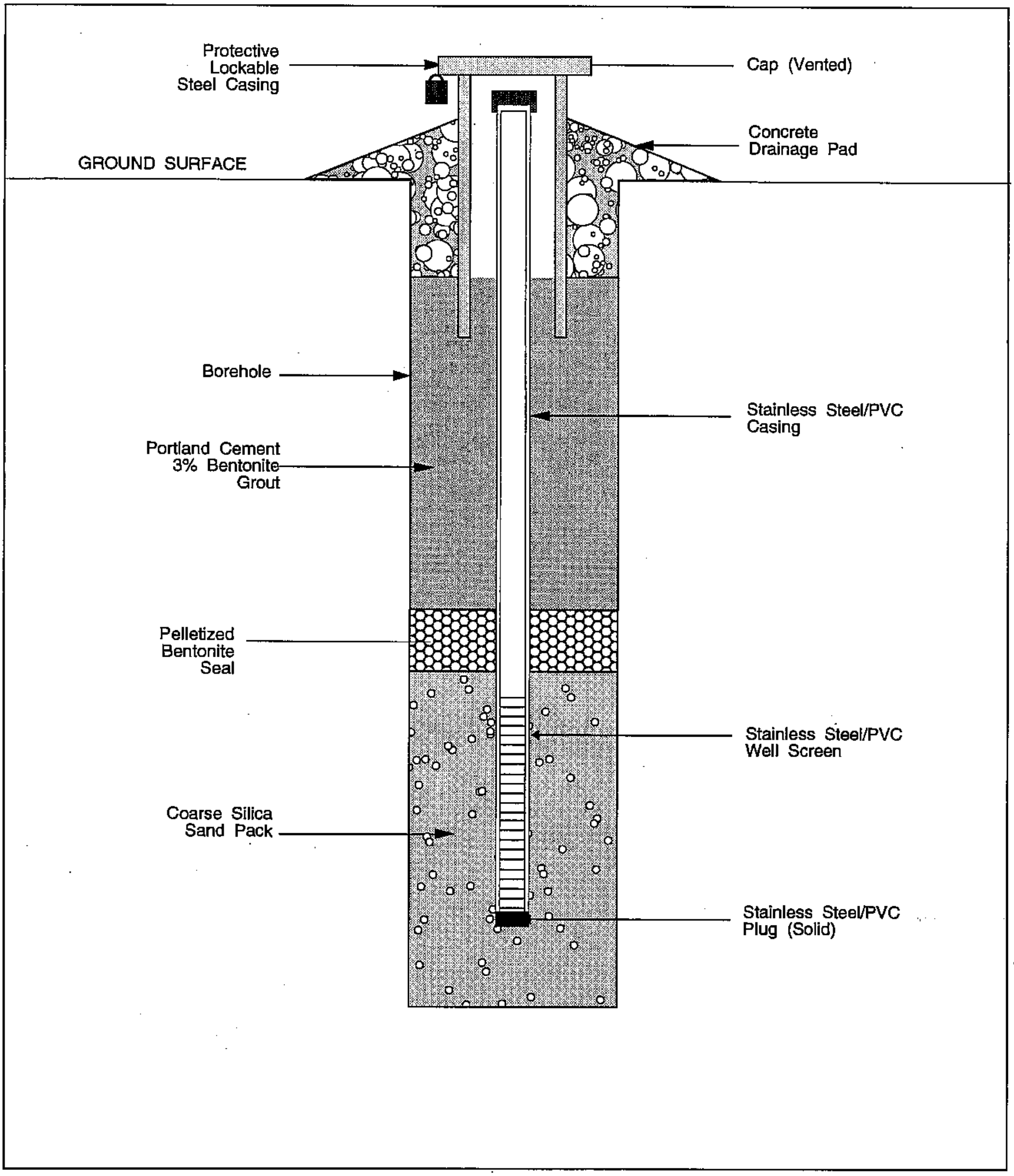
Weight	94 lbs.
Volume	7.48 gallons 1.0 ft^3
Density	3.15 g/cm^3

WATER

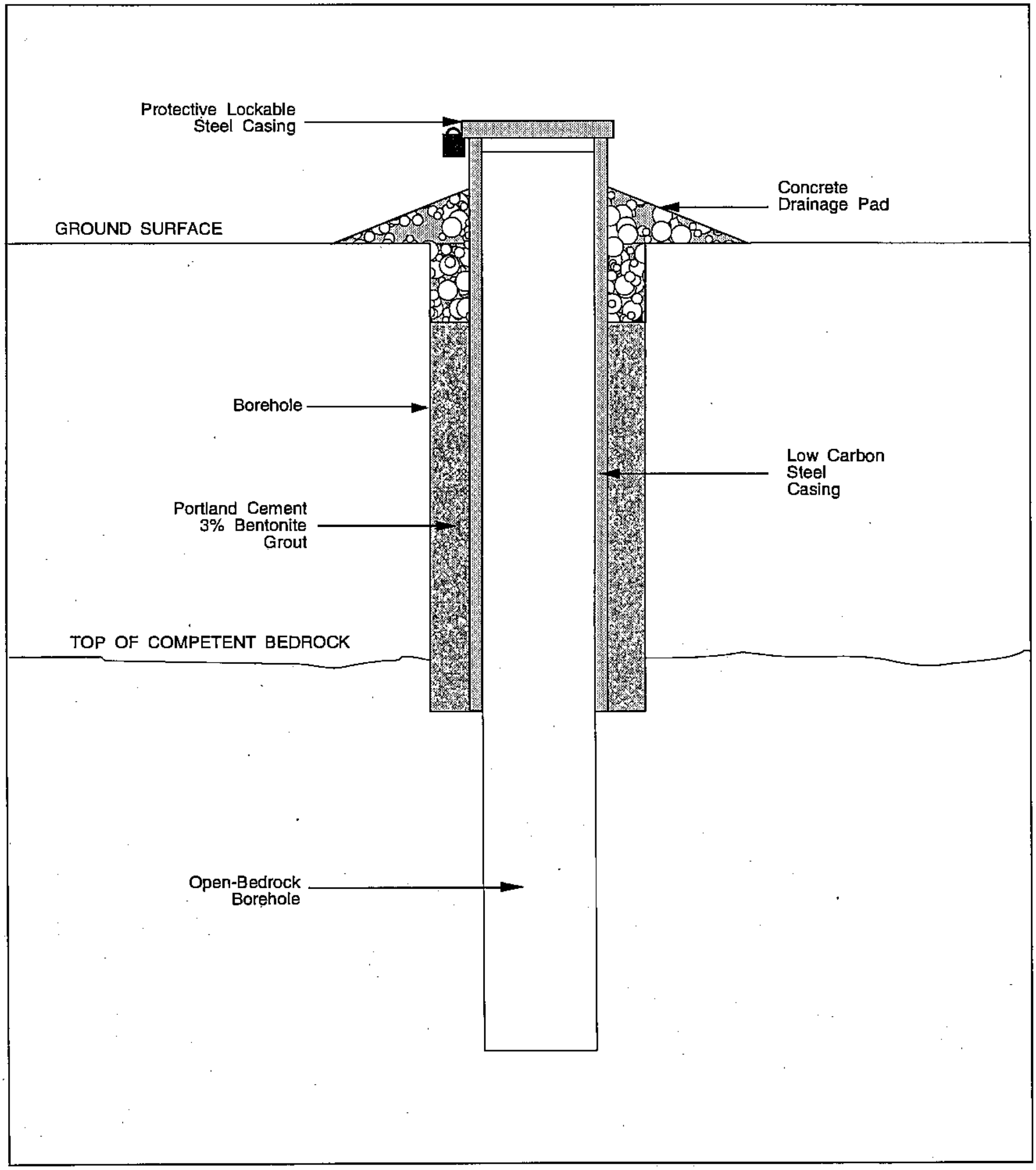
Density - 8.32 lbs./gallons

62.23 lbs/ ft^3

1.0 gallons/cm^3

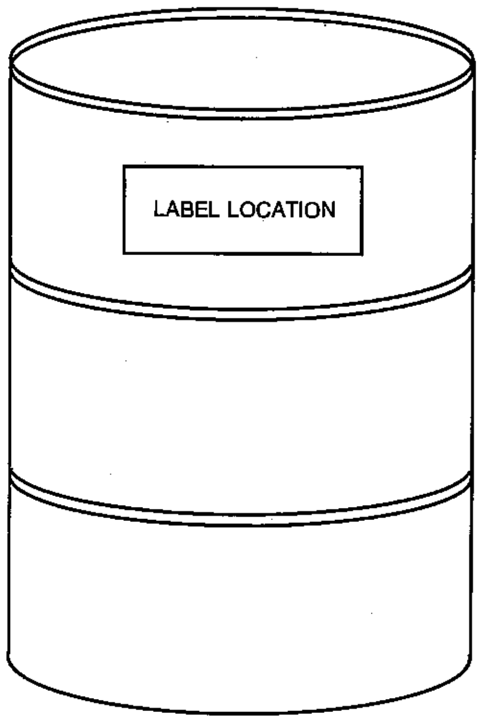


TYPICAL SCREENED MONITORING WELL CONSTRUCTION



TYPICAL OPEN-HOLE MONITORING WELL CONSTRUCTION

INVESTIGATION-DERIVED WASTE DRUM/CONTAINER PACKING AND LABELING



- Record applicable information on each drum (see Note No. 2)
- Labeling should be located on the upper 1/3 of the drum
- Label drum using an enamel paint stick

EXAMPLE LABEL

SITE NAME.	ABC LANDFILL
DATE	JAN. 2,1991
MATERIAL	DRILL CUTTINGS (100% SOLID)
DRUM ID. NUMBER	DRUM NO.3
SOURCE OF MATERIAL	MONITORING WELL 2 (30'-36')
SITE CONTRACTOR	ECOLOGY AND ENVIRONMENT

1. WASTE DRUM/CONTAINER PACKING

Wastes from separate sources should not be mixed into a single drum whenever possible. Drums should not be overpacked. Particular care should be taken to leave enough headspace to account for the expansion due to freezing of liquids containing water as it is not unusual for drums to remain onsite for several months or more. Care should be taken to keep the outsides of the drum free from investigation-derived wastes. Drums with bungholes (DOT 17-E) should be filled only with liquids. Drums with open tops (DOT 17-H) may be filled with liquids or solids. Be sure to properly fit the gasket on a 17-H drum when filling with liquids.

Lids should be placed on drums and be securely fastened with the retainer loop. Retainer loops are most easily put onto drums by starting at one end and working over the drum/lid lip. Care should be taken to visually inspect this seal. An improper seal will result in drum leakage regardless of how tight the nut-bolt fastener is tightened. The retainer loop may require gentle tapping around its circumference to seal properly. Finally, secure the retainer loop with the nut and bolt fastener. The nut and bolt assembly should be facing downward.

2. DRUM/CONTAINER LABELING

Waste drums should be clearly labeled using a enamel paint stick. The following information should be recorded directly on the drum face.

- Site name
- Date when material was generated
- Matrix (soil, water, personal protective gear, precentage of solids,liquids, etc.)
- Drum ID number
- Source of material and depth where applicable
- Ecology & Environment, Inc.

Additional material may include:

- Listing of hazardous substances known to be within (acetone, hexane, methanol, etc.)
- Expected concentration of materials (low, medium, high)
- Warnings/cautions for next party opening drum

All labeling should be done on the side of the drum. Duct tape should not be used to label drums. Writing should be done directly on the drum itself.

3. DRUM/CONTAINER STORAGE AND HANDLING

Investigation-derived waste should be left on site unless previously directed otherwise by the E&E Project Manager. Filled drums, particularly soils or waters should be left in the place where they are filled. Field crews should not attempt to lift, roll, or otherwise move drums at a site. Moving drums without the proper equipment can easily cause personal injuries, damage to the drum, and/or to the work site. Therefore if the drums need to be moved to a central repository, arrangements should be made for the appropriate equipment to be used.

4. DRUM/CONTAINER NUMBERING

Drum numbers should be consecutive.

REFERENCES

REFERENCES

American Society for Testing and Materials, 1986, 1986 Annual Book of ASTM Standards, Volume 4.08, Section 4, Construction, Soil and Rock: Building Stones, Philadelphia, Pennsylvania.

Deere, D.V., 1963, Technical Description of Rock Cores for Engineering Purposes: Rock Mechanics and Engineering Geology, Vol. 1, No. 1, pp.16-22.

Dow Chemical, 1980, Field Data Handbook, Dowell Division of Dow Chemical, Houston, Texas.

Driscoll, F.G. (editor/principal author), 1986, Groundwater and Wells, Second Edition, Johnson Filtration Systems, Inc., St. Paul, Minnesota.

Dutro, J.T., Jr., R.V. Dietrich, and R.M. Foose (compilers), 1989, AGI Data Sheets for Geology in the Field, Laboratory, and Office, Third Edition, American Geological Institute, Alexandria, Virginia.

Krumbien, W.C., and L.L. Sloss, 1963, Stratigraphy and Sedimentation, W.H. Freeman and Company, San Francisco, California.

U.S. Army Corps of Engineers, St. Louis District, Inspector's Manual, St. Louis, Missouri.

U.S. Environmental Protection Agency, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, U.S. Government Printing Office, Washington, D.C.

851 7826 - house

941 4422

714 720 5902

MEDICAL INFORMATION

HOSPITAL NAME: ____________________

HOSPITAL ADDRESS: ____________________

____

____

EMERGENCY ROOM PHONE ( ) --

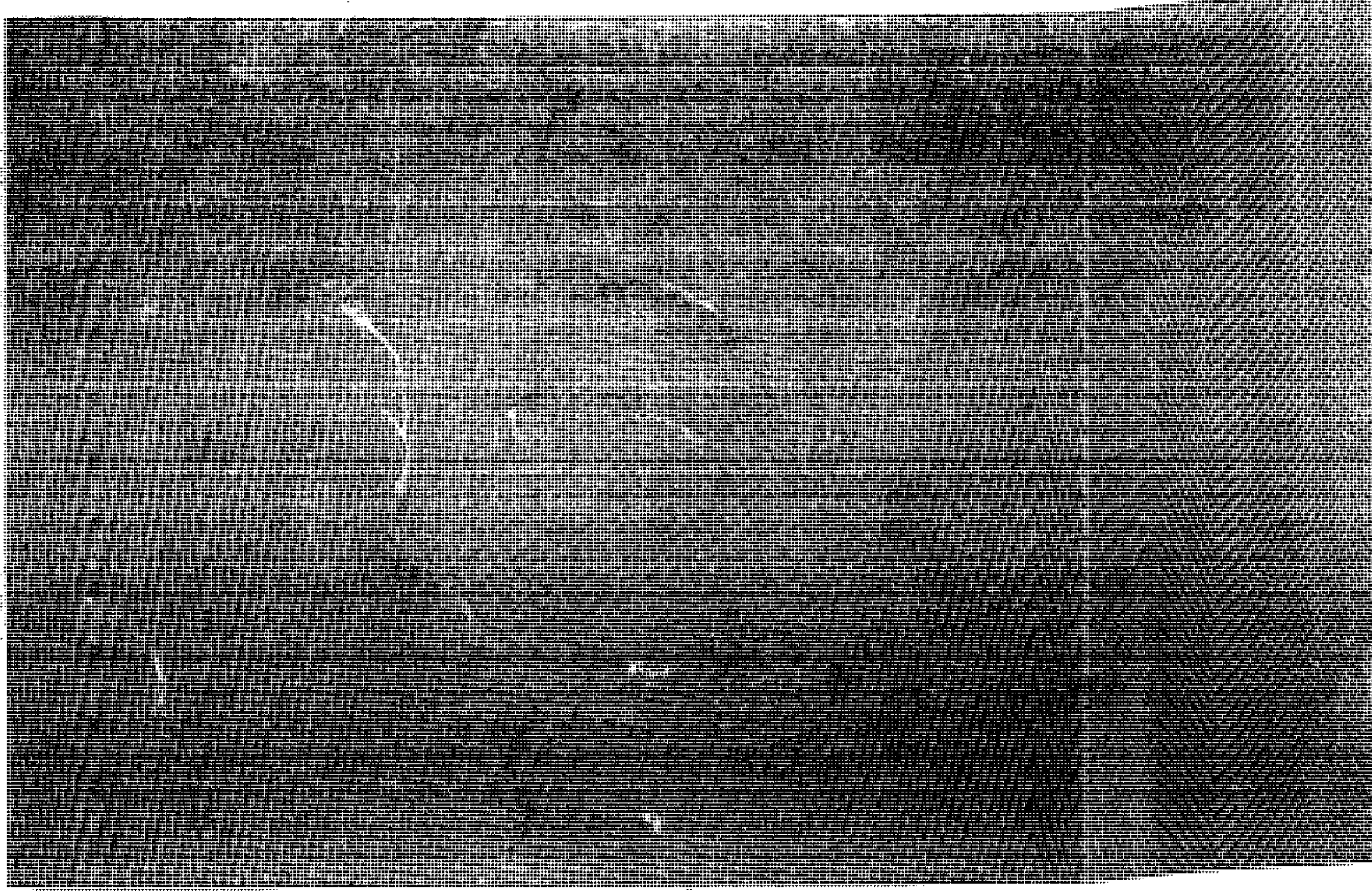
MEDTOX HOTLINE

1. Twenty-four hour answering service: (501) 370-8263
What to report:

- State: "This is an emergency."
- Your name, region, and site.
- Telephone number to reach you.
- Your location.
- Name of person injured or exposed.
- Nature of emergency.
- Action taken.

2. A toxicologist (Drs. Raymond Harbison or associate) will contact you. Repeat the information given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call the following persons in order untill contact is made:
   a. 24 hour hotline - (716) 684 8940
   b. Corporate Safety Director - Paul Jonmaire - home# (716) 655-1260
   c. Assistant Corp. Safety Officer - Tom Siener - home # (716) 662-4740



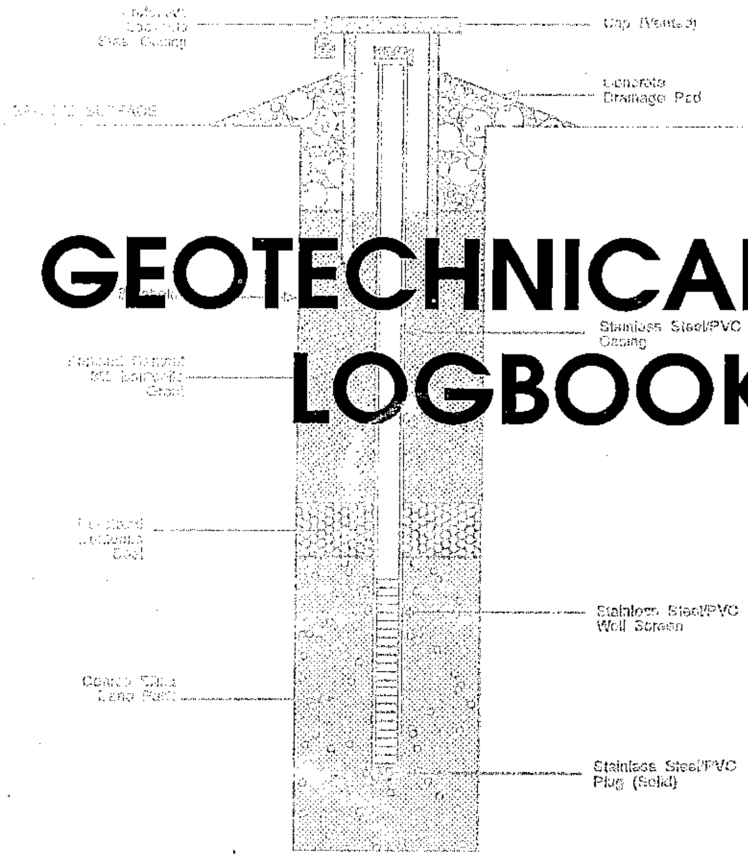
If lost please return to:
Ecology and Environment, Inc.
Attn: Manager Environmental Services Division
368 Pleasant View Drive
Lancaster, New York 14086
or call Ecology and Environment, Inc.
(716) 684-8060
Reward for return and postage charges

ecology and environment, inc.

ecology and environment, inc.

International Specialists in the Environment

#2



GEOTECHNICAL LOGBOOK

PROJECT NUMBER: 001096 0X75-01

CLIENT/SITE NAME: Ca Cal Fund BLM

DRILLING COMPANY: Test America Drilling

DATE OF FIELD ACTIVITIES: 4/

HOLES LOGGED IN BOOK: CSSB43B-B thru

RCRA FIELD BORING LOG CHECKLIST

(Adapted from RCRA Groundwater Monitoring Technical Enforcement Guidance Document, 1986)

Introduction

The field boring log checklist, which follows on this page, contains items which are deemed important to record per RCRA when installing monitoring wells, piezometers, and/or soil borings. A complete boring log contains these checklist items. This Geotechnical Logbook has been designed to help ensure that each borehole logged by E&E meets or exceeds the criteria for a complete technical record of the boring.

General

- Project name
- Hole name/number
- Date started and finished
- Geologist's name
- Driller's name
- Sheet number
- Hole location; map and elevation
- Rig type
- Bit size/auger size
- Petrologic lithologic classification scheme used (Wentworth, Unified Soil Classification System)

Information Columns

- Depth
- Sample location/number
- Blow counts and advance rate
- Percent sample recovery
- Narrative description
- Depth to saturation

Narrative Description

Geologic Observations:

- Soil/rock type
- Color and stain
- Gross petrology
- Friability
- Moisture content
- Degree of weathering
- Presence of carbonate
- Fractures
- Solution cavities
- Bedding
- Discontinuities e.g., foliation
- Water bearing zones
- Formational strike and dip
- Fossils
- Depositional structures
- Organic content
- Odor
- Suspected contaminant

Drilling Observations:

- Loss of circulation
- Advance rates
- Rig chatter
- Water levels
- Amount of air used
- Air pressure
- Drilling difficulties
- Fractures
- Solution cavities
- Bedding
- Discontinuities e.g., foliation
- Formation strike and dip
- Fossils
- Depositinal structures
- Organic content
- Odor
- Suspected contaminant

Other Remarks:

- Equipment failures
- Possible contamination
- Deviations from drilling plan
- Weather

Notes:

- All depths within this logbook are recorded in feet below ground surface (BGS) unless otherwise noted
- TOIC = Top of Inside Casing

CLIENT: ____________________

JOB NUMBER: ____________________

SITE NAME: ____________________

DRILLER: ____________________

LOCATION: CITY/TOWN: ____________________

STATE: ____________________

PROJECT MANAGER: ____________________

FIELD TEAM LEADERS: __________ / __________

SITE SAFETY OFFICER(S): __________ / __________

TEAM MEMBERS: ____________________

____

JOB START/FINISH DATE: __________ / __________

BOOK ________ OF ________

E&E CORPORATE: (716) 684-8060 FAX (716) 684-0844

E&E EMERGENCY RESPONSE CENTER: (716) 684-8940

E&E ANALYTICAL SERVICE CENTER: (716) 685-8080 FAX (716) 685-0852

E&E EQUIPMENT SERVICE CENTER: (716) 685-8080 FAX (716) 685-0852

FEDERAL EXPRESS TOLL FREE: (800) 238-5355

AIRBORNE EXPRESS: (716) 685-5040

PROJECT/CLIENT CONTACT(S)	AFFILIATION	PHONE

For inquires regarding the distribution, scope, and/or organization of the Geotechnical Logbook please contact: Manager, Environmental Services Division, Buffalo Corporate Office. Your comments and suggestions are welcomed and will be considered in future revisions.

TABLE OF CONTENTS

BOREHOLE RECORDS

BOREHOLE NO. GSSM58-13

Borehole Record for 05SMSB-R

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR OSSMSB-B

Project Name Contact/Sonoma EECA

Site Location Sonoma Mine

Date Started/Finished 4/26/10

Drilling Company Test America

Driller's Name Talon D.

Geologist's Name Bryan Ciecko

Geologist's Signature

Rig Type (s) —

Drilling Method (s) Hand Auger

Bit Size (s) ______ Auger Size (s) 4"

Auger/Split Spoon Refusal

Total Depth of Borehole Is 5'8"

Total Depth of Corehole Is

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ug/m3 ~~Fracture~~ Sketch	HNu/OVA (ppm)	XRF ppm ~~Comments~~
1	OSSMSB-B 0-3.5			0910				1.1		~~Cr 1318~~ 1,721
2										Hg 101
3										As ND
4	OSSMSB-B ~~#~~ 3.5-~~5.5~~			0930				0.3		Test 12 4/26
5										Cr 1318
6										Hg 102
7										As 10
8										
9										
10										
11										
12										
13										
14										
15										

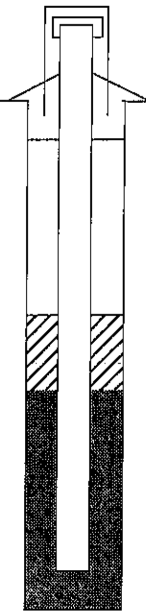
Lock Number ____________

SCREENED WELL

Inner Casing Material ____________

Inner Casing Inside Diameter ____ inches

Stick-up ____________ ft



GROUND SURFACE

Top of Grout ____________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ______ ft

Bottom of Screen at ____________ ft

Bottom of Hole at ______________ ft

Bottom of Sandpack at __________

Quantity of Material Used:

Bentonite Pellets ____________

Cement ____________

Borehole Diameter ________ inches

Cement/ Bentonite ____________

Grout ____________

Screen Slot Size ________

Screen Type ____________

☐ PVC ____________

☐ Stainless Steel _____

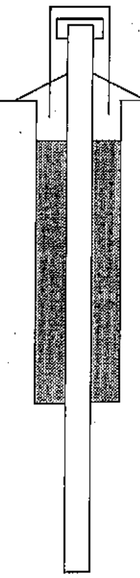
Pack Type/Size:

☐ Sand ____________

☐ Gravel ____________

☐ Natural ____________

OPEN-HOLE WELL



Stick-up ____________ ft

Inner Casing Material ____________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ____________

Bottom of Corehole ____________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	0-3.5' well graded gravelly silty loam mottled Red & grey. ~~Res~~ Be likely	○	●	○
2	~~3.5~~ a mixture of ash and tails (calcines). Gravel up to 2" at ~35%	○	●	○
3	the remaining material is silt to coarse sand.	○	●	○
4	3.5-4.5 Dark Brown Gravelly Clay. Sharp transition between above	○	●	○
5	material. ~65% clay 30% gravel & 5% coarse sand. likely native	○	●	○
6	4.5-8.5 lt Brown/yellow Very stiff clay w/ ~10% fine gravel/	○	●	○
7	coarse sand	○	○	○
8		○	○	○
9		○	○	○
10		○	○	○
11		○	○	○
12		○	○	○
13		○	○	○
14		○	○	○
15		○	○	○

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________

LOCATION ______________________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________ DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ____________________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 02CMSB

Borehole Record for 02 CMSB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 02CMSB

Project Name Contact/Sonoma EECA

Site Location Contact mine site

Date Started/Finished 4/26/10

Drilling Company Test America

Driller's Name Dave M.

Geologist's Name Bryan Ciecko

Geologist's Signature [signature]

Rig Type (s) CME 85

Drilling Method (s) HSA

Bit Size (s) ______ Auger Size (s) 8"

Auger/Split Spoon Refusal ______

Total Depth of Borehole Is 35'

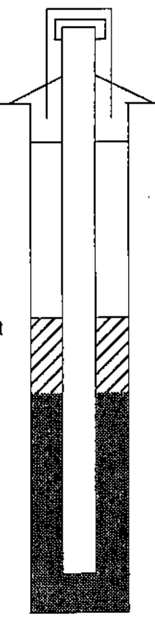
Total Depth of Corehole Is ______

Water Level (TOIC)		
Date	Time	Level(Feet)
4/26/10	1407	29
"	1546	25.2

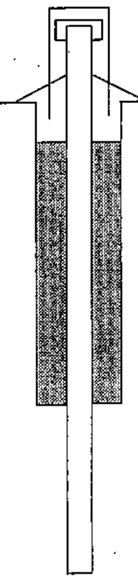
Well Location Sketch

Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ug/m3 ~~Fracture~~ Sketch	HNu/OVA (ppm)	XRF (PPM) ~~Comments~~
1											
2											#15 4/26
3											Cr 1098
4	02CMSB 4.5-6.5										Hg ND
5		5	6		1226		80%		0.2		As ND
6		13	17								
7											
8											only able to drive the
9	no sample "Rock"										2' sampler 4"
10		50/4"			1324		100%				Rock, no sample
11											
12											
13											
14	no sample						40% ~~90%~~ DG				no Sample, rocks recovered
15		50/4"			1335						

	Lock Number ____
SCREENED WELL	Inner Casing Material ____
Stick-up ____ ft	Inner Casing Inside Diameter ____ inches
	GROUND SURFACE
Top of Grout ____ ft	Quantity of Material Used: Bentonite Pellets ____
	Cement ____
Top of Seal at ____ ft	Borehole Diameter ____ inches
Top of Sand Pack ____ ft	Cement/ Bentonite ____
Top of Screen at ____ ft	Grout ____
	Screen Slot Size ____
Bottom of Screen at ____ ft	Screen Type ____
	☐ PVC ____
	☐ Stainless Steel ____
Bottom of Hole at ____ ft	Pack Type/Size:
	☐ Sand ____
	☐ Gravel ____
Bottom of Sandpack at ____	☐ Natural ____



OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

Outer Casing Diameter ____ inches

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Outer Casing ____ ft

Bottom of Inner Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1				
2				
3	4'-4.5' well graded gravelly Clay. or clayey gravel. ~45% clay			
4	~45% gravel (in the form of broken serpentenite) and ~10% Sand.			
5	4.5-6.5 Brown to Dark brown gravelly clay w/ ~60% Clay and			
6	40% angular gravel, up to 1". gravel is mainly Sandstone, fine grained and w?d			
7				
8	9.5-9.9 appears to be either bed rock or a large boulder of serpentinized			
9	sand stone.			
10	- the auger ~~[illegible]~~ BC made it trough, It was a boulder.			
11				
12				
13				
14	14.5-14.9 SAA. Note Cuttings are reddish			
15				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	~~Fracture Sketch~~	HNu/OVA (ppm)	~~Comments~~
16											
17											
18											#16 4-26
19	02CM5B 19.5-20	32 50/1					100%				Hg:458 AS 11
20					1344				29.6		CR ND
21											
22											
23											
24	02CM5B 24	50/2"			1335				1.5		Cr 148 Hg 42 As 18
25											
26											
27											
28											Hg 43
29	02CM5B 29	50/2"			1407				14.2		AS 7 Cr ND
30											
31											
32											
33											
34		50/5"			1426				NS		NS
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content (Dry / Moist / Wet)
16		
17		
18		
19	19.5 - 20.1: lt red/Brown to dark brown well graded clayey gravel.	
20	~40% clay, stiff w/60% fine to coarse (1.5") gravel. The gravel may	
21	be tailings it is reddish in color and breaks easily. The sampler	
22	may have been refused on a boulder which was gray/Bn w/ red veins.	
23	and wxd.	
24	24.5 - 24.8 dark grey and red/orange/Brown wxd rock, broken by sampler	
25	May still be tails/waste rock	
26	~~Rounded pebbles are appearing in cuttings~~ BC	
27		
28		
29	29.5-29.8 Red/Bn to blue/gray mottled wxd rock, ~~wet~~ BC, still drilling	
30	through soils or very wxd bedrock. ~~but since~~	
31	I think we are and have been in fractured bedrock for some time	
32	Small angular rock fragments are coming up in the cuttings it is difficult	
33	to say where Fill (Tails/WR) Ends & wxd rock begins but	
34	I think that occurs at ~20'.	
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		◯	◯	◯
77		◯	◯	◯
78		◯	◯	◯
79		◯	◯	◯
80		◯	◯	◯
81		◯	◯	◯
82		◯	◯	◯
83		◯	◯	◯
84		◯	◯	◯
85		◯	◯	◯
86		◯	◯	◯
87		◯	◯	◯
88		◯	◯	◯
89		◯	◯	◯
90		◯	◯	◯
91		◯	◯	◯
92		◯	◯	◯
93		◯	◯	◯
94		◯	◯	◯
95		◯	◯	◯
96		◯	◯	◯
97		◯	◯	◯
98		◯	◯	◯
99		◯	◯	◯
100		◯	◯	◯
101		◯	◯	◯
102		◯	◯	◯
103		◯	◯	◯
104		◯	◯	◯
105		◯	◯	◯

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________________

LOCATION ______________________________ WELL NO. ______________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
1 1/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
2 1/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
3 1/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
4 1/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
5 1/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________

WELL DEPTH (TD) ______________________________

COLOR ______________________________

ODOR ______________________________

CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________

WELL DEPTH (TD) ______________________________

COLOR ______________________________

ODOR ______________________________

CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ______________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 03CMMW

Borehole Record for 03CMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

[redacted]

DRILLING LOG FOR 03CMMW

Project Name: Cortest/Sonoma EECB

Site Location:

Date Started/Finished: 4-27-10

Drilling Company: Test America

Driller's Name: Dave M.

Geologist's Name: Bryan Corcker

Geologist's Signature: [signature]

Rig Type (s): CME 85

Drilling Method (s): HSA

Bit Size (s): Auger Size (s): 8"

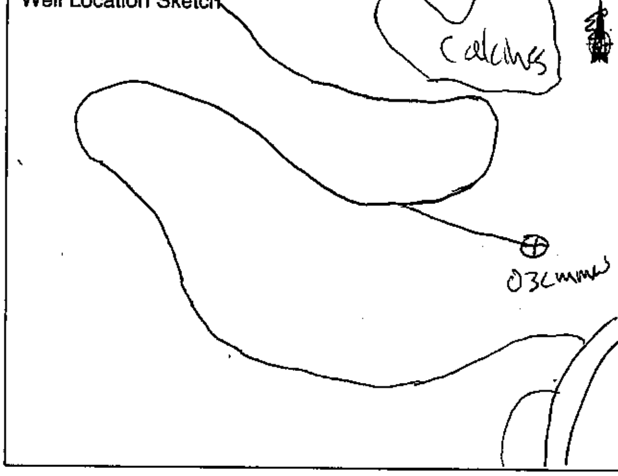
Auger/Split Spoon Refusal:

Total Depth of Borehole Is: 98'

Total Depth of Corehole Is:

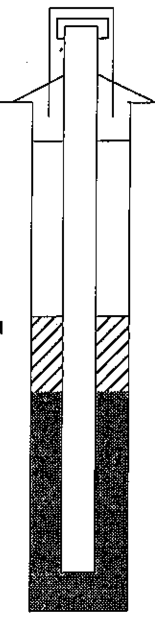
Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

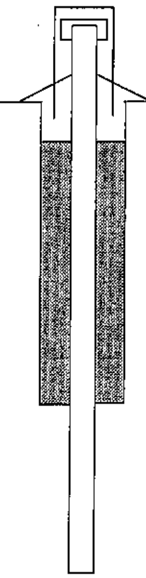


Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3	03CMMW 3-5										
4		10	18		0830		50%				
5		35	42								
6											
7											
8											
9	03CMMW 8-9.5	12	23		0845		75%				
10		50/2									
11											
12											
13	03CMMW 13-13.6	47	50/1		0904		100%				
14											
15											

SCREENED WELL	
Stick-up ________ ft	Lock Number ________
Top of Grout 0 ft	Inner Casing Material ________
Top of Seal at ~~4~~ 5' ft	Inner Casing Inside Diameter 2 inches
Top of Sand Pack 7' ~~4~~ ft	GROUND SURFACE
Top of Screen at 11' ft	Quantity of Material Used:
Bottom of Screen at 21' ft	Bentonite Pellets ________
Bottom of Hole at 48' ft	Cement ________
Bottom of Sandpack at 23'	Borehole Diameter ________ inches
	Cement/ Bentonite ________
	Grout ________
	Screen Slot Size .010
	Screen Type ________
	☒ PVC ________
	☐ Stainless Steel ________
	Pack Type/Size:
	☒ Sand ________
	☐ Gravel ________
	☐ Natural ________



OPEN-HOLE WELL	
Stick-up ________ ft	Outer Casing Diameter ________ inches
Inner Casing Material ________	Borehole Diameter ________ ft
Inner Casing Inside Diameter ________ inches	Bedrock ________ ft
	Bottom of Rock Socket/ Outer Casing ________ ft
	Bottom of Inner Casing ________ ft
	Corehole Diameter ________
	Bottom of Corehole ________ ft



NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
1	~~0~~			X
2				X
3	3-5' Brown/Dk Brown to ~~dark~~ ~~gray~~ Clayey Gravel and silt. unconsolidated			X
4	fill (Tails/WR) ~65% angular gravel (fine to course) and 25%			X
5	Clay 10% Sand. wet at top, dry at depth.		X	
6				
7				
8	8-9' Dark Brown to Dark gray Gravelly clay. ~35% fine to med gravel			
9	~30% Course Sand and 35% clay		X	
10	9-9.5' lt Brown to Dark brn/gray gravelly Clay. This appears to be		X	
11	Top of wxd bedrock. ~25% med fine gravel (angular) - 60%		X	
12	lt brown Clay and 15% med-course sand		X	
13	13-13.3 Dark Brown well graded Gravel-Clay ~35% fine-med gravel			
14	~35% Course-fine Sand ~30% clay			X
15	13.3-13.6 gravel (gray) little to no fines, possibly broken bedrock		X	

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16												
17												
18	03CMMW 18-19	34	50/5			0916		50%				
19												
20												
21												
22												
23	no sample	50/2				0933		50%				
24												
25												
26												
27												
28	03CMMW 28-29	35	50/5			0946		100				
29												
30												
31												
32												
33												
34	03CMMW ~~34-35~~ 33-34.5	17	39			0958		100%				
35		50/4										
36												
37												
38	Rock no sample	41	50/5			1012		50%				
39												
40												
41												
42												
43	no Sample	17	23			1028		0%				
44		35	41									
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
16				
17				
18	18-19 Blue Gray wx'd bedrock. Mostly clay material, Dry	●		
19				
20				
21				
22				
23	23-23.1 SAA, Slightly harder, dry. More rock like than clay	●		
24				
25				
26				
27				
28	28-29 Blue gray wx'd Bedrock, Sandstone?, more clay like than rock Moist		●	
29				
30				
31	- hard SS ~~[illegible]~~ in cuttings			
32				
33	33-34.5 Dark Gray to Black wx'd bedrock. Clay, possibly wx'd Shale moist	●		
34				
35				
36				
37				
38	38-39 Greenish very fine grained hard rock w/ [illegible] Possibly Siltstone - Dry - No Sample	●		
39				
40				
41				
42				
43	43-? no sample, Rock (gray, Dark) sandstone blocked sampler,			
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
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61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
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61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
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93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ____________________

LOCATION ______________________________ WELL NO. ____________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________
WELL DEPTH (TD) ______________________________
COLOR ______________________________
ODOR ______________________________
CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ____________________ No. of Drums: ____________

Inventory Date: ____________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

50 50/4

Borehole Record for 07SMMW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 07SM-MW

Project Name: Contact | Sonoma EECA

Site Location: Sonoma Mine

07SM-MW (upgradient)

Date Started/Finished: 5-2-10 | 5-2-10

Drilling Company: Test America

Driller's Name: Dave M

Geologist's Name: Courtney Funk

Geologist's Signature: Courtney Funk

Rig Type (s): CME 85

Drilling Method (s): HSA

Bit Size (s): ______ Auger Size (s): 5"

Auger/Split Spoon Refusal: ______

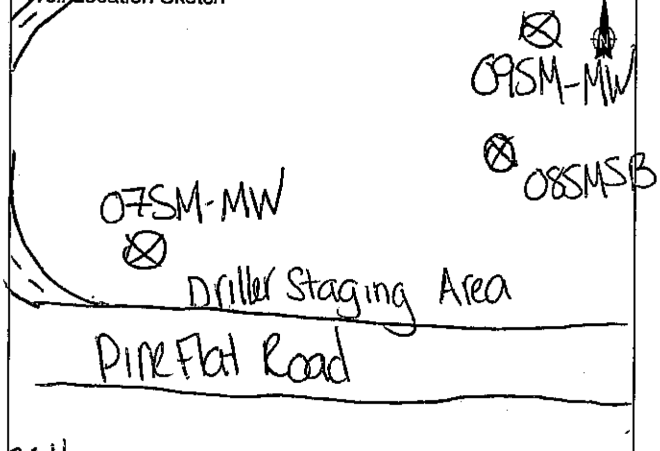
Total Depth of Borehole Is: 21 feet bgs

Total Depth of Corehole Is: ______

weight of hammer 140# lb length of drop: 30"

Water Level (TOIC)		
Date	Time	Level (Feet)

~~Well~~ Location Sketch

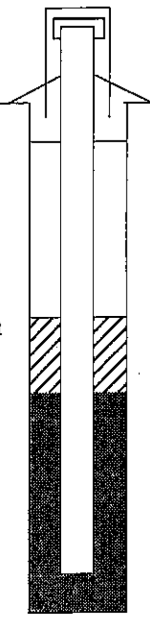


Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments (ppm)
1										
2										
3										
4						100%		~~0.1~~ 0.2		test #2 Cr: 294 ppm As 9 Hg: ND
5	07SM-MW-4.5-6.0	2 2 6	0830 →							
6										
7										
8										
9						100%		0.3		test #3 Cr: 203 As: 8 Hg: ND
10	07SM-MW9.5-11	3 4 8	0849 →							
11										
12										
13										
14										
15	07SM MW-14.5-16									

14.5 -16

DTW = 2.5 ft bgs

SCREENED WELL



Stick-up 2 ft

Top of Grout 1 ft

Top of Seal at ____ ft

Top of Sand Pack 2 ft

Top of Screen at 3 ft

Bottom of Screen at 13 ft

1 foot sump

Bottom of Hole at 24.5 ft

Bottom of Sandpack at 14

Lock Number ____

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

GROUND SURFACE

Quantity of Material Used:

Bentonite Pellets ____

Cement ____

Borehole ____ inches Diameter

Cement/ Bentonite ____

Grout ____

Screen Slot Size 0.010

Screen Type

☒ PVC ____

☐ Stainless Steel ____

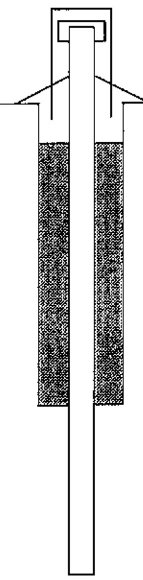
Pack Type/Size:

☒ Sand #1C ///

☐ Gravel ____

☐ Natural ____

OPEN-HOLE WELL



Stick-up ____ ft

Inner Casing Material ____

Inner Casing Inside Diameter ____ inches

Outer Casing Diameter ____ inches

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Outer Casing ____ ft

Bottom of Inner Casing ____ ft

Corehole Diameter ____

Bottom of Corehole ____ ft

NOTE: See pages 136 and 137 for well construction diagrams Chips used to abandon borehole from 24.5 to 14

~~# of Bags — /// = 3 bags~~

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
1		○	○	○
2		○	○	○
3	Dark brown/brown (Fill)	○	○	○
4	(4.5-6.0) - 4'.5"- 5'0" - Fine SAND, some silt and Clay, trace	●	○	○
5	angular gravel. pieces of glass, wellgraded. 5'.1" - 6.0 brown to orange clay	●	●	○
6	mottled with black + grey clay, trace sand, dry. Clay	●	●	○
7	poorly graded. Native	○	○	○
8		○	○	○
9	9'.5" - 11'.0" - Brown to orange firm CLAY. Medium to	○	○	○
10	high plasticity. weathered Clay is mottled red/black/grey.	○	●	○
11	Native	○	○	○
12		○	○	○
13				
14	14.5 - 16 - Brown/orange/grey Mottled Clay transitioning	○	○	○
15	to weathered bedrock. Moist to wet. Low plasticity.	○	●	●

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Lumex Fracture Sketch	HNu/OVA (ppm)	Comments
16		5	5			0850		100%		0.4		Cr: ND As: ND Hg: ND
17		7										
18	07SMMW 19.5-21	50	50/4									
19												
20	25											
21	~~07SMMW 21-22.5~~	50	50/4			0915		75%		0.0		
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
16				
17				
18	19.5-21 - Grey Blue weathered bedrock. some Angular	●		
19.5-21 19	fragments. heavily decomposed. Dry Serpentinite?			
20				
21	End of boring @ 21' bgs			
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
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69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
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101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________

LOCATION __________________________ WELL NO. __________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (μmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________ DATE ______________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. SLCM-MW

Borehole Record for 01CM-MW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR OICM-MW

Project Name: Contact/Sonoma EECA

Site Location: Contact Mine
OICM-MW

Date Started/Finished: 5-2-10

Drilling Company: Test America

Driller's Name: Dave M

Geologist's Name: Courthey Funk

Geologist's Signature: Courtney Funk

Rig Type (s): ~~HSA~~ CME-~~85~~ 75

Drilling Method (s): HSA

Bit Size (s): ____ Auger Size (s): 6

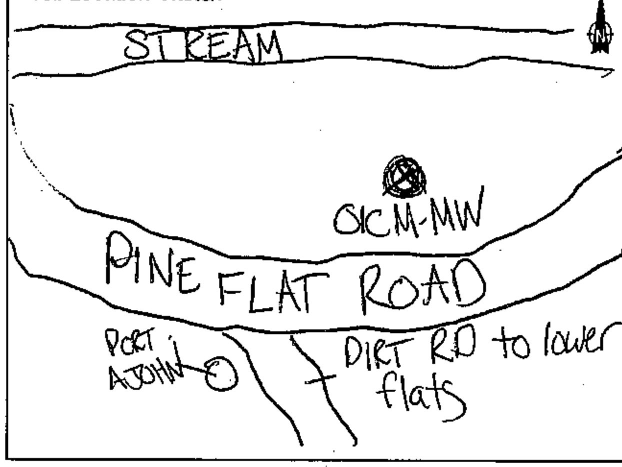
Auger/Split Spoon Refusal: ____

Total Depth of Borehole Is: 21.5' bgs ~~20' bgs~~

Total Depth of Corehole Is: ____

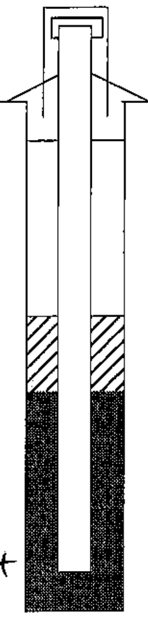
Water Level (TOIC)		
Date	Time	Level (Feet)

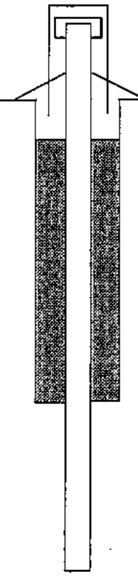
Well Location Sketch



Depth (Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments
1											
2											
3											
4	OICM-MW										
5	5-6.5	4	6		1040		100%		0.0		
6		9									
7											
8											
9											
10	OICM MW	4	6		1050		100%		0.0		
11	10-11.5	8									
12											
13											
14											
15											

SCREENED WELL		OPEN-HOLE WELL	
	Lock Number ________		Stick-up ________ ft
	Inner Casing Material PVC		Inner Casing Material ________
Stick-up 2 ft	Inner Casing Inside Diameter 2 inches		Inner Casing Inside Diameter ________ inches
	GROUND SURFACE		
Top of Grout 0.5 ft	Quantity of Material Used: Bentonite Pellets 2 bags		Outer Casing Diameter ________ inches
Top of Seal at ________ ft	Cement ________		Borehole Diameter ________ ft
	Borehole Diameter 8 inches		Bedrock ________ ft
Top of Sand Pack 2 ft	Cement/ Bentonite ________		
	Grout peletized (30mm)		Bottom of Rock Socket/ Outer Casing ________ ft
Top of Screen at 3 ft	Screen Slot Size ________		Bottom of Inner Casing ________ ft
Bottom of Screen at 13 ft	Screen Type ☒ PVC 0.010 ☐ Stainless Steel ________		Corehole Diameter ________
Sump 13-14 ft			
Bottom of Hole at 21.5 ft	Pack Type/Size: ☒ Sand #1C (3.5 bags) ☐ Gravel ________ ☐ Natural ________		Bottom of Corehole ________ ft
Bottom of Sandpack at 14			





medium chips used from ~21.5 ft

NOTE: See pages 136 and 137 for well construction diagrams

DTW (bgs) = 5 ft

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Dry	Moist	Wet
		○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5	5.0-6.3 - Dark brown/red/grey mottled CLAY, some silt,	○	●	○
6	trace fine sand, low plasticity, moist. Native	○	○	○
7	↳ trace angular gravel	○	○	○
8	6.3-6.5 - Med/light brown red mottled CLAY, some silt,	○	●	○
9	trace sand, moist, well graded.	○	○	○
10	10 - ~~10.5~~ 11.0 med light brown/red mottled CLAY, medium	○	○	○
11	plasticity, moist NATIVE	○	○	○
12	11.0 - 11.5' - light brown/red mottled CLAY with	○	○	○
13	angular gravel. Become wet @ 11.3 feet bgs	○	○	○
14		○	○	○
15				

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments
16	OKM MW 15-16.5	7	11			1100		25%		0.0		
17		12										
18												
19												
20	OKMW 20-21.5	11	14			1115				0.0		
21		19										
22												
23												
24												
25												
26												
27												
28												
29												
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31												
32												
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36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	15' - 16.5' - Med Light brown / red Mottled CLAY transitioning	○	○	●
16	to grey blue weathered bedrock. Mostly	○	○	○
17	Clay. Very wet. trace angular rock fragments.	○	○	○
18	Medium plasticity. poorly graded. Very poor recovery	○	○	○
19	20-21.5 - Grey Blue weathered bedrock bedrock. 50%	○	○	○
20	Clay 50% rock fragments. moist. quartz vein	○	○	○
21	visible in rock fragments.	○	○	○
22	End of boring @ ~~22'~~ 21.5' bgs	○	○	○
23		○	○	○
24		○	○	○
25		○	○	○
26		○	○	○
27		○	○	○
28		○	○	○
29		○	○	○
30		○	○	○
31		○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
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71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
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102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
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103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________

LOCATION ______________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (μmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ____________________ DATE ________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. 04CMSB

Borehole Record for 04CMSB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 04CMSB

Project Name: Contact Sonoma EECA

Site Location: Contact Mine 04CMSB

Date Started/Finished: 5-2-10

Drilling Company: Test America

Driller's Name: Dave M

Geologist's Name: Courtney Funk

Geologist's Signature: Courtney Funk

Rig Type (s): CME 85

Drilling Method (s): HSA

Bit Size (s): ______ Auger Size (s): 8

Auger/Split Spoon Refusal: ______

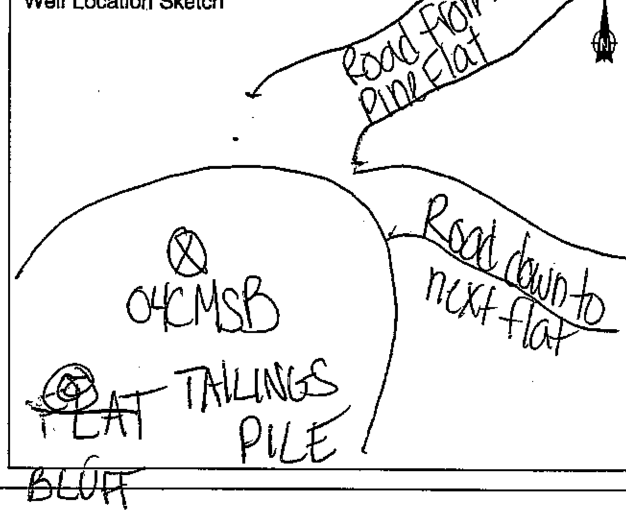
Total Depth of Borehole Is: ______

Total Depth of Corehole Is: ______

2ft sampler

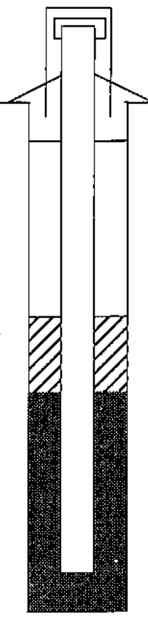
Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments
1											
2											Note Mercury
3	04CMSB 3.5-~~4.5~~	37	19		1325		80%		3.1		background=2~5
		50/1									
4											
5											
6	04CMSB 5.0-7.0				1400		50%				SHELBY TUBE SAMPLE
7	04CMSB 7.0-9.0				1410		50%				SHELBY TUBE SAMPLE
8											
9											
10	04CM SB9.0-11.0	~~11~~	~~14~~		1423				3.9		
11		11	11								
12		16	28								
13											
14	04CM-MW14-16	42	50/2		1440		25%		3.2		
15		8"									

SCREENED WELL



Stick-up ____________ ft

Top of Grout ______________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at _______ ft

Bottom of Screen at _____________ ft

Bottom of Hole at ________________ ft

Bottom of Sandpack at __________

Lock Number ____________

Inner Casing Material ______________

Inner Casing Inside Diameter _____ inches

Quantity of Material Used:

Bentonite Pellets ______________

Cement ______________

Borehole Diameter ________ inches

Cement/ Bentonite ______________

Grout ______________

Screen Slot Size __________

Screen Type __________

☐ PVC ____________

☐ Stainless Steel ______

Pack Type/Size:

☐ Sand ____________

☐ Gravel ____________

☐ Natural ____________

OPEN-HOLE WELL

Stick-up ____________ ft

Inner Casing Material ______________

Inner Casing Inside Diameter __________ inches

Outer Casing Diameter __________ inches

Borehole Diameter _________ ft

Bedrock ___________ ft

Bottom of Rock Socket/ Outer Casing _______ ft

Bottom of Inner Casing ___________ ft

Corehole Diameter ______________

Bottom of Corehole ____________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
1		○	○	○
2		○	○	○
3	3.5'-4.5' - Red sandy gravel. gravel is angular dry	●	○	○
4	well graded. (FILL) tailings present.	○	○	○
5		○	○	○
6		○	○	○
7		○	○	○
8		○	○	○
9	9.0'-11.0' - Redish brown/dark brown well graded	○	●	○
10	SAND with Clay and gravel. dry. gravel is	○	○	○
11	angular. (FILL) tailings present!	○	○	○
12		○	○	○
13	14-16' Redish brown well graded SAND ~~Clay~~ with	○	○	○
14	Clay and gravel. very dry. gravel is angular	○	○	○
15				

possible weathered bedrock - difficult to say

Some Fill likely.

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Lumex Fracture Sketch	HNu/OVA (ppm)	Comments
16												
17												
18												
19	04CM SB19	39	50/5			1500		50%		0.2		
20	-21											
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
16				
17				
18	19-21' – Red/Dark brown Clay with gravel and			
19	possible weathered bedrock. ~~It is @~~			
20	Dry. gravel appers sub angular to sub rounded.			
21	Likely Native material			
22	End of boring @ 21' bgs			
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
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56											
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67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
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93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ____________________ DATE ____________________

LOCATION ____________________ WELL NO. ____________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = ______ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ____________________
WELL DEPTH (TD) ____________________
COLOR ____________________
ODOR ____________________
CLARITY ____________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ____________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

BOREHOLE NO. ______

Borehole Record for 05CM-MW

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 05CM-MW

Project Name: Contact/Sonoma EECA

Site Location: Contact Mine 05CM-MW

Date Started/Finished: 5-3-10

Drilling Company: Test America

Driller's Name: Dave M.

Geologist's Name: Courtney Funk

Geologist's Signature: Courtney Funk

Rig Type (s): CME 85

Drilling Method (s): HSA

Bit Size (s): ______ Auger Size (s): 4 1/4

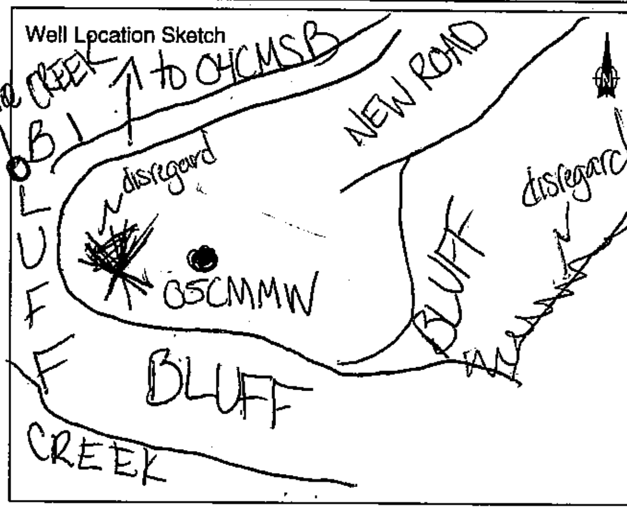
Auger/Split Spoon Refusal: ______

Total Depth of Borehole Is: 19 feet bgs

Total Depth of Corehole Is: ______

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch



Depth(Feet)	Sample Number	Blows on Sampler		Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex Fracture Sketch	HNu/OVA (ppm)	Comments
1											
2											
3											
4											
5	05CMMW 5.0-7.0										
6		11	18		0930		100%		0.0		
7		31	41								
8											
9											
10											
11		37	50/3	0.0	0945		50%		0.0		
12											
13											
14											
15	05CM MW 14.5-16.5	35	50/5		1000		50%				

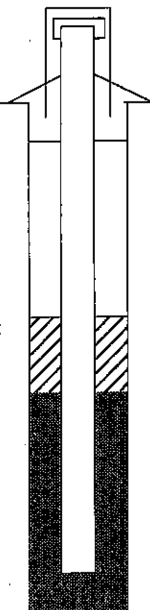
DTW = 5.58 ft bgs

Lock Number

Inner Casing Material

Inner Casing Inside Diameter ____ inches

SCREENED WELL



Stick-up 2 ft

GROUND SURFACE

Top of ~~Grout~~ chips 0 ft

Top of Seal at 1 ft

Top of Sand Pack 2.5 ft

Top of Screen at 3.5 ft

Bottom of Screen at 13.5 ft

1 foot sup

Bottom of Hole at 16.8 ft chips to 14.5

Bottom of Sandpack at 14.5

Quantity of Material Used:

Bentonite Pellets

Cement

Borehole Diameter ____ inches

Cement/ Bentonite

~~Grout~~ chips #4 2 bags 14.5 to 16.8

Screen Slot Size 0.010

Screen Type

☒ PVC

☐ Stainless Steel

Pack Type/Size:

☒ Sand #1 C

☐ Gravel

☐ Natural

OPEN-HOLE WELL

Stick-up ____ ft

Inner Casing Material

Inner Casing Inside Diameter ____ inches

Outer Casing Diameter ____ inches

Borehole Diameter ____ ft

Bedrock ____ ft

Bottom of Rock Socket/ Outer Casing ____ ft

Bottom of Inner Casing ____ ft

Corehole Diameter

Bottom of Corehole ____ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Dry	Moist	Wet
1				
2				
3				
4				
5	5-7' – 5.0-6.0' – Dark brown/red Clay, some	X		
6	gravel, trace fine Sand. Dry. (Fill)	X		
7	6.0'-7.0' – Dark brown/red CLAY transitioning to Gray/		X	
8	~~blue~~ blue clay = weathered bedrock. Moist. Some		X	
9	gravel/~~fractured~~ rock frag present. Calcite present @ 6.5.		X	
10	10-12' - Blue grey weathered bedrock. 50% rock fragments		X	
11	50% Clay. Moist from 10'-11.5'. 11.5-12.0 Dry.		X	
12	Some well graded sand present from 11.5-12.0'.	X		
13	Moist/wet interval = 6' - 11.5'			
14			X	
15	14.5-16.5' – Blue grey weathered bedrock. CLAY with		X	

well graded sand and little to no ~~fractured~~ rock fragments.
MOIST

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
16											
17											
18							<1%				
19		50/1					[illegible]				
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
16				
17				
18	17' – 19' - @			
19	~~19.5 – 21.5~~ - Insufficient soil - unable to log split spoon			
20				
21	End boring @ 19'. Monitoring Well			
22	installation to ocurr at a later date			
23				
24				
25				
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
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66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
46		○	○	○
47		○	○	○
48		○	○	○
49		○	○	○
50		○	○	○
51		○	○	○
52		○	○	○
53		○	○	○
54		○	○	○
55		○	○	○
56		○	○	○
57		○	○	○
58		○	○	○
59		○	○	○
60		○	○	○
61		○	○	○
62		○	○	○
63		○	○	○
64		○	○	○
65		○	○	○
66		○	○	○
67		○	○	○
68		○	○	○
69		○	○	○
70		○	○	○
71		○	○	○
72		○	○	○
73		○	○	○
74		○	○	○
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
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100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
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92				
93				
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95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				

WELL DEVELOPMENT RECORD

SITE ______________________________ DATE ______________

LOCATION ______________________________ WELL NO. ______________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.

- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.

- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419×10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________

WELL DEPTH (TD) ______________________________

COLOR ______________________________

ODOR ______________________________

CLARITY ______________________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________________

WELL DEPTH (TD) ______________________________

COLOR ______________________________

ODOR ______________________________

CLARITY ______________________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (μmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ______________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

EHOLE NO. 05CMMW

Borehole Record for OGCM-SB

- Drilling Log
- Narrative Lithologic Description
- Well Development Record
- Well Development -- Parameter Measurements
- Investigation - Derived Waste Inventory Sheet

DRILLING LOG FOR 06CM-SB

Project Name: Contact/Sonoma EECA

Site Location: Contact Mine
06CM-SB

Date Started/Finished: 5-3-10

Drilling Company: Test America

Driller's Name: Dave M.

Geologist's Name: Courtney Funk

Geologist's Signature: Courtney Funk

Rig Type (s): CME 85

Drilling Method (s):

Bit Size (s): ______ Auger Size (s): 4 1/4

Auger/Split Spoon Refusal:

Total Depth of Borehole Is:

Total Depth of Corehole Is:

Water Level (TOIC)		
Date	Time	Level(Feet)

Well Location Sketch

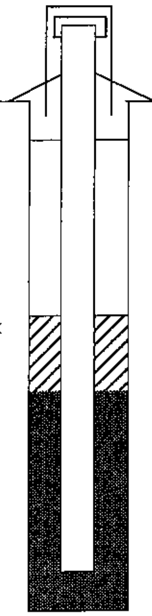
Depth(Feet)	Sample Number	Blows on Sampler	Soil Components Rock Profile CL SL S GR	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments
1										
2										
3										
4	06CM-SB 4-6.5	22 / 50	6	1300		20%		0.5		
5										
6										
7	~~06CM-SB 6.5-8.5~~	0								NO SAMPLE
8										
9	8.5-10.5									NO SAMPLE
10										
11										
12										
13										
14	06CMSB 10.5-12 (split spoon)	8 / 8 / 8		1405		100%		0.2		
15										

Lock Number ____________

SCREENED WELL

Inner Casing Material ____________

Inner Casing Inside Diameter ____ inches



Stick-up ____________ ft

GROUND SURFACE

Top of Grout ____________ ft

Top of Seal at ________ ft

Top of Sand Pack ________ ft

Top of Screen at ______ ft

Bottom of Screen at ____________ ft

Bottom of Hole at ____________ ft

Bottom of Sandpack at __________

Quantity of Material Used:

Bentonite Pellets ____________

Cement ____________

Borehole ________ inches Diameter

Cement/ Bentonite ____________

Grout ____________

Screen Slot Size ____________

Screen Type ____________

☐ PVC ____________

☐ Stainless Steel ______

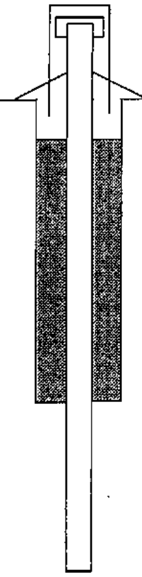
Pack Type/Size:

☐ Sand ____________

☐ Gravel ____________

☐ Natural ____________

OPEN-HOLE WELL



Stick-up ____________ ft

Inner Casing Material ____________

Inner Casing Inside Diameter ________ inches

Outer Casing Diameter ________ inches

Borehole Diameter ________ ft

Bedrock ________ ft

Bottom of Rock Socket/ Outer Casing ______ ft

Bottom of Inner Casing ________ ft

Corehole Diameter ____________

Bottom of Corehole ________ ft

NOTE: See pages 136 and 137 for well construction diagrams

Depth-ft.	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
		○	○	○
1		○	○	○
2		○	○	○
3		○	○	○
4		○	○	○
5	4.0-5.5' - Dark brown/Red Sandy Clay with	○	○	○
6	~~sm~~ gravel. (FILL) Dry. sand is ~~med-coarse~~	○	○	○
7	well sorted well grad	○	○	○
8	6.5-8.5 - Shelby tube sample-	○	○	○
9	no log - No recovery	○	○	○
10	8.5-10.5 - No recovery - tube becoming	○	○	○
11	deformed due to large amount of rocks in	○	○	○
12	pile. ——— Abandon Shelby at this	○	○	○
13	location	○	○	○
14		○	○	○
15		○	○	○

★10.5 - 12 (split spoon) Red/Dark brown CLAY with well graded sand and rock fragments. Moist. (Fill?)

Depth(feet)	Sample Number	Blows on Sampler		Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Lumex ~~Fracture Sketch~~	HNu/OVA (ppm)	Comments
16	06CM SB16.5-17	11	13			1415		20%		0.0		
17		16	20									
18												
19												
20	06CMSB 20.5-22	~~0~~				1430		50%		0.0		
21												
22												
23												
24												
25	06CM SB25.5-27					1448		20%		0.0		
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												

Depth(feet).	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content: Dry	Moist	Wet
	15.5-17' – Dark brown/brown Clay with well	○	○	○
16	graded sand. Large amount of rock fragments	○	○	○
17	Less red in color then previous intervals.	○	○	○
18	May be transitioning into native material	○	○	○
19		○	○	○
20	20.5-22' – Dark brown weathered	○	○	○
21	bedrock graded sand. Dry native material	○	○	○
22		○	○	○
23	~~25.5-2~~	○	○	○
24	25.5-27 – Blue grey weathered bedrock	○	○	○
25	Mostly Clay, very small amount of rock fragments	○	○	○
26	Native material	○	○	○
27	End of boring @ 27' bgs	○	○	○
28	End of corehole @ 30' bgs	○	○	○
29		○	○	○
30		○	○	○
31		○	○	○
32		○	○	○
33		○	○	○
34		○	○	○
35		○	○	○
36		○	○	○
37		○	○	○
38		○	○	○
39		○	○	○
40		○	○	○
41		○	○	○
42		○	○	○
43		○	○	○
44		○	○	○
45				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
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61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											

Depth(feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content Dry	Moist	Wet
46				
47				
48				
49				
50				
51				
52				
53				
54				
55				
56				
57				
58				
59				
60				
61				
62				
63				
64				
65				
66				
67				
68				
69				
70				
71				
72				
73				
74				
75				

Depth(feet)	Sample Number	Blows on Sampler	Soil Components CL SL S GR	Rock Profile	Penetration Times	Run Number	Core Recovery	RQD	Fracture Sketch	HNu/OVA (ppm)	Comments
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											
101											
102											
103											
104											
105											

Depth (feet)	NARRATIVE LITHOLOGIC DESCRIPTION	Moisture Content		
		Dry	Moist	Wet
		○	○	○
77		○	○	○
78		○	○	○
79		○	○	○
80		○	○	○
81		○	○	○
82		○	○	○
83		○	○	○
84		○	○	○
85		○	○	○
86		○	○	○
87		○	○	○
88		○	○	○
89		○	○	○
90		○	○	○
91		○	○	○
92		○	○	○
93		○	○	○
94		○	○	○
95		○	○	○
96		○	○	○
97		○	○	○
98		○	○	○
99		○	○	○
100		○	○	○
101		○	○	○
102		○	○	○
103		○	○	○
104		○	○	○
105		○	○	○

WELL DEVELOPMENT RECORD

SITE ______________________ DATE ______________________

LOCATION ______________________ WELL NO. ______________________

____

MEASUREMENT OF WATER LEVEL AND WELL VOLUME

- Prior to sampling, the static water level and total depth of the well will be measured with a calibrated weighted line. Care will be taken to decontaminate equipment between each use to avoid cross contamination of wells.
- The number of linear feet of static water (difference between static water level and total depth of well) will be calculated.
- The static volume will be calculated using the formula:

$$V = Tr^2 (0.163)$$

Where:
V = Static volume of well in gallons;
T = Depth of water in the well, measured in feet;
r = Inside radius of well casing in inches;
and 0.163 = A constant conversion factor which compensates for r^2h factor for the conversion of the casing radius from inches to feet, the conversion of cubic feet to gallons, and (pi).
1 well volume (v) = _____ gallons.

Volume of Water in Casing or Hole

Diameter of Casing or Hole (in)	Gallons per Foot of Depth	Cubic Feet per Foot of Depth	Liter per Meter of Depth	Cubic Meters per Meter of Depth
1	0.041	0.0055	0.509	0.509×10^{-3}
11/2	0.092	0.0123	1.142	1.142×10^{-3}
2	0.163	0.0218	2.024	2.024×10^{-3}
21/2	0.255	0.0341	3.167	3.167×10^{-3}
3	0.367	0.0491	4.558	4.558×10^{-3}
31/2	0.500	0.0668	6.209	6.209×10^{-3}
4	0.653	0.0873	8.110	8.110×10^{-3}
41/2	0.826	0.1104	10.260	10.260×10^{-3}
5	1.020	0.1364	12.670	12.670×10^{-3}
51/2	1.234	0.1650	15.330	15.330×10^{-3}
6	1.469	0.1963	18.240	18.240×10^{-3}
7	2.000	0.2673	24.840	24.840×10^{-3}
8	2.611	0.3491	32.430	32.430×10^{-3}
9	3.305	0.4418	41.040	41.040×10^{-3}
10	4.080	0.5454	50.670	50.670×10^{-3}
11	4.937	0.6600	61.310	61.310×10^{-3}
12	5.875	0.7854	72.960	72.960×10^{-3}
14	8.000	1.0690	99.350	99.350×10^{-3}
16	10.440	1.3960	129.650	129.650×10^{-3}
18	13.220	1.7670	164.180	164.180×10^{-3}
20	16.320	2.1820	202.680	202.680×10^{-3}
22	19.750	2.6400	245.280	245.280×10^{-3}
24	23.500	3.1420	291.850	291.850×10^{-3}
26	27.580	3.6870	342.520	342.520×10^{-3}
28	32.000	4.2760	397.410	397.410×10^{-3}
30	36.720	4.9090	456.020	456.020×10^{-3}
32	41.780	5.5850	518.870	518.870×10^{-3}
34	47.160	6.3050	585.680	585.680×10^{-3}
36	52.880	7.0690	656.720	656.720×10^{-3}

1 Gallon = 3.785 liters
1 Meter = 3.281 feet
1 Gallon water weighs 8.33 lbs. = 3.779 kilograms
1 Liter water weighs 1 kilogram = 2.205 pounds
1 Gallon per foot of depth = 12.419 liters per foot of depth
1 Gallon per meter of depth = 12.419 x 10^{-3} cubic meters per meter of depth

INITIAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

FINAL DEVELOPMENT WATER

WATER LEVEL (TOIC) ______________________
WELL DEPTH (TD) ______________________
COLOR ______________________
ODOR ______________________
CLARITY ______________________

DESCRIPTION OF DEVELOPMENT TECHNIQUE ______________________

____

____

WELL DEVELOPMENT - PARAMETER MEASUREMENTS

TIME	TOTAL VOL. WITHDRAWN		pH	COND. (µmhos/cm)	TEMP. (°C/°F)	TURB. (NTU)	COMMENTS
	GALS.	BORE VOL.					

DEVELOPED BY: ______________________

DATE ____________________

INVESTIGATION-DERIVED WASTE INVENTORY SHEET

Site: ______________________________ No. of Drums: ____________________

Inventory Date: ______________________________

Waste Source	Drum/Container ID Number	Date Generated	Contents (Solid, Liquids, etc.)	Approximate Volume	Drum Location/Comments

SOIL AND SEDIMENT CLASSIFICATION

GRAIN-SIZE SCALE (Modified Wentworth Scale)

phi	mm	inches	U.S. Standard Sieve Series	Grade Name		
-12	4096	161.3				
				very large		
-11	2048	80.6				
				large		
-10	1024	40.3			Boulders	
				medium		
-9	512	20.2				
				small		
-8	256	10.1				
				large		
-7	128	5.0			Cobbles	
				small		GRAVEL
-6	64	2.52	63 mm			
				very coarse		
-5	32	1.26	31.5 mm			
				coarse		
-4	16	0.63	16 mm			
				medium	Pebbles	
-3	8	0.32	8 mm			
				fine		
-2	4	0.16	No. 5			
				very fine		
-1	2	0.08	No. 10			
				very coarse		
0	1	0.04	No. 18			
				coarse	Sand	SAND
+1	0.500		No. 35			
				medium		
+2	0.250		No. 60			
				fine		
+3	0.125		No. 120			
				very fine		
+4	0.062		No. 230			
				coarse		
+5	0.031				Silt	
				medium		
+6	0.016					
				fine		
+7	0.008					MUD
				very fine		
+8	0.004					
				coarse		
+9	0.002					
				medium		
+10	0.001					
				fine		
+11	0.0005					
				very fine		CLAY SIZE
+12	0.00025					

PROPORTIONS USED IN DESCRIBING SOILS

Trace - Particles are present but estimated to be less than 5%
Few - 5 to 10%
Little - 15 to 25%
Some - 30 to 45%
Mostly - 50 to 100%

i.e.: Sand with a trace of silt = .95% Sand, <5% Silt

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to relatively small sample diameter.)

Soil Density from Standard Penetration Test (ASTM D1586)

Granular Soils	Cohesive Soils
0 - 10: Loose 10 - 30: Medium Dense 30 - 50: Dense Over 50: Very Dense	0 -4: Soft 4 - 8 : Medium Stiff 8 - 15 : Stiff 15 - 30 : Very Stiff

CLASSIFICATION CHART(United Soil Classification System)

MAJOR DIVISIONS		
GRAVELS (More than 1/2 of coarse fraction > No. 4 sieve size)	GW	Well-graded gravels or gravel-sand mixtures,little or no fines
	GP	Poorly graded gravels or gravel-sand mixtures little or no fines
	GM	Silty gravels, gravel-sand-silt mixture
	CC	Clayey gravels, gravel-sand-clay mixtures
SANDS (More than 1/2 of coarse fraction < No. 4 sieve size)	SW	Well-graded sands or gravelly sands, little or no fines
	SP	Poorly graded sands or gravelly sands, little or no fines
	SM	Silty sands, sand-silt mixtures
	SC	Clayey sands, sand clay mixtures
SILTS AND CLAYS LL< 50	ML	Inorganic silts, and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
	CL	Inorganic clays, of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	OL	Organic silts and organic clays of low plasticity
SILTS AND CLAYS LL> 50	MH	Inorganic silts, micaceous or diatamaceous, fine sandy or silty soils, elastic silts
	CH	Inorganic clays of high plasticity, fat clays
	OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS	Pt	Peat and other highly organic soils

ASTM CRITERIA FOR DESCRIBING SOIL

Criteria for Describing Angularity of Coarse-Grained Particles

Description	Criteria
Angular	Particles have sharp edges and relatively plane side with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved side and no edges

Criteria for Describing Dilatancy

Description	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

Criteria for Describing Toughness

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit . The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

Criteria for Describing Dry Strength

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and shard surface

Criteria for Describing Structure

Description	Criteria
Stratified	Alternating layers of varing material or color with layers at least 6 mm thick; note thickness.
Laminated	Alternating layers of varying materials or color with the layers less than 6 mm thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout.

CRITERIA FOR DESCRIBING SOIL (Cont.)

Criteria for Describing the Reaction with HCl

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

Criteria for Describing Consistency

Description	Criteria
Very Soft	Thumb will penetrate soil more than 1 inch (25 mm)
Soft	Thumb will penetrate soil about 1 inch (25 mm)
Firm	Thumb will indent soil about 1/4 inch (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

Criteria for Describing Cementation

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

Criteria for Describing Particle Shape

The particle shape shall be described as follows where length, width, and thickness refer to greatest, intermediate, and least dimensions of a particle, respectively (see page 104).

Flat	Particles with width/thickness ratio > 3
Elongated	Particles with length/width ratio > 3
Flat and Elongated	Particles meet criteria for both flat and elongated

Criteria for Describing Plasticity

Description	Criteria
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

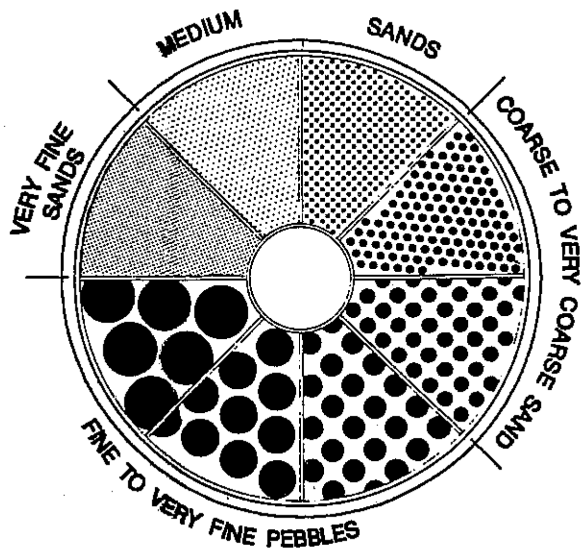
Identification of Inorganic Fine-Grained Soils from Manual Tests

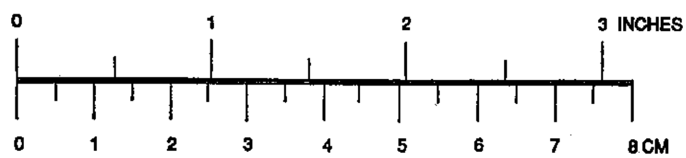
Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

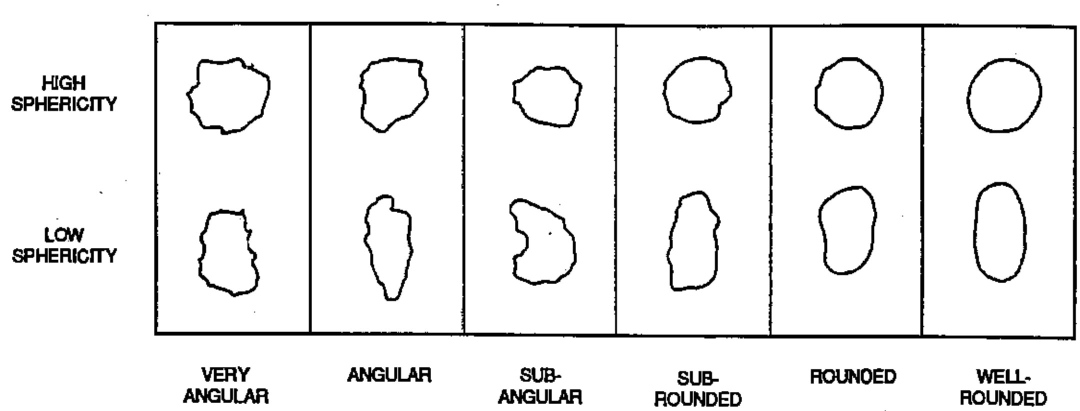
GRAPH FOR DETERMINING SIZE OF SEDIMENTARY PARTICLES





COBBLES RANGE FROM 6.4 TO 25.6 cm (~ 2.5 TO 10.1 INCHES)
BOULDERS ARE LARGER THAN 25.6 cm (>10.1 INCHES)

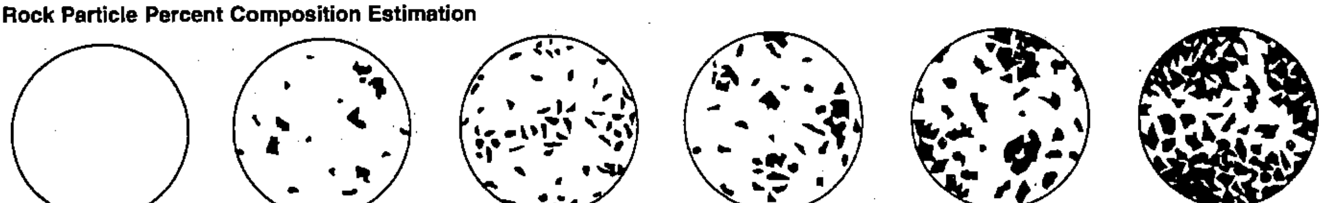
SEDIMENT PARTICLE SHAPES



ROCK DESCRIPTIVE TERMS

Term		Defining Characteristics	
Hardness	Soft	Scratched by fingernail	
	Medium Hard	Scratched easily by penknife	
	Hard	Difficult to scratch with a penknife	
	Very Hard	Cannot be scratched by penknife	
Weathering	Fresh	Rock is unstained. May be fractured, but discontinuities are not stained.	
	Slighty	Rock is unstained. Discontinuities show some staining on the surfaces of rocks, but discoloration does not penetrate rock mass.	
	Moderate	Discontinuity surfaces are stained. Discoloration may extend into rock along discontinuity surfaces.	
	High	Individual rock fragments are thoroughly stained and may be crumbly.	
	Severe	Rock appears to consist of gravel-sized fragments in a "soil" matrix. Individual fragments are thoroughly discolored and can be broken with fingers.	
Bedding Planes	Laminated	< .04 in.	< 1 mm
	Parting	.04 in. - .24 in.	1mm - 6mm
	Banded	.24 in. - 1in.	6 mm - 3 cm
	Thin	1 in. - 4 in.	3 cm - 9.1 cm
	Medium	4 in. - 12 in.	9.1 cm - 30.5 cm
	Thick	12 in.- 36 in.	30.5 cm - 1m
	Massive	> 36 in.	> 1 m
Joints and Fracture Spacing	Very close	< 2 in.	< 5.1 cm
	Close	2 in. - 1ft.	5.1 - 30.5 cm
	Moderately close	1ft. - 3 ft.	30.5 cm - 91.4 cm
	Wide	3 ft. - 10 ft.	91.4 cm - 3 M
	Very wide	> 10 ft.	> 3 M
Voids	Porous	Smaller than a pinhead. Their presence is indicated by the degree of absorbency.	
	Pitted	Pinhead size to a 1/4 inch. If only thin walls separate the individual pits, the core may be described as honeycombed.	
	Vug	1/4 inch to the diameter of the core. The upper limit will vary with core size.	
	Cavity	Larger than the diameter of the core.	

Rock Particle Percent Composition Estimation

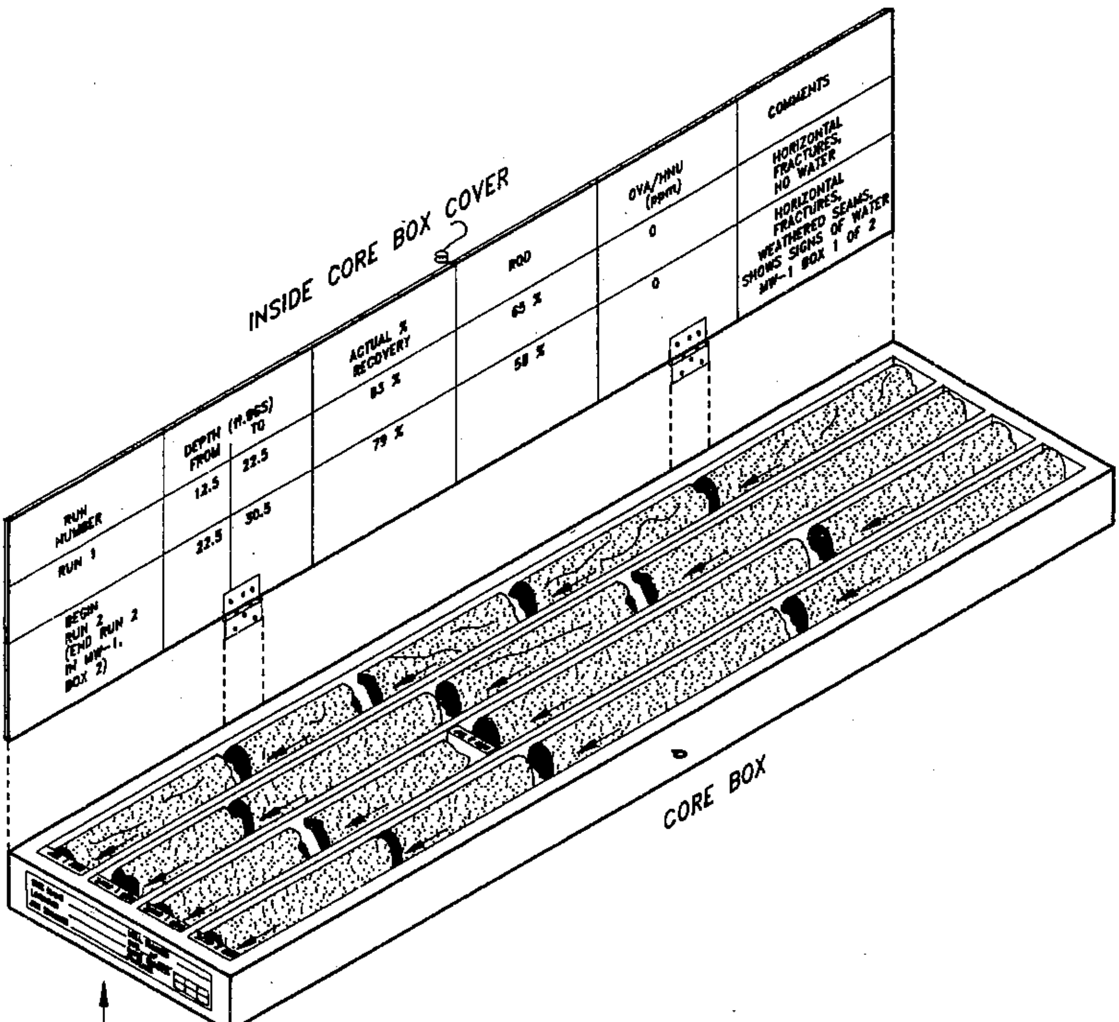


0% 5% 10% 15% 25% 50%

ABC LANDFILL
SYRACUSE, NEW YORK
XA-6022

MONITORING WELL MW-1
BOX 1 OF 2
CORE RUN 1 12.5'-22.5'
BEGINNING CORE RUN 2 22.5' - 30.5'

EXAMPLE: OUTSIDE CORE BOX COVER



RECORD THIS INFORMATION ON <u>EACH</u> END PANEL

SITE NAME ______________ WELL NUMBER ________
LOCATION ______________ BOX ___ OF ___
JOB NUMBER ______________ CORES #
FOOTAGE

SIDE PANELS

ROCK CORE HANDLING AND COREBOX PACKING

NOTES:

1. HANDLING OF CORE – THE TOP OF THE CORE SHALL BE PLACED AT THE BACK LEFT CORNER OF THE CORE BOX. THE REMAINING CORE SHALL BE PLACED TO THE RIGHT OF THE PRECEDING SECTION. THE CORE BOX SHALL BE FILLED IN THIS MANNER MOVING TO THE FRONT SECTIONS OF THE BOX AS NEEDED. THE BEGINNING OF EACH RUN SHALL BE MARKED ON THE CORE AND ALSO NOTED WITH A MARKED WOODEN BLOCK.

2. CORE LABELING – THE TOP OF THE CORE WILL BE SHOWN ON EACH PIECE OF CORE WITH AN ARROW WRITTEN IN A BLACK WATERPROOF MARKER. THE ARROW WILL INDICATE WHICH END OF THE CORE IS NEARER GROUND SURFACE.

   OTHER MARKS MADE ON CORES MAY INCLUDE:
   - MECHANICAL BREAKS
   - DRILLING FOOTAGES

3. CORE LOSS – MISSING SECTIONS OF CORE WILL BE SHOWN BY WOODEN SPACER BLOCKS. THE SITE GEOLOGIST WILL INSERT THE SPACER INTO THE COREBOX IN PLACE OF THE MISSING SECTION. THE SPACER SHOULD INDICATE THE RUN NUMBER AND FOOTAGE OF THE MISSING CORE.

4. CORE BOX LABELING – INCLUDE THE FOLLOWING:

   OUTER CORE BOX COVER

   TOP LEFT: PROJECT NAME
   CITY, STATE
   PROJECT NUMBER

   LOWER RIGHT: MONITORING WELL (MW1)
   (EXAMPLE) BOX 1 OF 2
   CORE RUN 1 12.5'–22.5'
   BEGINNING CORE RUN 2 22.5' – 30.5'

   BOTH OUTSIDE PANELS

SITE NAME ________	WELL NUMBER ________
LOCATION ________	BOX ___ OF ___
JOB NUMBER ________	CORE # [ ] [ ] [ ]
	FOOTAGE [ ] [ ] [ ]

   INSIDE CORE BOX COVER

   THE FOLLOWING COLUMNS WILL BE RECORDED ON THE INSIDE CORE BOX COVER.

RUN NUMBER	DEPTH (FT. BGS)		ACTUAL % RECOVERY	RQD	OVA/HNU (ppm)	COMMENTS
	FROM	TO				

   ONE ROW REGARDING THE ABOVE INFORMATION WILL BE RECORDED FOR EACH CORE RUN OR PARTIAL CORE RUN CONTAINED WITHIN THE COREBOX.

5. CORE BOX STORAGE – CORE BOXES FROM ALL SITE WELLS WILL BE MOVED FROM WELLHEADS ON A REGULAR BASIS AND STORED IN A DESIGNATED AREA. THIS LOCATION SHOULD BE IN AN AREA WHERE THE CORE BOXES WILL BE UNDISTURBED. WHEREVER POSSIBLE, THE COREBOX STORAGE AREA SHOULD BE INDOORS.

CORE BOX LOGGING DETAIL

ROCK QUALITY DESIGNATION AND FRACTURE FREQUENCY

Core borings are a useful means of obtaining information about the quality of rock mass. The recoverable core indicates the character of the intact rock and the number and character of the natural discontinuities.

Another quantitative index that has proved useful in logging NX core is a rock quality designation (RQD) developed by Deere (1963). The RQD is a modified core recovery percentage in which all the pieces of sound NX core over 4 inches long are counted as recovery. The length of the core run is the distance to the nearest tenth of a foot from the corrected depth of the hole at the end of the previous run to the corrected depth of the hole at the end of subject run. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. The RQD is a more general measure of the core quality than the fracture frequency. Core loss, weathered and soft zones, as well as fractures, are accounted for in this determination. The RQD provides a preliminary estimate of the variation of the in situ rock mass properties from the properties of the "sound" portion of the rock core. Thus, a general estimate of the behavior of the rock mass can be made. An RQD approaching 100 percent denotes an excellent quality rock mass with properties similar to that of an intact specimen. RQD values ranging from 0 to 50 percent are indicative of a poor quality rock mass having a small fraction of the strength and stiffness measured for an intact specimen.

RQD (Rock Quality Designation)

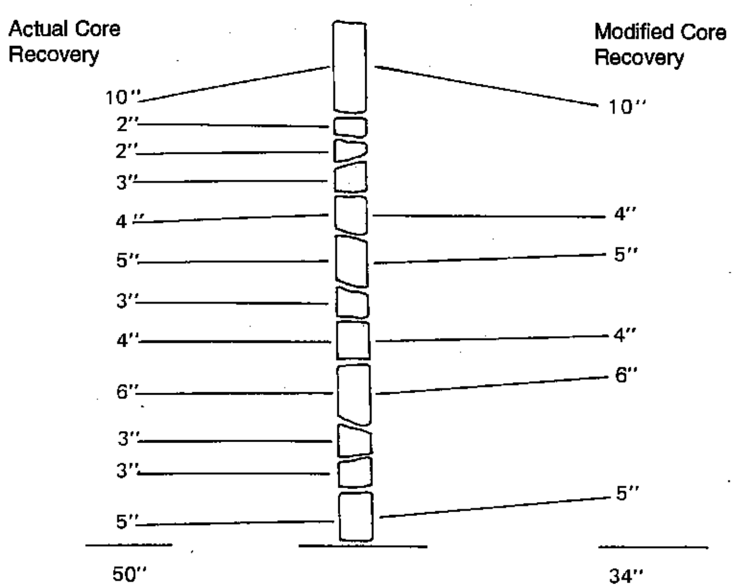
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

An example of determining the RQD from a core run of 60 inches measured from corrected depth to corrected depth is given in diagram below. For this particular case, the core recovery was 50 inches and the modified core recovery was 34 inches. This yields an RQD of 57 percent, classifying the rock mass in the fair category.

Problems arise in the use of RQD for determining the in situ rock mass quality. The RQD evaluates fractures in the core caused by the drilling process, as well as in natural fractures previously existing in the rock mass. For example, when the core hole penetrates a fault zone or a joint, additional breaks may form that, although not natural fractures, are caused by natural planes of weakness existing in the rock mass. These fresh breaks occur during drilling and handling of the core and are not related to the quality of the rock mass. The skill of the driller will affect the amount of breakage and the core loss that occurs. Poor drilling techniques will "penalize" the rock by lowering its apparent quality. It is difficult to distinguish between drilling breaks and those natural and incipient fractures that reflect the quality of the rock mass. In certain instances, it may be advisable to include all fractures when estimating RQD. Obviously, some judgment is involved in core logging.

Another problem with the use of the RQD index is that the determinations are not sensitive to the tightness of the individual joints, whereas in some instances, the in situ deformation modulus may be strongly affected by the average joint opening.

RQD OF A SINGLE CORE RUN



Core Run 60" (Corrected depth to corrected depth)

$$\frac{34"}{60"} \times 100\% = 57\% = \text{Fair}$$

Typical calculation of RQD of a single core run. Note that the run is calculated from corrected depth to corrected depth.

CEMENT AND GROUT MIXTURES, ANNULAR SPACE, AND CONVENIENT CONVERSION FACTORS

CEMENT MIX PER ONE - NO. 94 CEMENT SACK				
MIXING WATER		VOLUME OF SLURRY		DENSITY
gal	ft^3	gal	ft^3	g/cm^3
5.2 *	.70	8.8	1.2	1.9
6	.80	9.7	1.3	1.8
7	.94	10.5	1.4	1.7

81.5
-74.0
7.5

Table values reflect the cement mixture obtained using one 94 lb sack of API Class A/Portland Type I cement (one cubic foot) with specified volume of water.

4.48 ft^3

The addition of bentonite to cement requires that the amount of water also be increased. 5.3 % water by weight should be added for each 1.0% of bentonite by weight added.

* This is the minimum volume of water needed to hydrolize one 94 lb. sack of cement (neat cement slurry)

ANNULAR VOLUME

ANNULAR VOLUME FORMULA (gallons)

$$V = (d_2^2 - d_1^2)\ (D)\ (.041)$$

V = Volume (gallons)

d_2 = Diameter of borehole (inches)

d_1 = Casing O.D. (inches)

D = Depth of drilled hole to fill (feet)

ANNULAR VOLUME CHART (cubic feet/linear feet)*

	Borehole Diameter (O.D.)				
Casing (I.D)	6"	7"	8"	9"	10"
2"	.17	.24	.32	–	–
4"	–	.16	.24	.33	–
6"	–	–	.11	.20	.31

Note: Add extra cement/grout to account for seepage or loss due to voids around drill hole.

GENERAL INFORMATION

CONVERSION FACTOR

Multiply	By	To Obtain
Cubic feet	7.4805	Gallons (U.S.)
Gallons	0.1337	Cubic feet

CEMENT - ONE SACK

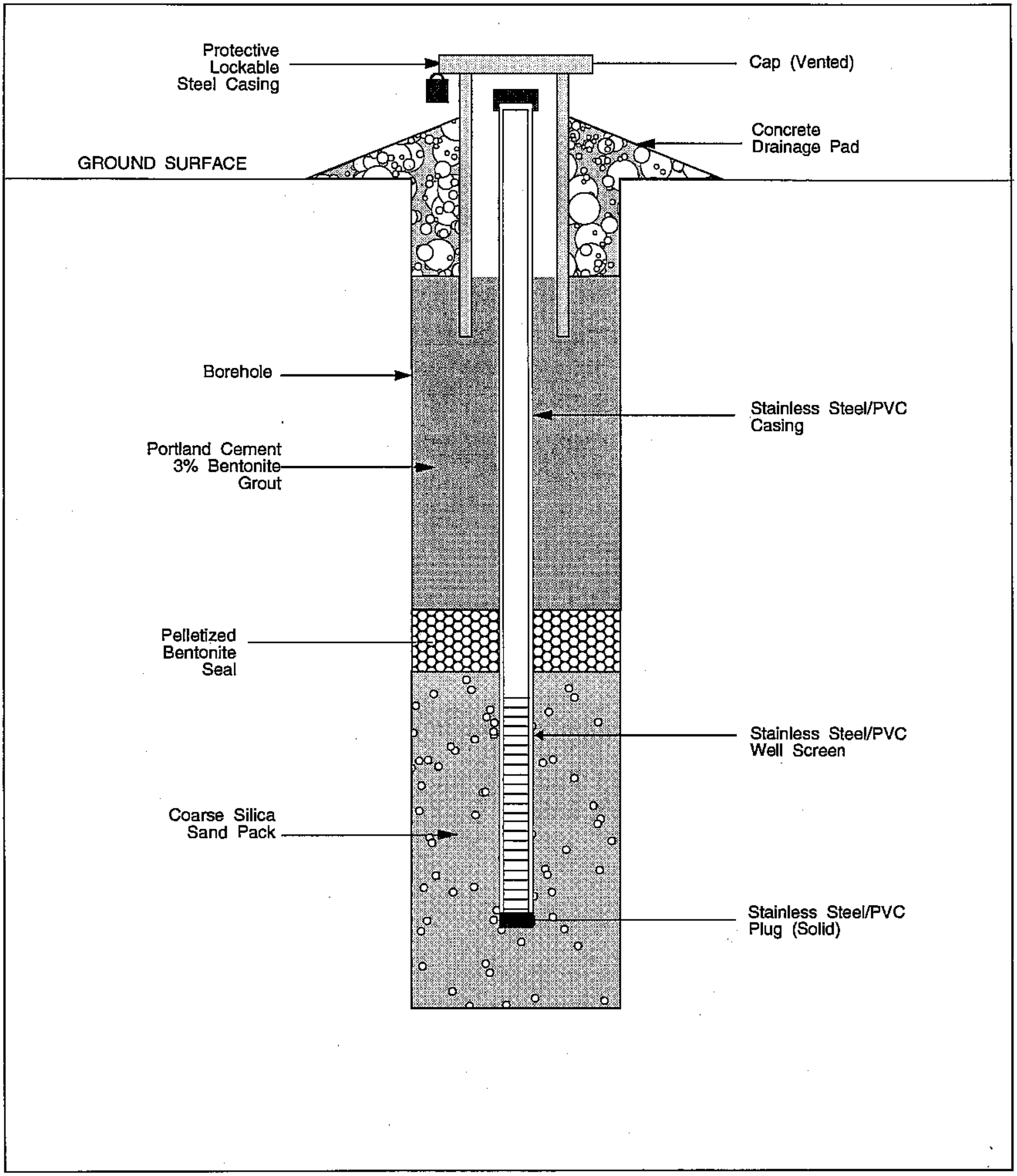
Weight	94 lbs.
Volume	7.48 gallons 1.0 ft^3
Density	3.15 g/cm^3

WATER

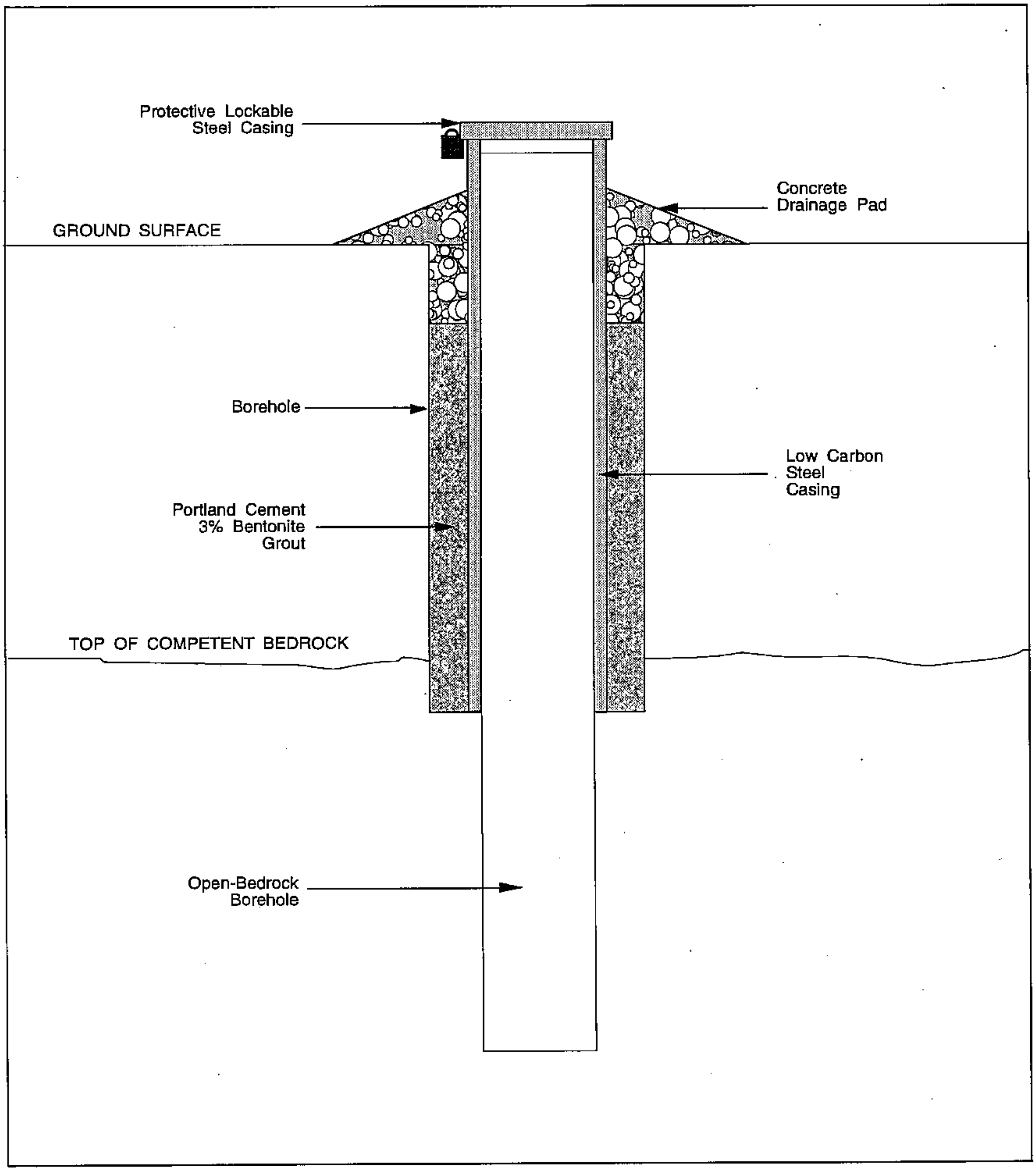
Density - 8.32 lbs./gallons

62.23 lbs/ ft^3

1.0 gallons/cm^3

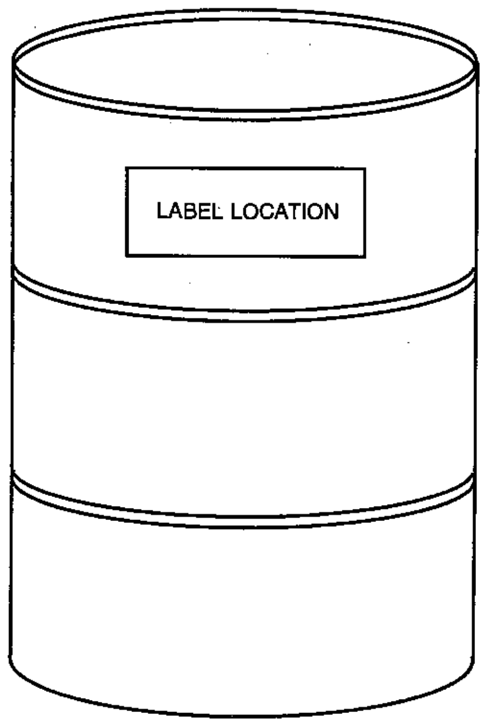


TYPICAL SCREENED MONITORING WELL CONSTRUCTION



TYPICAL OPEN-HOLE MONITORING WELL CONSTRUCTION

INVESTIGATION-DERIVED WASTE DRUM/CONTAINER PACKING AND LABELING



- Record applicable information on each drum (see Note No. 2)
- Labeling should be located on the upper 1/3 of the drum
- Label drum using an enamel paint stick

EXAMPLE LABEL

SITE NAME.	ABC LANDFILL
DATE	JAN. 2,1991
MATERIAL	DRILL CUTTINGS (100% SOLID)
DRUM ID. NUMBER	DRUM NO.3
SOURCE OF MATERIAL	MONITORING WELL 2 (30'-36')
SITE CONTRACTOR	ECOLOGY AND ENVIRONMENT

1. WASTE DRUM/CONTAINER PACKING

Wastes from separate sources should not be mixed into a single drum whenever possible. Drums should not be overpacked. Particular care should be taken to leave enough headspace to account for the expansion due to freezing of liquids containing water as it is not unusual for drums to remain onsite for several months or more. Care should be taken to keep the outsides of the drum free from investigation-derived wastes. Drums with bungholes (DOT 17-E) should be filled only with liquids. Drums with open tops (DOT 17-H) may be filled with liquids or solids. Be sure to properly fit the gasket on a 17-H drum when filling with liquids.

Lids should be placed on drums and be securely fastened with the retainer loop. Retainer loops are most easily put onto drums by starting at one end and working over the drum/lid lip. Care should be taken to visually inspect this seal. An improper seal will result in drum leakage regardless of how tight the nut-bolt fastener is tightened. The retainer loop may require gentle tapping around its circumference to seal properly. Finally, secure the retainer loop with the nut and bolt fastener. The nut and bolt assembly should be facing downward.

2. DRUM/CONTAINER LABELING

Waste drums should be clearly labeled using a enamel paint stick. The following information should be recorded directly on the drum face.

- Site name
- Date when material was generated
- Matrix (soil, water, personal protective gear, precentage of solids,liquids, etc.)
- Drum ID number
- Source of material and depth where applicable
- Ecology & Environment, Inc.

Additional material may include:

- Listing of hazardous substances known to be within (acetone, hexane, methanol, etc.)
- Expected concentration of materials (low, medium, high)
- Warnings/cautions for next party opening drum

All labeling should be done on the side of the drum. Duct tape should not be used to label drums. Writing should be done directly on the drum itself.

3. DRUM/CONTAINER STORAGE AND HANDLING

Investigation-derived waste should be left. on site unless previously directed otherwise by the E&E Project Manager. Filled drums, particularily soils or waters should be left in the place where they are filled. Field crews should not attempt to lift, roll, or otherwise move drums at a site. Moving drums without the proper equipment can easily cause personal injuries, damage to the drum, and/or to the work site. Therefore if the drums need to be moved to a central repository, arrangements should be made for the appropriate equipment to be used.

4. DRUM/CONTAINER NUMBERING

Drum numbers should be consecutive.

REFERENCES

REFERENCES

American Society for Testing and Materials, 1986, 1986 Annual Book of ASTM Standards, Volume 4.08, Section 4, Construction, Soil and Rock: Building Stones, Philadelphia, Pennsylvania.

Deere, D.V., 1963, Technical Description of Rock Cores for Engineering Purposes: Rock Mechanics and Engineering Geology, Vol. 1, No. 1, pp.16-22.

Dow Chemical, 1980, Field Data Handbook, Dowell Division of Dow Chemical, Houston, Texas.

Driscoll, F.G. (editor/principal author), 1986, Groundwater and Wells, Second Edition, Johnson Filtration Systems, Inc., St. Paul, Minnesota.

Dutro, J.T., Jr., R.V. Dietrich, and R.M. Foose (compilers), 1989, AGI Data Sheets for Geology in the Field, Laboratory, and Office, Third Edition, American Geological Institute, Alexandria, Virginia.

Krumbien, W.C., and L.L. Sloss, 1963, Stratigraphy and Sedimentation, W.H. Freeman and Company, San Francisco, California.

U.S. Army Corps of Engineers, St. Louis District, Inspector's Manual, St. Louis, Missouri.

U.S. Environmental Protection Agency, 1986, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, U.S. Government Printing Office, Washington, D.C.

5-9'

Shelby tubes
04 to 06, Control
1 per to 02'

Travelodge
exit College Ave go left 2 lights
R on Meadowood becomes Trexlertown ... ch Rayno

MEDICAL INFORMATION

HOSPITAL NAME: ______________________________

HOSPITAL ADDRESS: ______________________________

____

____

EMERGENCY ROOM PHONE ( ) --

MEDTOX HOTLINE

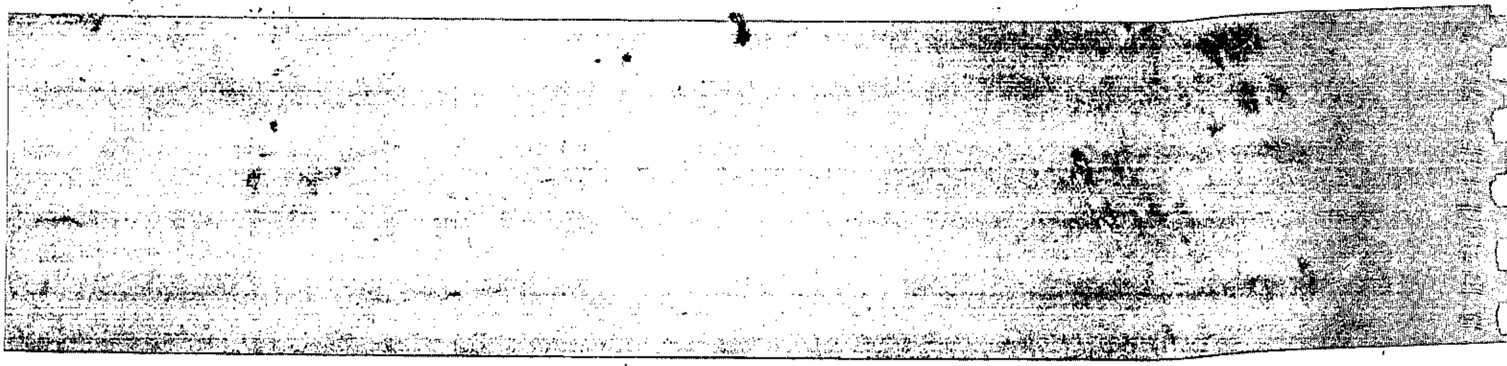
1. Twenty-four hour answering service: (501) 370-8263
What to report:

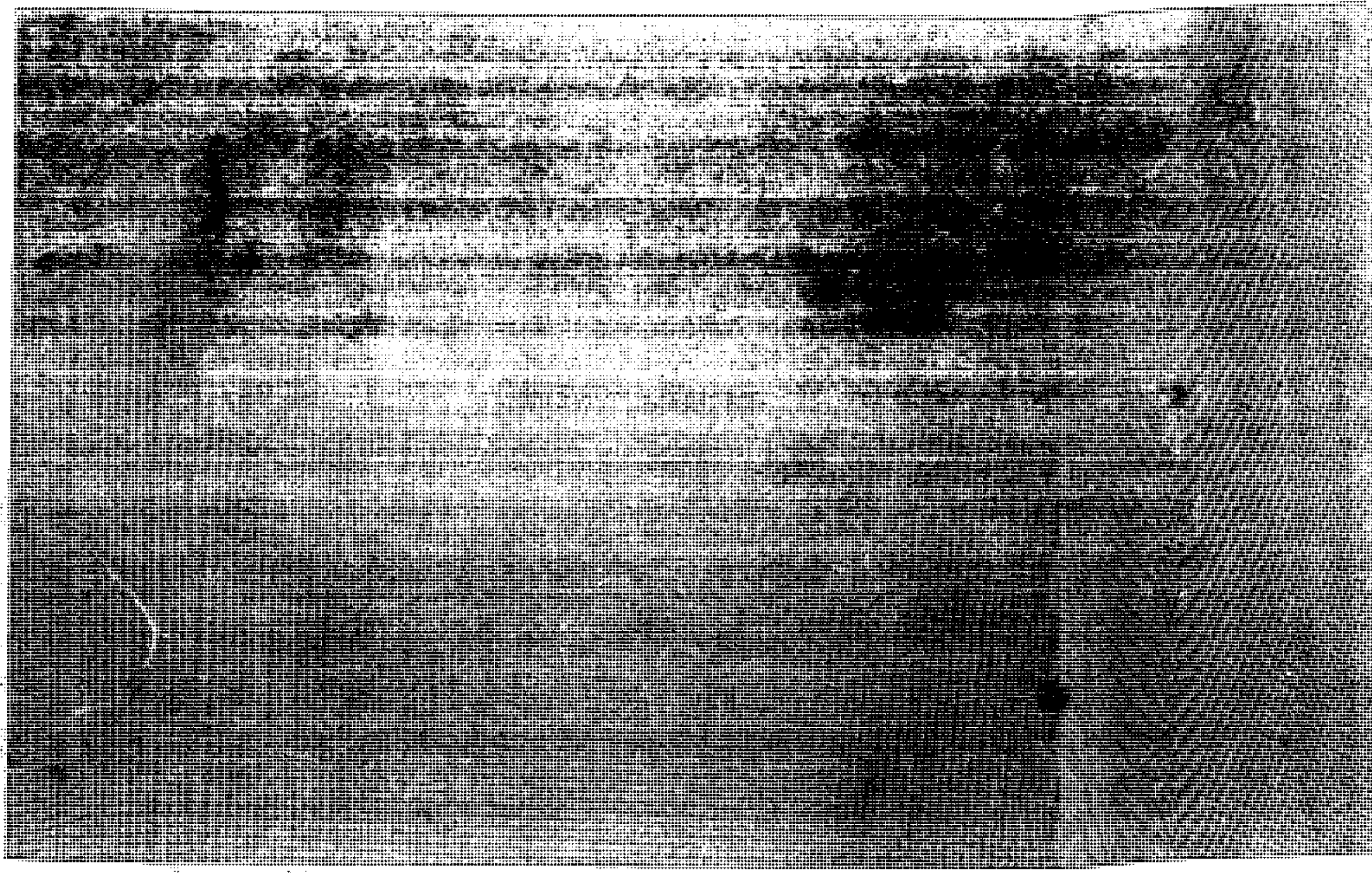
- State: "This is an emergency."
- Your name, region, and site.
- Telephone number to reach you.
- Your location.
- Name of person injured or exposed.
- Nature of emergency.
- Action taken.

Dale C
425 677-4772
Andy
503-334-5119

2. A toxicologist (Drs. Raymond Harbison or associate) will contact you. Repeat the information given to the answering service.

3. If a toxicologist does not return your call within 15 minutes, call the following persons in order untill contact is made:
   a. 24 hour hotline - (716) 684 8940
   b. Corporate Safety Director - Paul Jonmaire - home# (716) 655-1260
   c. Assistant Corp. Safety Officer - Tom Siener - home # (716) 662-4740





If lost please return to:
Ecology and Environment, Inc.
Attn: Manager Environmental Services Division
368 Pleasant View Drive
Lancaster, New York 14086
or call Ecology and Environment, Inc.
(716) 684-8060
Reward for return and postage charges

ecology and environment, inc.