APPENDIX D

COST OF RECLAMATION

APPENDIX D

COST OF RECLAMATION

CALCULATION NOTES

Subject: Drainage Ditch Evaluation

By: BAF

Checked:

Acc't:

Date: June 30 19 83

Sheet No. 1 of 2 Sheets

The drainage ditch east of the refuse pile provides an escape for excess water which may accumulate from the plant equipment and material storage yard area. Due to the flatness of the drainage area, runoff velocities are slow and in many areas nonexistent,resulting in puddling. Culverts located under roadways preclude significant puddling in roadways, and act to equalize standing water in most areas. Soil infiltration is high due to the slow velocities which allow moisture more time to percolate into the soils rather than run off.

The equipment and material storage yard is located on an old floodplain of the Price River and as such is subject to sediment deposition rather than erosion. The soil carrying capacity on these relatively flat surfaces is essentially nil.

Hydrologic evaluation for the drainage area feeding the drainage ditch is found on page B-6.. Cross sections of the ditch are found on Drawing No. E9-3431. Since the drainage area is not subject to sediment contributions, the Operator proposes that a silt fence be installed at the location of cross section K-K. As such, sediments that may be carried into the drainage ditch will be filtered prior to discharge. This area is considered a small area in terms of sediment contribution potential, and exemption from sedimentation pond installations is requested.

The drainage ditch is not subject to significant water velocities which would wash out the silt fence. Like the surrounding area, the ditch has only a slight grade which results in a maximum velocity of 2.8 feet per second. It should be noted that approximately one half of the total storm runoff (assuming all the runoff reached the drainage ditch) can be contained in the ditch from section K-K upstream while maintaining 0.3 feet of freeboard. The Geofab silt fence has a capacity to pass some 470 gallons per square foot of fence. Specifications for this silt fence is included on page B-27.

Ditch velocities were calculated using the manning formula given on page B-13. Velocities are calculated using Q = AV as follows:

- **Section JJ'**

  A = 19.8 SF (calculated from survey notes)
  P = 16.7 FT (measured when surveyed)
  R = A/P = 1.18 FT.

  $$Q = \frac{1.486}{0.035}(19.8)(1.18)^{2/3}(0.0027)^{1/2} = 49 \text{ cfs}$$

  $$V = \frac{Q}{A} = 2.5 \text{ ft./sec.}$$

Subject Heat Dryer	CALCULATION NOTES
Drainage Area	By BAF
Ref. Dwg. F9-177	Checked
	Acc't
	Date May 27 1983
	Sheet No. 4 of 5 Sheets

Runoff Requirement

Soil (1) (3) Type	Curve No. (2)	Acres (3)	Weighted CN (4)
BuB2	87	0.97	73.4
Blacktop/ Bldgs.	98	0.18	15.3
		1.15	88.7

CN = 89 Q10-24 = 0.879 in.
S = 1.24 Q25-24 = 1.177 in.

$$\text{Volume 10-24} = \frac{(0.879\text{ in.})\ (1.15\text{ ac})\ (43560\text{ sf/ac})}{12\text{ in/ft}} = 3{,}669\text{ cf}$$

$$\text{Volume 25-24} = \frac{(1.177\text{ in.})\ (1.15\text{ ac})\ (43560\text{ sf/ac})}{12\text{ in/ft}} = 4{,}913\text{ cf}$$

Soil Loss Requirement

F = 20 LS = 0.10
K = 0.50 C = 0.45

(20) (0.50) (0.10) (0.45) = 0.450 tons/acre/year

$$\text{3 year soil loss} = \frac{(0.450\text{ T/ac/yr})\ (0.97\text{ ac})\ (3\text{ yr})\ (2000\text{ \#/T})}{85\text{ \#/CF}} = 31\text{ CF}$$

Containment is provided in the Heat Dryer Pond (reference Dwg. E9-3433). where is this

Rev. 1: 6-30-83
Rev. 2: 12-30-83
Rev. 3: 2-24-84

SUMMARY OF RECLAMATION COSTS

1. Demolition and Disposal of Facilities

1.1	Main Plant	$ 241,649
1.2	Track Hopper and Raw Coal Conveyor	139,313
1.3	Heat Dryer and Conveyor	29,155
1.4	Refuse Pipeline	75,465
1.5	Pumphouse	10,377
1.6	Coarse Refuse Bin	1,089
1.7	Office Building	9,031
1.8	Storehouse	7,867
1.9	Shop	7,867
1.10	Coal Carbonization Lab	3,475
1.11	Fuel Storage	8,953
1.12	Plant Pumphouse	4,173
1.13	Sand Hopper	6,682
1.14	Substation	14,940
1.15	Plant Railroad	219,375
1.16	Powerline - West of Price River	2,631
1.17	Natural Gas Pipeline	1,398
1.18	Powerline - East of Price River	4,878
1.19	Pavement	17,364
1.20	Clear Water Dike Facilities	37,675
	Total	$ 843,357

2. Grading

2.1	Site Grading - West of Price River	$ 89,847
2.2	Road Pond	4,056
2.3	Heat Dryer Pond	187
2.4	Cover Refuse Pile with Topsoil	75,624
2.5	Cover Lower Refuse Pond with Refuse	275,749
2.6	Cover Refuse Disposal Area with Topsoil East of Price River	842,444
2.7	Grade Out Clear Water Dike	274,502
2.8	Grade Upper Refuse Dike to 5:1 Slope	2,745
2.9	Grade off Crest of Lower Refuse Dike	624
2.10	Grade Diversion Ditch - West of Price River	1,716
2.11	Cover Main Plant Area with Topsoil	167,899
2.12	Cover River Pump House and Slurry Pipeline Areas with Tcpsoil	14,915
2.13	Additional Cost to Mix Soils at Topsoil Borrow Area	98,871
	Total	**$1,849,179**

3. Revegetation $ 330,064

TOTAL RECLAMATION COST **$2,992,600**

Rev. 1: 6-30-83
Rev. 2: 12-30-83

1. Demolition and Disposal of Facilities

	Building or Structure	Unit	Unit Cost	Total Units	Cost	Total Cost
1.1	Main Plant					
	Building	C.F.	$ .15[2]	1,390,160	$208,524	
	Foundation	C.Y.	91.00[2]	347	31,577	
	Concrete Disposal	C.Y.	4.46[2]	347	1,548	$241,649
1.2	Track Hopper and Raw Coal Conveyor					
	Conveyor	C.F.	$ .15[2]	68,750	$ 10,312	
	Building	C.F.	.15[2]	249,700	37,455	
	Foundation	C.Y.	91.00[2]	959	87,269	
	Concrete Disposal	C.Y.	4.46[2]	959	4,277	$139,313
1.3	Heat Dryer and Conveyor					
	Conveyor	C.F.	$ .15[2]	21,824	$ 3,273	
	Building	C.F.	.15[2]	110,688	16,603	
	Scrubber	C.F.	.21[2]	2,267	476	
	Foundation	C.Y.	91.00[2]	117	8,281	
	Concrete Disposal	C.Y.	4.46[2]	117	522	$ 29,155
1.4	Refuse Pipeline					
	Structure	C.F.	$ .15[2]	64,230	$ 9,365	
	Foundation	C.Y.	91.00[2]	62	5,642	
	Concrete Disposal	C.Y.	4.46[2]	62	278	
	10" Pipeline	Ft.	8.85[2]	6,800	60,180	$ 75,465
1.5	Pumphouse					
	Building	C.F.	$ .15[2]	9,360	$ 1,404	
	Foundation	C.Y.	91.00[2]	94	8,554	
	Concrete Disposal	C.Y.	4.46[2]	94	419	$ 10,377
1.6	Coarse Refuse Bin					
	Building	C.F.	$ .15[2]	5,984	$ 898	
	Foundation	C.Y.	91.00[2]	2	182	
	Concrete Disposal	C.Y.	4.46[2]	2	9	$ 1,089
1.7	Office Building					
	Building	C.F.	$ .15[2]	28,392	$ 4,258	
	Foundation	C.Y.	91.00[2]	50	4,550	
	Concrete Disposal	C.Y.	4.46[2]	50	223	$ 9,031

	Building or Structure	Unit	Unit Cost	Total Units	Cost	Total Cost
1.8	Storehouse					
	Building	C.F.	$ .15[2]	26,352	$ 3,953	
	Foundation	C.Y.	91.00[2]	41	3,731	
	Concrete Disposal	C.Y.	4.46[2]	41	183	$ 7,867
1.9	Shop					
	Building	C.F.	$ .15[2]	26,352	$ 3,953	
	Foundation	C.Y.	91.00[2]	41	3,731	
	Concrete Disposal	C.Y.	4.46[2]	41	183	7,867
1.10	Coal Carbonization Lab					
	Building	C.F.	$ .15[2]	11,712	$ 1,757	
	Foundation	C.Y.	91.00[2]	18	1,638	
	Concrete Disposal	C.Y.	4.46[2]	18	80	$ 3,475
1.11	Fuel Storage					
	Building	C.F.	$ .15[2]	32,317	$ 4,848	
	Foundation	C.Y.	91.00[2]	43	3,913	
	Concrete Disposal	C.Y.	4.46[2]	43	192	$ 8,953
1.12	Plant Pumphouse					
	Building	C.F.	$ .15[2]	13,820	$ 2,073	
	Foundation	C.Y.	91.00[2]	22	2,002	
	Concrete Disposal	C.Y.	4.46[2]	22	98	$ 4,173
1.13	Sand Hopper					
	Foundation	C.Y.	$91.00[2]	70	$ 6,370	
	Concrete Disposal	C.Y.	4.46[2]	70	312	$ 6,682
1.14	Substation					
	Foundation	C.Y.	$91.00[2]	35	$ 3,185	
	Chain Link Fence	L.F.	1.09[2]	122	133	
	Equip. & Struct.	M.H.	22.70[2]	512	11,622	$ 14,940
1.15	Plant Railraod					
	Ties & Tracks	L.F.	$11.25[2]	19,500	$219,375	$219,375
1.16	Powerline - West of Price River					
	Powerpoles	Ea.	$61.00[2]	23	1,035	
	Conductors	Mile	958.00[3]	1.67	1,596	$ 2,631

	Building or Structure	Unit	Unit Cost	Total Units	Cost	Total Cost
1.17	Natural Gas Pipeline					
	Branch Line to Track Hopper	Ft.	$ 4.42[2]	150	$ 663	
	Branch Line to Office	Ft.	4.42[2]	50	221	
	Branch Line to Plant	Ft.	4.42[2]	50	221	
	Concrete Meter Station	C.Y.	91.00[2]	3	270	
	Concrete Disposal	C.Y.	7.55[2]	3	23	$ 1,398
1.18	Powerline - East of Price River					
	Powerpoles	Ea.	$61.00[2]	25	$ 1,525	
	Conductors	Mile	958.00[3]	3.5	3,353	$ 4,878
1.19	Pavement					
	Bituminous Pavement	S.Y.	$ 1.33	13,056	$ 17,364	$ 17,364
1.20	Clear Water Dam Facilities					
	.1 Water Intake Tower	C.Y.	$91.00[2]	35	$ 3,185	
	Fresh Water Line 24" Concrete	Ft.	5.90[2]	200	1,180	
	Spillway 24" Concrete	Ft.	5.90[2]	200	1,180	
	.2 Disposal - push to Lower Refuse Dike and bury Quantity of Material					
	(a) Pipe (cy)				146	
	(b) Water Intake Tower (cy) with 2.0 swell factor				70	
	(c) Total				216	
	(d) Estimated production refer to site grading (LCY/Hr) for Caterpillar D9L				302	
	(e) Total Bulldozer time (hrs)				1.4	
	(f) Bulldozer cost/hr.				$192.58	
	(g) Total Disposal Cost				270	
	.3 10" Steel Pipe	Ft.	$ 8.85[2]	3,600	$ 31,860	
	.4 Total					$ 37,675

2. Grading

2.1 Site Grading - West of Price River

.1	Volume of material to be graded (BCY)	75,000
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	98,000
.4	Production for Cat D8L bulldozer (LCY/hr)[1]	675
.5	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	340
.7	Total grading time (hrs)	288
.8	Labor and equipment costs/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	$151.72	$151.72
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman[2]	1	16.75	16.75
			$311.97

.9 Total Grading Cost $89,847

2.2 Road Pond

.1	Volume of material to be graded (BCY)	2,750
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	3,575
.4	Production for Cat D81 bulldozer (LCY/hr)	550
.5	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	277
.7	Total grading time (hrs)	13
.8	Labor and equipment costs/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	151.72	151.72
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman[2]	1	16.75	16.75
			$311.97

.9 Total Grading Cost — $ 4,056

2.3 Heat Dryer Pond

.1	Material to be graded (BCY)	350
.2	Swell factor[1]	1.30
.3	Total grading (LCY)	455
.4	Production for Cat D8L[1] dozer with universal blade (LCY/hr)	1,500
.5	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	756
.7	Total grading time (hrs)	0.6
.8	Labor and equipment cost/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L	1	151.72	151.72
(b) Water truck	1	132.09	132.09
(c) Sheeps-foot roller	1	11.41	11.41
(d) Foreman[2]	1	16.75	16.75
			$311.97

.9 Total Grading Cost — $ 187

2.4 Cover Refuse Pile with Topsoil

.1	**Required topsoil 1 ft. thick (cy)**	33,000
.2	**Available topsoil - cy (from recovering soil material when refuse pile was expanded)**	29,100
.3	**Required borrow topsoil (cy)**	3,900

.4 Move Topsoil From Topsoil Pile to Refuse Pile

Cycle Times

(a)	Basic wheel loader cycle time (Cat 988)[1]	0.55
(b)	Truck haul distance (ft.)	1,700
(c)	Truck haul time-loaded (Cat 769C)[1]	2.5 min.
(d)	Truck haul fime-empty[1]	.6 min.
(e)	Truck capacity (cy)[1]	28.20
(f)	Wheel loader bucket capacity (cy)[1]	7
(g)	Cycles to load truck	4
(h)	Load time	2.2
(i)	Total cycle time (min.)	5.3
(j)	A second truck can be loaded while the first truck is hauling	
(k)	Cycles/hr.	11.3
(l)	Cy/cycle (28.2 x 2)	56.4
(m)	Cy/hour	637
(n)	Hours to move topsoil	45.7

.5 Move Borrow Topsoil to Refuse Pile

Cycle Times

(a)	Basic wheel loader cycle time (Cat 988)[1]	0.55
(b)	Truck haul distance (ft)	6,800
(c)	Truck haul time - loaded (Cat 769C)[1]	5.9
(d)	Truck haul time - empty[1]	2.5
(e)	Truck load time (min)	2.2
(f)	Total cycle time for 2 trucks (min)	10.6
(g)	Cycles/hour	5.7
(h)	Cy/hour	319
(i)	Volume of material to be moved (cy)	3,900
(j)	Hours to move	12.2

.6 Total Time to Move and Spread Topsoil Hours 57.9

(a)	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
(b)	Total time to move topsoil (hours)	114.9

.7 Equipment and Labor Costs/Hr.

	Qty.	Hourly Cost/ Unit	Total
(a) Cat 988 wheel loader	1	$143.05	$143.05
(b) Cat 769 off-highway truck	2	107.28	214.56
(c) Cat D8L dozer	1	151.72	151.72
(d) Foreman[2]	1	16.75	16.75
(e) Water truck	1	132.09	132.09
(f) Total			$658.17

.8 Total Cost for Topsoil $75,624

2.5 Cover Lower Refuse Pond with 18" Thick Layer of Refuse

.1	Volume of material required (compacted cy)	183,500
.2	Swell factor[1]	1.30
.3	Volume of material to be moved (LCY)	238,600
.4	Cycle Times	
	(a) Scraper capacity-Cat 637D (cy)[1]	31
	(b) Haul distance (ft.)	2,800
	(c) Loaded haul time[1]	1.5
	(d) Empty haul time[1]	2.9
	(e) Maneuver	0.5
	(f) Total cycle time (min)	4.9
	(g) Cycles/hour	12.2
	(h) Production factors	
	Average operator[1]	0.75
	Job efficiency[1]	0.84
	Material[1]	0.80
	(i) Cycles/hour	6.2
.5	Production/hour (LCY/unit)	192
.6	Production for 3 units (LCY/hr)	576
.7	Spread topsoil with Cat D8L bulldozer	
	(a) Production/hr at 100' dozing distance (LCY/hr)	1,250
	(b) Production factors	
	Average operator[1]	0.75
	Job efficiency[1]	0.84
	Material[1]	0.80
	(c) Estimated production (LCY/hr)	630
.8	Total hours to move and spread refuse	414
.9	Equipment and Labor Costs/Hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	$151.72	$151.72
(b) Cat 637D scraper	3	229.04	687.12
(c) Sheeps-foot roller	1	11.41	11.41
(d) Foreman[2]	1	16.75	16.75
(e) Water truck	1	132.09	132.09
(f) Total Cost/hr.			$999.09

.10 Total Cost to Move Refuse $413,623

2.6 Spread 6" Layer of Topsoil Over Refuse Disposal Area

.1	Volume of topsoil required (LCY)	168,900
.2	Haul distance (mi)	11
.3	Truck cycle time	
	(a) Average speed (mph)	30.0
	(b) Haul cycle time (min)	22.0
	(c) Maneuver and dump (min)	1.5
	(d) Total truck cycle time (min)	23.5
.4	Loading Cycle Time	
	(a) Basic cycle Cat 988 wheel loader[1]	0.55
	(b) Truck capacity (cy)[4]	28
	(c) Wheel loader bucket capacity[1]	7
	(d) Cycles to load truck	4
	(e) Cycle time to load truck (min)	2.2
	(f) Production factor	
	Average operator[1]	0.75
	Material [1]	0.80
	(g) Adjusted cycles time to load truck	3.7
	(h) Trucks which can be loaded/wheel loader	5
.5	Estimated production (LCY/hr)	140
.6	Job efficiency[1]	0.84
.7	Production (LCY/hr)	118
.8	Time required (hrs)	1,436
.9	Equipment and labor costs	

	Qty.	Hourly Cost/ Unit	Total
(a) 28 cy tractor tr.	5	$ 84.19	$420.95
(b) Cat 988 wheel loader	2	143.05	286.10
(c) Cat D8L dozer	1	151.72	151.72
(d) Water truck	1	132.09	132.09
(e) Foreman[2]	1	16.75	16.75
(f) Total			$586.66

.10 Total Cost to Spread Topsoil $842,444

2.7 Grade Out Clear Water Dike

.1	Volume to be graded (BCY)	180,900
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	235,200
.4	Production with D9L dozer with universal blade (LCY/hr)	600
.5	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	302
.7	Total grading time (hrs)	778
.8	Equipment and labor costs/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D9L dozer	1	$192.58	$192.58
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman[2]	1	16.75	16.75
			$352.83

.9 Total Grading Cost $274,502

2.8 Grade Upper Refuse Dike to 5:1 Slope

.1	Volume to be graded (BCY)	5,600
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	7,280
.4	Production with D8L dozer with universal blade (LCY/hr)[1]	1,650
.5	Production factors	
	Average operator[1]	0.75
	Material[1]	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	832
.7	Total grading time (hrs)	8.8
.8	Labor and equipment costs/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	$151.72	$151.72
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman[2]	1	16.75	16.75
			$311.97

.9 Total Grading Cost $ 2,745

2.9 Grade Off Crest of Lower Refuse Dike

.1	Volume of material to be graded (BCY)	1,200
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	1,560
.4	Production with D8L dozer with universal blade (LCY/hr)	1,900
.5	Production factors	
	Average operator[1]	0.75
	Material	0.80
	Job efficiency[1]	0.84
.6	Estimated production (LCY/hr)	958
.7	Grading time (hrs)	2.0
.8	Equipment and labor cost/hr.	

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	$151.72	$151.72
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman[2]	1	16.75	16.75
			$311.97

.9 Total Grading Cost $624

2.10 Grade Diversion Ditch - West of Price River

.1	Volume of material to be graded (BCY)	4,050
.2	Swell factor[1]	1.30
.3	Volume of material to be graded (LCY)	5,265
.4	Production with D8L dozer with universal blade (LCY/hr)[1]	1,900

.5 Production factors

Average operator[1]	0.75
Material[1]	0.80
Job efficiency[1]	0.84

.6 Estimated production (LCY/hr) 958

.7 Grading time (hrs) 5.5

.8 Equipment and labor cost/hr.

	Qty.	Hourly Cost/ Unit	Total
(a) Cat D8L dozer	1	$151.72	$151.72
(b) Sheeps-foot roller	1	11.41	11.41
(c) Water truck	1	132.09	132.09
(d) Foreman	1	16.75	16.75
			$311.97

.9 Total Grading Cost $1,716

2.11 Cover Main Plant Area with 6" layer of topsoil

.1 Volume of topsoil required (LCY) 36,000

.2 Move borrow topsoil

Cycle Times

(a) Basic wheel loader cycle time (Cat 988)[1]	0.55
(b) Truck haul distance (ft)	7,800
(c) Truck haul time - loaded (Cat 769C)[1]	6.8
(d) Truck haul time - empty[1]	2.9
(e) Truck load time (min)	2.2
(f) Total cycle time for 2 trucks (min)	11.9
(g) Cycles/hour	5.0
(h) Cy/hour	280
(i) Volume of material to be moved (cy)	36,000
(j) Hours to move	128.6

.3 Total time to move and spread topsoil hours

(a) Production factors

Average operator[1]	0.75
Material[1]	0.80
Job efficiency[1]	0.84

(b) Total time to move topsoil (hours) 255.1

.4 Equipment and labor costs/hour

		Qty.	Hourly Cost/ Unit	Total
(a)	Cat 988 wheel loader	1	$143.05	$143.05
(b)	Cat 769 off-highway truck	2	107.28	214.56
(c)	Cat D8L dozer	1	151.72	151.72
(d)	Foreman[2]	1	16.75	16.75
(e)	Water truck	1	132.09	132.09
(f)	Total			$658.17

.5 Total cost for topsoil $167,899

2.12 Cover River Pump House and Slurry Pipelines with 6" layer of topsoil

.1	Volume of topsoil required (LCY)	3,000
.2	Haul distance (mi)	11
.3	Truck cycle time	
(a)	Average speed (MPH)	30.0
(b)	Haul cycle time (min)	22.0
(c)	Maneuver and dump (min)	1.5
(d)	Total truck cycle time (min)	23.5
.4	Loading Cycle Time	
(a)	Basic cycle Cat 988 wheel loader[1]	0.55
(b)	Truck capacity (cy)[4]	28
(c)	Wheel loader bucket capacity[1]	7
(d)	Cycles to load truck	4
(e)	Cycle time to load truck (min)	2.2
(f)	Production factor	
	Average operator[1]	0.75
	Material[1]	0.80
(g)	Adjusted cycles time to load truck	3.7
(h)	Trucks which can be loaded/wheel loader	5
.5	Estimated production (LCY/hr)	140
.6	Job efficiency[1]	0.84
.7	Production (LCY/hr)	118
.8	Time required (hrs)	25.4

.9 Equipment and labor costs

		Qty.	Hourly Cost/ Unit	Total
(a)	28 cy tractor tr.	5	$ 84.19	$420.95
(b)	Cat 988 wheel loader	2	143.05	286.10
(c)	Cat D8L dozer	1	151.72	151.72
(d)	Water truck	1	132.09	132.09
(e)	Foreman[2]	1	16.75	16.75
(f)	Total			$586.66

.10 Total Cost to Spread Topsoil $14,915

2.13 Additional Cost to Mix Soils at Topsoil Borrow Area

.1	Volume of material(cy)	195,500
.2	Ripping production with D9D[1] (cy/hr)	3,000
.3	Production factors[1]	
	Average Operator	0.75
	Job Efficiency	0.84
	Material	1.00
.4	Estimated production cy/hr	1,890
.5	Hours to rip	103.4
	Purshing time will be increased 50 percent to allow for soil mixing. Pushing cost is included in topsoil removal costs.	
.6	Volume of material (cy)	98,000
.7	Dozing distance (ft)	600
.8	Production with Cat D9D bulldozer (cy/hr)[1]	380
.9	Production factors[1]	
	Average Operator	0.75
	Job Efficiency	0.84
	Material	1.00
.10	Estimated production (cy/hr)	239
.11	Time (hrs)	410
.12	Total Time	513.4
.13	Equipment and Labor costs/hr	192.58
.14	Total cost	$98,871

3. Revegetation Cost

3.1 Acres to be revegetated 392

3.2 Development of revegetation cost[5]

	Cost/Acre
Seedbed preparation	$ 60
Fertilizer	120
Seeding	362
Mulching	300
	$842

3.3 Total Revegetation Cost $330,064

DEVELOPMENT OF EQUIPMENT COSTS[4]

1. Caterpillar D8L Bulldozer with Universal Blade

1.1	Basic rental one month	$12,845
	"U" dozer	1,610
	Hydraulic tilt attachment	165
	Rear ripper	1,365
	Total Monthly Rental	$15,985
1.2	Adjustment	1.05
1.3	Adjusted monthly rental	$16,784
1.4	Hourly rental (176 hours/month)	95.37
1.5	Operating Costs	
	.1 Basic	34.15
	.2 "U" dozer	1.40
	.3 Hydraulic tilt attachment	.20
	.4 Rear ripper	1.70
	.5 Operator[2]	18.90
	Total Operating Costs/Hour	$56.35
1.6	Total Equipment Cost/Hour	$151.72

2. Caterpillar 988 Wheel Loader

2.1	Basic rental/month	$12,415
2.2	Adjustment	1.05
2.3	Adjusted monthly rental	12,752
2.4	Hourly rental (176 hrs/mo)	72.45
2.5	Operating cost	51.70
2.6	Operator[2]	18.90
2.7	Total Equipment Cost/Hour	$143.05

3. Caterpillar 769 Off-Highway Truck

3.1	Basic rental/month	$10,305
3.2	Adjustment	1.05
3.3	Adjusted monthly rental	10,820
3.4	Hourly rental (176 hrs/mo)	61.48

3.5	Operating costs	$ 26.90
3.6	Operator	18.90
3.7	Total Equipment Cost/Hour	$107.28

4. 28 CY On-Highway Bottom Dump Tractor Trailer

4.1	Basic monthly rental	
	(a) Tractor	$ 5,810
	(b) Trailer	1,690
4.2	Adjustment	1.05
4.3	Adjusted monthly rental	7,875
4.4	Hourly rental (176 hrs/mo)	44.74
4.5	Operating costs tractor $13.60-trailer $10.60	24.20
4.6	Operator[2]	15.25
4.7	Total Equipment Cost/Hour	$ 84.19

5. Caterpillar 637D Scraper

5.1	Basic rental/month	$22,970
5.2	Adjustment	1.05
5.3	Adjusted monthly rental	24,119
5.4	Hourly rental (176 hrs/mo)	137.04
5.5	Operating costs	73.10
5.6	Operator[2]	18.90
5.7	Total Equipment Cost/Hour	$229.04

6. Sheeps-Foot Roller - Pull Type

6.1	Basic rental/month	$ 1,510
6.2	Adjustment	1.05
6.3	Adjusted monthly rental	1,585
6.4	Hourly rental (176 hrs/mo)	9.01
6.5	Operating costs	2.40
6.6	Operator	
6.7	Total Equipment Cost/Hour	$ 11.41

7.	10,000 Gallon Water Truck		
	7.1	Basic rental/month	$13,945
	7.2	Adjustment	1.05
	7.3	Adjusted monthly rental	14,643
	7.4	Hourly rental (176 hrs/mo)	83.19
	7.5	Operating costs	33.65
	7.6	Operator[2]	15.25
	7.7	Total Equipment Cost/Hour	$132.09
8.	Caterpillar D9L Bulldozer with Universal Blade		
	8.1	Basic rental/month	$16,295
		"U" dozer	1,720
		Hydraulic tilt attachment	165
		Rear ripper	2,475
		Total Monthly Rental	$20,655
	8.2	Adjustment	1.05
	8.3	Adjusted monthly rental	21,688
	8.4	**Hourly rental (176 hours/mo)**	**123.23**
	8.5	Operating costs	
		.1 Basic	45.00
		.2 U dozer	2.20
		.3 Hydraulic tilt attachment	0.20
		.4 Rear ripper	3.05
		.5 Operator[2]	18.90
		Total Operating Costs/Hour	$ 69.35
	8.6	Total Equipment Cost/Hour	$192.58

Total Cost of Reclamation

1.	Demolition of concrete	$209,000
2.	Site grading	36,000
3.	Powerline removal	2,000
4.	Track removal	76,000
5.	Revegetation	60,000
	Total Cost	$383,000

<u>REFERENCES</u>

1 Caterpillar Performance Handbook, Edition 12

2 Building Construction Cost Data 1983, 41st Annual Edition

3 Building Construction Cost Data 1981, 39th Annual Edition

4 Rental Rate Blue Book, Equipment Guide Book Company

5 Mining and Reclamation Plan - Somerset Mine - Vegetation Study (on file at District Office)

Superseded by Collins's report of October 1983

APPENDIX E

VEGETATIVE SURVEY
U. S. STEEL PROPERTIES
WELLINGTON, UTAH

Robert M. Thompson
February 1981

A vegetative and floristic survey was made of the U. S. Steel properties on February 23, 1981. The purpose of this survey was to map the vegetative types; list the dominant plant species, and identify any endangered, threatened, or sensitive species.

Each vegetative type was sampled using a 9.6 square foot circular plot. Data collected from these plots and other occular reconnaissance was used to determine plant species composition, ground cover density and site productivity. Sampling points were selected at sites that were considered to be representative of the plant type. Vegetative types were delineated on base maps of the area. Each vegetative type was then inspected on the ground and characterized according to their dominant and other indicator plant species. All of the present disturbed areas and facilities are located in the (2A) Mat Saltbrush - Indian Ricegrass, and (2B) Mat Saltbrush - Shad Scale - Galleta grass types. The railroad tracks and right-of-way are within the (3A) Greasewood - Summer cypress plant community.

The vegetative types and plant communities that occur within this area all belong in the desert shrub plant association. The vegetative cover of the plant types occurring on the ridges and upper slopes is usually quite sparse, averaging less than 10 percent in most types. Forage production is variable and is dependent on the amount of moisture received. The Mat Saltbrush type is the least productive of all the plant communities in this area. The Shad-Scale - Galleta grass type is the most productive.

Plant types in the bottom lands mostly have good vegetative cover, averaging 50 to 100 percent cover. Forage production potential is controled by the amount of alkali and salts present in the soils. The Greasewood - Summer cypress - type is the least productive of any type found in the bottomlands. See Table 1.

Endangered, Threatened or Sensitive Plant Species

The following plant species that are known to occur in Carbon County have been proposed to the Fish and Wildlife Service for inclusion on their lists of Endangered, Threatened and Sensitive Plants.

Endangered Species

Eriogonum corymbosum var. davidesi
Eriogonum lancifolium
Cryptantha johnstonii

Threatened Species

Cryptantha jonesiana

None of the above listed plant species were found on this study area. However, a small area located on one of the upper ridge tops contains some habitat that is suitable for Cryptantha joensiana but no plants or evidence of this plant was found. Therefore, this area is cleared from an endangered or threatened plant species standpoint.

Revegetation

Plant types 3A, 3B, 3C and 3D are not suitable for any types of revegetation measure. This is because of the very narrow growth limitation of the habitats here. These sites are very high in alkalis and free salts. Also, the water table is very high. Disturbed sites in these types are better left to be reinvaded by the native plants common on the site.

Plant types 1A and 1B, if disturbed, could be treated and reseeded with a mixture of native plant species or several species of introduced plants will do good here.

Types 2A and 2B, if disturbed, (most of the facilities are here) can be reseeded with such native species as Indian Ricegrass, Alkali Sacation, Shad Scale and Alkali Seepweek. The seed sources for these plants should be from sites with heavy clay soils and similar habitats.

The reclamation of the refuse piles will be difficult. This is because of the dark color of the material, which prevents the establishment of any plant growth. These piles may need to be covered with a thin layer of top soil, 4 to 6 inches thick before any plants will be able to become established. The introduction of such native annual plants as Lamb Quarter (Chenopodium album or leptophyllum), Red Root (Amaranthus spp.) and the introduced annual Black Mustard (brassica nigra) onto those piles that have had a chance to become more stable should provide a type of cover crop which in time will make it possible for the invasion of native perennial plants.

Vegetative Types and Plant Communities

Map No.	Type and Community
1	Ridges and Rocky Slopes
1A	Shad Scale - Galleta grass (Atriplex confertifolia - Hilaria jamesii)
1B	Shad Scale - Indian Ricegrass (Atriplex confertifolia - Oryzopsis hymenoides)
2	Alluvial Toe Slopes and Valley Bottoms
2A	Mat Saltbrush - Indian Ricegrass (Atriplex corrugata - Oryzopsis hymenoides)
2B	Mat Saltbrush - Shad Scale - Galleta grass (Atriplex corrugata - Atriplex confertifolia - Hilaria Jamesii)
2C	Mat Saltbrush (Antriplex corrugata)
3	Bottom Lands
3A	Greasewood - Summer cyprus (Sarcobatus vermiculatus - Kochia americana)
3B	Saltgrass - Reed Canary grass (Distichlis stricta - Phalaris arundinacea)
3C	Reed Canary grass - Wiregrass (Phalaris arundinacea - Juncus gerardi)
3C	Reed Canary grass (Phalaris arundinacea - Juncus gerardi)
3D	Tamarisk - Saltgrass - River bottom (Tamarix pentardra - Distichlis stricta)
4	Cultivated Fields

Ridges and Rocky Slopes

Type 1A. Shad Scale - Galleta grass
(Atriplex confertifolis - Hilaria jamesii)

This plant type occurs on all the higher ridges, plateaus and steep rocky slopes within and adjacent the property. Vegetative cover is dominated by Shad Scale and Galleta grasses. Many other plant species common to the desert shrub plant association are also found here.

Dominant Species

Shad Scale - Atriplex confertifolia
Galleta grass - Hilaria jamesii

Other Common Species

Blue grama - Bouteloua gracilis
Indian Ricegrass - Oryzopsis hymenoides
Cryptantha - Cryptantha flavoculata

Plant Composition	Percent
Grasses	62
Forbs	12
Shrubs	26

Ground Cover Data	
Vegetative cover	3
Litter cover	4
Total Ground Cover	7
Bare Soil	63
Rocks	30

This plant type is presently at about 90 percent of its productive potential. Average green weight production is about 400 pounds per acre.

Endangered, Threatened and Sensitive Plant Species

No listed or proposed endangered, threatened or sensitive plant species were found during the survey. However, a small amount of habitat does exist on the high ridge for Cryptantha jonesiana.

Type 1B - Shad Scale - Indian Rice grass
(Atriplex confertifolia - Lryzopsis humenoides)

This plant type occurs on steep slopes and ridges which are rocky, with Mancos shale outcrops. Vegetative cover at present is dominated by Shad Scale and several species of grasses which are common to the desert shrub plant association.

Dominant Species

Shad Scale - Atriplex confertifolia
Indian Ricegrass - Oryzopsis hymenoides

Other Common Species

Galleta Grass - Hilaria jamesii
Desert Trumpet - Eriogonum inflatum
Bud Sage - Artemisia spinescens

Plant Composition	Percent
Grasses	56
Forbs	10
Shrubs	34
Ground Cover	
Vegetative cover	5
Litter cover	5
Total Ground Cover	10
Bare soil	73
Rocks	17

This plant type is within the area that has been disturbed in the recent past and much of the type is now in a successional stage of development. The type is at about 60 percent of its productive potential. Present production average about 300 pounds green weight per acre.

Endangered, Threatened and Sensitive Plant Species

No listed or proposed endangered, threatened or sensitive plant species or their habitat were found in this plant type.

Alluvial Toe Slopes and Valley Bottoms

Type 2A. Mat Saltbrush - Indian Ricegrass
(Atriplex corrugata - Oryzopsis humenoides)

This plant type occurs on the upper open broad alluvial slopes. Soils are heavy clays and vegetation is very sparse and scattered.

Dominant Species

Mat Saltbrush - Atriplex corrugata
Indian Ricegrass - Oryzopsis hymenoides

Other Common Species

Galleta grass - Hilaria jamesii
Desert Trumpet - Eriogonum inflatum
Winter Fat - Ceratoides lanata

Ground Cover Data	Percent
Vegetative cover	2
Litter cover	3
Total Ground Cover	5
Bare soil	95
Rocks	0

Green weight production for this type will average near 200 pounds per acre. It has a very poor potential for revegetation. The two settling ponds are in this type.

Endangered, Threatened and Sensitive Plant Species

No endangered, threatened or sensitive plant species or their habitat were found in this type.

Type 2B. Mat Saltbrush - Shad Scale - Galleta Grass
(Atriplex corrugata - Atriples confertifolia - Hilaria jamesii)

This plant type occurs on the lower toe slopes and alluvial fans. Most of the facilities are in this broad type and the native vegetation has nearly been lost.

Dominant Species

Mat Saltbrush - Atriplex corrugata
Gallieta grass - Hilaria jamesii

Other Common Species

Shad Scale - Atriplex confertifolia
Desert Trumpet - Eriogonum inflatum

Plant Composition	Percent
Grasses	4
Forbs	7
Shrubs	89

Ground Cover Data

Vegetative cover	2
Litter cover	6
Total Ground Cover	8
Bare soil	88
Rocks	3

This plant type area has very poor, low productive soil and any revegetation will be difficult to do. Native species will eventually reinvade this area but it will take many years, and cover will be sparse. Using introduced species, such as crested wheatgrass, tall wheatgrass and sweet clover, would give a good quick cover and prevent some soil loss.

Endangered, Threatened and Sensitive Species

No listed or proposed endangered, threatened or sensitive plant species, or their habitat is present in this plant type.

Type 2C. Mat Saltbrush
(Atriplex corrugata)

This plant type occurs in several narrow valley bottoms. Soils are very heavy clay alluvium in the bottoms and Mancos shale outcrops along the edges. Vegetation here is very sparse and scattered.

Dominant Species

Mat Caltbrush - Atriplex corrugata

Other Common Species

Squirrel Tail - Sitanion hystrix
Evening Primrose - Oenothera caespitosa

Plant Composition	Percent
Grasses	23
Forbs	14
Shrubs	63

Ground Cover Data	
Vegetative cover	4
Litter cover	3
Total Ground Cover	7
Bare soil	93
Rocks	0

This plant type is near its productive potential, averaging about 100 pounds of forage per acre. It has no revegetation potential. Soils are too alkaline and hard.

Endangered, Threatened and Sensitive Plant Species

At present no listed or proposed threatened, endangered or sensitive plant species or their habitat are known to occur in this plant type.

Bottom Lands

Type 3A. Greasewood - Summer Cypress
(Sarcobatus vermiculatus - Kochia americana)

This plant type occurs along the upper edge of the bottom lands. Vegetative cover is sparse except in sites which have been disturbed, here Kochia forms a very dense cover. Greasewood forms a shrub by overstory in this type.

Dominant Species

Greasewood - Sarcobatus vermiculatus
Summer cypress - Kochia americana

Other Common Species

Plant Composition	Percent
Grasses	0
Forbs	64
Shrubs	36

Ground Cover Data

Vegetative cover	3
Litter cover	8
Total Ground Cover	11
Bare soil	89
Rocks	6
Shrub Overstory	12

This plant has been heavily impacted in the past. Revegetation of this type will be very difficult because of the high alkalinity and poor permeability of the soil. Introduced species that may be used here are sweet clover, and tall wheatgrass.

Endangered, Threatened and Sensitive Plant Species

No listed or proposed endangered, threatened or sensitive plant species or their habitat is known to occur in this plant type.

Type 3B. Salt Grass - Reed Canary Grass
(Distichlis stricta - Phalaris arundinacea)

This plant type occurs in the lower bottoms, which are very alkaline and high in salt content. Grasses dominate the type, few shrubs can survive in soils with such high salt content.

Dominant Species

Salt Grass - Distichlis stricta
Reed Canary Grass - Phalaris arundinaccea

Other Common Species

Summer Cypress - Kochia americana

Plant Composition	Percent
Grasses	91
Forbs	9
Shrubs	0
Ground Cover Data	
Vegetative cover	6
Litter cover	65
Total Ground Cover	71
Bare soil	29
Rocks	0

Due to the very high water table and salt content of the soil in this type, it cannot be revegetated successfully.

Endangered, Threatened and Sensitive Plant Species

No listed or proposed endangered, threatened, or sensitive plant species or their habitat are known to occur in this type.

Type 3C. Reed Canarygrass - Wiregrass
(Phalaris arundinacea - Juncus gerardi)

This plant type is confined to areas that are covered with shallow, very salty water. Very few plant species are able to survive in this type of habitat.

Dominant Species

Reed Canayrgrass - Phalaris arundinacea
Wiregrass - Juncus gerardi

Plant Composition	Percent
Grasses	97
Forbs	3
Shrubs	0

Ground Cover Data

Vegetation and litter cover is 100 percent cover in this type, water averages 3 to 12 inches deep over the entire area.

This type at present, is fully occupied with vegetation of the species that are the climax or plant best suited for this type of habitat. Any disturbance in this type will, in time, be covered with the present species. This area provides good wild bird habitat and cover.

Endangered, Threatened and Sensitive Plant Species

There are no endangered, threatened or sensitive plant species in this plant type.

Type 3D. Tamarisk - Salt Grass - River Bottoms
(Tamarix pentandra - Distichlis stricta)

This plant type occurs along the edges and flood plains of the streambeds and riverbeds.

Dominant Species

Tamarisk - Tamarix pentandra
Salt Grass - Distichlis stricta

Other Species

Summer Cypress - Kochia americana

Plant Composition	Percent
Grasses	18
Forbs	10
Shrubs	72

Ground Cover Data

Vegetative cover	20
Litter	70
Total Ground Cover	90
Bare soil	10
Rocks	0

This type is quite productive. It has a potential for forage production of about 300 pounds per acre. However, it provides good cover for wild birds and small mammals of many kinds.

Endangered, Threatened and Sensitive Plant Species

No endangered, threatened or sensitive species or their habitat are known to occur in this vegetative type.

Type 4. Old Cultivated Fields

The plants present in these sites, that were once tilled and irrigated, are mostly introduced weedy plants such as Gumweed and Povertyweed. Saltgrass is rapidly invading the lower edges of these sites. These fields are capable of producing a good cover crop. At present they are only producing about one-fifth of what they could. Planting a cover crop on these sites, consisting of several species of clovers, alfalfa and smooth brome, would provide a good wildlife food source, especially for wild birds.

Table - 1: Percent Plant Composition, Ground Cover Data and Average Forage Production for each of the Vegetative Types.

	Vegetative Types									
	1A	1B	2A	2B	2C	3A	3B	3C	3D	4
Plant Composition										
Percent Grasses	62	56	8	4	23	0	91	97	18	15
Percent Forbs	12	10	32	7	14	64	9	3	10	80
Percent Shrubs	26	34	60	89	63	36	0	0	72	5
Ground Cover Data										
Percent Vegetative Cover	3	5	2	2	4	3	6	-	20	5
Percent Litter Cover	4	5	3	6	3	8	65	-	70	15
Percent Total Ground Cover	7	10	5	8	7	11	71	100	90	20
Percent Bare Soil	63	73	95	88	93	89	29	0	10	80
Percent Rocks	30	17	0	3	0	0	0	0	0	0
Forage Production Potential lbs/Acre Green Weight	400	300	300	200	100	150	300	800	600	800

Table - 2: Plant Species and Rates of Seeding

Native Species		Rate
Grasses		
Alkali sacaton	Sporobolus airoides	1 lb/A
Indian Ricegrass	Oryzopsis humenoides	1 lb/A
Galleta Grass	Hilaria jamesii	1 lb/A
Squirrel Tail	Sitanion hystrix	1 lb/A
Forbs		
Seepweed	Suaeda fruticosa	1/2 lb/A
Lamb Quarter	Chanopodium album	1/4 lb/A
Globe-mallow	Sphaeralcea coccinea	1/2 lb/A
Shrubs		
Shadscale	Atiplex conifertifolia	2 lbs/A
Gardner Saltbrush	Atiplex gardneri	2 lbs/A
Winterfat	Ceratoides lanata	2 lbs/A
Introduced Species		
Crested Wheatgrass	Agropyron cristatum	3 lbs/A
Streambank Wheatgrass	Agropyron riparium	2 lbs/A
Russian Wildrye Grass	Elymus junceus	
Smooth Brome (pasture variety)	Bromus inermis	4 lbs/A
Meadow Fescue	Festuca elatior	4 lbs/A
Yellow Sweet Clover	Melilotus officinalis	1 lb/A
Common Alfalfa	Medicago sativa	1/2 lb/A
Red Clover	Trifolium pratense	1 lb/A
Tall Wheatgrass	Agropyron elongatum	2 lbs/A

PLANT SPECIES

Common Name	Botanical Name	Vegetative Types 1	2	3	4
<u>Grasses</u>					
Bluegrama	Bouteloua gracilis	X			
Galleta Grass	Hilaria jamesii	X	X		
Indian Ricegrass	Oryzopsis hymenoides	X	X		
Reed Canarygrass	Phalaris arundinacea			X	X
Saltgrass	Distichlis stricta			X	X
Squirrel Tail	Sitanion hystrix	X	X		
Wiregrass	Juncus gerardi			X	
<u>Forbs</u>					
Cryptantha	Cryptantha flauoculata	X			
Cryptantha	Cryptantha wetherillii	X			
Desert Trumpet	Eriogonum inflatum	X	X		
Evening Primrose	Oenothera caespitosa	X	X		
Globemallow	Sphaeralcea coccinea	X			
Gumweed	Grindelia squarrosa				X
Povertyweed	Iva axillanis				X
Summer cypress	Kochia americana			X	X
Desert Plantain	Plantago purshii	X	X		
<u>Shrubs</u>					
Bud sage	Artemisia spinescens	X			
Big sagebrush	Artemisia tridentata	X			
Shrubby Buckwheat	Eriogonum microthecum	X			
Match Brush	Gutierrezia sarothrae	X	X		
Greasewood	Sarcobatus vermiculatus			X	
Mat Saltbrush	Atriplex corrugata		X		
Gardner Saltbrush	Atriplex gardneri	X			
Shad Scale	Atriplex confertifolia	X	X		
Tamarisk	Tamarix pentandra			X	X
Winterfat	Ceratoides lanata		X		

APPENDIX E

REFUSE DISPOSAL

1. Introduction

A geotechnical investigation has been completed for the Settling Pond Impoundment Dikes at the Wellington Coal Cleaning Plant Facility near Wellington, Utah. US Steel Mining Company is considering increasing the capacity of the settling ponds by increasing the height of the dikes, and the purpose of this investigation was to evaluate US Steel's proposed modifications and to make recommendations with regard to construction procedures.

The dikes to be modified will include the Lower Refuse Dike, the Upper Refuse Dike and the North Dike as shown in Figure No. 1. The work has been completed in such a manner as to achieve the basic objective, and the details of the investigation are presented in the following sections of this report. Specifically, the report includes: (1) Existing Dike Conditions, (2) Subsurface Material Characteristics, (3) Laboratory Tests, (4) Stability Analysis and (5) Recommended Construction Practices.

2. Existing Dike Conditions

The general location of the existing settling pond impounding dikes is shown in Figure No. 1. Also shown in this figure are section views of the Lower, Upper and North Dikes along with the proposed modifications.

A soil and foundation investigation was completed in 1978 to evaluate the slope stability for the existing impounding dikes. The report entitled "Soil and Foundation Investigation, Slope Stability Evaluation, U.S. Steel Tailings Dikes, Wellington, Utah", dated March 1978, should be referred to in reviewing this report.

A. Lower Refuse Dike

The existing lower refuse dike impounds clear water on the southwest side and fine-coal refuse on the northeast side. The dike is approximately 35 feet high with a crest width of 20 feet and side slopes of 2 horizontal to 1 vertical. The embankment consists of low plasticity silts and clays with a 12-inch sand and gravel exterior zone. It is our understanding that the elevation of the existing dike is at 5374.5, while the maximum clear water level is at elevation 5369, and the elevation of the fine-coal refuse material is at elevation 5370.5.

B. Upper Refuse Dike

The upper refuse dike impounds fine-coal slurry both upstream and downstream. The dike is approximately 20 feet high, having a crest width of 25 feet and side slopes of 2 horizontal to 1 vertical. At the present time there is approximately a 10-foot elevation difference between the fine refuse on the north side of the dike and the fine refuse on the south side of the dike.

C. North Dike

The north dike was formed by excavating a trench on the north side of the structure and piling the material from the excavation to form the embankment. The embankment is approximately 12 feet high with side slopes of 2 horizontal to 1 vertical. Seepage has been observed on the downstream face of this dike.

3. Subsurface Material Characteristics

During the investigation completed in March of 1978, six test borings were drilled along the center line of both the lower refuse dike and the upper refuse dike. The intent of these test borings was to define the nature of the material within the embankments and within the foundation. Three test pits were also excavated along the north dike alignment.

During the present investigation, five test borings were drilled along the north dike alignment and four test borings were drilled at the upstream and downstream edge of the upper refuse dike.

The approximate location of all the test borings performed to date is presented in Figure No. 1, while the logs for the test borings performed during the present investigation are presented in Figures 2 through 6. The logs for the test borings performed during the 1978 investigation, are presented in Figures No. 4 and 5 of the original report.

Drilling was performed using a rotary drill rig with water as the drilling fluid. Both disturbed and undisturbed samples were obtained during the drilling operations. The disturbed samples were obtained by driving a standard split-spoon sampling tube through a distance of 18 inches using a 140-pound weight dropped from a distance of 30 inches. The number of blows to drive the sampling spoon through each six inches of penetration is shown on the boring logs. The sum of the last two blow counts, which represents the number of blows to drive the sampling spoon through a distance of 12 inches, is defined as the standard penetration value. The standard penetration value is used to obtain an indication of the in-place density of sandy-type materials; however, considerable care must be used in interpreting the standard penetration values obtained in cohesive materials and coarse granular-type soils.

Undisturbed samples were obtained by pressing a 2.5-inch inside diameter thin-walled shelby tube into the cohesive material using the hydraulic pressure of the drill rig. Each sample obtained in the field was classified in the laboratory according to the Unified Soil Classification System. The symbol designating the soil type according to this system is presented on the boring logs. A description of the Unified Soil Classification System is presented in Figure No. 7, and the full meaning of the various symbols shown on the boring logs can be obtained from this figure.

The characteristics of the subsurface material for the upper refuse dike and the lower refuse dike are presented on pages 4 through 6 of the original report.

During this investigation two test borings were drilled along the upstream edge and two test borings along the downstream edge of the Upper Refuse Dike, in an attempt to define the characteristics of the subsurface material, which will form the foundation for the dike modification. The logs for these test borings are presented in Figures No. 2 and 3, and it will be observed that the subsurface profile at both the upstream and downstream edge consists of coarse-coal refuse to a depth varying between 20 and 25 feet. In test boring No. 1, the coarse coal refuse is underlain by 5 feet of fine coal refuse, while the remainder of the profile in all of the test borings consists of silty clay to clayey silt-type materials.

It will be observed from the test borings that the coarse coal refuse material is in a medium to loose density state, while the silt and clay material is in a relatively soft condition.

Five test borings were drilled along the North Dike alignment, and the results of these test borings are presented in Figures 4 through 6. It will be observed from these boring logs that the subsurface profile along the North Dike alignment consists primarily of low- to medium- plasticity silts and clays. In test borings No. 3 and 4, the clay was underlain by silty sand at a depth of approximately 20 feet below the existing dike surface.

The results of field permeability tests performed at 5-foot intervals throughout the soil profile are presented on the boring logs, and it will be observed that the permeability rates for the test borings in the vicinity of the Upper Refuse Dike vary from no measurable loss to 6560 feet per year, while the permeability rates for the North Dike varied from no measurable loss to 3250 feet per year.

Samples obtained during the subsurface investigation were brought into the laboratory to more fully define the physical characteristics of the material. In addition to the samples obtained during the drilling operations, four representative samples of the coarse coal refuse material weighing approximately 50 pounds each were obtained from the Upper Refuse Dike and two representative samples of the fine coal refuse were obtained from the refuse adjacent to the Upper Refuse Dike embankment.

The results of the laboratory tests are discussed below:

A. Classification Tests

During the 1978 study, classification tests were performed on representative samples obtained from the drill holes for the Lower Refuse Dike and the Upper Refuse Dike. The results of these classification tests, which consisted of Atterberg limits and mechanical analysis, are presented in Tables 1.1 and 1.2 of the original report. The results of these tests indicate that the embankment material in the Lower Refuse Dike is primarily low plasticity silty clay, having a plastic index less than 8 percent, while the coal refuse in the Upper Refuse Dike consists of a granular-type material generally having less than 22 percent in the silt- and clay-size range.

During this investigation, mechanical analysis tests were performed on samples obtained from test boring No. 1, and the results of these tests are presented in Table No. 1, Summary of Test Data. It will observed from this table that the coarse refuse in the upper 20 feet of the soil profile classifies as SM-type material, having generally less than 25 percent passing a No. 200 sieve, while the fine refuse material encountered between 20 and 25 feet below the ground surface, classifies as ML-type soil, having approximately 71 percent passing a No. 200 sieve. Also shown in this table are the results of mechanical analysis tests performed on the four bulk samples of the coarse coal refuse and the two bulk samples of the fine coal refuse obtained from the Upper Dike area.

In order to more fully define the characteristics of the coarse coal refuse, which will be used to increase the height of the dikes, particle-size distribution curves were drawn for each of the four samples, and these curves are shown in Figures No. 8 and 9. It will be observed from these figures that the coarse coal refuse is fairly well graded, having between 13 and 16 percent passing a No. 200 sieve.

Fifteen classification tests were performed on representative samples obtained from test boring No. 1, 3 and 5 from the North Dike, and the results of these tests are presented in Table No. 2, Summary of Test Data. It will be observed from this table that the material within the embankment and foundation of the North Dike is predominantly cohesive-type material classifying as ML, CL-1 and CL-2 type soils.

B. Moisture Density Relationships

The moisture density relationship was determined for both the coarse coal refuse and the fine coal refuse. The results of moisture density relationships for four samples obtained from the Upper Refuse Dike are presented in Figures 10 through 13. It will be observed that the in-place density varied from about 102 to 105 pounds per cubic foot.

Two moisture density relationships were determined on representative samples of the fine refuse obtained from the Upper Refuse Dike, and the results of these tests are presented in Figures 14 through 15. It will be noted that one sample was performed in accordance with ASTM D 698, while the other sample was performed according to ASTM D 1557-78. Unit weights of 62 - 67 pounds per cubic foot were obtained.

During the performance of the shear tests, which will be discussed in a subsequent section of this report, samples of both the coarse coal refuse and the fine coal refuse were densified at various unit weights. The maximum density curves presented herein enable a determination to be made of the in-place density of the material used in these tests in terms of the maximum laboratory density.

C. Shear Tests

(1) Upper Refuse Dike

During the 1978 investigation, one triaxial shear test was performed on the coarse coal refuse material from within the embankment. This sample was densified to an in-place total unit weight of 103 pounds per cubic foot with 18 percent moisture, yielding a dry density of 87 pounds per cubic foot. The consolidated drained shear test yielded a friction angle of 28.5 degrees with a cohesion of approximately 15 psi. As indicated on page 9 of the original report, it was doubtful that the cohesion actually existed. It was our opinion that the high cohesion and low friction angle were caused by performing the test at an accelerated rate.

During this investigation, two Mohr envelopes were obtained by performing triaxial shear tests on samples obtained from Test Hole 1 at a depth of 15 to 16 feet and Test Hole 2 at a depth of 15 to 16 feet. The coarse coal refuse material was compacted to an in-place dry density of 93.7 and 84 pounds per cubic foot respectively. The tests were performed over a sufficient period of time such that pore pressures were allowed to dissipate yielding a consolidated drained envelope. The results of these two tests are presented in Figures 16 and 17, and it will be observed from these figures that a friction angle of 34.7 degrees and 32.8 degrees were obtained for the samples.

A consolidated drained direct shear test was performed on the minus No. 10 material from the sample obtained from Test Hole 2 at a depth of 15 to 16 feet below the ground surface. This sample was also compacted to an in-place dry density of 84 pounds per cubic foot and a friction angle of 33.5 degrees was obtained. This compares favorably with the triaxial shear test which was performed on the same sample. The results of this test is shown in Figure No. 18.

One triaxial shear test was performed on a samples of the fine coal refuse obtained from Test Hole 1 at a depth of 20 to 21.5 feet below the ground surface. This sample was compacted to an in-place dry density of approximately 60 pounds per cubic foot and performed as a consolidated drained test. The results of this test are presented in Figure No. 19, and it will be observed that a friction angle of 31.3 degrees, with a cohesion of 1.5 psi, was obtained.

A consolidated drained direct shear test was also performed on this sample, and the results of this test are presented in Figure No. 20. It will be observed that the same shear strength parameters were obtained for the direct shear test as were obtained in the triaxial shear tests.

It is our opinion that the shear tests performed during this investigation provide a reasonable indication of the range of the insitu shear strengths likely to exist throughout the Upper Dike area.

(2) North Dike

Two Mohr envelopes were developed to evaluate the shearing strength of the embankment and foundation for the North Dike. Three triaxial shear tests were performed on an undisturbed sample obtained from Test Boring No. 5 at a depth of 10 to 11.5 feet below the dike surface. The results of these tests are shown in the form of a Mohr envelope in Figure No. 21 , and it will be observed from this figure that the in-place dry density varied from 110 to 112 pounds per cubic foot with a moisture content varying from 15.8 to 20.9 percent. The samples were tested under consolidated drained conditions, yielding a friction angle of 28.2 degrees with a cohesion of 5 psi.

Three direct shear tests were performed on a sample obtained from Test Boring No. 1 at a depth of 25 to 26 feet below the dike surface, and the results of these tests are presented in Figure No. 22. The in-place dry density of this material was 110.6 pounds per cubic foot with a moisture content of 16.5 percent. It will be noted from this figure that a friction angle of 27.6 degrees with a cohesion of 2 psi was obtained.

C. Consolidation Tests

To evaluate the settlement characteristics of the embankment and foundation materials within the North Dike, eight consolidation tests were performed on representative samples obtained from Test Borings 1 and 5. The results of these tests are presented in Figures 23 through 30. The subsurface materials throughout the embankment and foundation are not highly compressible, and since the load associated with raising the dike 6 feet is relatively small, it is our opinion that adverse settlement will not occur throughout this structure. It should also be noted that no collapsible characteristics were observed for the foundation materials beneath the North Dike embankment.

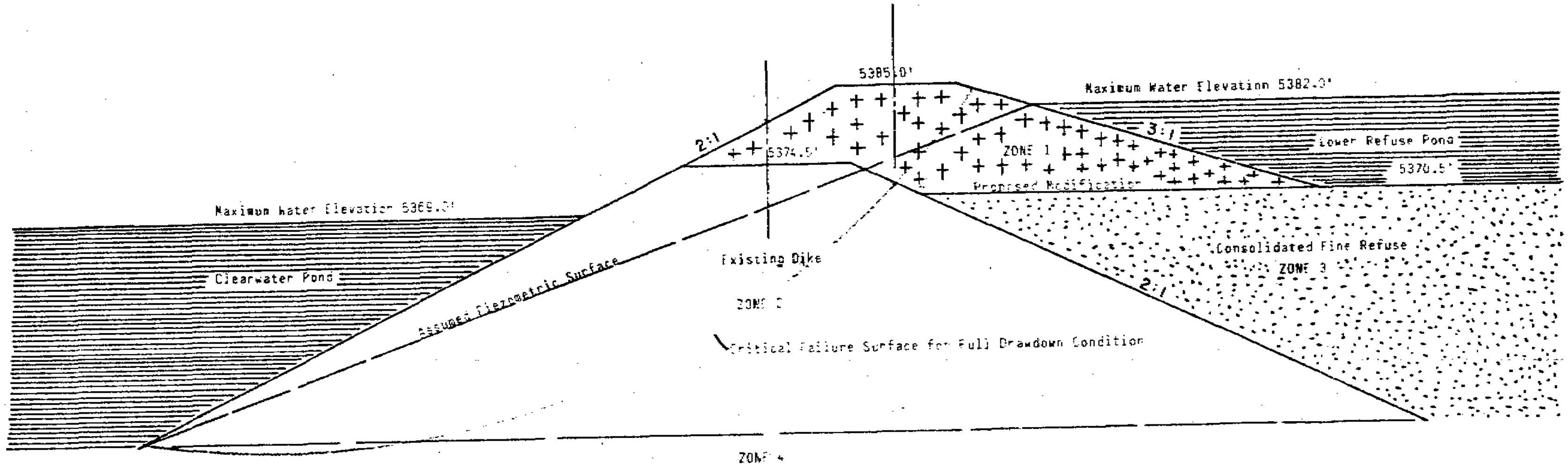
4. Stability Considerations

A stability analysis has been performed for the proposed modifications to the Lower Refuse Dike, the Upper Refuse Dike and the North Dike, as shown in Figure No. 1. In performing the stability analysis, a computer adaption of Spencer's Method has been used. Spencer's Method satisfies both force and moment equilibrium and can be performed using both a total stress analysis and an effective stress analysis. An effective stress analysis was used during this investigation, along with various assumptions relative to the piezometric surface throughout the dike areas. The results of the stability analysis performed for each of the dikes is discussed below as follows:

A. Lower Refuse Dike

A cross section of the existing Lower Refuse Dike, along with the proposed modifications, are presented in Figure No. 21 . The most critical stability consideration will be for the downstream slope of this facility. It should be noted that if the modifications to the Lower Refuse Dike

Zone	Material Type	Shear Strength Parameter		Factor of Safety	
		Cohesion PSF	Friction Angle	Case 1	Case 2
1	Coarse Coal Refuse	100	33	1.32	1.70
2	Silty Clay	250	29		
3	Fine Coal Refuse	150	31		
4	Silty Clay	400	28		



LOWER REFUSE DIKE

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

EXISTING CROSS SECTION AND PROPOSED MODIFICATIONS
TO THE LOWER REFUSE DIKE
U.S. STEEL MINING COMPANY, INC.

FIGURE NO. 31

are made, the crest elevation of the dike will be higher than the elevation of the crest of the main dam. If the Lower Refuse Dike were breached under conditions where the clearwater pond is full, overtopping may occur at the main dam. If the clearwater pond is empty and the Lower Refuse Dike is breached, the situation would be less critical, since the clearwater pond would be available to store flow from the Lower Refuse pond.

In view of the above considerations, stability computations have been performed for the downstream slope of the Lower Refuse Dike, assuming for Case 1 that the clearwater pond was empty and that the piezometric surface intersects the downstream toe of the dam, as shown in Figure 31. Case 2 considers the clearwater pond at its maximum elevation. The results of the stability analysis for these two cases are presented in Figure No. 31,, and it will be noted that a factor of safety of 1.32 for Case 1 was obtained and that a factor of safety of 1.7 for Case 2 was obtained.

The shear strength parameters for the various zones in the Lower Refuse Dike cross section are presented in Figure No. 31. These shear strength parameters are compatible with the shear strengths determined during the laboratory investigations, and it is our opinion that the Lower Refuse Dike will be stable under static conditions for the modifications contemplated.

B. Upper Refuse Dike Alternate A

The modifications to the existing Upper Refuse Dike, according to Alternate A, are presented in Figure 32. It will be noted that the existing embankment will be raised by placing the fill material on the downstream side of the existing facility. The downstream slope of this structure has also been assumed to be the critical stability situation, since rupture of this dike with the Lower Refuse pond full or with a sudden drawdown of the Lower Refuse pond may create hazard downstream.

Case 1 for the Upper Refuse Dike Alternate A, assumes a sudden drawdown condition of the Lower Refuse pond. The piezometric surface is assumed to intersect the downstream toe of the dike, as shown in Figure No. 32. The shear strength parameters used for the stability analysis for this case are presented in Figure No. 32, and it will be observed that a factor of safety of 1.46 was obtained for this condition.

Built Alt B. 6/30/87 [illegible]

Case 2 assumes that the water level in the Lower Refuse pond will be at its maximum elevation, as shown in Figure No. 1. The same shear strength parameters were used for Case 2 as for Case 1. A factor of safety of 2.6 was obtained for this case. It is our opinion that the factors of safety obtained for both Cases 1 and 2 for Alternate A are satisfactory and that the Upper Refuse Dike will perform satisfactorily having the modified cross section as shown in Figure No. 32.

C. Upper Refuse Dike Alternate B

The proposed modification to the Upper Refuse Dike Alternate B is presented in Figure No. 33, and it will be noted that the existing facility is raised by adding coarse coal refuse to the upper side of the facility. As indicated in the previous section of this report, it is our opinion that the most critical stability consideration for the Upper Refuse Dike will involve the stability of the downstream slope. Case 1 assumes that the water level in the Lower Refuse pond is withdrawn suddenly to the toe of the downstream slope and that the piezometric surface developed during the drawdown will exist approximately as shown in Figure No. 33. The shear strength parameters used for the various zones throughout the cross section are shown in Figure 33.

The results of the stability analysis for Case 1 indicates a factor of safety of 1.35. Case 2 considers that the water level in the Lower Refuse pond will be at its maximum elevation as shown in Figure No. 33. Using the same shear strength parameters as for the case of sudden drawdown, the factor of safety for Case 2 is approximately 2.4.

It is our opinion that the Upper Refuse Dike using Alternate B will be stable for the conditions assumed. It should be noted, however, that the factor of safety for both sudden drawdown and for the Lower Refuse pond full gives a higher factor of safety for Alternate A than for Alternate B, and we recommend that if the modifications to the Upper

Refuse Dike are performed they be made in accordance with Alternate A.

D. North Dike

The modifications proposed for the North Dike are shown in Figure No. 34 , and it will be observed that the existing facility will be capped with coarse coal refuse. As indicated above, the existing dike consists of clay, which was constructed without any controlled compaction. The critical stability condition for this case will be the downstream slope under steady state seepage conditions. A stability analysis has been performed for this case assuming a piezometric surface as shown in Figure No. 34 . The shear strength parameters used for the various materials within the cross section of the North Dike are shown in Figure No. 34 . The results of this analysis indicates a factor of safety of 1.9 for this facility.

The existing structure has performed in a satisfactory manner for several years, and it should be observed that the increase in the height of this dike is only 5.5 feet, and it is our opinion that the proposed facility will be stable for the modifications shown with an adequate factor of safety.

E. Seismic Considerations

The proposed site is located in Seismic Zone 2, and some consideration should be given to the seismic stability of the proposed facility. Mechanical analyses performed on the fine refuse material indicate that the percentage of material in the silt-and clay-size range varies from 53 to 70 percent, which indicates that the subsurface material would classify as an ML-type material according to the Unified Soil Classification System.

The fine refuse material is generally nonplastic, and inasmuch as they are relatively loose, instability may occur if these materials are subjected to a sufficiently high seismic event.

Since the proposed site is located in Seismic Zone 2, where the probability of a large intensity earthquake is relatively small, a detailed liquefaction analysis has not been performed. In order to obtain some indication of the affect of seismic activity on the proposed facilities, a pseudostatic analysis has been performed for the Lower Refuse Dike, assuming that the water level in the Clear Water Pond is at Elevation 5349 which corresponds to its minimum pool elevation. The results of this analysis indicates a factor of safety of 1.2 , which will still result in a stable facility. While a pseudostatic analysis may not provide a good estimate of the resistance of the fine coal refuse to liquefaction, it does, nevertheless, indicate that some measure of safety exists for these facilities.

5. Recommended Construction Practices

A. Abutment Preparation

It is recommended that prior to placing any of the coarse coal refuse adjacent to the existing abutments, the entire contact area be stripped of all vegetative matter, including the upper 4 to 5 inches of the natural material. Following the completion of the stripping operation, we recommend that the entire abutment contact area be scarified to a depth of 8 inches and redensified to an in-place unit weight equal to 90 percent of the maximum laboratory density as determined by ASTM D 1557-78.

We also recommend that a keyway be constructed up each abutment for each of the modified dikes. The keyway should have a depth of at least 5 feet and should have a bottom width of 15 feet with sideslopes of 1 horizontal to 1 vertical.

B. Placement and Compaction Procedures

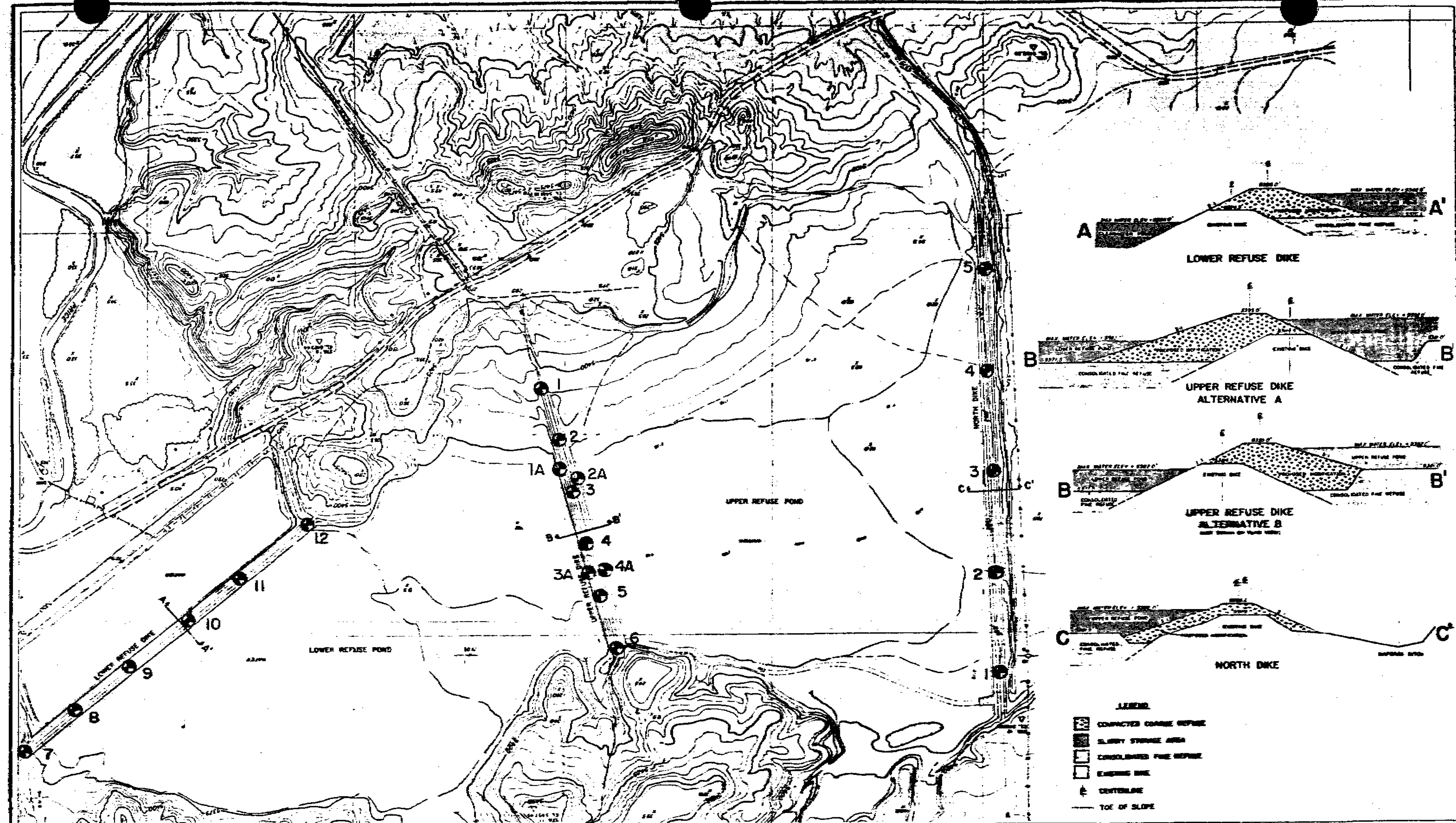
In our opinion, a controlled placement and compaction procedure should be used in the dike modifications. We recommend that the coarse refuse material be placed in 15-inch layers and densified to an in-place unit weight equal to 95 percent of the maximum laboratory density as determined by ASTM D 698.

Experience has shown that the coarse coal refuse can be densified to the in-place unit weight specified above using four passes of a vibratory roller having a dynamic force of at least 10 tons or with four passes of a heavy rubber-tired roller.

C. Slope Protection

We understand that U.S. Steel Company has 8-inch material available for riprap at the plant. It is our opinion that the only dike where slope protection is highly important would be on the downstream side of the Lower Refuse Dike where the slope would be exposed to the clearwater. We recommend that an 18-inch thick layer of the available riprap be placed on the downstream side of this facility.

It is anticipated that fine refuse material would occupy both the Lower and Upper Refuse ponds and that the depth of water in these ponds would be relatively shallow. In view of this situation, it is our opinion that the 8-inch riprap material available at the plant would be entirely satisfactory for slope protection on any of the dikes throughout the area.

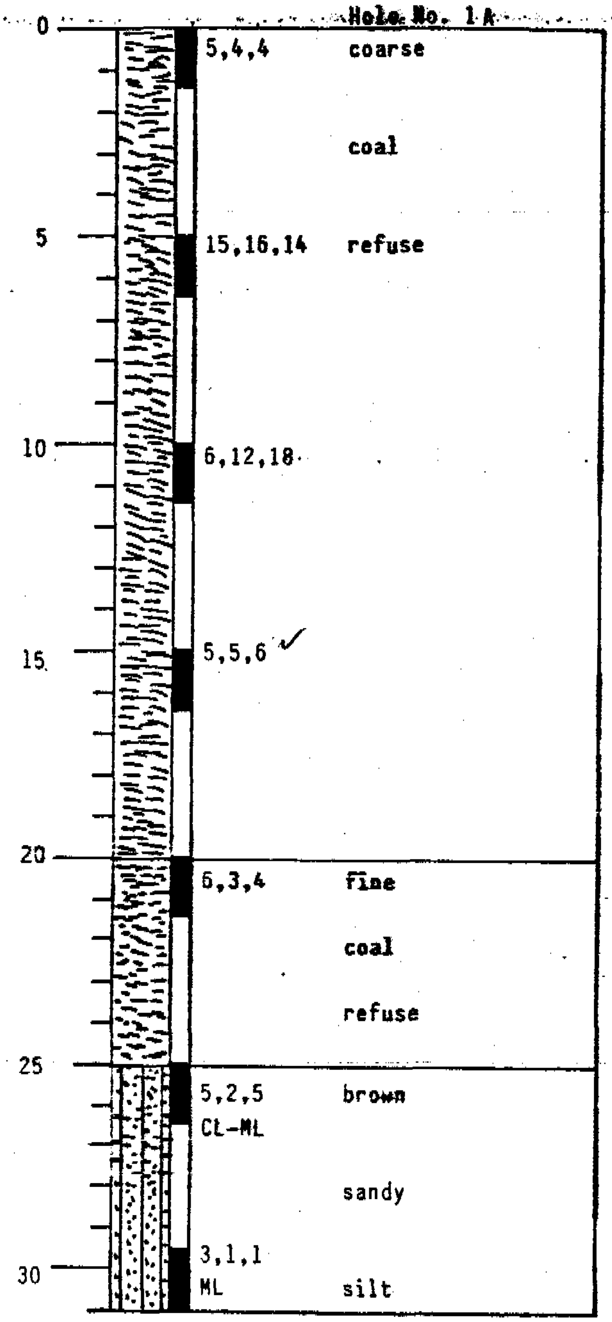


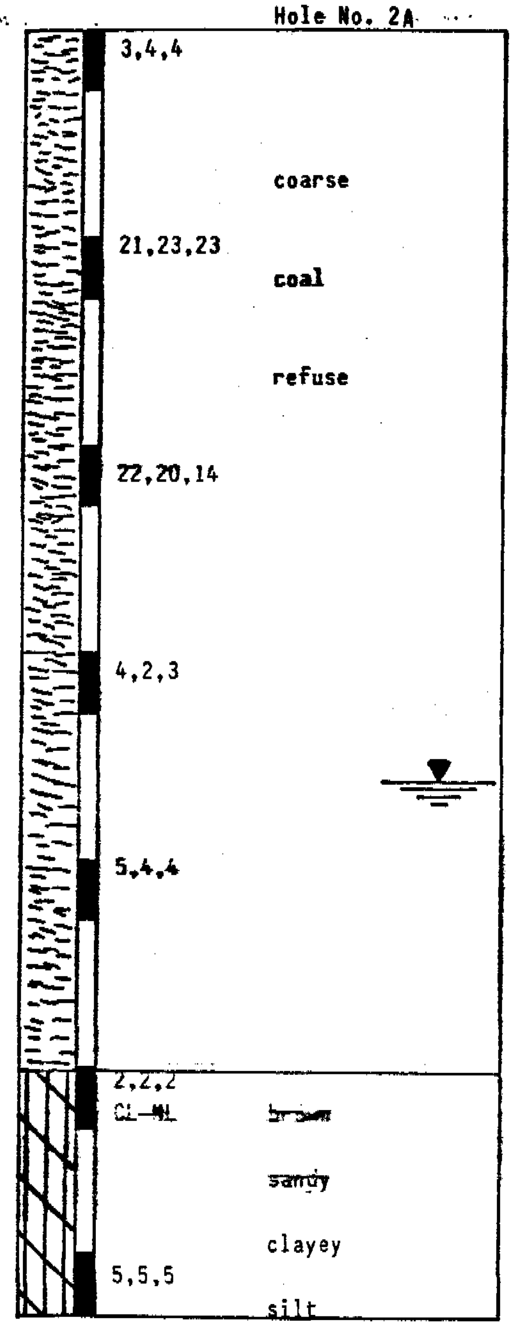
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

LOCATION OF IMPOUNDMENT POND DIKES AND DRILL HOLES
U.S. STEEL MINING COMPANY, INC.

FIGURE NO. 1

DEPTH





Hole No. 1A

Depth	Permeability ft/yr
0-5'	3280
5-10'	1749
10-15'	246
15-20'	2343
20-25'	1822
25-30'	1670

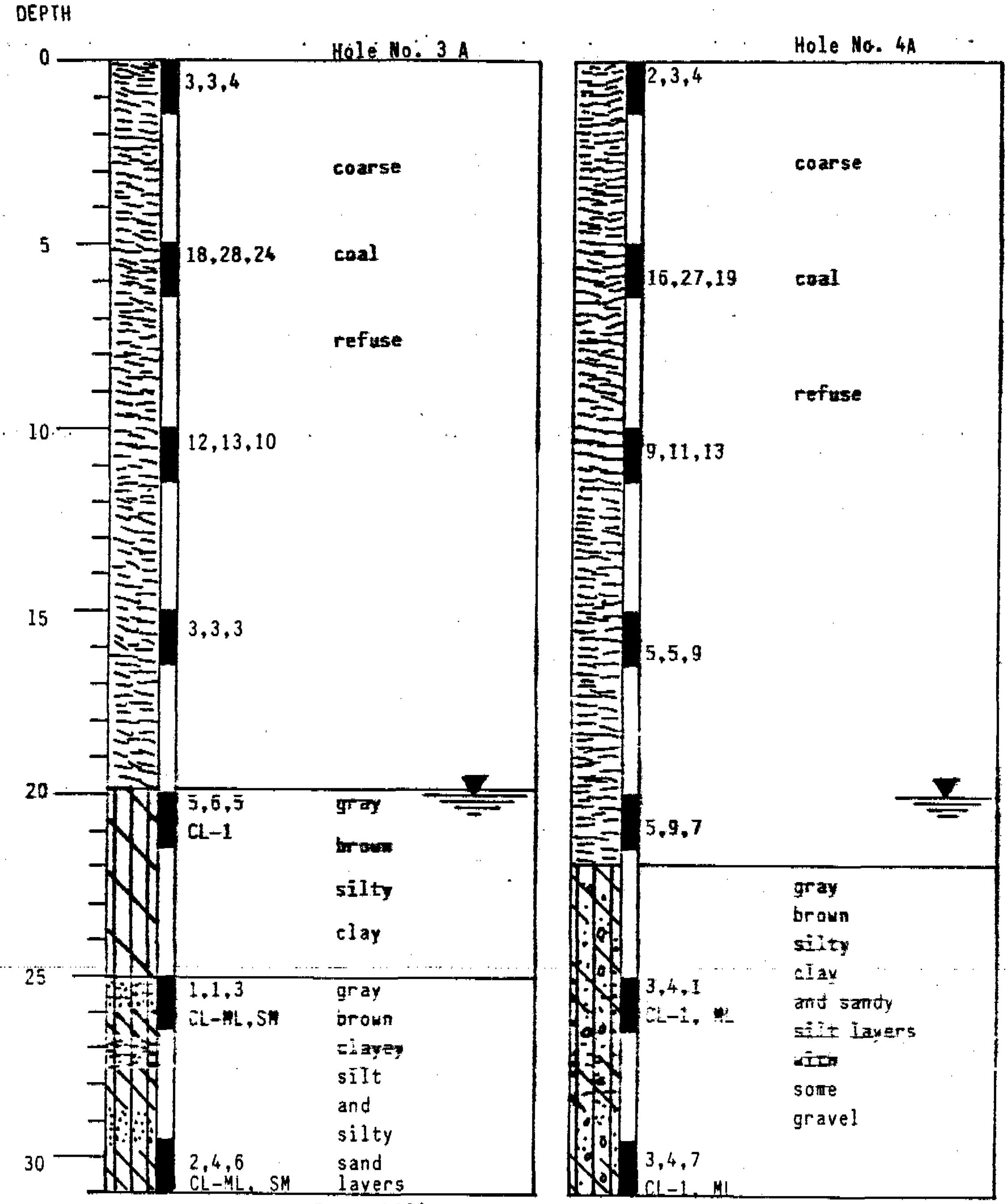
Hole No. 2A

Depth	Permeability ft/yr
0-5'	6560
5-10'	1531
10-15'	NML
15-20'	7
20-25'	2733
25-30'	1330

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

Log of Borings for:
US STEEL UPPER DIKE

Figure No. 2



Hole No. 3 A

Depth	Permeability ft/yr
0-5'	492
5-10'	513
10-15'	197
15-20'	469
20-25'	2050
25-30'	3200

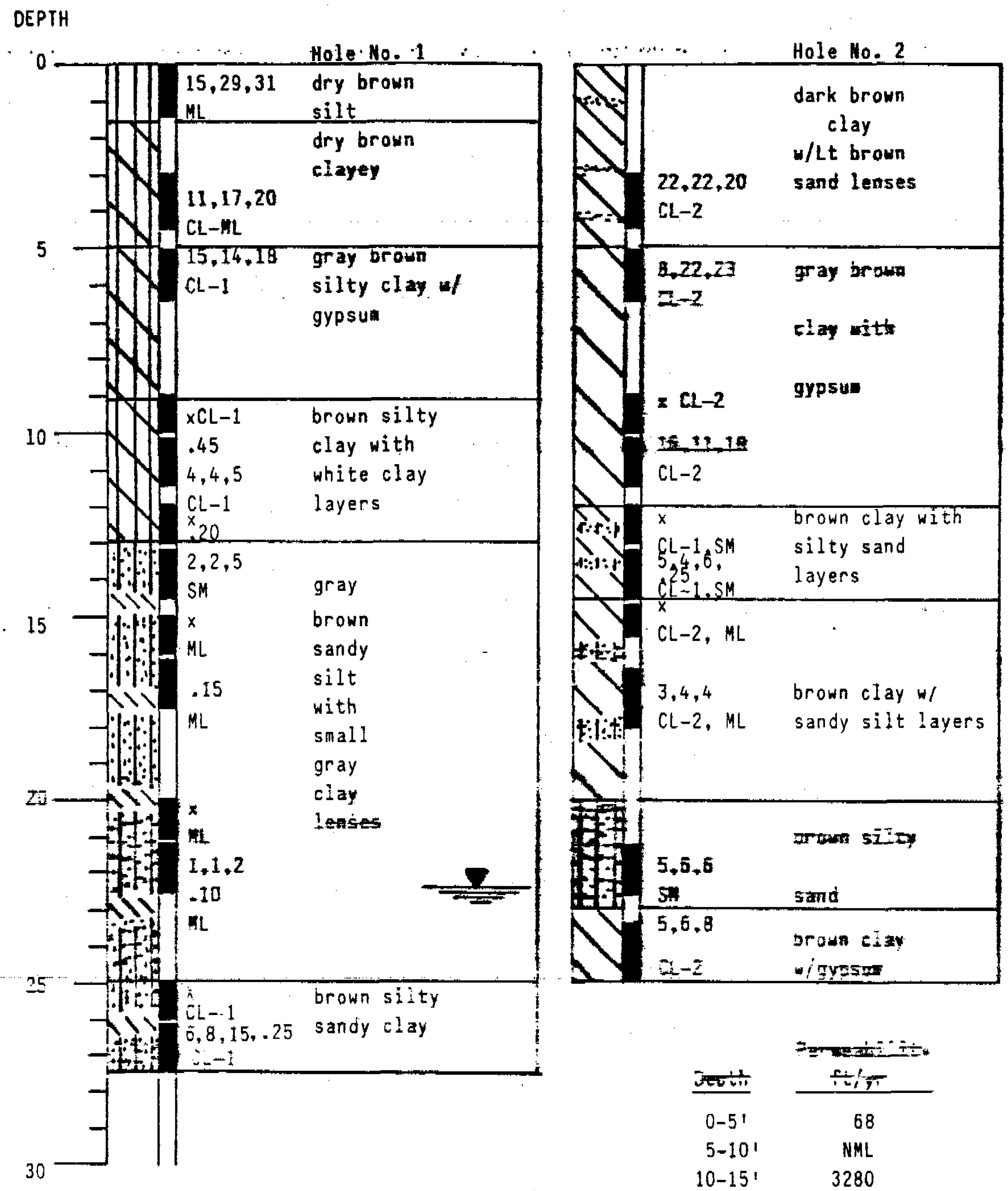
Hole No. 4A

Depth	Permeability ft/yr
0-5'	328
5-10'	219
10-15'	NML
15-20'	281
20-25'	1640
25-30'	820

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

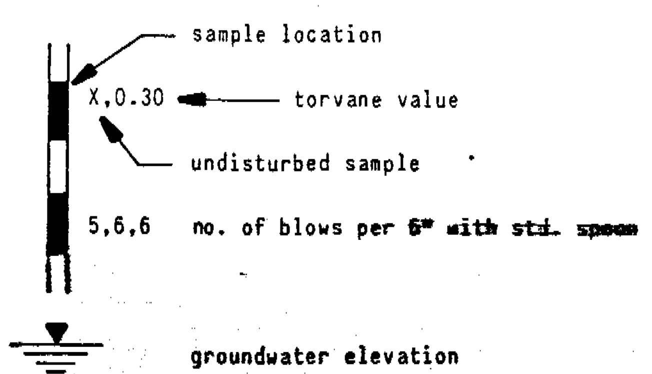
Log of Borings for:
US STEEL UPPER DIKE

Figure No. 3



Depth	Permeability ft/yr
0-5'	68
5-10'	NML
10-15'	3280
15-20'	469
20-25'	1845

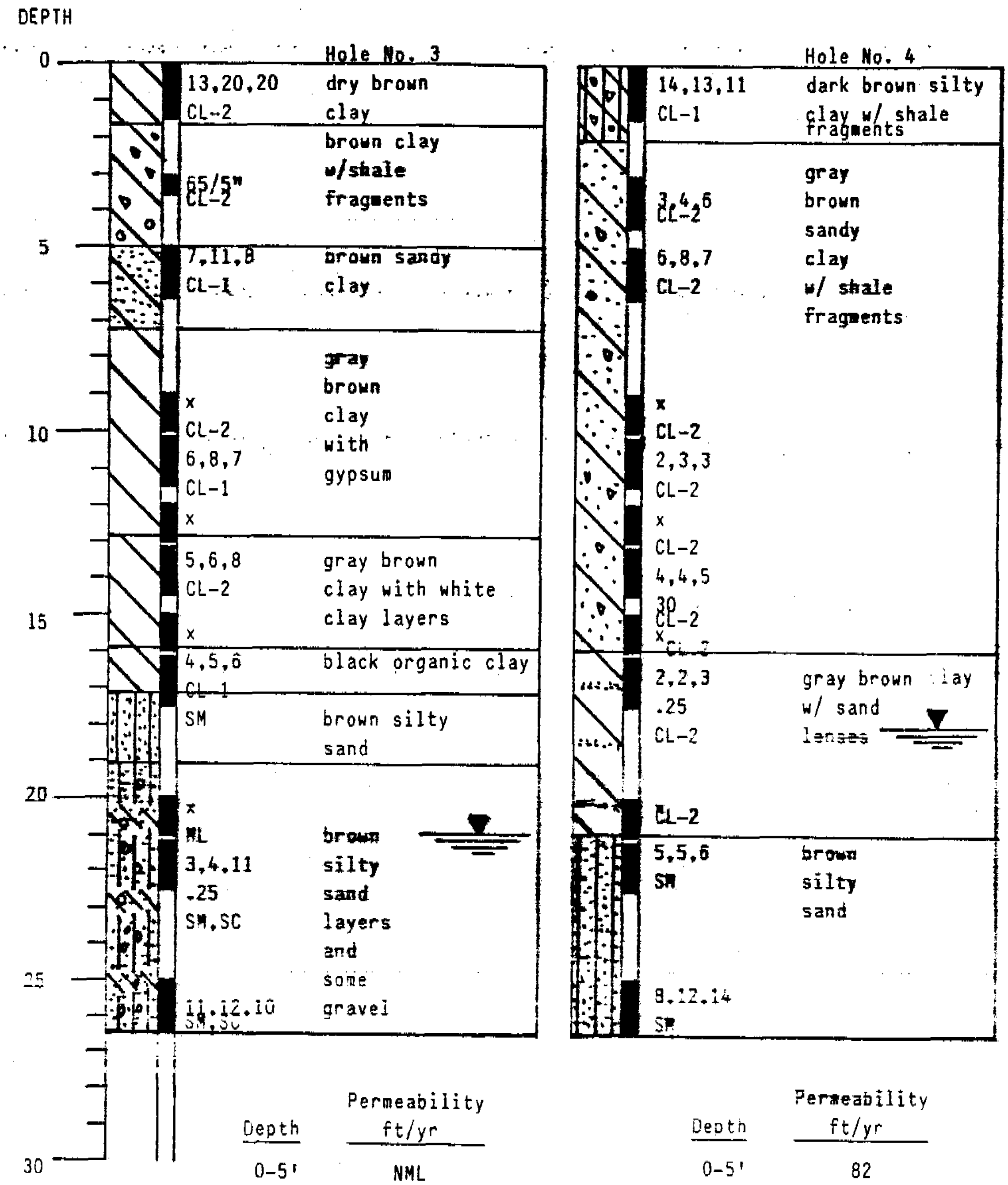
LEGEND



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

Log of Borings for:
US STEEL NORTH DIKE

Figure No. 4



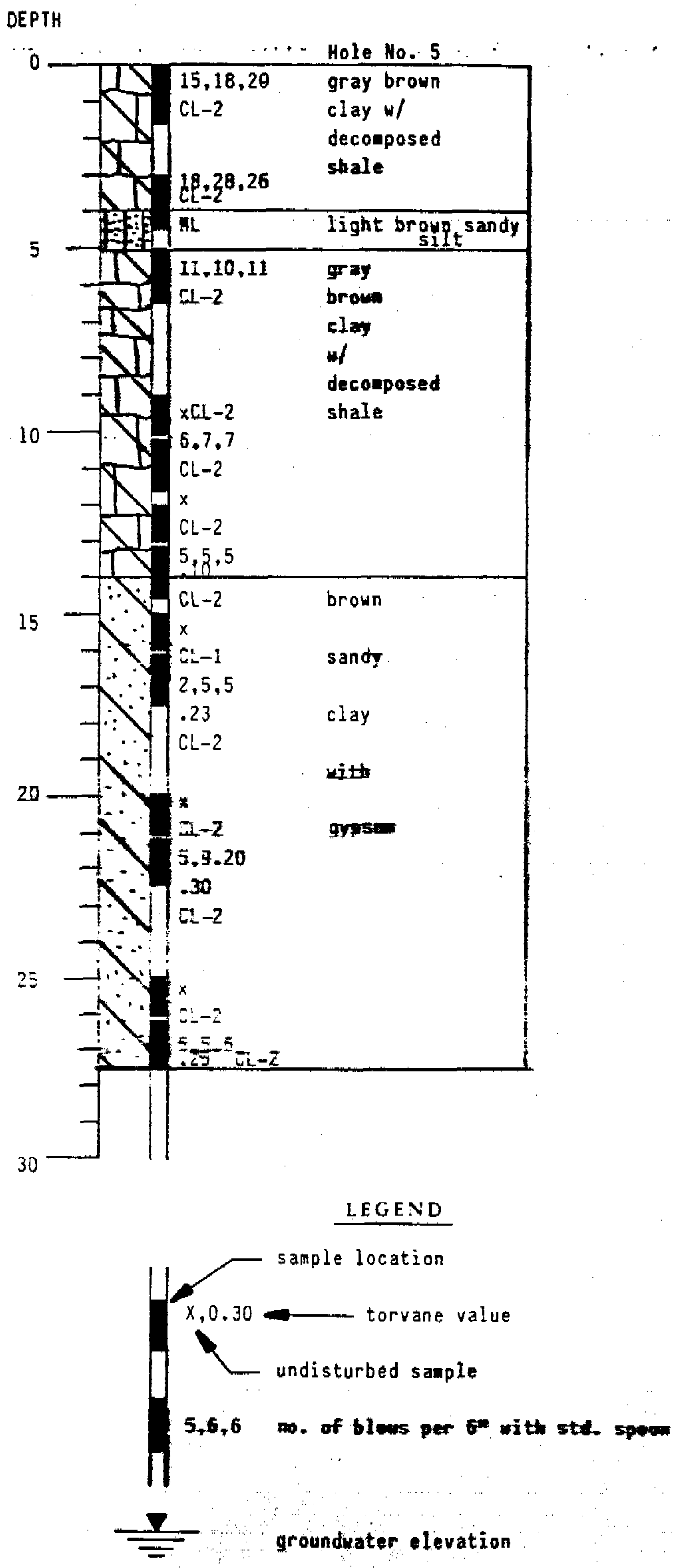
Depth	Permeability ft/yr
0-5'	NML
5-10'	1275
10-15'	98
15-20'	656
20-25'	781

Depth	Permeability ft/yr
0-5'	82
5-10'	164
10-15'	33
15-20'	820
20-25'	820

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

Log of Borings for:
US STEEL NORTH DIKE

Figure No. 5



Depth	Permeability ft/yr
0-5'	41
5-10'	55
10-15'	NML
15-20'	23
20-25'	23

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

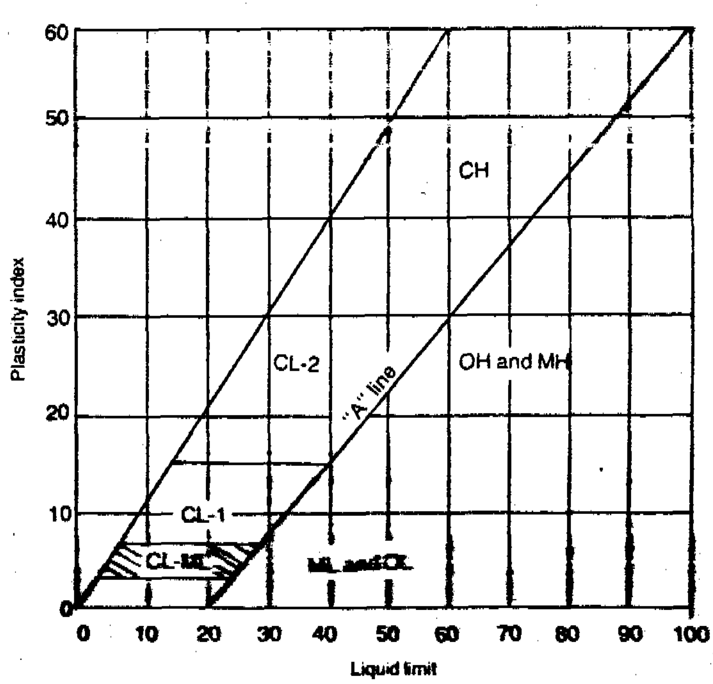
Log of Borings for:
US STEEL NORTH DIKE

Figure No. 6

Figure No. 7

Unified Soil Classification System

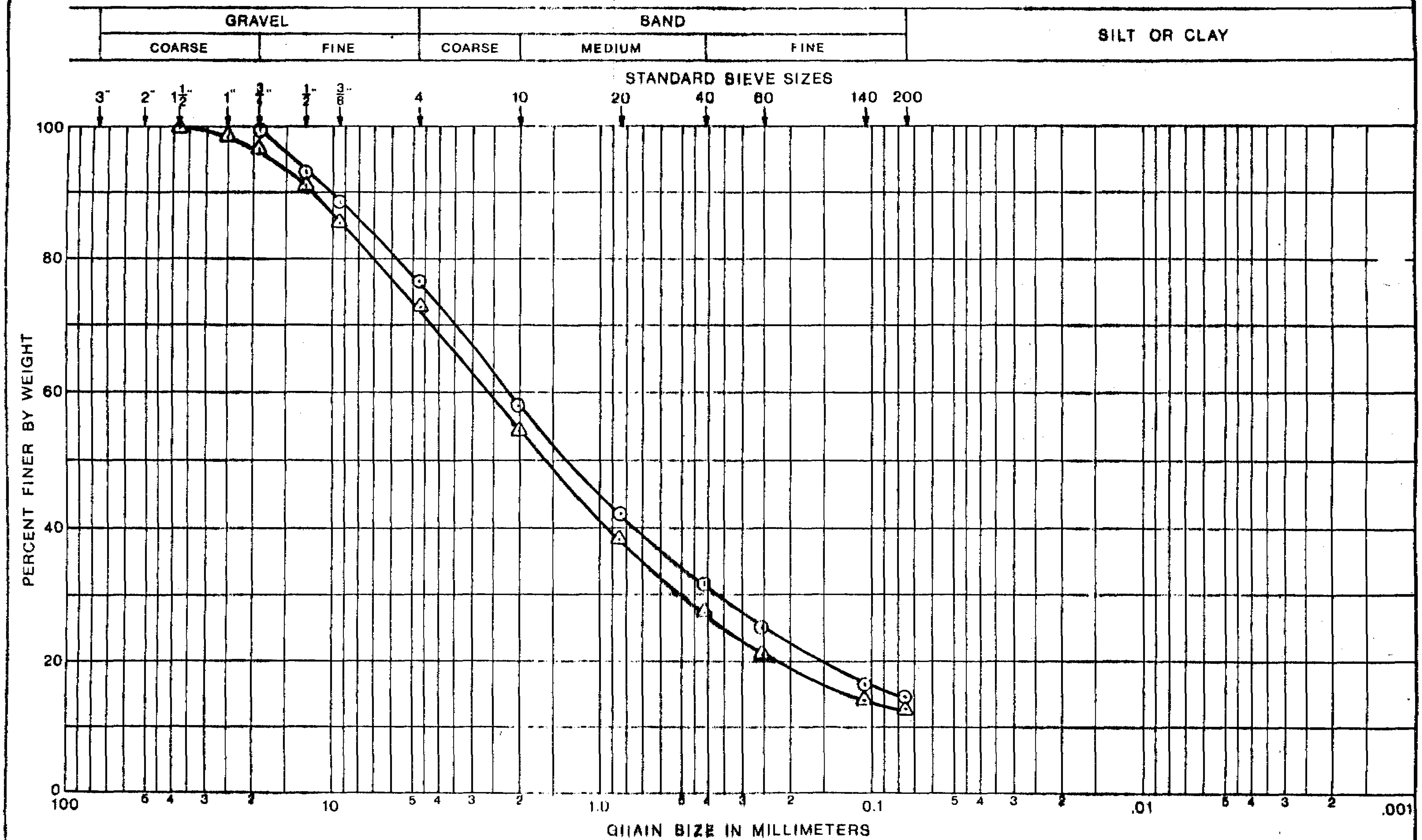
Major divisions			Group symbols	Typical names	Laboratory classification criteria		
Coarse-grained soils (More than half of material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent ...... GW, GP, SW, SP; More than 12 percent ...... GM, GC, SM, SC; 5 to 12 percent ...... Borderline cases requiring dual symbols**	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4, $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM* d/u	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6, $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP	Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM* d/u	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. less than 7	
Fine-grained soils (More than half of material is smaller than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart (see below)		
			CL 1/2	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL	Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH	Inorganic clays of high plasticity, fat clays			
			OH	Organic clays of medium to high plasticity, organic silts			
Highly organic soils			Pt	Peat and other highly organic soils			



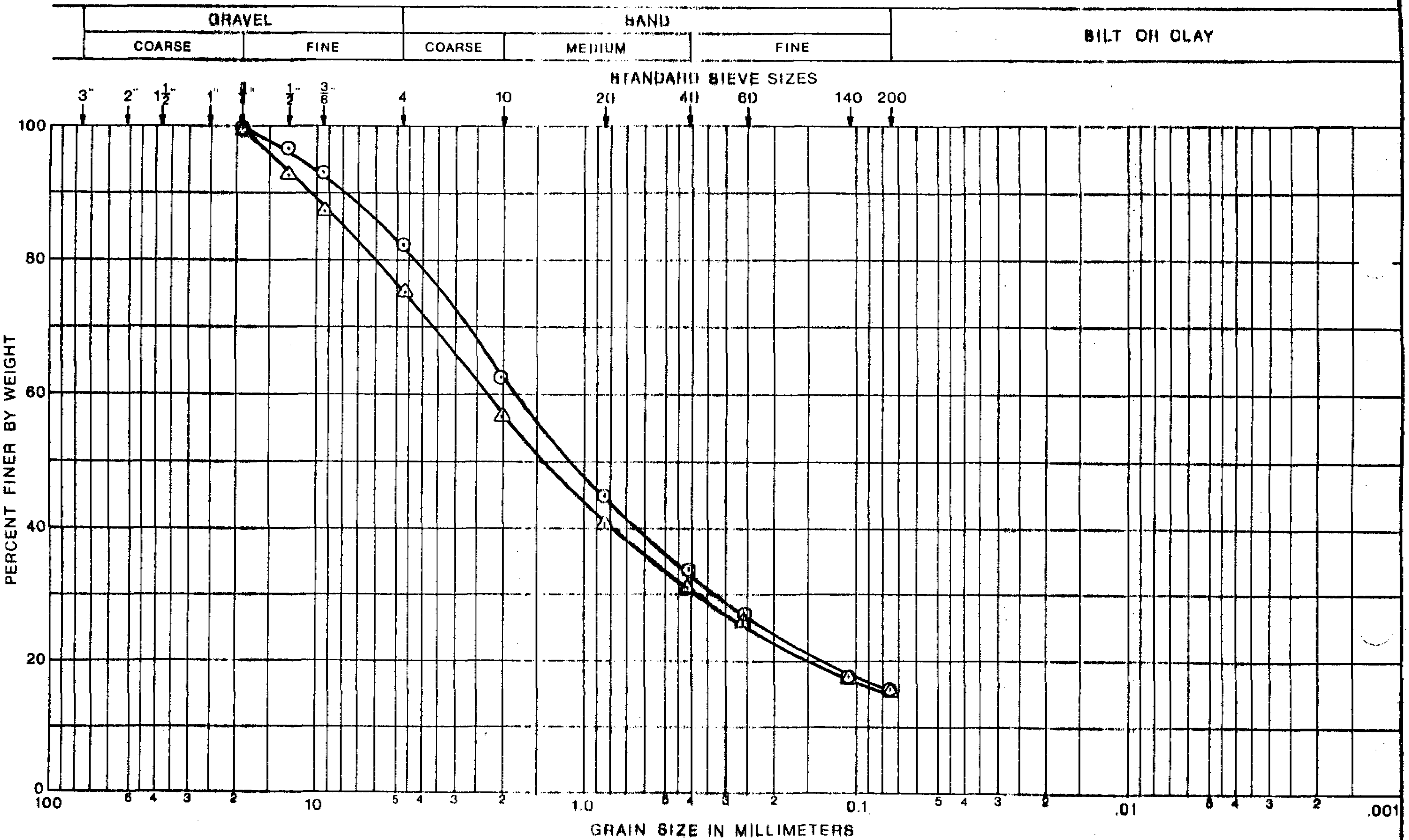
Plasticity Chart

*Division of GM and SM groups into subdivisions of d and u for roads and airfields only. Subdivision is based on Atterberg limits, suffix d used when L. L. is 28 or less and the P.I. is 6 or less, the suffix u used when L. L. is greater than 28.

** Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.



ROLLINS, BROWN AND GUNNELL, INC. PROFESSIONAL ENGINEERS	GRAIN SIZE DISTRIBUTION CURVE Project: US STEEL Location: UPPER REFUSE DIKE	○ SAMPLE No.1 △ SAMPLE No.2	FIGURE NO. 8



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

GRAIN SIZE DISTRIBUTION CURVE

Project: US STEEL
Location: UPPER REFUSE DIKE

○ SAMPLE NO. 3
△ SAMPLE NO. 4

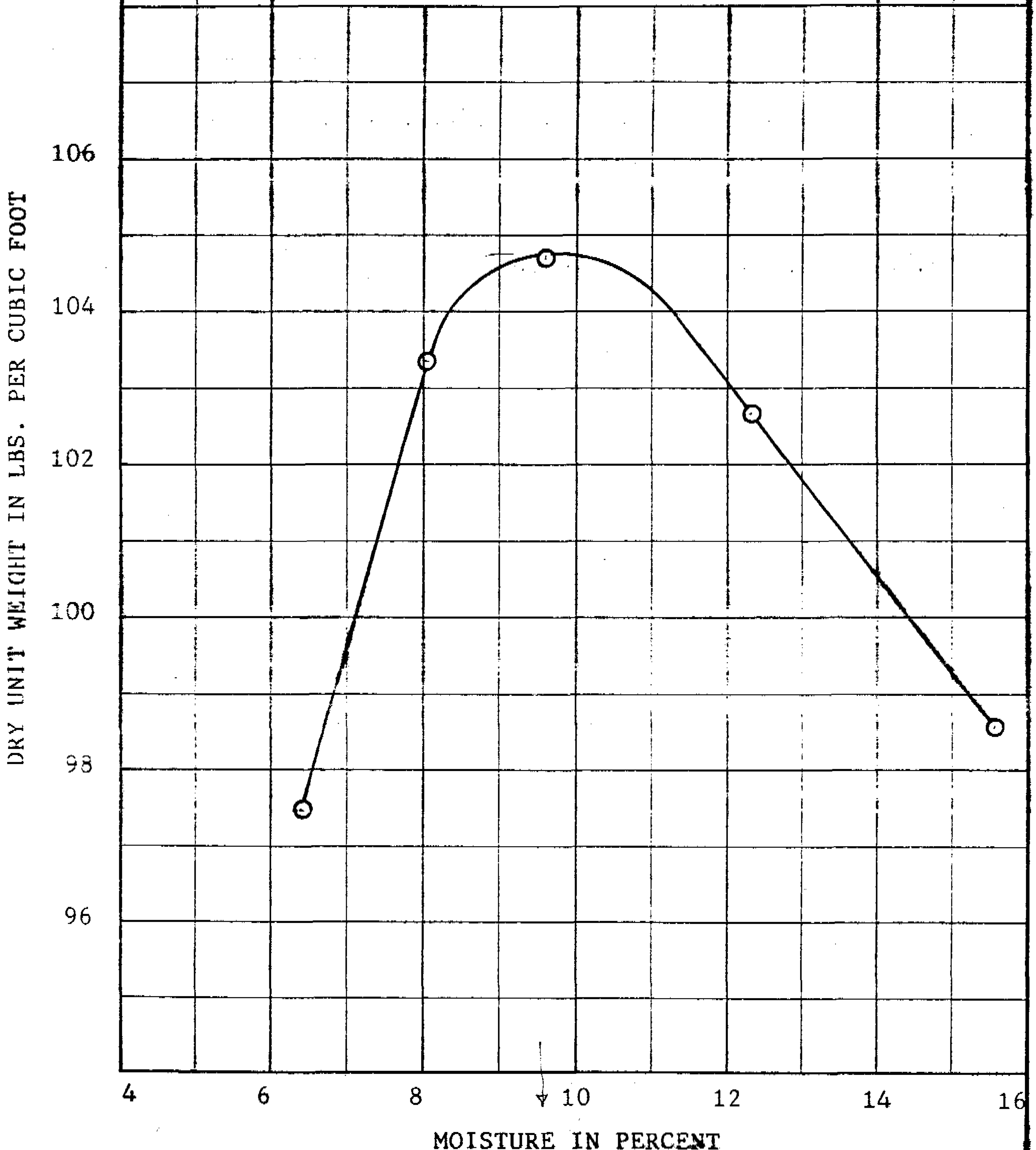
FIGURE NO. 9

SOIL MOISTURE DENSITY RELATIONSHIP

ASTM D 1557-78

Maximum Density 104.7 lbs. per cubic foot

Optimum Moisture 9.6 %



ROLLINS, BROWN AND GUNNELL, INC.

PROFESSIONAL ENGINEERS

Project: U.S. Steel Upper Refuse Dike--Coarse Refuse

Location: Sample #1

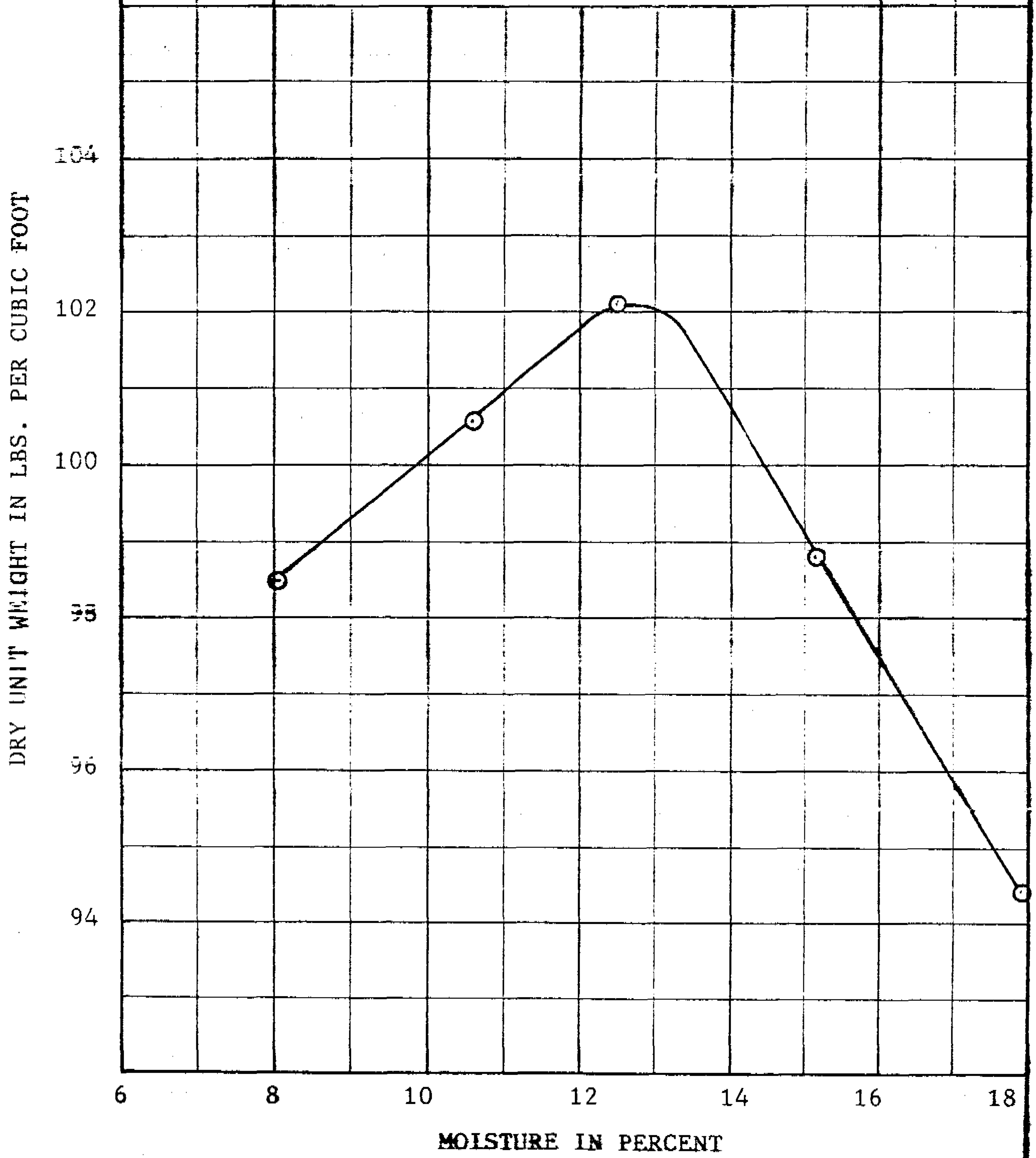
Figure No. 10

SOIL MOISTURE DENSITY RELATIONSHIP

ASTM D 1557-78

Maximum Density 102.1 lbs. per cubic foot

Optimum Moisture 12.5 %



ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

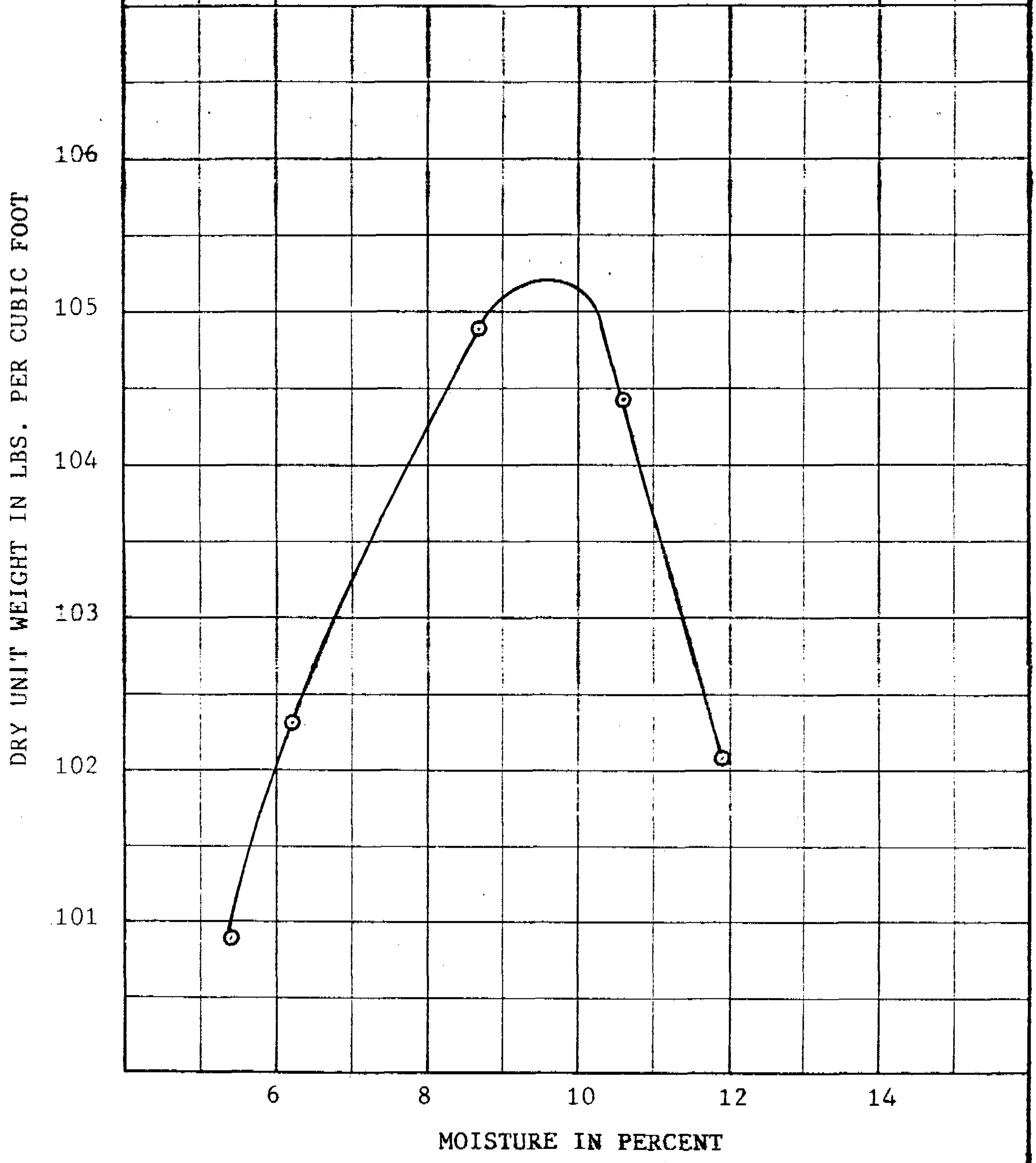
Project:	U.S. Steel Upper Refuse Dike--Coarse Refuse
Location:	Sample #2
Figure No.	11

SOIL MOISTURE DENSITY RELATIONSHIP

ASTM D 1557-78

Maximum Density 105.2 lbs. per cubic foot

Optimum Moisture 9.6 %



ROLLINS, BROWN AND GUNNELL, INC.

PROFESSIONAL ENGINEERS

Project: U.S. Steel Upper Refuse Dike--Coarse Refuse

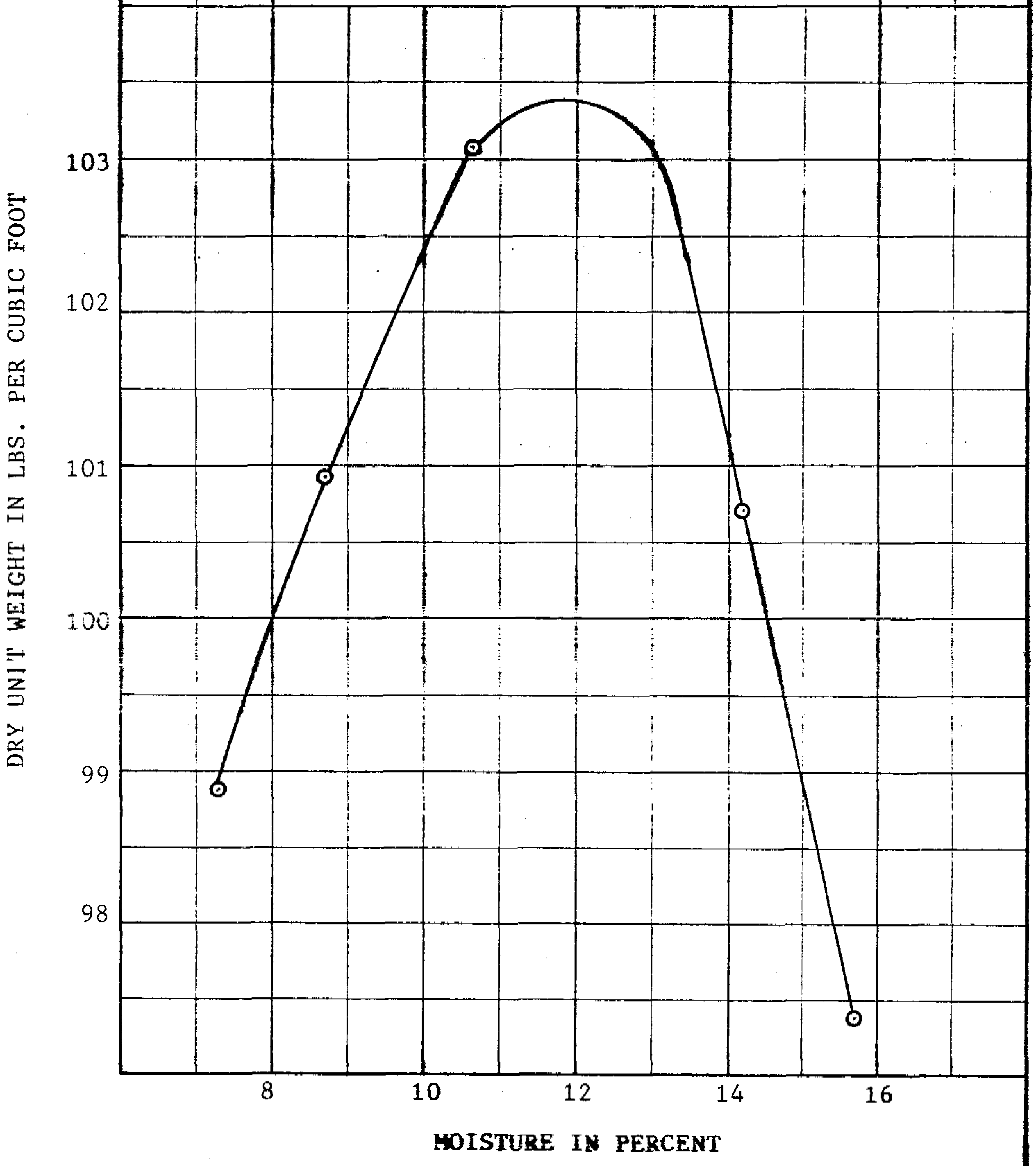
Location: Sample #3

Figure No. 12

SOIL MOISTURE DENSITY RELATIONSHIP
ASTM D 1557-78

Maximum Density 103.4 lbs. per cubic foot

Optimum Moisture 12.0 %



ROLLINS, BROWN AND GUNNELL, INC.

PROFESSIONAL ENGINEERS

Project: U.S. Steel Upper Refuse Dike--Coarse Refuse

Location: Sample #4

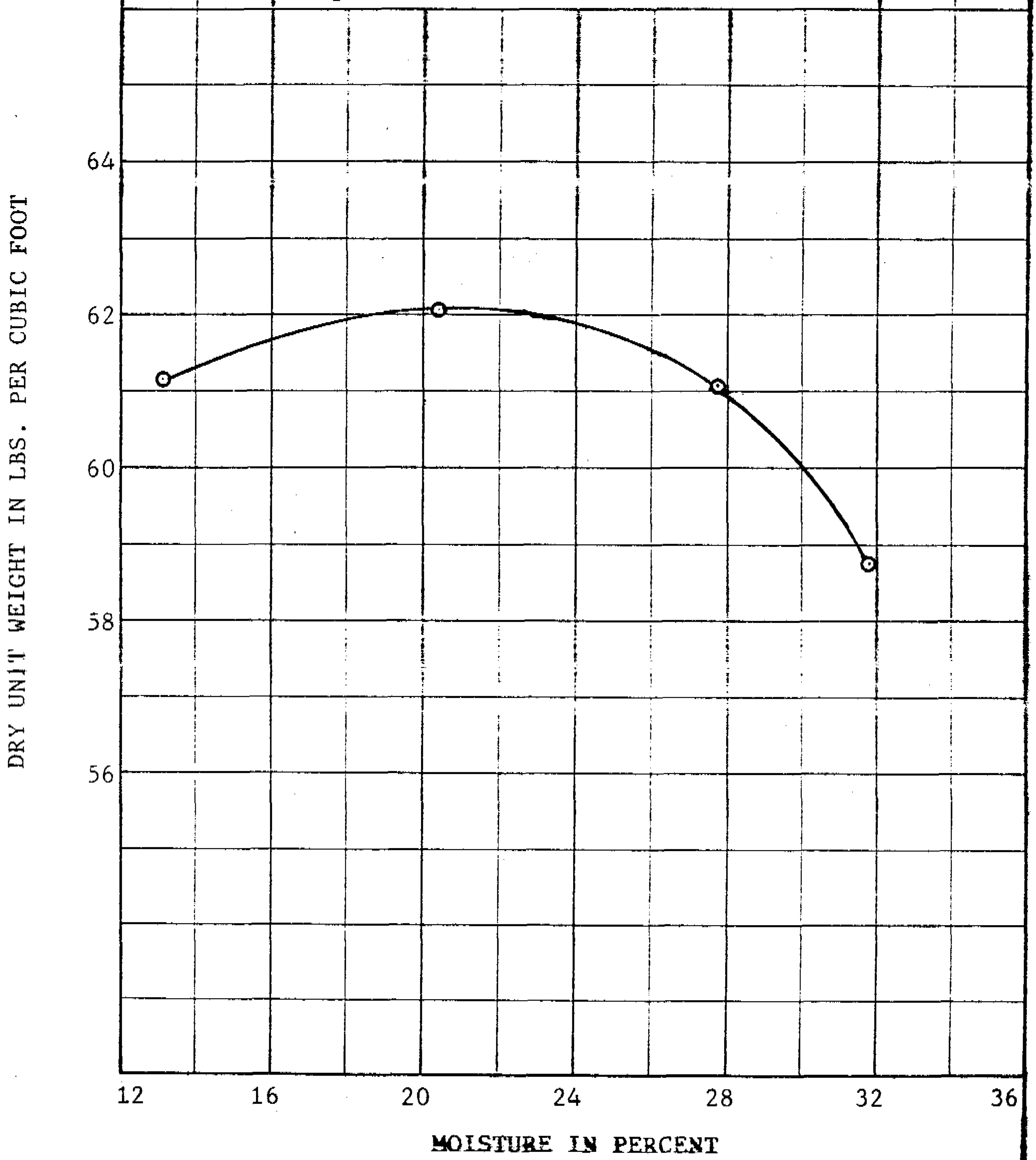
Figure No. 13

SOIL MOISTURE DENSITY RELATIONSHIP

ASTM D 698

Maximum Density 62.0 lbs. per cubic foot

Optimum Moisture 22.0 %



ROLLINS, BROWN AND GUNNELL, INC.

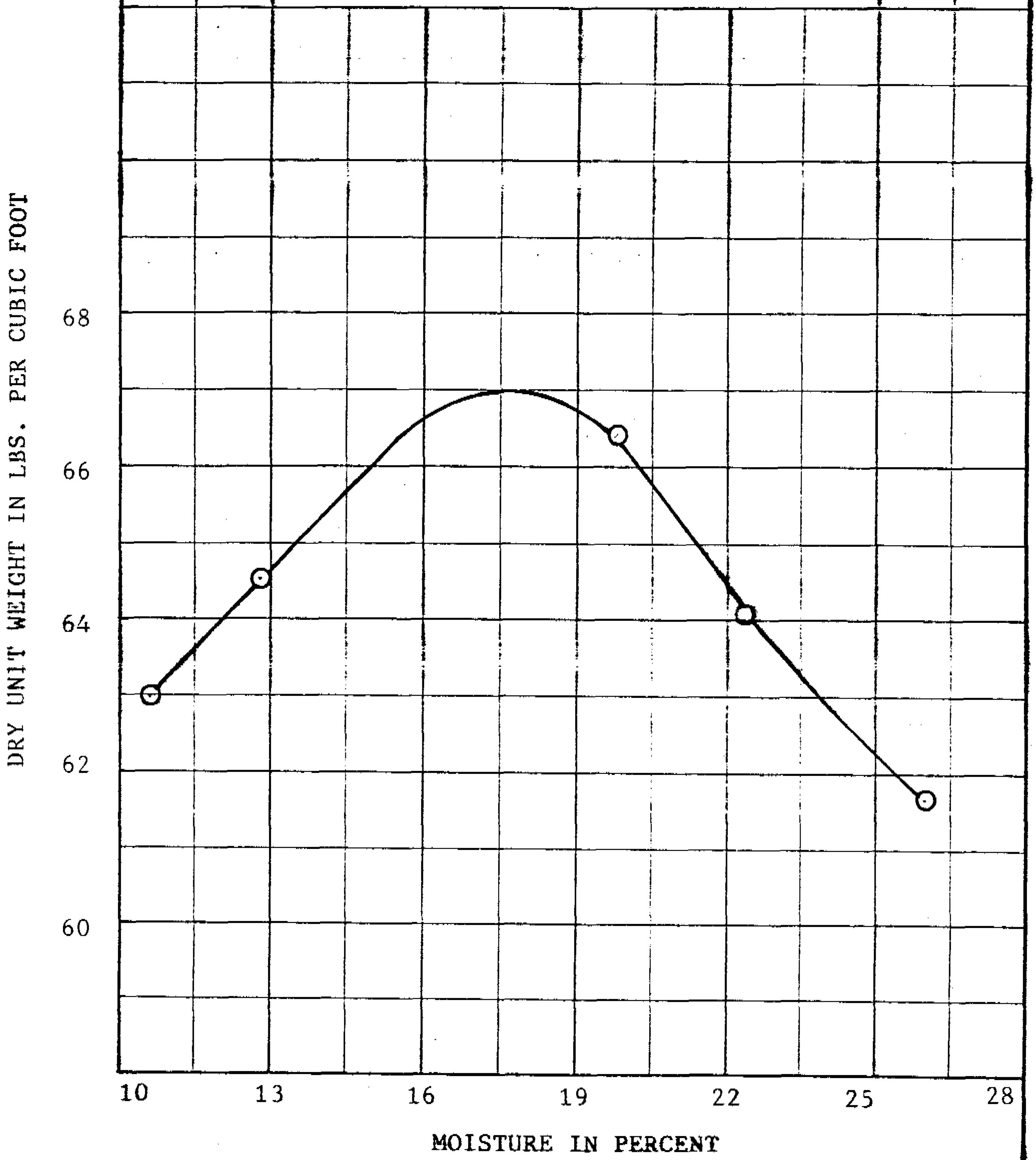
PROFESSIONAL ENGINEERS

Project:	U.S. Steel Refuse Dike Fine Refuse
Location:	Sample No. 2
Figure No.	14

SOIL MOISTURE DENSITY RELATIONSHIP
ASTM D 1557-78

Maximum Density 67.0 lbs. per cubic foot

Optimum Moisture 18.0 %



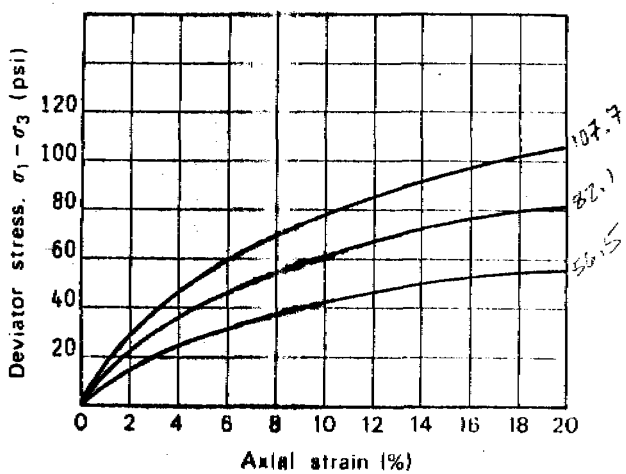
ROLLINS, BROWN AND GUNNELL, INC.

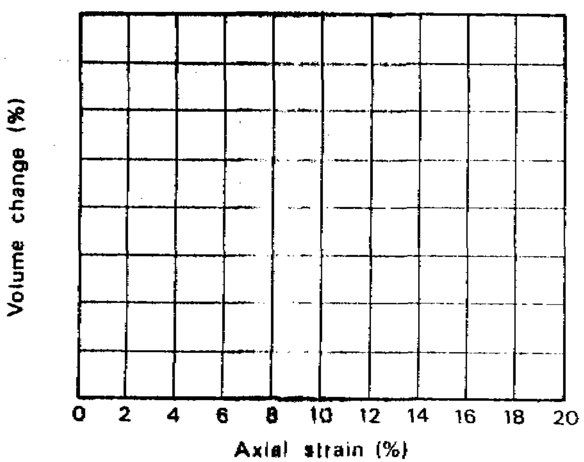
PROFESSIONAL ENGINEERS

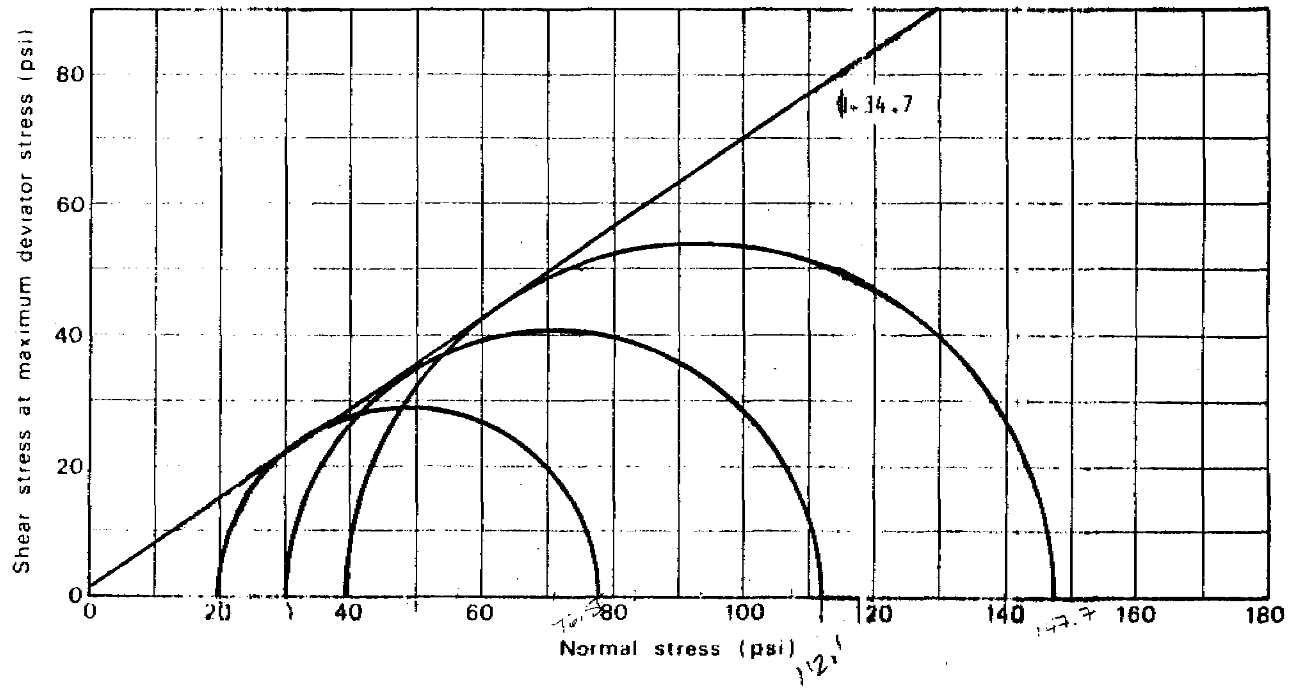
Project: U.S. Steel Refuse Dike Fine Refuse

Location: Sample No. 1

Figure No. 15







Test no or symbol	Boring no or depth	Sample data		Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure		Sample size, L/D (inches)	Strain rate (inches/minute)
		Dry density (pcf)	Moisture content (%)				Friction angle φ (degrees)	Cohesion (c/psi)		
		93.7	10.0	100	20	56.5	34.7	1	2.8/1.32	.002
		93.7	10.0	100	30	82.1	34.7	1	2.8/1.32	.002
		93.7	10.0	100	40	107.7	34.7	1	2.8/1.32	.002

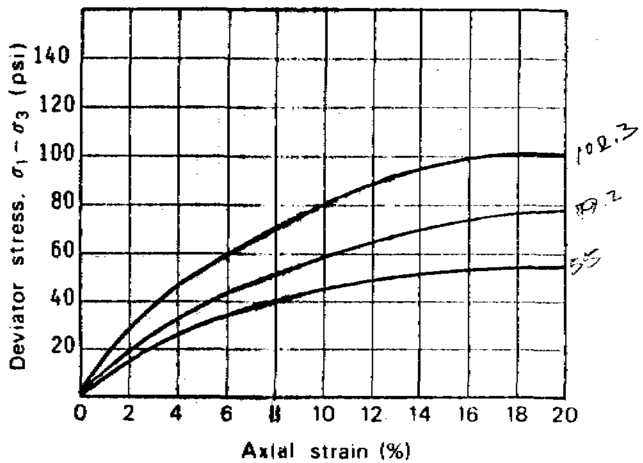
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

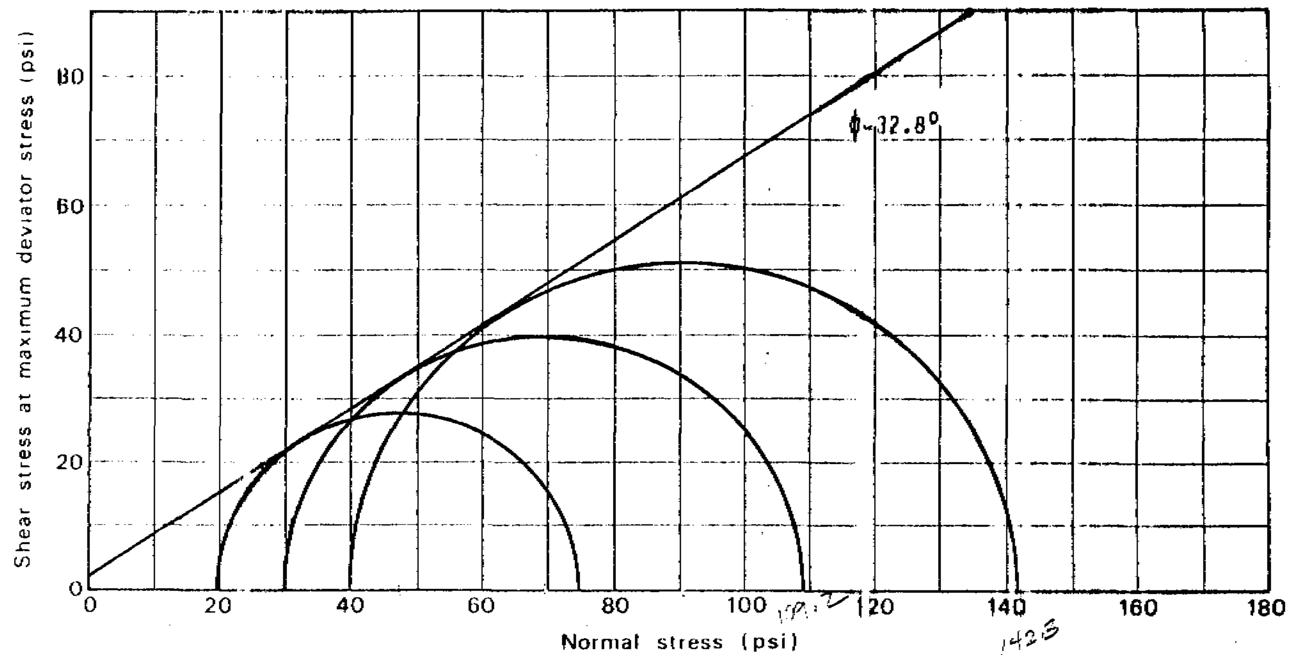
CONSOLIDATED DRAINED
TRIAXIAL SHEAR TEST

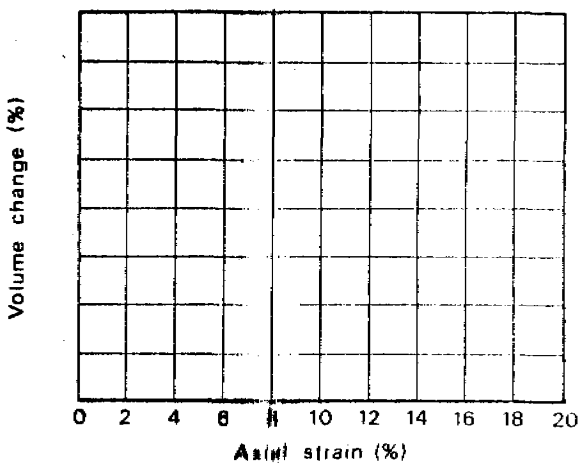
Project: US STEEL UPPER DIKE

HOLE NO. 1
DEPTH: 15'-16'

FIGURE NO. 16







Test no. or symbol	Boring no. or depth	Sample data: Dry density (pcf)	Sample data: Moisture content (%)	Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure: Friction angle φ (degrees)	Strength values at failure: Cohesion (c/psi)	Sample size, L/D (inches)	Strain rate (inches/minute)
		84	13.2	100	20	55.0	32.8	2.0	2.8/1.32	.0016
		84	13.2	100	30	79.2	32.8	2.0	2.8/1.32	.0016
		84	13.2	100	40	102.3	32.8	2.0	2.8/1.32	.0016

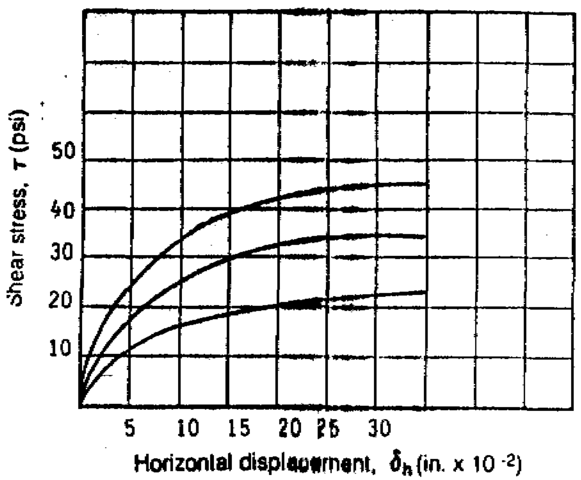
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

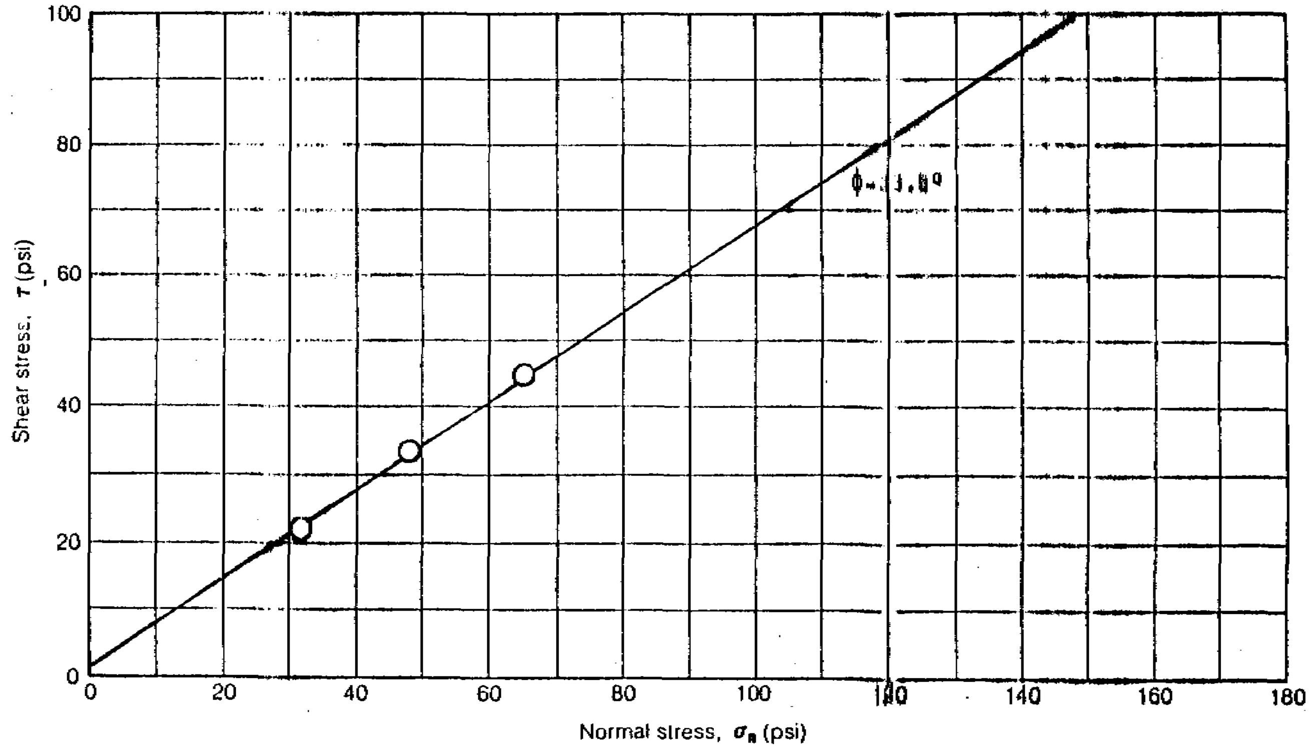
CONSOLIDATED DRAINED TRIAXIAL SHEAR TEST

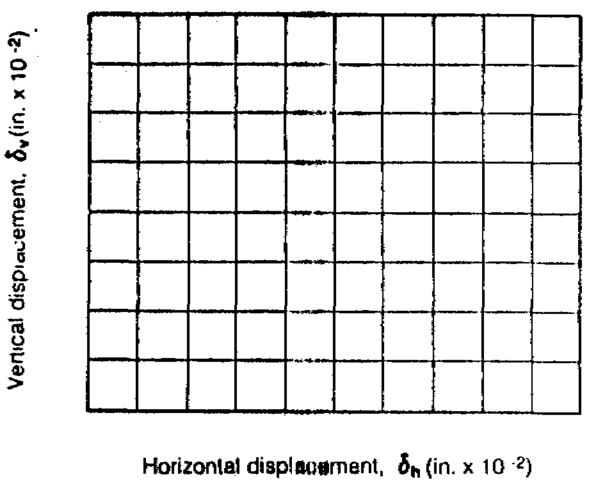
Project: US STEEL UPPER DIKE

HOLE NO. 2
DEPTH: 15'-16'

FIGURE NO. 17







Test no. or symbol	Sample size (inches)	Sample data		Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters	
		Dry density (pcf)	Moisture content (%)					Friction angle ϕ (degrees)	Cohesion (c / psi)
	2.5	84	13.2	100	32.5	22.8	.0031		
	2.5	84	13.2	100	48.2	35.2	.0031	33.8	1.5
	2.5	84	13.2	100	64.5	46.2	.0031		

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

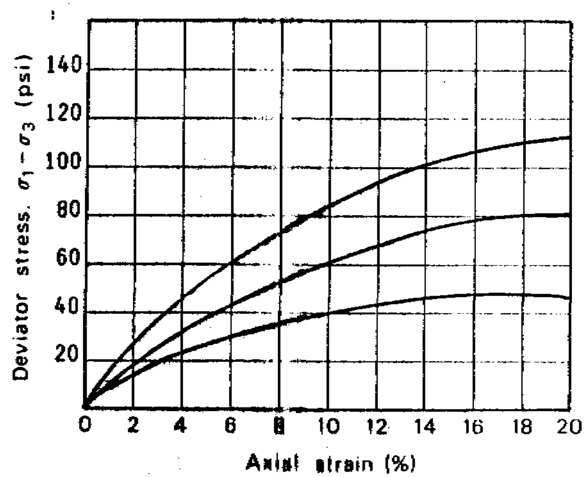
CONSOLIDATED DRAINED DIRECT SHEAR TEST

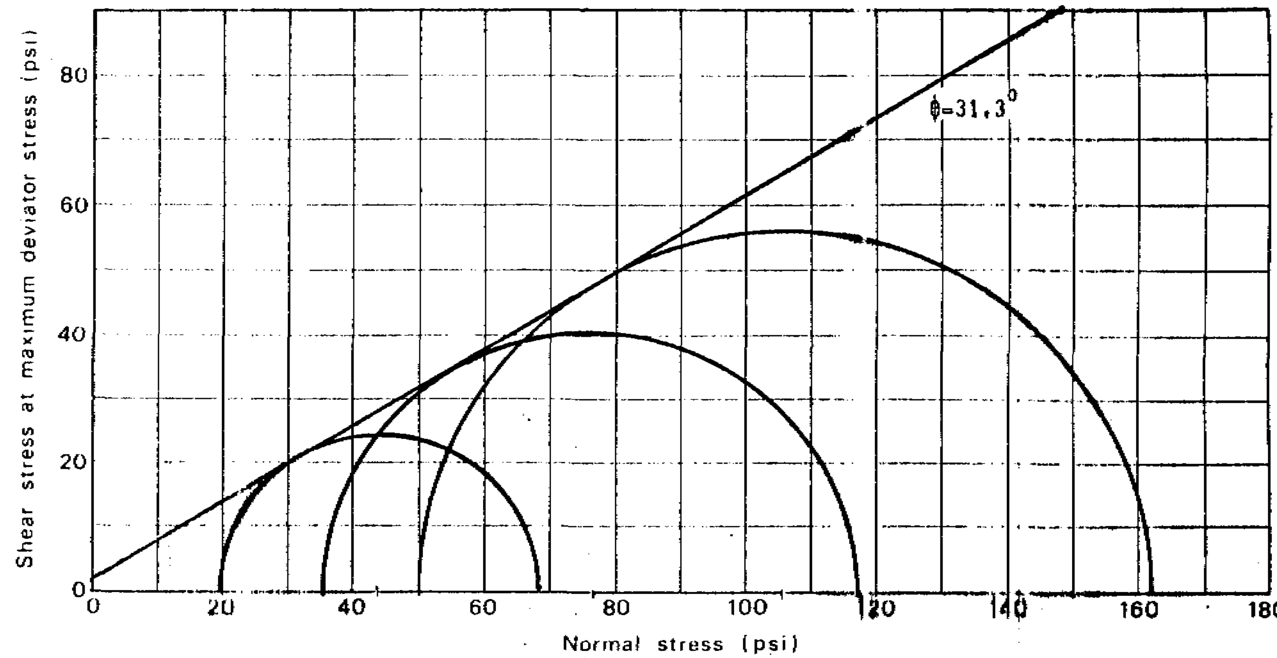
Project: US STEEL UPPER DIKE

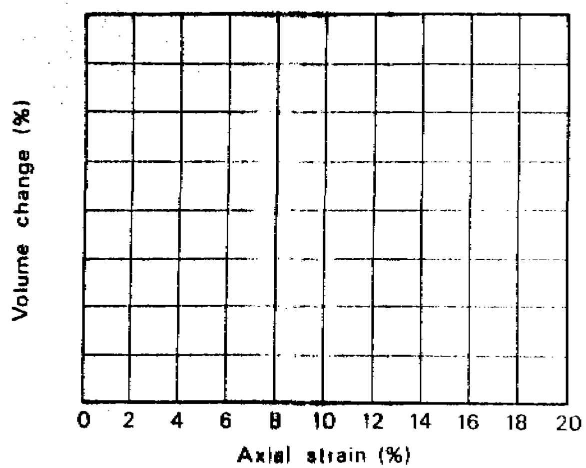
HOLE NO. 2

DEPTH: 16 18.5'

FIGURE NO. 18







Test no or symbol	Boring no or depth	Sample data		Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure		Sample size, L/D (inches)	Strain rate (inches/minute)
		Dry density (pcf)	Moisture content (%)				Friction angle φ (degrees)	Cohesion (c, psi)		
		60.1	21.5	100	20	48.7	31.3	1.5	2.8/1.32	.0019
		59.6	21.5	100	36	82.1	31.3	1.5	2.8/1.32	.0019
		59.4	21.5	100	50	113.1	31.3	1.5	2.8/1.32	.0019

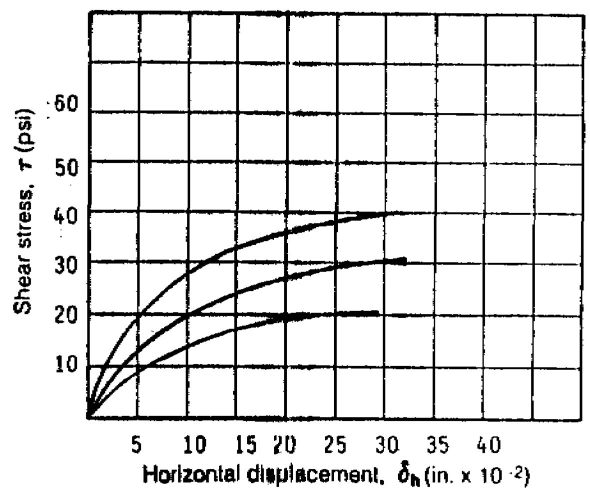
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

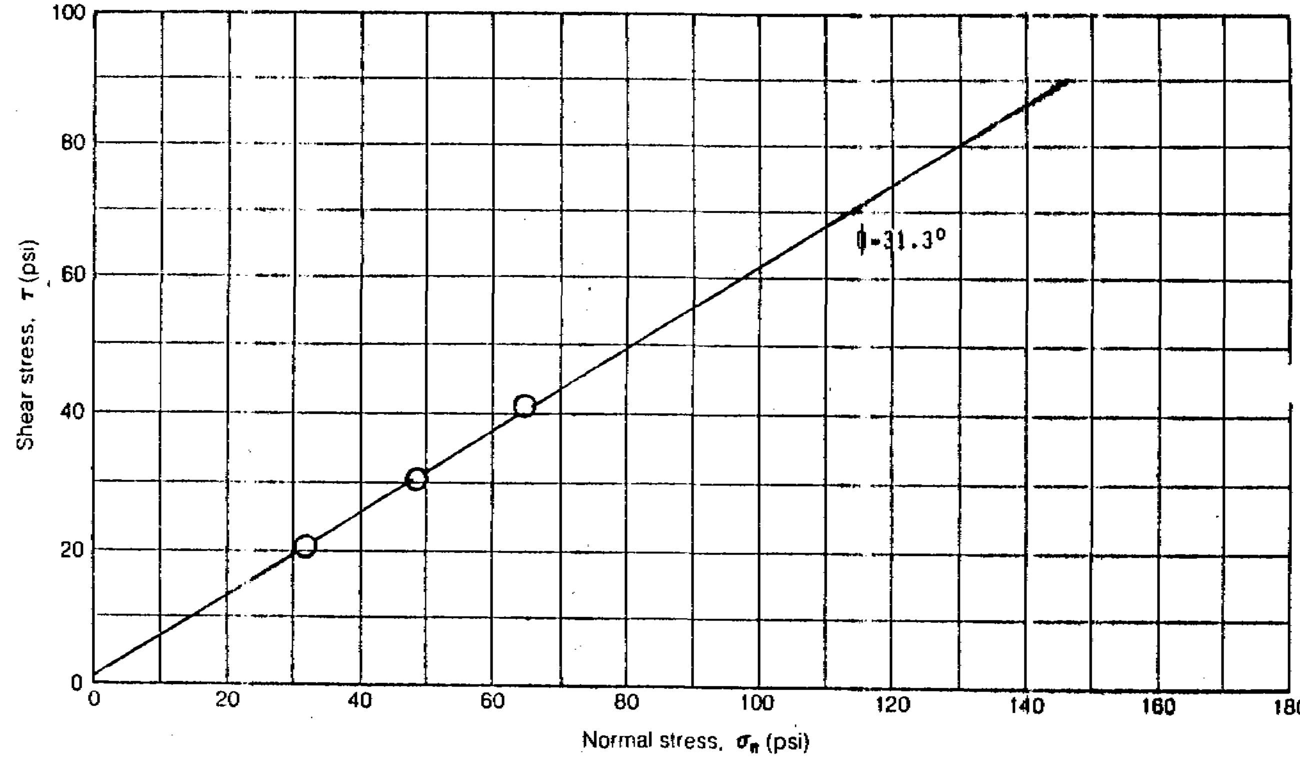
CONSOLIDATED DRAINED
TRIAXIAL SHEAR TEST

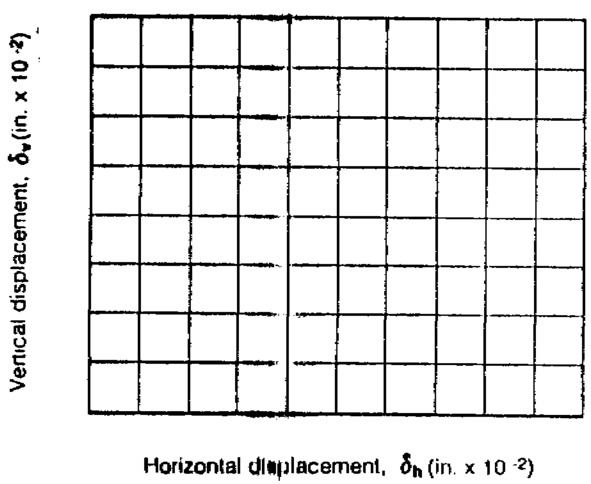
Project: US STEEL UPPER DIKE

Fine Coal Refuse
HOLE NO. 1
DEPTH: 20-21.5'

FIGURE NO. 19







Test no. or symbol	Sample size (inches)	Sample data: Dry density (pcf)	Sample data: Moisture content (%)	Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters: Friction angle ϕ (degrees)	Shear strength parameters: Cohesion (c / psi)
	2.5	60	21.5	100	31.8	21.1	.0031		
	2.5	60	21.5	100	48.3	30.6	.0031	31.3	1.5
	2.5	60	21.5	100	64.7	41.9	.0031		

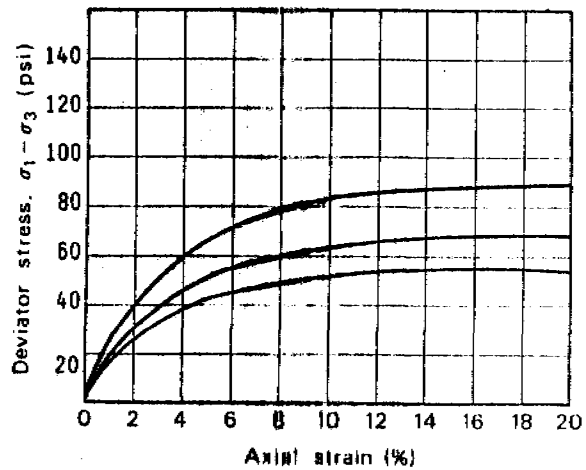
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

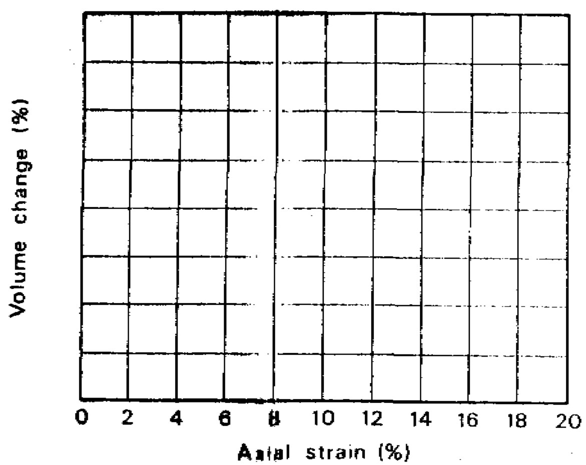
CONSOLIDATED DRAINED
DIRECT SHEAR TEST

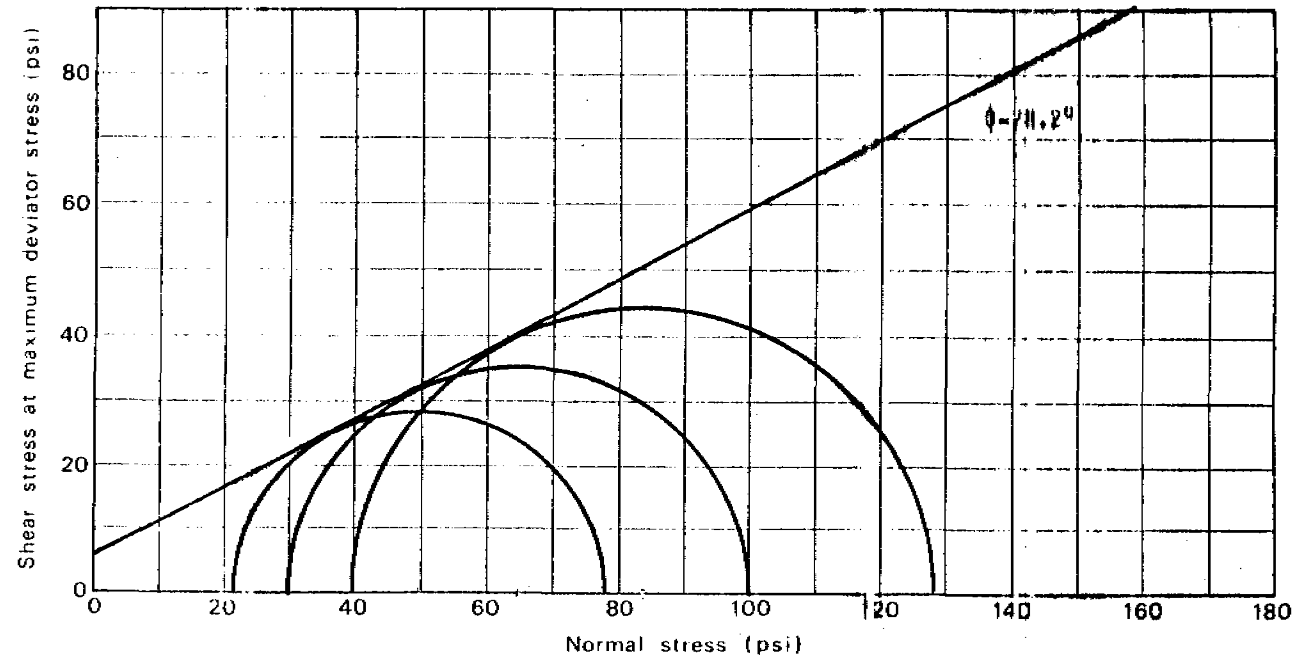
Project: US STEEL UPPER DIKE

Fine Coal Refuse
HOLE NO 1
DEPTH: 20-21.5'

FIGURE NO. 20







Test no or symbol	Boring no. or depth	Sample data: Dry density (pcf)	Sample data: Moisture content (%)	Degree of saturation (%)	Confining pressure (psi)	Maximum deviator stress (psi)	Strength values at failure: Friction angle ϕ (degrees)	Strength values at failure: Cohesion (c/psi)	Sample size, L/D (inches)	Strain rate (inches/minute)
		110.7	20.9	100	21	57.9	28.2	5	5.0/2.5	.0028
		110.0	20.9	100	30	69.9	28.2	5	5.0/2.5	.0028
		112.3	15.8	100	40	88.7	28.2	5	5.0/2.5	.0028

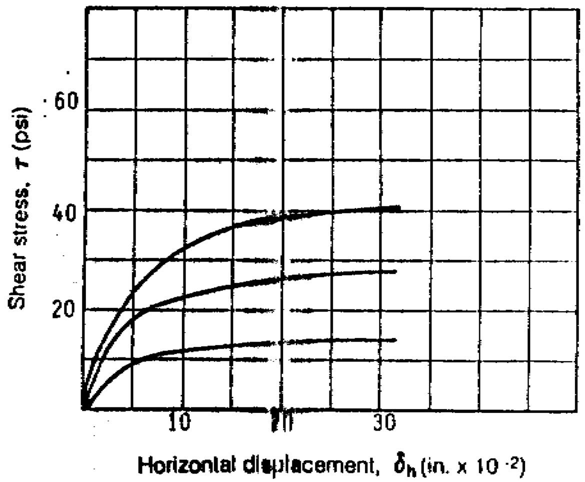
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

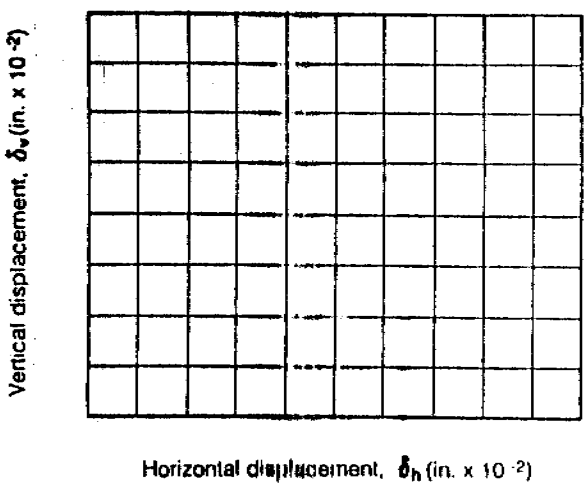
CONSOLIDATED DRAINED
TRIAXIAL SHEAR TEST

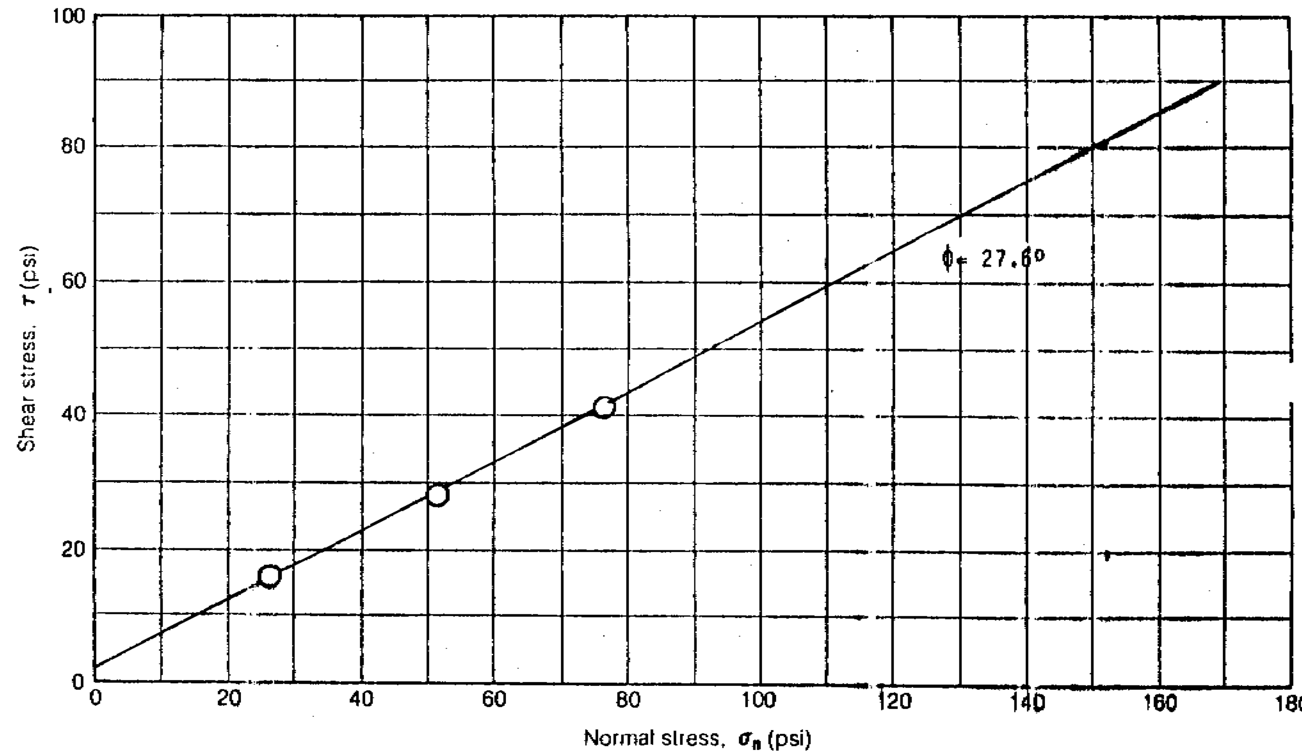
Project: US STEEL NORTH DIKE

HOLE NO. 5
DEPTH: 10-11.5'

FIGURE NO. 21







Test no. or symbol	Sample size (inches)	Sample data		Degree of saturation (%)	Normal stress σ_n (psi)	Maximum shear stress τ (psi)	Strain rate (inches / minute)	Shear strength parameters	
		Dry density (pcf)	Moisture content (%)					Friction angle ϕ (degrees)	Cohesion (c / psi)
	2"	110.6	16.5	100	26.3	16.2	.002	27.6°	2
	2"	110.6	16.5	100	51.0	27.8	.002		
	2"	110.6	16.5	100	77.5	41.7	.002		

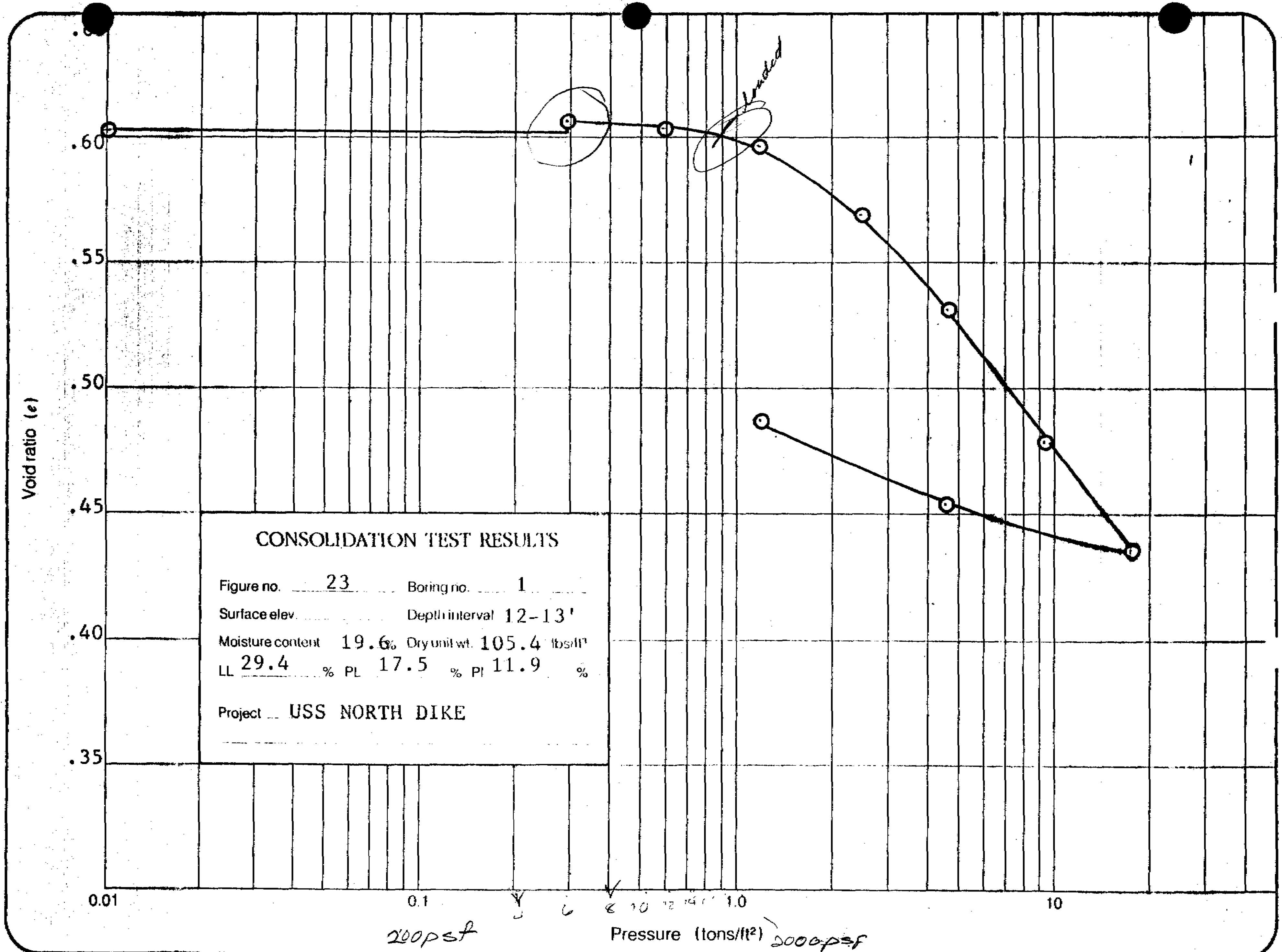
ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

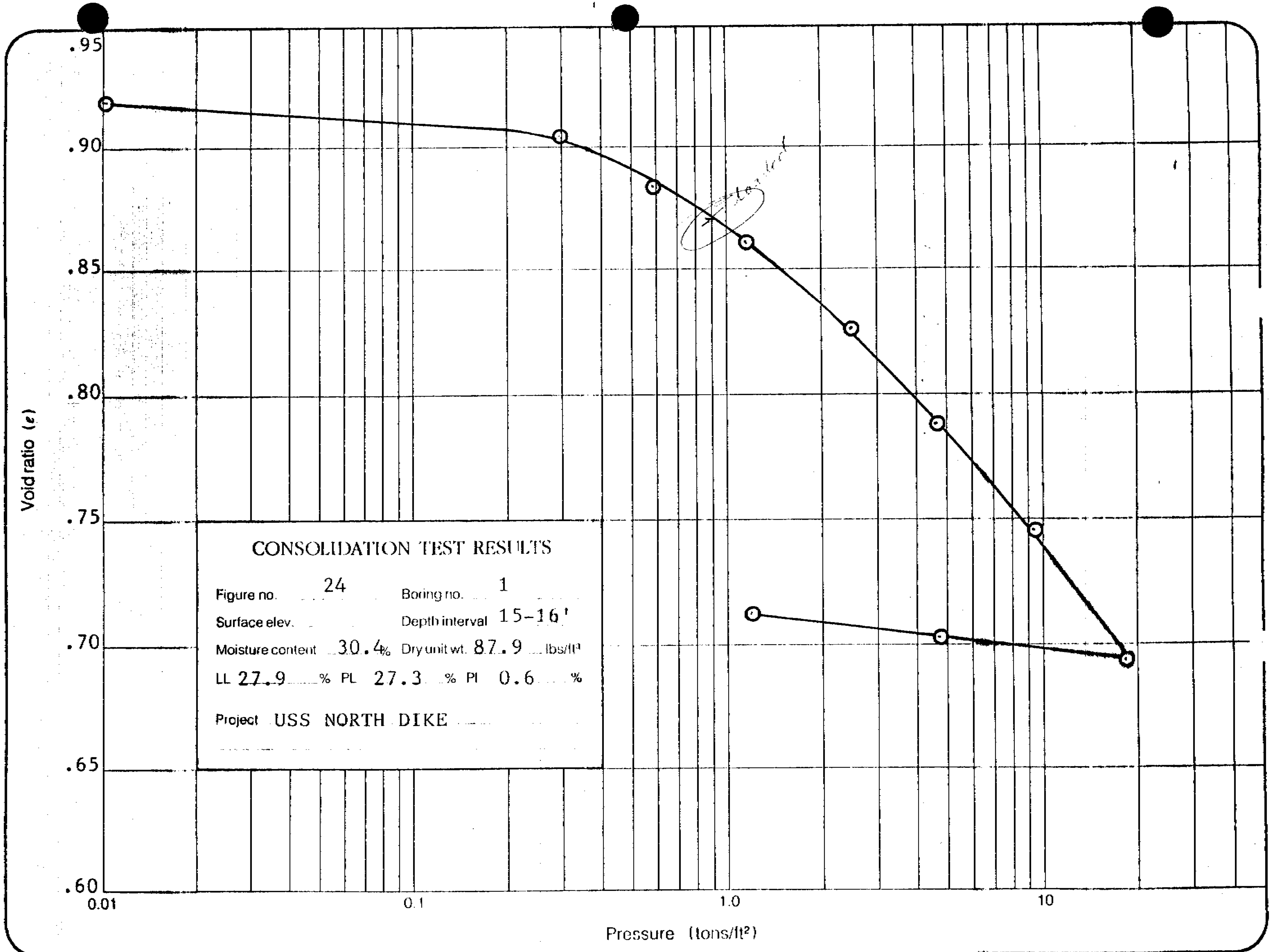
CONSOLIDATED DRAINED
DIRECT SHEAR TEST

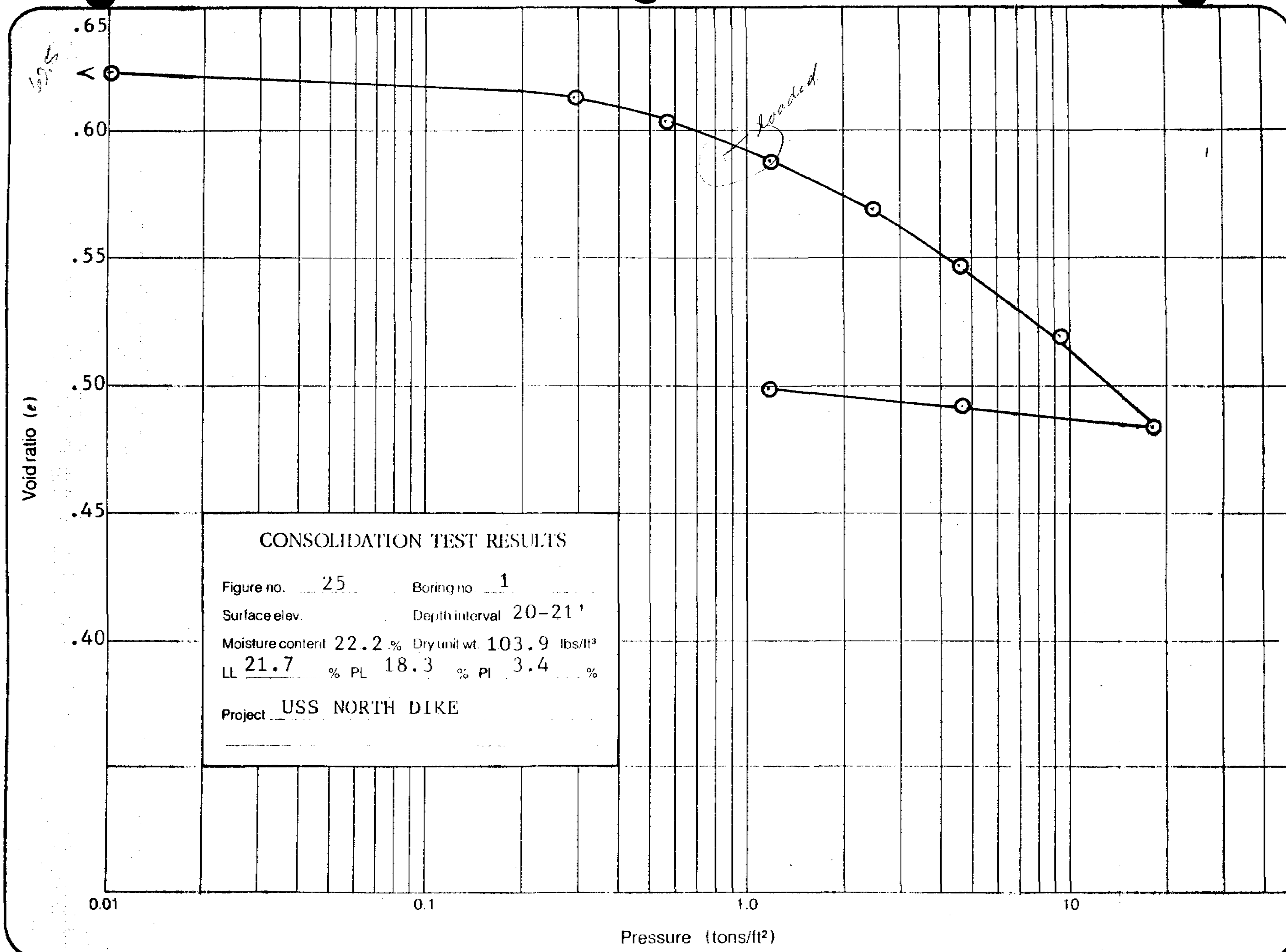
Project: US STEEL NORTH DIKE

HOLE NO. 1
DEPTH: 25-26'

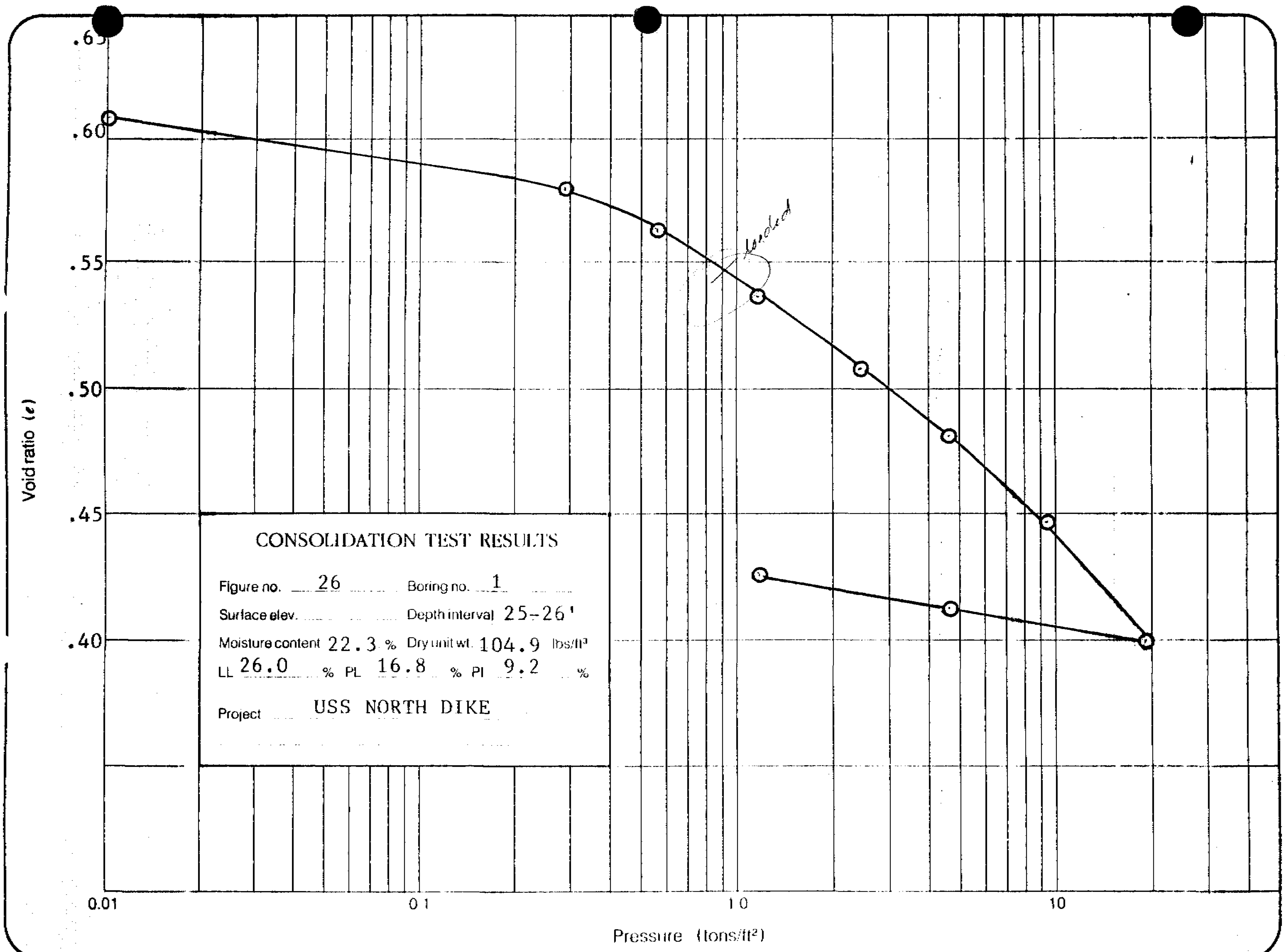
FIGURE NO. 22


CONSOLIDATION TEST RESULTS
Figure no. 23 Boring no. 1
Surface elev.
Depth interval 12-13'
Moisture content 19.6% Dry unit wt. 105.4 lbs/ft³
LL 29.4 % PL 17.5 % PI 11.9 %
Project USS NORTH DIKE
Void ratio (e)
.60
.55
.50
.45
.40
.35
0.01
0.1
1.0
10
Pressure (tons/ft²)
200psf
2000psf

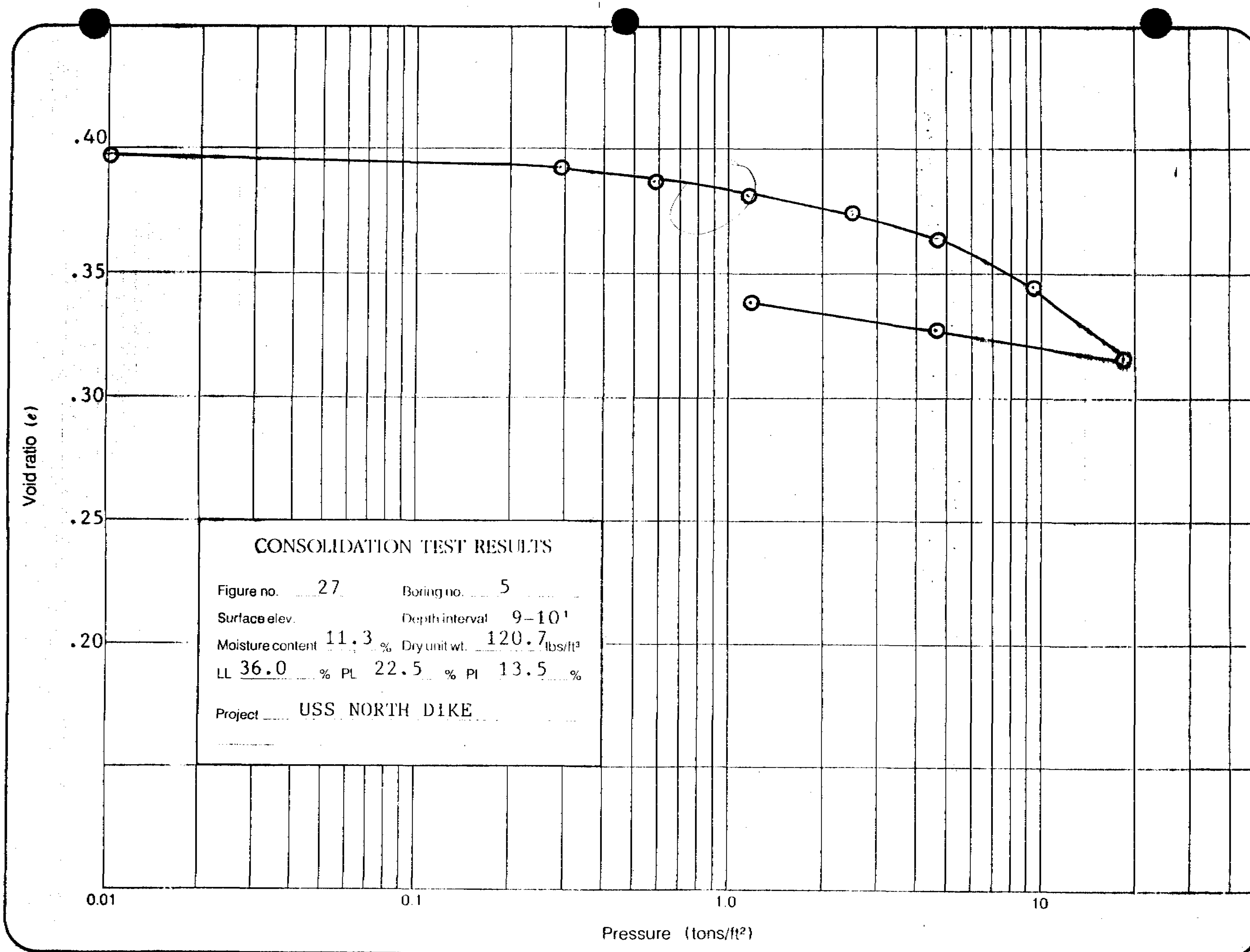

CONSOLIDATION TEST RESULTS
Figure no. 24
Boring no. 1
Surface elev.
Depth interval 15-16'
Moisture content 30.4%
Dry unit wt. 87.9 lbs/ft³
LL 27.9 %
PL 27.3 %
PI 0.6 %
Project USS NORTH DIKE
Void ratio (e)
.95
.90
.85
.80
.75
.70
.65
.60
0.01
0.1
1.0
10
Pressure (tons/ft²)



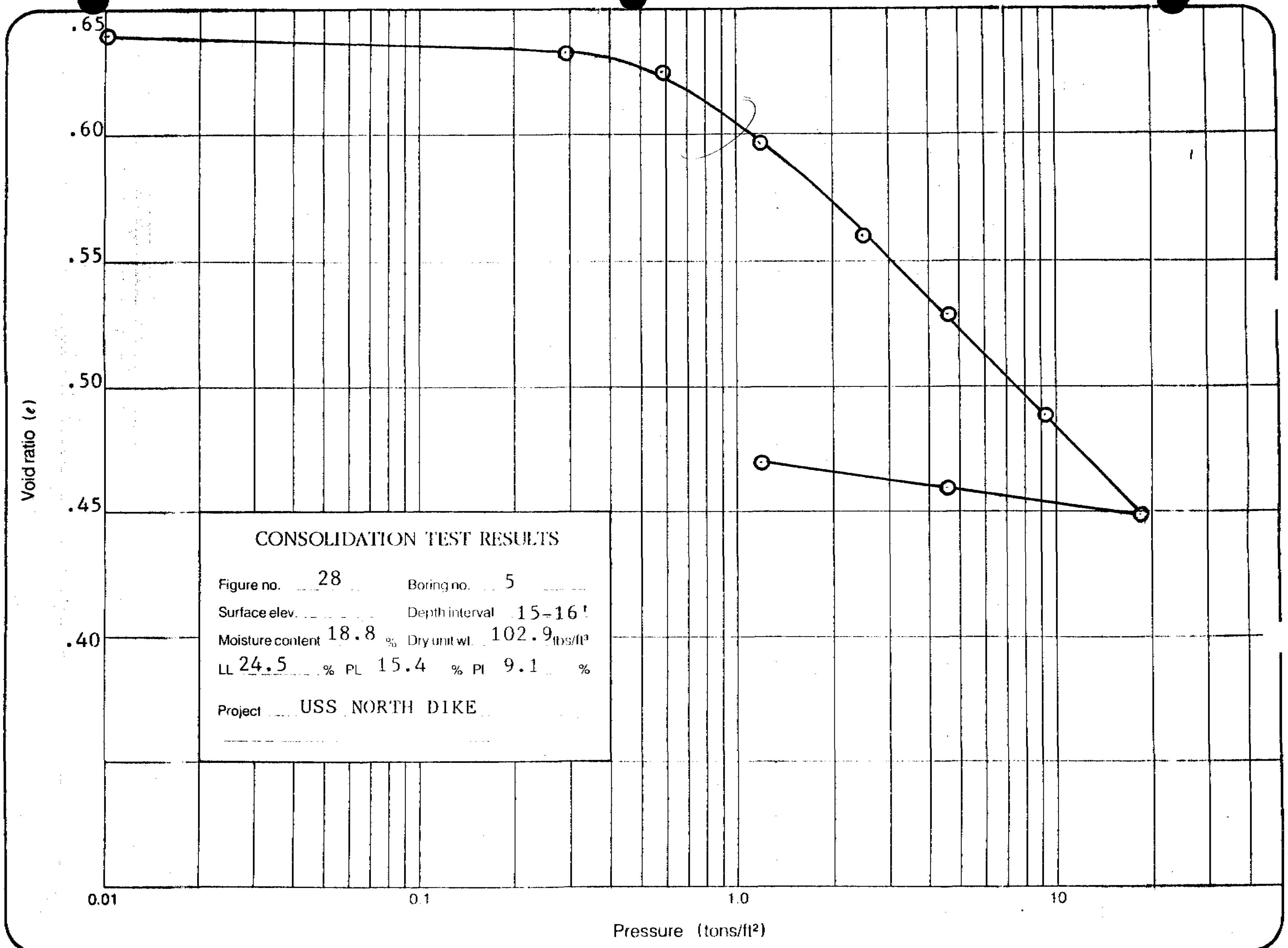
CONSOLIDATION TEST RESULTS
Figure no. 25
Boring no. 1
Surface elev.
Depth interval 20-21'
Moisture content 22.2 %
Dry unit wt. 103.9 lbs/ft³
LL 21.7 % PL 18.3 % PI 3.4 %
Project USS NORTH DIKE
Void ratio (e)
.65
.60
.55
.50
.45
.40
0.01
0.1
1.0
10
Pressure (tons/ft²)
loaded



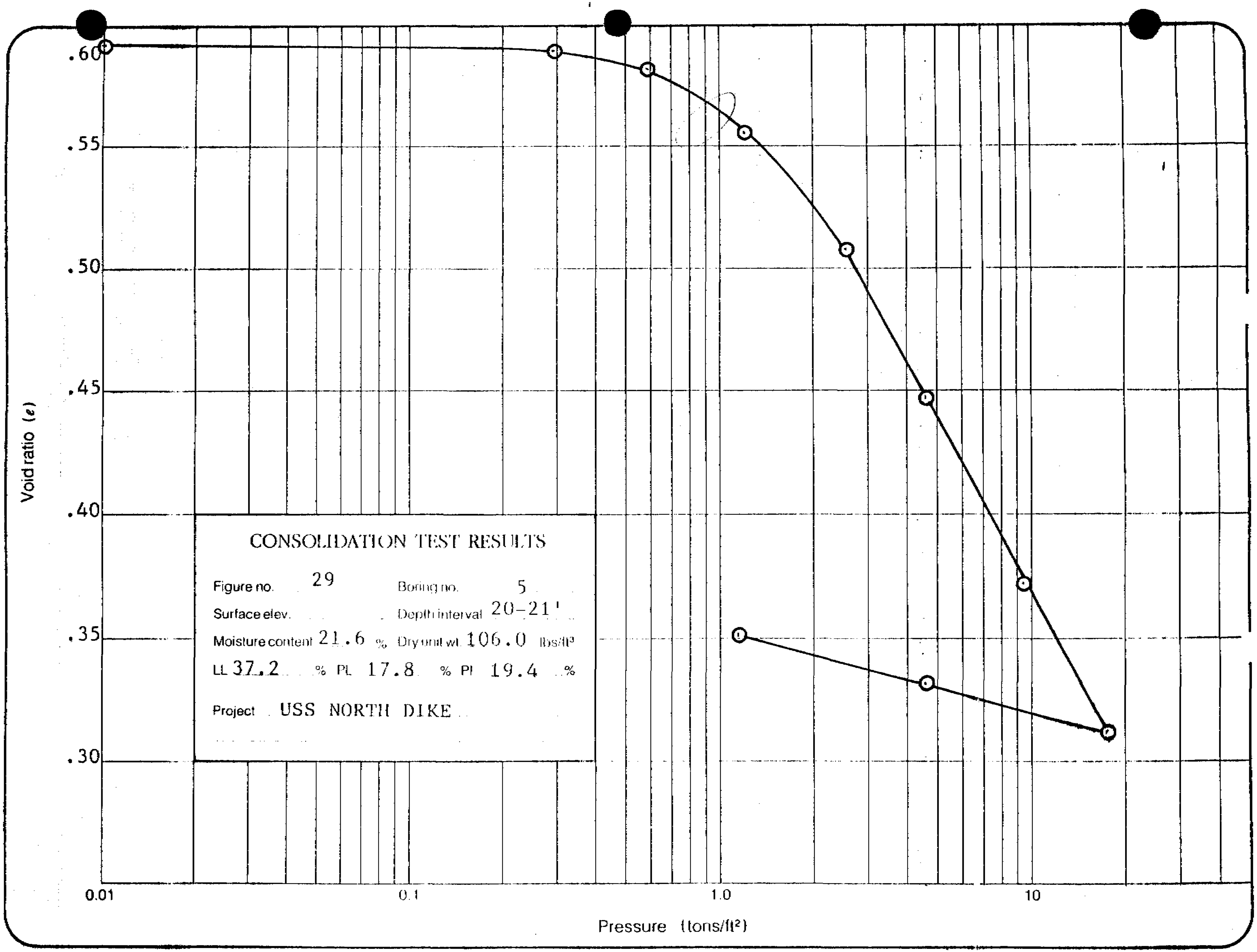
CONSOLIDATION TEST RESULTS
Figure no. 26
Boring no. 1
Surface elev.
Depth interval 25-26'
Moisture content 22.3 %
Dry unit wt. 104.9 lbs/ft³
LL 26.0 %
PL 16.8 %
PI 9.2 %
Project USS NORTH DIKE
Void ratio (e)
.65
.60
.55
.50
.45
.40
0.01
0.1
1.0
10
Pressure (tons/ft²)

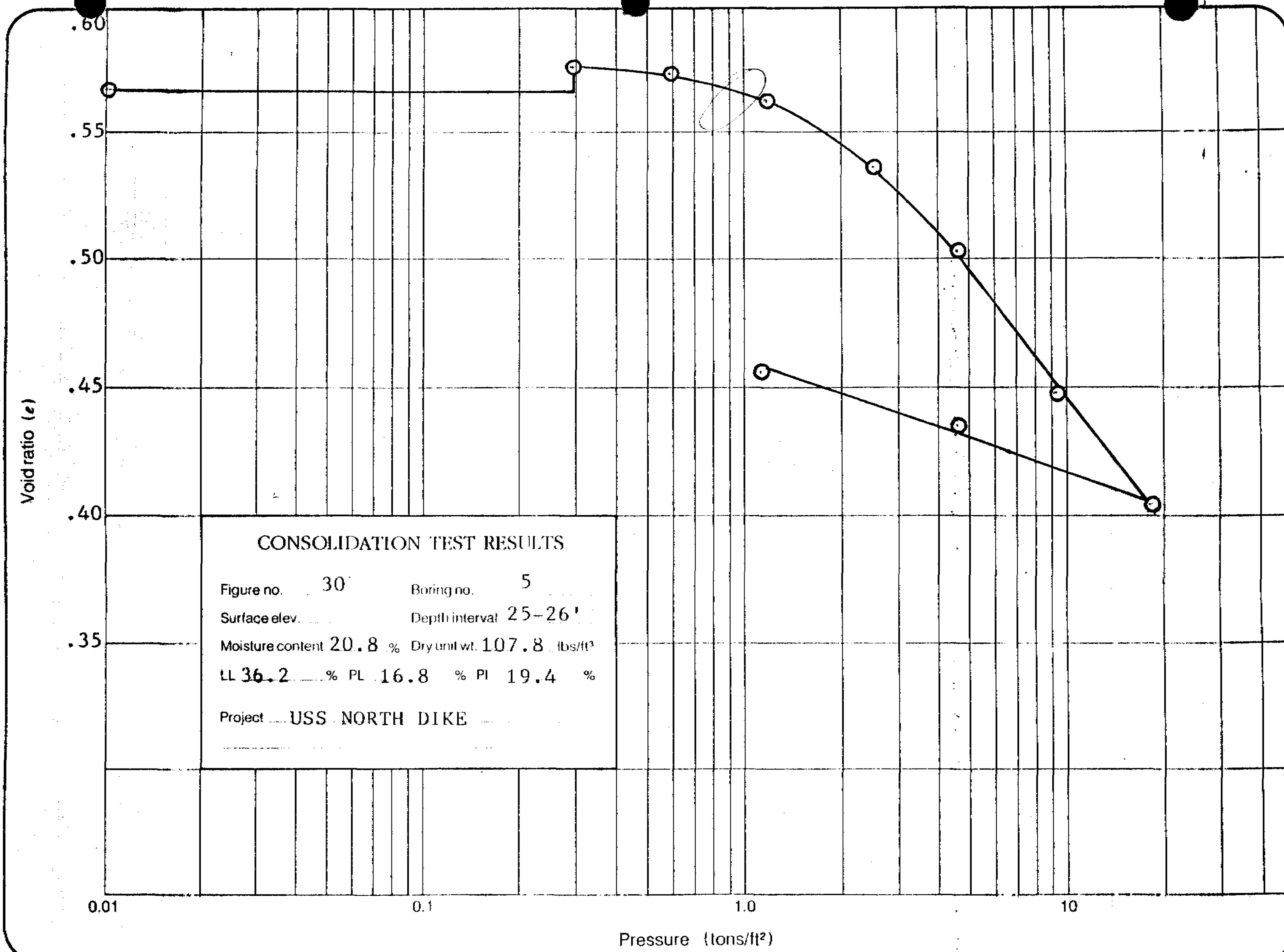


.40
.35
.30
.25
.20
Void ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
CONSOLIDATION TEST RESULTS
Figure no. 27
Boring no. 5
Surface elev.
Depth interval 9-10'
Moisture content 11.3 %
Dry unit wt. 120.7 lbs/ft³
LL 36.0 % PL 22.5 % PI 13.5 %
Project USS NORTH DIKE

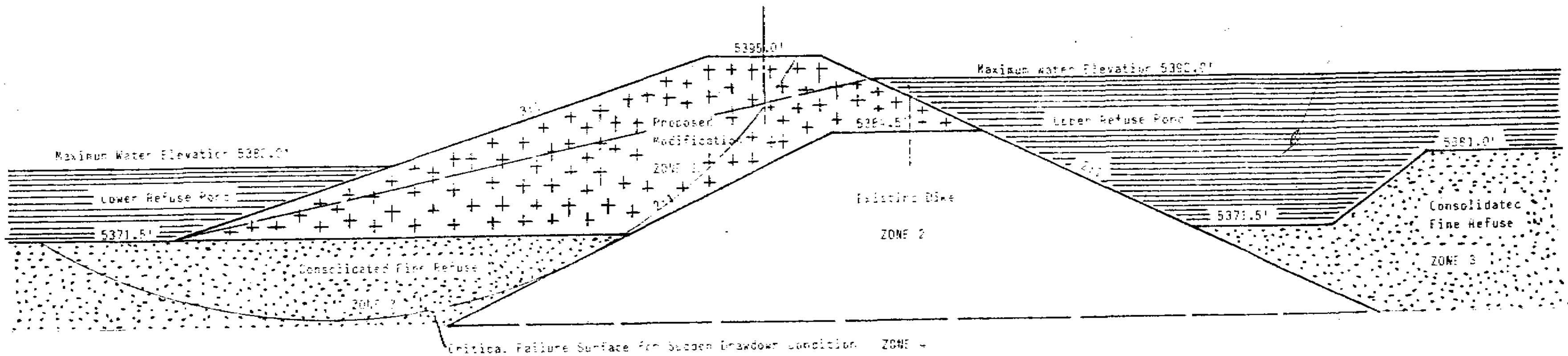


.65
.60
.55
.50
.45
.40
Void ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
CONSOLIDATION TEST RESULTS
Figure no. 28
Boring no. 5
Surface elev.
Depth interval 15-16'
Moisture content 18.8 %
Dry unit wt. 102.9 lbs/ft³
LL 24.5 %
PL 15.4 %
PI 9.1 %
Project USS NORTH DIKE


CONSOLIDATION TEST RESULTS
Figure no. 29
Boring no. 5
Surface elev.
Depth interval 20-21'
Moisture content 21.6 %
Dry unit wt. 106.0 lbs/ft³
LL 37.2 % PL 17.8 % PI 19.4 %
Project USS NORTH DIKE
Void ratio (e)
.60
.55
.50
.45
.40
.35
.30
0.01
0.1
1.0
10
Pressure (tons/ft²)


.60
.55
.50
.45
.40
.35
Void ratio (e)
0.01
0.1
1.0
10
Pressure (tons/ft²)
CONSOLIDATION TEST RESULTS
Figure no. 30
Boring no. 5
Surface elev.
Depth interval 25-26'
Moisture content 20.8 %
Dry unit wt. 107.8 lbs/ft³
LL 36.2 %
PL 16.8 %
PI 19.4 %
Project USS NORTH DIKE

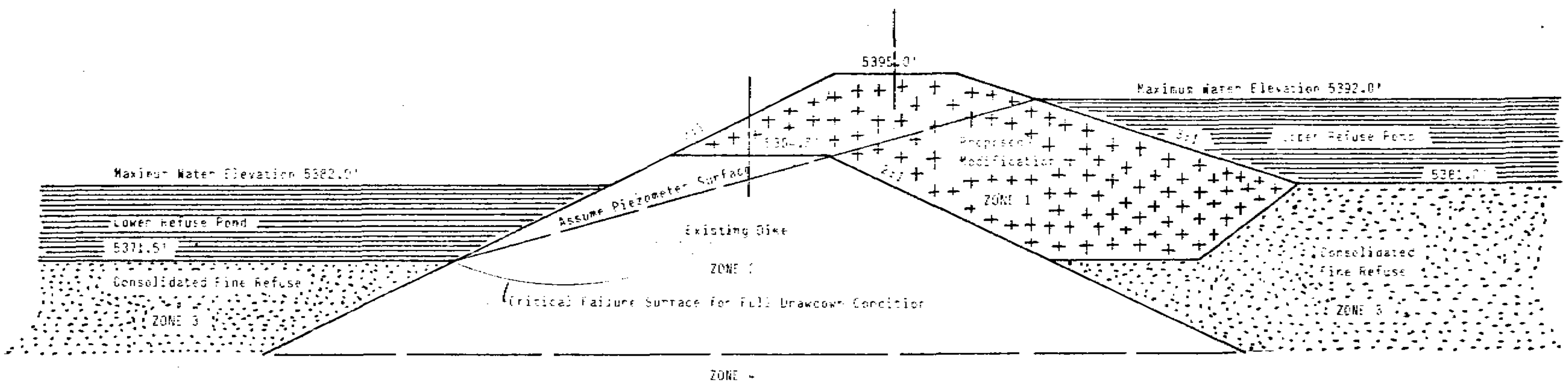
Zone	Material Type	Shear Strength Parameter		Factor of Safety	
		Cohesion PSF	Friction Angle	Case 1	Case 2
1	Coarse Coal Refuse	100	33	1.46	2.6
2	Coarse Coal Refuse	100	33		
3	Fine Coal Refuse	150	31		
4	Silty Clay	200	25		



UPPER REFUSE DIKE
ALTERNATIVE A

ROLLINS, BROWN AND GUNNELL, INC. PROFESSIONAL ENGINEERS	EXISTING CROSS SECTION AND PROPOSED MODIFICATIONS TO THE UPPER REFUSE DIKE ALTERNATIVE A U.S. STEEL MINING COMPANY, INC.	FIGURE NO. 32

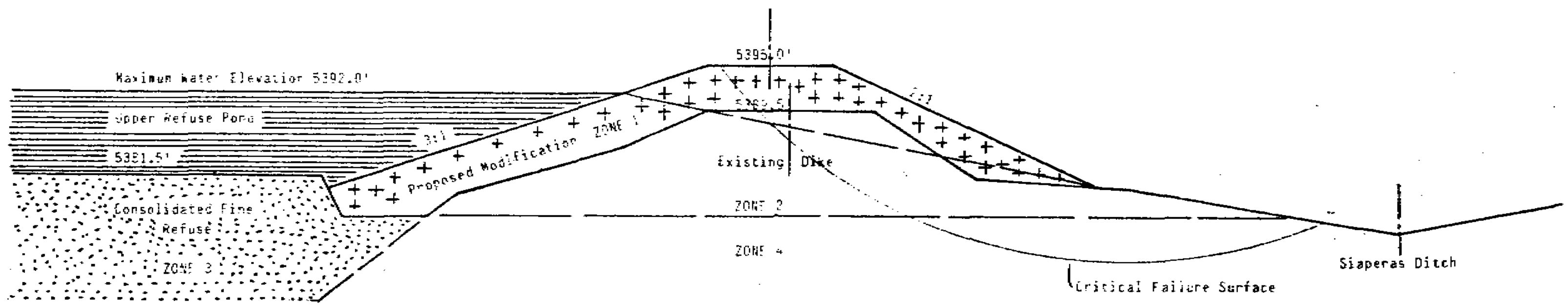
Zone	Material Type	Shear Strength Parameter		Factor of Safety	
		Cohesion PSF	Friction Angle	Case 1	Case 2
1	Coarse Coal Refuse	100	33	1.35	2.4
2	Coarse Coal Refuse	100	33		
3	Fine Coal Refuse	150	31		
4	Silty Clay	200	28		



UPPER REFUSE DIKE
ALTERNATIVE B

ROLLINS, BROWN AND GUNNELL, INC. PROFESSIONAL ENGINEERS	EXISTING CROSS SECTION AND PROPOSED MODIFICATIONS TO THE UPPER REFUSE DIKE ALTERNATIVE B U.S. STEEL MINING COMPANY, INC.	FIGURE NO. 33

Zone	Material Type	Shear Strength Parameters		Factor of Safety
		Cohesion PSF	Friction Angle	
1	Coarse Coal Refuse	100	33	1.9
2	Silty Clay	250	28	
3	Fine Coal Refuse	150	31	
4	Silty Clay	200	28	



NORTH DIKE

ROLLINS, BROWN AND GUNNELL, INC.
PROFESSIONAL ENGINEERS

EXISTING CROSS SECTION AND PROPOSED MODIFICATIONS
TO THE NORTH DIKE
U.S. STEEL MINING COMPANY, INC.

FIGURE NO. 34

TABLE NO. 1 SUMMARY OF TEST DATA

PROJECT U.S. Steel Upper Dike FEATURE ______ LOCATION near Wellington, Utah

HOLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE UNIT WEIGHT LB/FT3	IN-PLACE MOISTURE PERCENT	IN-PLACE VOID RATIO	UNCONFINED COMPRESSIVE STRENGTH LB/FT2	FRICTION ANGLE Φ	CONSISTENCY LIMITS L.L. %	CONSISTENCY LIMITS P.L. %	CONSISTENCY LIMITS P.I. %	MECHANICAL ANALYSIS % GRAVEL	MECHANICAL ANALYSIS % SAND	MECHANICAL ANALYSIS % SILT & CLAY	UNIFIED SOIL CLASSIFICATION SYSTEM
1	0-10'	8									28.2	48.9	22.9	SM
	5-6½'	30									31.2	47.3	21.5	SM
	9-10½'	30									36.0	46.5	17.5	SM
	15-16½'	11									15.9	59.2	24.9	SM
	20-21½'	7						NONPLASTIC			0.0	29.3	70.7	ML
	25-26½'	7						19.3	14.9	4.4				CL-ML
	30-31½'	7									17.2	29.9	52.9	ML
BULK SAMPLES														
1	coarse coal refuse										23.5	61.9	14.6	SM
2	coarse coal refuse										27.1	59.8	13.1	SM
3	coarse coal refuse										17.5	66.5	16.0	SM
4	coarse coal refuse										24.9	59.1	16.0	SM
1	fine coal refuse										0	47.1	52.9	ML
2	fine coal refuse										0	51.9	48.1	SM

TABLE NO. 2 SUMMARY OF TEST DATA

PROJECT USS NORTH DIKE FEATURE ______ LOCATION Wellington, Utah

HOLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-PLACE			UNCONFINED COMPRESSIVE STRENGTH LB/FT^2	FRICTION ANGLE ϕ	CONSISTENCY LIMITS			MECHANICAL ANALYSIS			UNIFIED SOIL CLASSIFICATION SYSTEM
			UNIT WEIGHT LB/FT^3	MOISTURE PERCENT	VOID RATIO			L.L. %	P.L. %	P.I. %	% GRAVEL	% SAND	% SILT & CLAY	
1	12-13	Shelby	105.4	19.6	.6021			29.4	17.5	11.9				CL-1
	15-16	Shelby	87.9	30.4	.9191			27.9	27.3	0.6				ML
	20-21	Shelby	103.9	22.2	.6237			21.7	18.3	3.4				ML
	25-26	Shelby	104.9	22.3	.6082			26.0	16.8	9.2				CL-1
3	3-4.5	65/6"						25.2	16.4	8.8				CL-1
	5-6.5	19						31.5	20.2	11.3				CL-1
	10-11.5	15						32.5	23.1	9.4				CL-1
	13-14.5	14						39.9	24.0	15.9				CL-2
	16-17.5	11						26.1	17.5	9.0				CL-1
	21-22.5	15						17.6	14.9	2.7				ML
	25-26.5	22									20.9	48.3	30.8	SM
5	9-10	Shelby	120.7	11.3	.3983			36.0	22.5	13.5				CL-1
	15-16	Shelby	102.9	18.8	.6392			24.5	15.4	9.1				CL-1
	20-21	Shelby	106.0	21.6	.5917			37.2	17.8	19.4				CL-2
	25-26	Shelby	107.8	20.8	.5669			36.2	16.8	19.4				CL-2

Refuse Disposal Area - East of the Price River

The Wellington Coal Cleaning Plant pumps coal processing waste through slurry pipelines to a refuse disposal area east of the Price River. This waste consists of crushed rock, coal fines, and water. The coarse refuse (rock) drops out of suspension almost immediately when discharged from the slurry pipelines and forms a refuse pile on the west side of the Upper Refuse Pond. The coal fines and fine rock particles continue in suspension into the refuse ponds. The water is clarified by successive settlings in the Upper and Lower Refuse Ponds. Clarified water is then stored in the Clear Water Pond for re-use in the coal cleaning plant.

Refuse Ponds

The continued operation of the Wellington Coal Cleaning Plant will require periodic modifications to the refuse ponds in order to maintain adequate settling capacity and operating freeboard. The operator proposes to make the necessary modifications in phases as they are required to support the plant operation.

Phase 1

The operator has submitted Technical Revision No. 1 which includes complete plans for the modifications as follows:

1. Increase the height of the Lower Refuse Dike approximately 10.5 feet to a crest elevation of 5385.

2. Modify the discharge structures in the Upper and Lower Refuse Dikes.

3. Construct a permanent diversion northeast of the Upper Refuse Pond. This structure will divert runoff from undisturbed areas around the refuse ponds.

Map E9-3426 shows a plan view of these modifications. Refer to Technical Revision No. 1 for complete details of these proposed modifications.

Phase 2

It is anticipated that in 1984 or 1985, it will be necessary to raise the working level of the Upper Refuse Pond. The plans to raise the Upper Refuse Pond operating level include the following:

1. Increase the height of the Upper Refuse Dike approximately 10.5 feet to a crest elevation of 5395.

2. Increase the height of the North Dike to a crest elevation of 5395. This also includes modifying both upstream and downstream slopes to be 3h:1v and 2h:1v respectively.

3. Construct an addition to the North Dike on the pond side of the permanent diversion. This addition will preclude fine coal refuse from entering the permanent diversion structure. Refer to Map E9-3436 for a plan view of the refuse disposal area upon completion of the modifications in Phase 2.

The Upper Refuse Pond is bounded by a refuse pile on the west, near vertical cliffs on the east, and dikes on the north and south. These effectively limit the surface effects of raising the Upper Refuse Pond working level. Map E9-3436 shows a plan view of the modifications proposed in Phase 2.

Phase 3

It is currently estimated that it will be necessary to raise the dikes around the Upper Refuse Pond an additional 10 feet in 20 to 25 years. This modification will bring the dike crests to an elevation of 5405 feet. This modification should provide slurry handling capacity for the remainder of the plant life. No new surface areas will be affected by the Phase 3 modifications. Refer to Map E9-3437.

Construction

The operator will furnish the Division with final construction plans at least two months prior to the anticipated start of construction. It is the operator's intention to use coarse refuse as a construction material for all of the modifications to the dikes.

Stability

U. S. Steel Mining Co., Inc. contracted with Rollins, Brown, and Gunnell, Inc. to perform a stability analysis of various proposed pond modifications. A complete copy of their report is included in Technical Revision No. 1. This report shows that the pond modifications proposed in Phases 1 and 2 above have an adequate stability safety factor.

A study determining the impacts of the required design storm on the refuse modifications will be furnished to the Division with the final construction plans.

Refuse Pile - West of the Price River

Oversize rock is hauled to a refuse pile near the coal cleaning plant main building, refer to Map E9-3341. The rock is then placed and compacted with a bulldozer. It will eventually be necessary to enlarge the refuse pile to the west. Prior to expanding the pile the following actions will be taken:

1. The diversion ditch will be extended to divert undisturbed runoff around the refuse pile. As a minimum the upstream capacity of the ditch will be maintained. Final construction plans will be submitted to the Division approximately 60 days prior to construction.

2. Topsoil will be removed from the area to be covered with refuse in accord with the topsoil management plan.

The estimated final contours of the refuse pile are shown on Map E9-3342.

WELLINGTON COAL CLEANING PLANT

Refuse Sample Analysis

	Slurry Pond Fine Refuse	Slurry Pond Coarse Refuse	Refuse Pile Coarse Refuse
% Clay	<0.01	2.50	1.50
% Gravel	<0.01	<0.01	83.50
% Sand	5.20	8.40	2.50
% Silt	3.40	2.20	12.50
pH Initial Units	8.30	7.60	8.40
Acidity as CaCO3 ppm	<0.01	<0.01	<0.01
Alkalinity as CaCO3 ppm	156	136	142
Calcium as Ca ppm	1,190.00	2,670.00	76.00
Conductivity mmhos/cm	900.00	860	250.00
Magnesium as Mg ppm	595.0	675.00	18.20
% Saturation	31.40	30.66	20.40
Sodium Absorption Ratio	12.414	2.306	33.973
Sodium as Na, ppm	2,100	515	1,270
Total Dissolved Solids mg/l	12.660	10,680	7,040
Arsenic as As Tot. ppm SM404C	.016	.007	.004
Boron as B ppm	.114	.099	.258
Iron as Fe (Tot) ppm	2,688.000	2,485.000	2,245.000
Iron as Fe Dissolved ppm	2.450	3.350	2.850
Molybdenum as Mo ppm	.019	.024	.017
Pyrite FeS2 %	2.40	2.10	2.20
Selenium as Se Tot ppm SM318C	.005	.003	.008
Sulfate, SO4 ppm SM427C	695	635	650
Total combustable Solids ppm	21.5	17.4	18.5

STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

1636 West North Temple • Suite 220 • Salt Lake City, UT 84116-3156 • 801-533-6071

April 16, 1986

Ms. Denise A. Dragoo
Fabian & Clendenin
215 South State Street, Twelfth Floor
Salt Lake City, Utah 84111-2309

Dear Ms. Dragoo:

Re: 91-254 (Appl. No. 30076) and
91-255 (Appl. No. 30080)

This letter is sent to correct our previous notice. The records have been endorsed to show ownership in the name of Kaiser Coal Corporation, not Kaiser Steel Corporation as indicated in the earlier letter.

Yours truly,

Marge Tempest

Marge Tempest
Title Section

cc: Price Office

STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

636 West North Temple • Suite 220 • Salt Lake City, UT 84116-3156 • 801-533-6071

April 2, 1986

Ms. Denise A. Dragoo
Fabian & Clendenin
215 South State Street, Twelfth Floor
Salt Lake City, Utah 84111-2309

Dear Ms. Dragoo:

Re: 91-254 (Appl. No. 30076) and
91-255 (Appl. No. 30080)

We have processed the recorded conveyance document concerning the above-numbered water filings. The records have been endorsed to show ownership in the name of Kaiser Steel Corporation.

Yours truly,

Marge Tempest

Marge Tempest
Title Section

cc: Price Office

MAR 07 1986

FABIAN & CLENDENIN WATER RIGHTS
SALT LAKE

A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW

TWELFTH FLOOR
215 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84111-2309

TELEPHONE
(801) 531-8900

March 5, 1986

Mr. Earl Staker
Deputy State Engineer
State of Utah
Department of Natural Resources
Division of Water Rights
1636 West North Temple
Salt Lake City, Utah 84116

Re: State Engineer Recordation of Water Rights Transfer - Water User Claim Nos. 91-254 and 91-255

Dear Earl:

Enclosed for filing of record in the Utah State Engineer's Office is a copy of a Deed of Water Rights conveying Water User Claim Nos. 91-254 and 91-255 from United States Steel Corporation to Kaiser Coal Corporation, effective December 30, 1985, executed February 12, 1986 and recorded on February 25, 1986, at Book 257, Pages 671-676, official records of the Carbon County Recorder, Price, Utah.

Please send written verification to me that this instrument has been received and recorded by the State Engineer's Office.

Very truly yours,

Denise A. Dragoo

Denise A. Dragoo

DAD:mf
Enclosure

cc: Jeffrey Collins, Esq.
Mark Page, Area Engineer

MAR 07 '86 STATE OF [illegible]) SS COUNTY OF [illegible]) FILED AND RECORDED FOR S. E. Utah Title

Entry No. 011295
Indexed ✓✓
Abstracted ✓
Recdg. Fee 8.00

WATER RIGHTS
SALT LAKE

FEB 25 11 19 AM '86

BOOK 257 RECORDS
PAGE 674-676

DEED OF WATER RIGHTS

(UTAH)

THIS DEED OF WATER RIGHTS (this "Deed") dated as of December 30, 1985, is from UNITED STATES STEEL CORPORATION, a Delaware corporation, 600 Grant Street, Pittsburgh, Pennsylvania 15230 ("U.S. Steel") to KAISER COAL CORPORATION, a Delaware corporation, 102 South Tejon, Suite 800, P.O. Box 2679, Colorado Springs, Colorado 80901-2679 ("Kaiser").

FOR AND IN CONSIDERATION of Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, U.S. Steel, as successor in interest by merger and consolidation to United States Steel Corporation, a New Jersey corporation, hereby grants, bargains, sells and conveys to Kaiser, without representations or warranty of title whatsoever, the water rights described on Schedule I attached hereto (the "Water Rights"); together with any and all water and water rights, ditch and ditch rights, reservoir and reservoir rights and wells and well rights appurtenant to or used upon the real property described in Special Warranty Deed of even date between the parties which rights are conveyed without any warranty of title, either express or implied.

TO HAVE AND TO HOLD the Water Rights unto Kaiser and its successors and assigns forever.

EXECUTED this 12th day of February, 1986, to be effective for all purposes as of the date fartst above written.

UNITED STATES STEEL CORPORATION

ATTEST:

[signature]
(Seal) Assistant Secretary

By [signature]

STATE OF Pennsylvania)
: ss.
CITY AND COUNTY Pittsburgh/ Allegheny)

On the 12th day of February, 1986, personally appeared before me G. Colombari, who, being by me duly sworn did say that he is the Sr. Vice President-Steel & Related Resources of UNITED STATES STEEL CORPORATION, and that said instrument was signed in behalf of said corporation by authority of its by-laws and said G. Colombari acknowledged to me that said corporation executed the same.

Notary Public
Residing at Pittsburgh, Pa.

My Commission Expires:

LOIS A. WITT, Notary Public
Pittsburgh, Allegheny County
Commonwealth of Pennsylvania
My Commission Expires October 18, 1986

SCHEDULE I

WATER RIGHTS

Statement of Water User's Claim No. 91-254. Certificate of Appropriation Application No. 30076, claiming priority date of July 19, 1958 for industrial use of 0.15 cfs from January 1 to December 31, for the Wellington Preparation Plant at the following point of diversion located in Carbon County, Utah:

Township 15 South, Range 11 East, SLM
South 28 degrees 23' East, 1321.8 feet
from the Northwest corner of Section 16;

Statement of Water User's Claim No. 91-255. Certificate of Appropriation Application No. 30080, claiming priority date of July 19, 1958 for industrial use of 0.21 cfs from January 1 to December 31, for the Wellington Preparation Plant at the following point of diversion located in Carbon County, Utah:

Township 15 South, Range 11 East, SLM
South 22 degrees 42' West, 1919 feet
from the Northeast corner of Section 16.

STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

1636 West North Temple • Suite 220 • Salt Lake City, UT 84116-3156 • 801-533-6071

February 5, 1987

Ms. Denise A. Dragoo
Fabian & Clendenin
P. O. Box 510210
Salt Lake City, Utah 84151

Dear Ms. Dragoo:

Re: Water Right Nos. 91-37 (Cert. 1030), 91-71 (Cert. 1580), 91-118 (Cert. 1532), 91-143 (Cert. 5510), 91-145 (Cert. 5684), 91-158 (Cert. 7792), 91-159 (Cert. 5670), 91-361 (Cert. a531), 91-364 (Cert. a184), 91-372 (Cert. a556), 91-3522, 91-3524, and 91-3761

I have processed the recorded deeds conveying title to 91-71, 91-118, 91-143, 91-145, 91-158, 91-159, 91-361, 91-3522, and 91-3524 from Royal Land Company to Kaiser Coal Corporation. All of these rights except 91-71 have been endorsed to show ownership in the name of Kaiser Coal Corporation. The certificate on 91-71 was forfeited by United States Steel Corporation, and thus the right was disallowed in the proposed determination of the Price River drainage.

I have attached copies of the assignment of lease from Royal Land Company to Kaiser Coal Corporation on 91-37, 91-364, 91-372, and 91-3761. However, these rights were previously deeded to Kaiser Coal Corporation from Denver and Rio Grande Western Railroad Company.

Yours truly,

Marge Tempest

Marge Tempest
Title Section

cc: Price Office

WHEN RECORDED, RETURN TO

Denise A. Dragoo, Esq.
FABIAN & CLENDENIN, P.C.
215 South State, 12th Floor
Salt Lake City, UT 84111

Entry No. 015557
Indexed ✓
Abstracted
Rcdg. Fee 6.00

STATE OF UTAH } SS
COUNTY OF CARBON
FILED AND RECORDED FOR
Fabian & Clendenin
JAN 14 9 53 AM '87
BOOK 269
PAGE 11-12

QUITCLAIM DEED OF UTAH WATER RIGHTS

For Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency whereof are acknowledged, ROYAL LAND COMPANY, a Delaware corporation, Grantor, hereby quit claims to KAISER COAL CORPORATION, a Delaware corporation whose address is 102 South Tejon, Suite 800, Colorado Springs, CO 80901, Grantee, all its right, title and interest to the following described water rights in Carbon County, Utah, as evidenced by Utah State Engineer's Certificates:

RECEIVED
JAN 28 1987
WATER RIGHTS
SALT LAKE

Application No.	Certificate No.	Water Users Claim No.
a-2682	a-531	91-361 ✓
15620	5510	91-143 ✓
15621	5684	91-145 ✓
19136	5670	91-159 ✓
8256	1580	91-71 disallowed
19041	7792	91-158 ✓
a-3442	a-532	91-118 ✓

Subject, however, to the inclusion of said water rights, claims and applications in that certain Joint Venture Agreement dated September 17, 1951 between Kaiser Coal Corporation and Geneva Steel Company, as amended and supplemented, relating to the ownership, operation, management and use of water and water rights in the East Carbon County area.

Dated this 23rd day of December, 1986.

ROYAL LAND COMPANY

By: [signature]
R. A. Bray
President

ATTEST:
[signature]
Secretary

STATE OF OHIO)
) SS
COUNTY OF CUYAHOGA)

On the 23rd day of December, 1986, personally appeared before me R.A. Bray who being by me duly sworn, did say that he is President of Royal Land Company and that the above Quitclaim Deed was signed in behalf of said Corporation and acknowledged to me that said Corporation executed the same.

Raymond L. Guzik

Notary Public

Residing at: Cleveland, Ohio

My Commission Expires:

RAYMOND L. GUZIK
Notary Public, State of Ohio
Recorded in Cuyahoga County
My Comm. Expires 08-06-90

STATE OF UTAH
NATURAL RESOURCES
Water Rights

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Robert L. Morgan, State Engineer

1636 West North Temple • Suite 220 • Salt Lake City, UT 84116-3156 • 801-533-6071

January 15, 1986

Ms. Denise A. Dragoo
Fabian & Clendenin
Attorneys at Law
215 South State Street, Twelfth Floor
Salt Lake City, Utah 84111-2309

Dear Ms. Dragoo:

Re: ✓91-215 (Appl. 27718),
✓91-216 (Appl. 27818),
✓91-371 (Change Appl. a-3851),
91-737 (Appl. 35177),
✓91-3759, ✓91-3882, and ✓91-3883

We have processed the recorded conveyance document concerning the above-numbered water filings. The records have been endorsed to show ownership of 91-215, 91-216, 91-371, 91-3759, 91-3882, and 91-3883 in the name of Kaiser Coal Corporation. A copy of the deed has been attached to 91-737 to show Kaiser's assumption of the water agreement with Price River Water Improvement District under this application.

Yours truly,

Marge Tempest

Marge Tempest
Title Section

cc: Price Office

PETER W. BILLINGS
ALBERT J. COLTON
RALPH H. MILLER
GEORGE D. MELLING, JR.
WARREN PATTEN
M. BYRON FISHER
STANFORD B. OWEN
WILLIAM H. ADAMS
ANTHONY L. RAMPTON
PETER W. BILLINGS, JR.
GORDON CAMPBELL
THOMAS CHRISTENSEN, JR
RAND M. ELISON
RANDALL A. MACKEY
DENISE A. DRAGOO
JAY B. BELL
DANIEL W. ANDERSON
TERRIE T. McINTOSH

FABIAN & CLENDENIN
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW

TWELFTH FLOOR
215 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84111-2309

TELEPHONE
(801) 531-8900

HAROLD P. FABIAN
1885-1975
BEVERLY S. CLENDENIN
1889-1971
SANFORD M. STODDARD
1909-1974

GARY E. JUBBER
W. CULLEN BATTLE
KEVIN N. ANDERSON
DOUGLAS L. FURTH
JATHAN JANOVE
JAMIS M. JOHNSON
ROSEMARY J. BELESS
MICHELE MITCHELL
JOHN E. S. ROBSON
DOUGLAS B. CANNON
ROBERT J. SKOUSEN

RECEIVED
JAN 15 1986
WATER RIGHTS
SALT LAKE

January 14, 1986

Earl Staker
Deputy State Engineer
Department of Natural Resources
Division of Water Rights
1636 West No. Temple
Salt Lake City, Utah 84116

Re: State Engineer Recordation of Water Rights Transfer - 91-215; 91-216; 91-371; 91-3882; 91-3883; 91-3759; 91-~~35177~~ 737

On December 30, 1985, Kaiser Coal Corporation purchased the Wellington Preparation Plant and certain water rights. Enclosed for filing of record in the State Engineers Office is a copy of the Deed of Water Rights from United States Steel Corporation to Kaiser Coal Corporation conveying the above-stated water rights, dated December 30, 1985 and recorded as Entry No. 01721, Book 256, Pages 176-179, offices of Carbon County Recorder in Price, Utah.

Please send written verification that this instrument has been received and recorded in the State Engineers files.

Very truly yours,

Denise

Denise A. Dragoo

DAD/etf

Enc.

cc: Jeffery Collins, Esq.
Mark Page, Area Engineer

Indexed
Abstracted
Redg. Fee 11.00

FILED AND RECORDED FOR
William B. Prince
HOLME, ROBERTS & OWEN
JAN 2 4 16 PM '86
BOOK 256 OF RECORDS
PAGE 176-179

Deed of Water Rights

(Utah)

THIS DEED OF WATER RIGHTS (this "Deed") dated as of December 30, 1985, is from UNITED STATES STEEL CORPORATION a Delaware corporation, 600 Grant Street, Pittsburgh, Pennsylvania 15230 ("U.S. Steel") to KAISER COAL CORPORATION, a Delaware corporation, 102 South Tejon, Suite 800, P.O. Box 2679, Colorado Springs, Colorado 80901-2679 ("Kaiser").

FOR AND IN CONSIDERATION of Ten Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, U.S. Steel as successor in interest by merger and consolidation to United States Steel Corporation, a New Jersey corporation ("U.S. Steel New Jersey") hereby grants, bargains, sells and conveys to Kaiser, without representations or warranty of title except as set forth herein, the water rights described on Schedule I attached hereto (the "Water Rights"); together with any and all water and water rights, ditch and ditch rights, reservoir and reservoir rights and wells and well rights appurtenant to or used upon the real property described in Special Warranty Deed of even date between the parties which rights are conveyed without any warranty of title, either express or implied.

TO HAVE AND TO HOLD the Water Rights unto Kaiser and its successors and assigns forever.

This Deed is given with limited warranty of title by U.S. Steel to Kaiser that the Water Rights described in Paragraphs A, B and C of Schedule I are certificated with the State of Utah and that U.S. Steel has not transferred or encumbered rights under the certificates. No other warranties, implied or expressed, are made or intended to be made by U.S. Steel herein.

Executed this 30th day of December, 1985, to be effective for all purposes as of the date first above written.

ATTEST: UNITED STATES STEEL CORPORATION

R. M. Horton
Assistant Secretary

By: F. P. Adams
F. P. Adams, Vice President - Accounting & Related Resources

STATE OF COLORADO)
) ss.
CITY AND COUNTY OF DENVER)

On the 30th day of December, 1985, personally appeared before me F. P. Adams, who, being by me duly sworn did say that he is the Vice President - Accounting & Related Resources of UNITED STATES STEEL CORPORATION, and that said instrument was signed in behalf of said corporation by authority of its by-laws and said F. P. Adams acknowledged to me that said corporation executed the same.

(SEAL)

My Commission Expires:

Nov 14 1986

Carol A. Phillips

Notary Public

Residing at:

1700 Broadway
Denver, Colorado 80290

177

SCHEDULE I(C)

(Attached to and made a part of the DEED OF WATER RIGHTS from UNITED STATES STEEL COMPANY and U.S. STEEL MINING to KAISER COAL COMPANY dated December 30, 1985)

WATER RIGHTS

PART 1. UTAH - PREPARATION PLANT

A. Milner Diversion. Certificate of Appropriation of Water, State of Utah, No. 9042, Application No. 27718, a-4661, a-6519 (Water User's Claim No. 91-215), dated February 25, 1972, recorded in Book 130 at page 519 in the office of the Carbon County Recorder, Price, Utah, in the name of United States Steel Corporation, appropriating ten (10.0) c.f.s. of water from the Price River and underground sources for industrial and irrigation uses, from the following points of diversion:

Township 15 South, Range 11 East, SLM

No. 1: North 5 degrees 31' West, 2272 feet from Southeast corner of Section 16; No. 2: South 22 degrees 50' West, 2089 feet from Northeast corner of Section 16; No. 3: North 1410 feet and West, 535 feet from South quarter corner of Section 8; and No. 4: South 22 degrees 31' West, 1880 feet from Northeast corner of Section 16;

B. Pumphouse Diversion. Certificate of Appropriation of Water, State of Utah, No. 9043, Application No. 27818, a-4662, a-6518 (Water User's Claim No. 91-216), dated February 25, 1972, recorded in Book 130 at page 520 in the office of the Carbon County Recorder, Price, Utah, in the name of United States Steel Corporation, appropriating five (5.0) c.f.s. of water from the Price River and underground well sources for irrigation and industrial uses, and from the following points of diversion:

Township 15 South, Range 11 East, SLM

No. 1: North 5 degrees 31' West, 2272 feet from Southeast corner of Section 16; No. 2: South 22 degrees 50' West, 2089 feet from Northeast corner of Section 16; No. 3: North 1410 feet and West, 535 feet from South quarter corner of Section 8; and No. 4: South 22 degrees 31' West, 1880 feet from Northeast corner of Section 16;

C. Farnham Diversion. Certificate of Permanent Change of Point of Diversion, Place, Purpose or Period of Use of Water, State of Utah, No. a-713, Change Application No. a-3851, a-4244, a-6520 (Water User's Claim No. 91-371), dated February 25, 1972, recorded in Book 130 at page 518 in the office of the Carbon County Recorder, Price, Utah, in the name of United States Steel Corporation, changing rights to 5.197 c.f.s. of water (limited to 1247 acre feet per year) for irrigation and industrial uses, from the following points of diversion:

Township 15 South, Range 11 East, SLM

No. 1: North 5 degrees 31' West, 2272 feet from Southeast corner of Section 16; No. 2: South 22 degrees 50' West, 2089 feet from Northeast corner of Section 16; No. 3: North 1410 feet and West, 535 feet from South quarter corner of Section 8; and No. 4: South 22 degrees 31' West, 1880 feet from Northeast corner of Section 16;

D. Stockwatering Claims.

1. Water User's Claim No. 91-3882 by United States Steel Corporation to a diligence stockwatering use for 150 cattle from the Price River, from the following point of diversion:

Township 15 South, Range 11 East, SLM

Section 16: Point where stream SE¼NW¼ of Section 16 to point where stream leaves NE¼SE¼ of Section 16.

2. Water User's Claim No. 91-3883 by United States Steel Corporation to a diligence stockwatering use for 150 cattle from the Price River, from the following point of diversion:

Township 15 South, Range 11 East, SLM

Section 8: Point where stream enters NE¼SW¼ of Section 8 to point where stream leaves NE¼SW¼ of Section 8.

3. Water User's Claim No. 91-3759 by United States Steel Corporation to a diligence stockwatering use for 150 cattle from the Price River, from the following point of diversion:

Township 15 South, Range 11 East, SLM

Section 9: Point where stream enters SW¼NW¼ of Section 9 to point where stream leaves SE¼SW¼ of Section 9.

E. Water Agreement. Rights to a maximum of ten (10.0) second feet of water under Application No. 35177 (91-737) for irrigation and industrial uses pursuant to an Agreement dated December 17, 1974, between Price River Water Improvement District and United States Steel Corporation.

RECEIVED
AUG 5 1985
WATER RIGHTS
SALT LAKE

SOUTH EASTERN UTAH TITLE COMPANY
ORDER NO. 20,260-C

Entry No. 007881
Indexed ✓
Abstracted ✓
Recdg. Fee 276.00

STATE OF UTAH } SS
COUNTY OF CARBON
FILED AND RECORDED FOR
LEGAL
MAR 1985 S.E.Utah Title Co
MAY 3 3 47 PM '85
BOOK 248 OF Records
PAGE 589-619
ANN O'BRIEN
COUNTY RECORDER

DEED AND ASSIGNMENT

This Deed and Assignment made and entered into as of the 28th day of March, 1985, by and between Kaiser Steel Corporation, a Delaware corporation ("Kaiser"), as party of the first part, and Kaiser Coal Corporation, a Delaware corporation, having its principal place of business at 102 South Tejon Street, Suite 800, Colorado Springs, CO 80903 ("Grantee"), as party of the second part.

WITNESSETH: THAT

WHEREAS, Kaiser is the owner of various interests in real property located in Carbon, Emery and Sanpete Counties, Utah, that portion located in Carbon and Emery Counties is described in the attached Exhibit "A"; and

WHEREAS, Kaiser, as lessee, is the owner of various coal leasehold estates granted by the federal government, the State of Utah and Carbon County, Utah covering lands in Carbon and Emery Counties, Utah, more particularly described in the attached "Exhibit B"; and

WHEREAS, Kaiser desires to transfer, convey and assign to the Grantee all of its real property interests and coal leasehold estates (collectively, the "Properties") which Kaiser owns within the State of Utah, including without limitation, that portion of the Properties described in Exhibits "A" and "B", subject, however, to the indebtedness and obligations associated with the Properties; and

WHEREAS, Kaiser has inspected all of the Properties and has reviewed in detail the current state of reclamation at the Sunnyside coal mine, which is currently operating, and at the Geneva and Columbia mines, both of which are closed mines, all of said mines are located within the confines of the Properties described on Exhibits "A" and "B"; and

WHEREAS, Grantee has reviewed the indebtedness and obligations associated with the Properties and desires to purchase the Properties on an "as is", "where is" basis, in accordance with the terms and provisions herein contained.

NOW, THEREFORE, for and in consideration of the sum of Ten Dollars ($10.00) and other good and valuable consideration paid to Kaiser, the receipt, adequacy and sufficiency of which is acknowledged, Kaiser does grant, sell, assign, set-over, transfer, quit-claim and convey to Grantee, its successors and assigns, to the full extent of the rights of Kaiser therein, the following:

REAL PROPERTY

The entire fee simple estate and all other rights, titles, claims and interests of Kaiser in the lands described in Exhibit "A", together with all appurtenances thereunto belonging, all easements, rights-of-way, licenses, reservations, royalties, coal and mineral rights, water rights and pipelines, mining rights and estates of Kaiser therein, to the full extent of the ownership of Kaiser therein, subject, however, to all existing liens, encumbrances, easements, rights-of-way, licenses, grazing and agricultural leases, royalties and all other adverse interests whatsoever, whether recorded or not, as of even date herewith, except as otherwise provided herein.

COAL LEASEHOLD ESTATES

The entire leasehold estate of Kaiser and all other rights, titles, claims and interests of Kaiser in the leases described in Exhibit "B", together with all appurtenances thereunto belonging, to the full extent of the ownership of Kaiser therein, subject, however, to all existing liens, encumbrances, easements, rights-of-way, licenses, royalties, overriding royalties and all other adverse interests whatsoever, whether recorded or not, as of even date herewith, except as otherwise provided herein.

Kaiser makes no warranties or representations, either expressed or implied, as to the title to the Properties herein transferred and assigned.

The Properties transferred unto the Grantee pursuant to this Deed and Assignment are being transferred on an "as is", "where is" condition and, other than as expressly provided herein, are being transferred without any representations, obligations or warranties whatsoever, whether express or implied, including without limitation any warranty, obligation or liability of Kaiser with respect to fitness, merchantability or consequential damages, whether or not occasioned by the fault or negligence of Kaiser.

Kaiser has furnished Grantee with a schedule of indebtedness (the "Schedule") relating to the Properties dated of even date herewith to which reference is hereby made for the purpose of incorporating herein said Schedule, and Grantee assumes and agrees to discharge all such liabilities and obligations as set forth in said Schedule and, in addition, Grantee assumes and agrees to discharge all obligations imposed upon the lessee by the coal leases, and each of them, described in Exhibit "B".

Grantee recognizes that certain rehabilitation and reclamation work must be undertaken in connection with the coal mines located upon the Properties, including without limitation, the ones at Sunnyside and Geneva, and Grantee assumes and agrees to discharge all obligations imposed by the United States, the State of Utah, or any political subdivision thereof, in effect or hereafter enacted regulating or relating to the rehabilitation or reclamation of the Properties, or any portion thereof.

The Grantee acknowledges that the coal leases from the federal government, the State of Utah and Carbon County, Utah described in Exhibit "B" are assigned subject to the right of the respective lessor to approve such assignment and the transfer of such lease from Kaiser to Grantee is only to the extent same may be assigned without the consent of the appropriate governmental entity. At such time as the required consent is duly given, the assignment of the appropriate leases will automatically become effective.

The Grantee further acknowledges that the coal leases denoted in Exhibit "B" as the "B" Canyon leases are assigned subject to the right of Royal Land Company to approve such assignment, and the transfer of such "B" Canyon leases from Kaiser to Grantee is only to the extent same may be assigned without the consent of said Royal Land Company. At such time as the required consent is duly given, the assignment of the appropriate leases will automatically become effective.

IN TESTIMONY WHEREOF, witness the execution hereof as of the day and year first above written, pursuant to corporate resolutions duly adopted by each of the respective corporate parties.

ATTEST:

____

KAISER STEEL CORPORATION

By: [signature]

Its: Asst. Sec.

KAISER STEEL CORPORATION INCORPORATED JULY 26, 1923 DELAWARE

ATTEST:

____

KAISER COAL CORPORATION

By: [signature]

Its: VP, Finance

KAISER COAL CORPORATION CORPORATE SEAL DELAWARE

STATE OF New York)
) ss.
COUNTY OF New York)

On the 29th day of March, 1985, personally appeared before me George E. Stigger III, who being by me duly sworn did say that he is the Asst. Secretary of KAISER STEEL CORPORATION, and that said instrument was signed in behalf of said corporation by authority of its by-laws and said George E. Stigger III acknowledged to me that said corporation executed the same.

My Commission Expires:

(Seal)

[signature]
Notary Public

SONIA B. CROSSDALE
Notary Public, State of New York
No. 24-4626294
Qualified in Kings County
Certificate Filed in New York County
Commission Expires March 30, 1986

LEGAL10:2
MAR 1985

STATE OF New York)
) ss.
COUNTY OF New York)

On the 29th day of March, 1985, personally appeared before me W. Wesley Emerson, who being by me duly sworn did say that he is the Vice President, Finance of KAISER COAL CORPORATION, and that said instrument was signed in behalf of said corporation by authority of its by-laws and said W. Wesley Emerson acknowledged to me that said corporation executed the same.

My Commission Expires:

(Seal)

Sonia B. Crossdale
Notary Public

SONIA B. CROSSDALE
Notary Public, State of New York
No. 24-4636294
Qualified in Kings County
Certificate Filed in New York County
Commission Expires March 30, 1986

Exhibit A
Real Property
Part II: Water Rights & Pipelines

Attached hereto and made a part thereof of the Deed and Assignment dated as of March 28, 1985, by and between Kaiser Steel Corporation "Kaiser" and Kaiser Coal Corporation "Grantee".

1. Fee Simple Water Rights

The following described water rights in Carbon and Emery Counties, State of Utah, identified by the following Water Users Claim Numbers (W.U.C.N.) on file in the office of the Utah State Engineer:

91- 11, 28, 33, 55, 81, 84, 89, 98, 100, 114, 125, 138, 144, 146, 178, 192, 231, 241, 298, 299, 362, 367, 368, 369, 399, 808, 809, 810, 1635, 1640, 2655, 3006, 3169, 3458, 3459, 3464, 3465, 3519, 3520, 3521, 3523, 3526, 3530, 3532, 3533, 3914, and 4270.

2. Water Pipeline

An eight inch (8") water pipeline and easement therefor extending from East Carbon, Utah, to the Geneva Mine, together with all equipment, structures and improvements appurtenant or used in connection therewith. Assigned to Kaiser Steel Corporation, a Delaware corporation, by Lease and Water Pipeline Assignment dated December 11, 1984, recorded in Emery County, Utah, in Book 150, at pages 521-531, and recorded in Carbon County, Utah, in Book 245 of Records, at pages 97-107 from United States Steel Corporation and United States Steel Mining Company, Inc., as follows:

3. Water rights conveyed to Kaiser Steel Corporation, a Delaware corporation, by Deed of Utah Water Rights dated December 11, 1984, recorded in Emery County, Utah, in Book 150, at pages 503-511, and recorded in Book 245 of Records, at pages 108-116, from United States Steel Corporation and United States Steel Mining Company, Inc., as follows:

A. Certificate of Appropriation of Water No. 4592, Application No. 20888, Water User's Claim 91-183, dated August 30, 1952, recorded in Book C of Water Rights at page 259 in the office of the Emery County Recorder, United States Steel Company, appropriator, appropriating eighty-one thousandths second feet from Horse Canyon Creek, Emery County, Utah, for the period from January 1 to December 31, inclusive, for mining purposes, for diversions and use as further described in the Certificate.

B. Certificate of Appropriation of Water No. 4154, Application No. 17147, Water User's Claim 91-150, dated November 20, 1950, recorded in Book C of Water Rights at pages 245-246 in the office of the Emery County Recorder, Geneva Steel Company, appropriator, appropriating ten hundredths second feet of underground water in Emery County, Utah, for the period from January 1 to December 31, inclusive, for mining purposes, for diversion and use as further described in the Certificate.

C. Certificate of Appropriation of Water No. 4152, Application No. 17145, Water User's Claim 91-148, dated November 20, 1950, recorded in Book C of Water Rights at pages 241-242 in the office of the Emery County Recorder, Geneva Steel Company, appropriator, appropriating thirty hundredths second feet of underground water in Emery County, Utah, for the period from January 1 to December 31, inclusive, for mining purposes, for diversion and use as further described in the Certificate.

D. Certificate of Appropriation of Water No. 4153, Application No. 17146, Water User's Claim 91-149, dated November 20, 1950, recorded in Book C of Water Rights at pages 241-242 in the office of the Emery County Recorder, Geneva Steel Company, appropriator, appropriating ten hundredths second feet of underground water in Emery County, Utah, for the period from January 1 to December 31, inclusive, for mining purposes, for diversion and use as further described in the Certificate.

HEADQUARTERS OFFICE

U.S. Steel Mining Co., Inc.
a Subsidiary of United States Steel Corporation

600 GRANT STREET
PITTSBURGH, PENNSYLVANIA 15230
CABLE: USSMINING
TELEX NO 866425

February 14, 1986

Mr. Brent C. Bradford
Executive Secretary
Air Conservation Committee
P. O. Box 4550
3266 State Office Building
Salt Lake City, Utah 84145-0500

Re: Air Emission Inventory
Wellington Coal Cleaning Plant

Dear Mr. Bradford:

I am enclosing the 1985 air emission inventory that you requested.

Please note that on December 30, 1985, the Wellington Coal Cleaning Plant was sold to:

Kaiser Coal Corporation
102 South Tejon
Suite 800
Colorado Springs, Colorado 80903

Please address any future correspondence to Kaiser Coal Company.

Sincerely,

Larry King

L. King
Sr. Environmental Engineer

Enclosure

cc: √Martin Holmes (Kaiser Coal Co.)

U. S. Department of Labor

Mine Safety and Health Administration
P O Box 25367
Denver, Colorado 80225

Coal Mine Safety & Health
District 9

October 1, 1986

Douglas C. Pearce
Mine Engineer
Kaiser Coal Corporation of Sunnyside
P.O. Box 10
Sunnyside, UT 84539

Re: Wellington Coal Cleaning Plant
ID No. 42-00099
Wellington Pond Refuse Pile,
ID No. 1211-UT-09-00011
New Identification Number
Wellington Lower Refuse Dike Impoundment
Impoundment Design Investigation

Dear Mr. Pearce:

Kaiser Coal Corporation of Sunnyside's two letters of September 18, 1986, concerning the decant pipe system and request for an identification number change, have been reviewed by MSHA personnel.

The proposed work to excavate and examine the stability of the decant pipe system of the Wellington Lower Refuse Dike Impoundment is approved. The requested Identification Number 1211-UT-09-00099-05 for the Wellington Pond Refuse Pile is granted.

Notify MSHA should any unusual conditions arise during the work process and upon completion of the rehabilitation of the Wellington Lower Refuse Dike Impoundment.

If you have any questions, contact Lee Smith at 303/236-2743.

Sincerely,

William G Holgate
for John W. Barton
District Manager

KAISER COAL

KAISER COAL CORPORATION
Sunnyside Coal Mines
P.O. Box 10
Sunnyside, Utah 84539
Telephone (801) 888-4421

September 18, 1986

Mr. Mike Stanton
M. S. H. A.
P. O. Box 25367, DFC
Denver, Colorado 80225

Re: Wellington Coal Cleaning Plant
ID No. 42-00099
Wellington Pond Refuse Pile
ID No. 1211-UT-09-00011
Assignment of New ID

Dear Mr. Stanton:

In the letter dated June 6, 1986, from Mr. John Barton to Mr. Ron Hughes, new identification numbers were assigned to the impoundments and refuse piles at Wellington with the exception of the Pond Refuse Pile. To remain consistent with the new numbering system, we are requesting that this pond be assigned the ID No. 1211-UT-09-00099-05.

Sincerely,

KAISER COAL CORPORATION

Douglas C. Pearce
Mine Engineer

DCP:th

To: P.P.

U. S. Department of Labor

Mine Safety and Health Administration
P O Box 25367
Denver, Colorado 80225
Coal Mine Safety & Health
District 9

June 6, 1986

Mr. Ronald O. Hughes
Manager, Engineering
Kaiser Coal Corporation
P.O. Box D
Sunnyside, UT 84539

Re: Wellington Coal Cleaning Plant,
ID No. 42-00099
Clear Water Pond,
ID No. 1211-UT-09-00012
Lower Refuse Pond,
ID No. 1211-UT-09-00013
Upper Refuse Pond,
ID No. 1211-UT-09-00014
Plant Refuse Pile,
ID No. 1211-UT-09-00010
Annual Impoundment Report

Dear Mr. Hughes:

Kaiser Coal Corporation's letter dated May 23, 1986, containing the annual impoundment reports and acknowledgement of the adopted subject sites along with the plans that are required by 30 CFR 77.215-2 and 77.216 has been received in this office. The annual impoundment reports have been reviewed by MSHA personnel and will be placed in your mine file.

MSHA District 9 is instituting a new identification numbering system for mine waste and refuse facilities. This system will utilize a 15 digit alpha numeric number and will incorporate the last 5 digits of the coal mine or coal preparation facility identification number into the alpha numeric identification numbers assigned to sites belonging to that particular entity. All sites will be assigned double digit trail numbers in consecutive order ranging from 01 to 99. Accordingly, the identification numbers assigned to the Kaiser Coal Corporation sites are:

Plant Refuse Pile, ID No. 1211-UT-09-00099-01

Clear Water Pond, ID No. 1211-UT-09-00099-02

Lower Refuse Pond, ID No. 1211-UT-09-00099-03

Upper Refuse Pond, ID No. 1211-UT-09-00099-04

* * * * *

If this is not the desired sequential numbering system, notify this office as soon as possible, including all other sites belonging to ID No. 42-00099 and the preferred numbering order.

If you have any questions, contact Lee Smith at 303/236-2743.

Sincerely,

William A. Holgate
for John W. Barton
District Manager

KAISER COAL

KAISER COAL CORPORATION
Sunnyside Coal Mines
P.O. Box D
Sunnyside, Utah 84539
Telephone (801) 888-4421

May 23, 1986

RECEIVED
MAY 29 1986
DISTRICT 9
MSHA
DENVER, CO

Mr. John Barton
District Manager (9)
Mine Safety & Health Administration
P. O. Box 25367
Denver, Colorado 80225

Re: Wellington Coal Cleaning Plant
ID No. 42-00099
Impoundments No. 1211-UT-9-0012
1211-UT-9-0013
1211-UT-9-0014
Refuse Pile No. 1211-UT-9-0010

Dear Mr. Barton:

In response to your letter of April 11, 1986, Kaiser Coal Corporation elects to adopt the plans for the four subject structures as submitted by and approved for the U. S. Steel Mining Co., Inc.

Annual Impoundment Reports for the ponds are attached.

Sincerely,

Ronald O. Hughes
Manager, Engineering

ROH:th

cc: J. Kiser

Attachments

U. S. Department of Labor

Mine Safety and Health Administration
P O Box 25367
Denver, Colorado 80225
Coal Mine Safety and Health
District 9

Get Plan
from Kirkwood

April 11, 1986

Robert N. Wiley
Kaiser Coal Corporation
102 South Tejon, Suite 800
Colorado Springs, CO 80903

RE: Wellington Coal Preparation Plant
ID No. 42-00099
Legal Identity Reports

Dear Mr. Wiley:

Enclosed are the 4 legal identity report forms 2000-7, dated December 30, 1985 and signed March 21, 1986, indicating a change of ownership for the 3 impoundments and 1 refuse pile attached to the above referenced facility. These forms are being returned because the 2000-7 form is to be used only to report changes to a mine or facility, not refuse piles or impoundments associated with a mine or facility.

You must either adopt the plans that are required by 30 CFR 77.215-2 and 77.216 as submitted by the former operator or submit plans as required by these regulations. In either case you must notify this office of how you plan to comply with the above listed regulations.

If you have any further questions regarding impoundments, please contact Lee Smith at (303) 236-2743. If you have any questions regarding the 2000-7 form and its use, contact Leslie Lewis at the same number.

Sincerely,

Theodore L Caughman
for John W. Barton
District Manager

cc: Charles McGlothlin
Vice President & General Manager
Kaiser Coal Corporation of Sunnyside
P.O. Box 10
Sunnyside, UT 84539

UMC 782.21 <u>Newspaper Advertisement and Proof of Publication</u>

Notice is hereby given that the Wellington Coal Cleaning Plant, operated by the U. S. Steel Mining Co., Inc., Western District, P. O. Box 807, East Carbon, Utah 84520, has submitted an application for a permit to the Utah Division of Oil, Gas and Mining.

The permit application was submitted March 20, 1981 to conduct coal cleaning plant operations on United States Steel Corporation owned land near Wellington, Utah pursuant to UCA-40-10-1 et seq.

The permit area is located in T15S R11E as follows:

Section 8 SE1/4 NE1/4, SE1/4
Section 9 S1/2 N1/2, S1/2
Section 10 W1/2 SW1/4
Section 15 W1/2 NW1/4
Section 16 All
Section 17 NE1/4, E1/2 SE1/4

The permit area is located on the U. S. Geological Survey Wellington Quadrangle.

A copy of the permit application may be reviewed at the following location:

Carbon County Recorders Office
Carbon County Courthouse Building
Price, Utah 84501

Pertinent comments are solicited from anyone affected by this proposal. Such comments should be filed with:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

A copy of the determination of completeness public notice is included on page 782-22ii.

Notice of the request to transfer the Wellington permit from U. S. Steel Mining Co. to Kaiser Coal Corporation is included on page 782-22iii.

782.21 cont.

Correspondence approving the permit transfer for the Wellington Preparation Plant is concluded on page 782-22iv.

AFFIDAVIT OF PUBLICATION

STATE OF UTAH } ss.
County of Carbon, }

I, Dan Stockburger, on oath, say that I am the General Manager of The Sun-Advocate, a weekly newspaper of general circulation, published at Price, State and County aforesaid, and that a certain notice, a true copy of which is hereto attached, was published in the full issue of such newspaper for Four (4) consecutive issues, and that the first publication was on the 27th day of January 19 84 and that the last publication of such notice was in the issue of such newspaper dated the 17th day of February, 19 84

Dan Stockburger

Subscribed and sworn to before me this 17th day of February, 19 84.

Hally Jo Baker
Notary Public.

My Commission expires My Commission Expires October 22, 1988

Publication fee, $ 127.20

PUBLIC NOTICE

Notice is hereby given that U.S. Steel Mining Co., Inc. has filed a Mining and Reclamation Plan with the State of Utah, Department of Natural Resources, Division of Oil, Gas and Mining (Division) for the Wellington Coal Cleaning Plant. The Division has completed a review of the plan and determined it to be apparently complete.

1. The full name and business address of the applicant is:

U.S. Steel Mining Co., Inc.
Western District
P.O. Box 807
East Carbon, Utah 84520

2. The U.S. Steel Mining Co., Inc. permit area is located in Carbon County approximately one mile east of Wellington City. The permit area is south of the U.S. Highway 6 and is bisected by the Price River. The lands containing the permit area are contained in Township 15 South, Range 11 East (SLBM) and are more fully described as follows:

SE¼ NE¼ and SE¼ of Section 8
S½ N½ and S½ of Section 9
W½ NW¼ of Section 15
All of Section 16
E½ SE¼, NE¼ Section 17

All lands are owned in fee by United States Steel Corporation and are shown on the Wellington Quadrangle of the U.S. Geological Survey 7.5 minute map series.

3. Copies of the Mining and Reclamation Plan are available for public inspection at the following locations:

Recorders Office
Carbon County Courthouse
Price, Utah 84501

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

4. Comments on the Mining and Reclamation Plan may be submitted to:

State of Utah
Department of Natural Resources
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Published in the Sun Advocate January 27; February 3, 10 and 17, 1984.

782 - 22ii

Affidavit of Publication

STATE OF UTAH,
ss.
County of Salt Lake

Cheryl Gierloff

Being first duly sworn, deposes and says that he/she is legal advertising clerk of THE SALT LAKE TRIBUNE, a daily newspaper printed in the English language with general circulation in Utah, and published in Salt Lake City, Salt Lake County, in the State of Utah.

Notice is hereby given that Kaiser Coal Corporation, 102 South Tejon, Suite 800, Colorado Springs, Colorado 80903 has submitted an application to the State of Utah, Department of Natural Resources, Division of Oil, Gas & Mining for transfer of a permit to operate the Wellington Preparation Plant under the provisions of the Utah Coal Mining and Reclamation Act (Utah Code Ann. 40-10-1 et. seq.) and the Utah Coal Program Regulation UMC 788.18.
The Previous permittee of the Wellington Preparation Plant was the United States Steel Corporation, Permit No. ACT/007/012. The permit area is located in Carbon County, Utah as follows:

Township 15 South,
Range 11 East, SLB&M:
Sec. 8: SE¼NE¼ and SE¼
Sec. 9: S½N1/2 and S½
Sec. 15: W½NW¼
Sec. 17: E½NE¼ and NE¼

Pertinent comments are solicited from anyone affected by this proposal. Such comments should be filed within the next thirty (30) days with:
State of Utah
Dept. of Natural Resources
Division of Oil, Gas & Mining
355 West North Temple
III Triad, Suite 350
Salt Lake City, Utah 84108
A-83

That the legal notice of which a copy is attached hereto

Notice - Kaiser Coal Corporation

was published in said newspaper on

January 17, 1986

Cheryl Gierloff
Legal Advertising Clerk

Subscribed and sworn to before me this 22nd day of January A.D. 19 86

B. J. Davis
Notary Public

My Commission Expires

March 1, 1988

782 - 22iii

NOTARY PUBLIC
B. T. DAVIS
STATE OF UTAH

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

Norman H. Bangerter, Governor
Dee C. Hansen, Executive Director
Dianne R. Nielson, Ph.D., Division Director

355 W. North Temple • 3 Triad Center • Suite 350 • Salt Lake City, UT 84180-1203 • 801-538-5340

February 25, 1986

Mr. Charles S. McNeil, President
Kaiser Coal Corporation
102 South Tejon, Suite 800
Colorado Springs, Colcrado 80903

Dear Mr. McNeil:

Re: Approval for Permit Transfer, Wellington Preparation Plant, ACT/007/012, Folder No. 2 and 4, Carbon County, Utah

The Division has found that Kaiser Coal Corporation has met all requirements for a permit transfer as required under UMC 788.18. Therefore, in accordance with the attached Findings, the request for transfer of the permit for the Wellington Preparation Plant is hereby approved.

As you are aware, Kaiser Coal Corporation is now responsible for all prior commitments relating to this operation as made by U. S. Steel Corporation. Please contact me or Lowell Braxton if we can provide further assistance.

Best regards,

Dianne R. Nielson

Dianne R. Nielson
Director

SCL:jvb
cc: A. Klein
Denise Dragoo
Marty Holmes
L. Braxton
S. Linner
0026R-72

782 - 22iv

and some 1.5 miles from the permit area.

The groundwater in the alluvium, considered a utilized aquifer in the plant area, flows from the top of the foothills to the Price River. (see groundwater levels on map E9-3428.) The location of the refuse ponds impounded in a swale above the Price River may create points of high groundwater potential. The north diversion ditch between the refuse ponds and irrigation fields to the north, appears to be a point of low ground water potential. As such, the ditch would tend to separate ground water flow between the refuse ponds and irrigated fields.

Wells to the north of the plant are assumed to be up gradient. It is doubtful the plant operations would affect these wells.

The "Hydrologic Resources, Probable Hydrologic Consequences and Hydrologic Monitoring Associated with the Wellington Prep Plant" report is included in Appendix I.

UMC 783.18 Climatological Information

(a) See the following sheet for the average precipitation by month and total year for the Price-BLM weather station, which is the closest station to Wellington.

(b) See the following sheet for the average temperatures recorded by months at the Price-BLM weather station.

Temperature and precipitation data for 1986 is attached on page 783 - 29i.

KAISER COAL CORPORATION
WELLINGTON PREPARATION PLANT
ACT/007/012

1986 WEATHER DATA*

	Average Minimum Temperature	Average Maximum Temperature	Monthly Precipitation
January	22.6	46.8	0.15
February	28.9	49.6	1.85
March	34.2	60.9	0.69
April	35.7	61.8	1.19
May	42.2M	73.0	0.37
June	55.5	88.5	0.10
July	56.4	87.5	1.12
August	57.2	88.3	0.93
September	42.1	78.4M	1.99
October	31.4	66.2	1.42
November**			
December**			.
	Total Precipitation		

*   Data from Price Warehouses weather station
** Official NOAA information not yet published
M = 1-9 days data missing

UMC 783.19

A vegetation study is included in Appendix H. This study contains the following information which can be used to develop a revegetation plan:

* General Site Description
* Sampling Methods
* Sampling Results
* Revegetation Plan
* Tables
* Vegetation Maps.

that would improve the range were not feasible according to the Soil Conservation Service publication "Soil Survey Carbon-Emery Area, Utah". Based on the soils descriptions it is concluded that the productivity of the predisturbance areas was relatively low.

(b) The paragraph refers to mining.

(c) The land use classifications and land use of the permit area is industrial under local law. Land uses of adjacent areas include residential, mining, grazing, agricultural, and industrial.

A statement of predisturbance vegetation productivity is included in the Vegetation Study (Appendix H).

UMC 784.11 <u>Operation Plan</u>

The permit area is occupied by a coal cleaning plant, railroad tracks, material storage and refuse disposal areas.

(a) The coal cleaning plant has operated from 1958 to 1985. During December 1985 the plant ceased operations temporarily and has remained idle due to market conditions. The cleaning plant receives raw coal by rail from operating mines, dumps, processes and ships clean coal by rail. The plant has processed from 1.5 to 1.8 million tons of raw coal annually and shipped 1.2 to 1.5 million tons of clean coal. Some 300,000 tons of refuse is pumped or trucked to the refuse disposal areas.

(b) (1) The refuse disposal area contains three impounding structures and one embankment as follows:

<u>Upper Refuse Dike</u>

Appendix C describes the construction of this impounding structure. The purpose of this structure is to impound the flow of waste carrying water from the coal cleaning plant, permitting the initial settlement of the waste material carried by this water. The partially clarified water is decanted to the Lower Refuse Pond. Future plans include raising the height of this impoundment. Conversion plans are contained in Appendix E of this text.

<u>Lower Refuse Dike</u>

Appendix C describes the construction of this impounding structure. The purpose of this structure is to impound the decanted water from the Upper Refuse Pond, complete the clarification of the water and decant the clear water to the Clear Water Pond. Plans are contained in Appendix E for raising this impoundment. The as constructed drawing is also included in Appendix E.

<u>Clear Water Dike</u>

Appendix C describes the construction of this impounding structure. This structure impounds the decanted water from the Lower Refuse Pond and forms the reservoir for the clear water that passes to the coal cleaning plant for the processing of raw coal. This structure is not expected to be modified. Refer to Exhibit 4, page 784-14.

North Dike

Appendix C describes the construction of this embankment. The purpose of this structure is to divert water within the ponds toward the impounding structures, and divert water passing from the fields north of the ponds away from the ponds. Future plans include conversion to an impounding structure. Conversion plans are contained in Appendix E of this text.

For the operation and maintenance plan for these structures refer to 784.16 (a) (2) (iii).

For reclamation plans for the refuse area east of the Price River refer to 784.13, 14, 15, and 16.

(2) The future surface disturbances at the coal cleaning plant will generally be associated with the extension of the refuse piles onto adjacent areas. Overburden spoil piles from proposed pond excavations are described in the list of facilities referenced on Drawing No. E9-3341. Topsoil handling is discussed on in 784-13 (b) (4).

(3) The run-of-mine (raw) coal is dumped from rail cars in the dump station. The rail cars are moved either under a clean coal loading station and loaded with clean coal or placed in storage tracks for return to the mines. The cars loaded with clean coal are placed on the Denver and Rio Grande Western Railroad tracks for shipment. All coal cleaning plant tracks will be removed during reclamation. The rail bed will be graded to the configuration shown on Drawing No. E9-3342.

(4) See Map E9-3341 for the location of the coal processing waste disposal areas. Refer to Appendix E for long range operation and

784.11 cont.

expansion plans. For reclamation plans, refer to 784.13, 14, 15, and 16.

(5) The following structures and facilities are locatedon Drawing No. E9-3341:

U. Lower Refuse Dike

The lower refuse dike is the impounding structure that forms the lower refuse pond. For further discussion, refer to item (b)(1) in this section.

V. Clear Water Pond

The clear water pond provides storage for the clarified water that is used in coal processing. Refer to Exhibit 4, page 784-14.

W. Clear Water Dike

The clear water dike is the impounding structure for the clear water pond. Refer to Exhibit 4, page 784-14.

X. Coarse Refuse Pile

The coarse refuse pile is the disposal area for coarse reject from the coal cleaning process.

Y. Diversion Ditch

This diversion ditch was constructed to lower the water table in the fields north of the slurry ponds and to divert irrigation return water from those fields away from the slurry ponds. Refer to Appendix E for proposed modifications. This diversion ditch is a permanent structure.

Z. Sauerman Hoist and Tail Tower

The sauerman hoist and tail tower are used to remove coal fines from the refuse ponds. The sauerman hoist has been dismantled and removed from the site. Reclamation of the site was completed during the Fall of 1986. Appendix B contains additional information.

784.11 cont.

AA. Clear Water Pipeline

The clear water pipeline is a buried line that carries water from the clear water pond to the coal cleaning plant for processing raw coal.

BB. Material and Equipment Storage Area

The material and equipment storage area provides storage for equipment and various repair, maintenance, and construction materials (primarily steel) that are required to support the coal cleaning plant operation. Refer to Appendix G.

CC. Scrap Metal Storage Area

Two scrap metal storage areas, one for carbon steel and one for stainless steel, are holding area for the accumulation of recyclable scrap metals. Accumulated scrap metal is periodically loaded into rail cars for shipment to recycling plants. Refer to Appendix G.

DD. Wood Storage Area

The wood storage area ia a holding area for the wood which is removed from the coal product during the coal cleaning process. Refer to Appendix G.

EE. Non-Coal Waste Holding Area

Non-coal waste is accumulated in the designated holding area. This material is periodically hauled off the site for disposal in an approved sanitary landfill. Refer to Appendix G.

FF. Oil Drum Storage Area

The oil drum storage area is used for the accumulation of empty "returnable oil drums", other drums for the accumulation of waste oil, and empty drums for the future use as required by the plant operation. Refer to Appendix G.

784.11 cont.

GG. River Water Collection Well

The river water collection well pumps water from the well, fed by the Price River through the unconsolidated alluvials, into the sump in the pumphouse (H). Refer to Exhibit 4, page 784-14.

HH. Road Pond

The proposed road pond will provide storage capacity to receive plant discharge and runoff volumes. The holding capacity of the road pond will be combined with the auxiliary pond by a culvert.

II. Spoil Pile II

The proposed road pond is an incised pond. The soil which will be excavated will be stored in this location. (See Map C4 - 0071).

JJ. Heat Dryer Pond

The proposed heat dryer pond will be a catch basin for effluent waters from the heat drying process and excess runoff. Water will be pumped from the pond from a gravity-fed sump and returned to the plant water circuit.

KK. Spoil pile

The proposed heat dryer pond is a incised pond. The soil which will be excavated will be stored in this location.

LL. Natural Gas Pipeline

The natural gas pipeline will provide natural gas fuel for heating the coal cleaning plant, office, and railroad car thawers.

MM. Diversion Ditch

The diversion ditch diverts runoff from undisturbed areas away from the plant site.

NN. Topsoil Borrow Area

Areas from which topsoil will be obtained for use in final reclamation.

OO. Future Topsoil Storage Area

Area to be cleared of topsoil as coarse refuse pile is expanded. Topsoil may be stored in the Future Storage Area just west of the plant.

PP. Slurry Containment Basin

The catch basin collects flow from the area adjacent to the slurry pipe line on the east side of the Price River.

QQ. Pond Refuse Pile

This refuse pond is constructed by using the Sauerman Dragline to pull up the settled coarse slurry materials. Once in a pile, the coarse slurry material is compacted in 2 ft. lifts by a dozer. Slopes generally are less then 2H : 1V.

(6) Water Pollution Control Facilities

Refer to Appendix B and Section 784.14 of this text for a description of the protection of the hydrologic balance.

The maintenance and inspection plan for the slurry pipeline is as follows:

(A) The pipeline is inspected daily for substandard conditions. Observed substandard conditions are corrected immediately.

(B) The pipeline is rotated 1/4 turn at regular intervals to insure even wear and extend the life of the pipeline.

(C) The pipeline is replaced when wall thickness will not support the pumping load.

(D) The joints in the pipeline immediately above, east and west or the Price River are welded to preclude line breaks in this area.

The procedure for cleaning a plugged slurry line is as follows:

(A) If it is determined that plugging is occurring, the solid feed is reduced and water increased, which usually clears the line.

(B) If the line plugs, the pumping is switched to the standby line and only water is pumped through the line.

(C) In the event the line cannot be cleared by pumping water, the line is broken outside the river buffer zone for unplugging.

UMC 784.12 Operation Plan: Existing Structures

(a) (1) See Map E9-3341 for location of structures at the coal cleaning plant and the waste disposal areas.

(2) Plans for the buildings are available for review. The buildings described in 784.11 (b)(5) are maintained in excellent condition and there has been no indication of instability since construction in 1957-58. For pictures of structures, see pages 784-11 through 14.

The impounding structures are described in Appendix C. The structures are stable and meet the required factors of safety.

Plans for the Dryer Pond and Road Pond are included on Drawing E9-3453.

Plans for the East Side Slurry Containment Catch Basin are shown on Drawing E-3450.

The Pond Refuse Pile (Coarse Slurry Basin, MSHA ID No. 1211-UT-09-00099-05) was started in 1958. The pile configuration has changed as the lifetime volume has increased. Plans and cross-sections are available at the Sunnyside Mine Office.

(3) The structures were completed and placed in operation in 1958 with the coal dryer placed in operation in 1960.

The Upper Refuse Dike and the Lower Refuse Dike have been increased in height since initial construction. THe study by Rollins, Brown and Gunnell, Inc. (Appendix C) concluded that the structures are stable and that the safety factors are adequate and in accord with applicable regulations. There have been no modifications to these structures since the stability study. It is planned to increase the height of the North Dike, Upper Refuse Dike, and the Lower Refuse Dike. The plans for the proposed modifications to the Lower Refuse Dike, Upper Refuse Dike and North Dike are discussed in Appendix E of this text.

The Lower Refuse Dike was raised during 1985 (see Drawing E9-3460).

The East Side Slurry Containment Basin, the Road Pond, and the Dryer Pond have been completed. Spoil Pile II was constructed during the construction of the Road Pond.

(4) The structures were constructed in accord with engineered plans. It is concluded that the structures meet the relevant performance standards.

(b) The operator plans to increase the height and impounding capacity of the slurry impoundment structures. The plans for pertinent modifications are included in Appendix E and meet the requirements of this paragraph.

The operator has begun removal of the high ash coal fines that are contained within the Upper and Lower Refuse Ponds to provide pond space for continued water clarification. The material will be removed from the ponds with a Sauerman Scraper and stored with the coarser refuse material outside the pond areas. The operator plans to sell this material to energy consumers as purchasers become available. The material will be trucked from the site to the consuming location or to the rail spur on the west side of the river for rail transportation to consumers.

The design criteria for the Road and Dryer Ponds are included on pages 784 - 17i to 784 - 17vii. This inclusion also discusses changes in water volumes from the plant as applicable.

During the temporary cessation of operation, the operator proposes the following activities:

(1) Water monitoring;
(2) Environmental monitoring;
(3) Inspection of surface facilities;
(4) Irrigation of revegetation test plots, as required; and
(5) Contemporaneous reclamation, as required.

O P E R A T I O N   P L A N

ROAD POND

The Auxiliary Pond provides water storage capacity to support plant operations. Water is maintained in the pond for use in plant operations. Void capacity is maintained to receive plant discharge and runoff volumes.

The Road Pond is an extension or enlargement of the Auxiliary Pond. The culvert, shown on Drawing No. E9-3453, connects the ponds to combine their capacities.

Volume Requirememts

Volume requirements for the Auxiliary Pond and Road Pond are calculated as one since the pond capacities are connected. There are four main sources of water inflow into the ponds:

1. Clear water from the Clear Water Pond

2. Plant discharge water

3. Runoff from precipitation events

4. Dryer Pond discharge water

Capacity requirements were developed as follows:

1. Clear Water from Clear Water Pond

   The Operator has the capability of filling the Auxiliary Pond with water directly from the incoming fresh water line from the Clear Water Pond. Prior to plant startup, the pond is filled with an adequate volume of water for plant operation. It has been the Operators experience that approximately 11,364 cu. ft. (85,000 gallons) is required to operate one shift. Pond design operating volume is therefore based on running two shifts a day or 22,727 cu. ft. (170,000 gallons) of storage capacity for plant operation.

2. Plant Discharge Water

   Inherant to the coal washing process, a given volume of water and slurry are constantly circulated by pumps when coal is being washed. All pumps within the system are electrically driven. In the event of a power loss during the coal washing process, approximately 8792 cu. ft. (65,764 gallons) of water and slurry will be in the system in excess of sump and structure capacities. This volume is itemized on Exhibit A.

3. Runoff from Precipitation Events

The drainage area into the Auxiliary and Road Ponds is shown on drawing number F9-177 in the Operation and Reclamation Plan (ORP). Hydrologic calculations included in Appendix B of the ORP show that approximately 23,290 cu. ft. (174,209 gallons) of capacity is required to contain a 10 year 24 hour precipitation event.

4. Dryer Pond Discharge Water

All water which enters the Dryer Pond is pumped from that pond into the Auxiliary Pond (see drawing number A9-1234). The void capacity required in the Auxiliary Pond in the event of a power failure is 8,792 cu. ft. The pump in the Dryer Pond is electrically driven so the Auxiliary Pond cannot receive both plant discharge and Dryer Pond discharge concurrently. Since the capacity requirement for a power failure is greater than the Dryer Pond discharge capacity (see discussion on Dryer Pond capacity in this document), the Dryer Pond discharge is not included in the volume requirements.

The total design storage requirement for the Auxiliary Pond and Road Pond is 54,809 cu. ft.; the sum of the first three water sources discussed.

Pond Capacities

Capacities of the Auxiliary Pond and Road Pond are determined in terms of live storage. The live storage is that portion of the pond capacity which can be pumped from the ponds for use in the plant.

The Plant Pumphouse (item O, page 784-6 of the ORP) is situated in the Auxiliary Pond (see Exhibit 2, page 784-12 of the ORP). Pond water flows into the pumphouse sump through windows which are 2' 4" below the pond overflow (overflow elevation = 5339.8 ft). Water is pumped from the sump either into the plant water system when the plant is operating or into the refuse ponds when the plant is idle. Since water contained in the Road Pond flows through the culvert into the Auxiliary Pond, the water from both ponds is recovered by this system.

The Auxiliary Pond is an incised existing pond that has been in place since 1958. The pond was constructed with near vertical side slopes. The banks are stable with no indication of bank instability. Due to the proximity of the plant support buildings to the west and the railroad tracks to the east, there is not sufficient area to bring these side slopes to a 2h:1v. The pond was surveyed on 5-31-83 and found to have 110,000 gallons per foot of depth (ref. drawing C9-1285 for surface area). Total operating capacity in the Auxiliary Pond is approximately 34,265 cu. ft. (2.33' x 110,000 gal/ft. / 7.46 gal/cu. ft.).

The Auxiliary Pond was originally excavated about 5 to 6 feet deep. During the course of plant operations, water is discharged from the plant into the pond and pumped from the pond back into the plant. Coal fines from the plant discharge settle out and accumulate in the pond. When the fines in the pond approach the elevation of the sump inlet window into pumphouse, the Operator cleans out the pond. As such, the pond bottom may vary from 2.3 feet to 6 feet from the overflow, depending on how recently the pond was cleaned out. Because of this variability, the Operator has chosen not to utilize the dead storage volume as part of the design capacity shown in the calculations. The 34,265 cu. ft. capacity in the pond utilizes only the live storage volume in the pond between the bottom of the inlet windows and the pond overflow.

Storage in the Road Pond is established from the elevation of the connecting culvert. The capacity between elevation 5339.8 (overflow elevation of Auxiliary Pond) and 5337.9 (elevation of bottom of culvert in Road Pond) is live storage because water will flow into the Auxiliary Pond through the culvert as water is pumped out of the Auxiliary Pond. Pond details are shown on Drawing No.'s E9-3453 and C9-1284.

Summary

Requirements:

Operating Volume	22,727 cu. ft.
Plant Discharge	8,792 cu. ft.
Runoff (10 YR 24 HR event)	23,290 cu. ft.
TOTAL REQUIREMENT	54,809 cu. ft.

Capacities:

Auxiliary Pond live storage	34,265 cu. ft.
Road Pond live storage	24,603 cu. ft.
TOTAL CAPACITY	58,868 cu. ft.

Pond capacity exceeds the requirements.

DRYER POND

The Heat Dryer Pond provides water storage capacity for dryer effluent and runoff from precipitation events. Refer to drawing number A9-1464.

Volume Requirements

Capacity requirements were developed as follows:

1. Scrubber effluent water

   During normal plant operation, water occasionally enters the Dryer Pond when the volume of water entering the scrubber sump exceeds the scrubber return pump capacity. This condition occurs when the plant is in operation and as such the Dryer Pond sump pump is maintained in working order. Therefore, no void capacity is maintained in the Dryer Pond for discharges which may occur during plant operation.

   When the plant is idle, water is pumped from a sump inside the Blower Room into the scrubber sump. The Blower Room sump is fed at a maximum rate of 4 gallons per minute (measured on 1/31/85). During normal shutdown, the scrubber sump is pumped down so that there is some available capacity in the sump before it will overflow.

   Both the Dryer and Auxiliary Ponds are inspected at least twice a day, including weedends and holidays, to make sure the pumps are functioning. If a pump is not working properly, the inspector takes immediate action to try to correct the problem.

   The volume required to contain the discharge from the scrubber is approximately 1,540 cu. ft. (4 gal/min X 60 min/hr X 48 hrs / 7.48 gal/cu. ft.). This volume is considered prudent in that: (1) 4 gallons per minute is a maximum flow rate and is usually somewhat less than that, (2) the ponds are checked and maintained at least twice a day, so it is unlikely that a pump would remain inoperative for a 48 hour period, and (3) there may be some available capacity in the scrubber sump.

2. Runoff from Precipitation Events

   The drainage area into the Dryer Pond is shown on drawing number F9-177 in the Operation and Reclamation Plan (ORP). Hydrologic calculations included in Appendix B of the ORP show that approximately 3,669 cu. ft. of capacity is required to contain a 10 year 24 hour precipitation event.

The total design storage requirement for the Dryer Pond is 5,209 cu. ft.; the sum of the two water sources discussed.

Pond Capacity

The capacity of the Dryer Pond can be broken down into three categories: 1) dead storage, 2) live storage within the float range, and 3) live storage above the float range.

1. Dead storage is provided in the Dryer Pond because scrubber effluent water usually contains coal fines which will settle out and accumulate. The dead storage available from the pond bottom to approximately elevation 5335 is 3,886 cu. ft. The pond bottom, and subsequently the dead capacity, will vary depending on how recently the pond was cleaned. When the sediment accumulations approach elevation 5335, the Operator clams out the pond and disposes of the sediment at a designated refuse disposal site.

2. The pump in the Dryer Pond sump is equipped with a level sensor. When the water elevation reaches approximately 5336 the pump is activated. When the water elevation is reduced to approximately 5335, the pump shuts off. The pump has a capacity of some 150 gallons per minute, which is well in excess of all pond inflows. The capacity within the float range is 2,416 cu. ft.

3. The pump in the Dryer Pond is activated at elevation 5336, and will pump continuously while the water level exceeds 5335. The pump has the capacity to handle all inflows even during a 10 year 24 hour storm and maintain the water level at or below 5336. In the unlikely event that the storm should occur during a power failure, water would only back up into the drainage ditch which enters the east end of the pond. Untreated water would not discharge from the pond.

Summary

Requirements:

Scrubber effluent volume	1,540 cu. ft.
Runoff (10 YR 24 HR event)	3,669 cu. ft.
TOTAL REQUIREMENT	5,209 cu. ft.

Capacity:

Dead storage	3,886 cu. ft.
Live storage within float range	2,416 cu. ft.
Live storage above float range	3,445 cu. ft.
TOTAL CAPACITY	9,747 cu. ft.

Pond live capacity equals 5,861 cu. ft., which exceeds the requirements.

EXHIBIT A

Water Entering the Auxiliary Pond from a Power Failure

Description	Diameter	Area(ft2)	Height or Length(ft)	Volume(gal)
Desiltor Bowl	44'	1521	1/12	127
Desiltor Bowl	44'	1521	1/12	127
Fresh Water Head Tank	10'	78.5	10.5	6,169
Recirculated Water Head Tank	-	-	-	5,000
Bird Effluent Piping	8"	0.349	114	298
Bird Bypass Piping	8"	0.349	97	253
Raw Coal Piping	10"	0.545	82	334
Silt Piping	6"	0.196	71	104
Scrubber Piping	6"	0.196	250	367
Sand Piping	10"	0.545	28	212
Refuse Sand Piping	8"	0.349	38	99
Refuse Sand Piping	8"	0.349	38	99
Fresh Water Piping	16"	1.396	118	1,232
Slurry Pipeline	10"	0.545	2100	8,561
Slurry Pipeline	10"	0.545	2100	5,861
Slurry Pipeline	12"	0.785	2900	17,037
Slurry Pipeline	12"	0.785	2900	17,037
				65,764

* During normal plant operations, a drain valve is kept partially open which discharges approximately 8.5 gal/min (approx. 1" per 15 minute period). In the event of a power loss, these valves would be closed immediately by the Operator in order to maintain water in the system as well as minimize the time required to start up again when power is reestablished. It is considered a prudent assumption that these valves would be closed within fifteen minutes after a power loss.

2. Pumphouse Area

The pumphouse areas will be regraded to smooth contours and cover concrete foundations with at least two feet of soil. When the River Water Collection Well was constructd, the material removed from the well was piled around the circumference. The surface portion of the well casing will be removed (at least two feet below final grade). The well will then be filled with soil from the pumphouse area.

3. Area West of the Price River

The main plant facilities area west of the Price River will be regraded as shown on Map E9-3342 following the removal of the surface facilities. The fills constructed for the plant railroad system and the ponds will be contoured to blend with the surrounding areas. The diversion ditch will be left in place until revegetation success has been acheived. At that time, the diversion will be filled and graded to blend with the surrounding areas.

4. Refuse Disposal Area West of Price River

The final contours of the refuse pile will be achieved as refuse is placed during plant operation. No grading will be required to achieve the final reclamation contours. A six-inch soil cover will be placed over the refuse pile to provide a medium for achieving revegetation success.

The required material volumes for all grading are included in Appendix D.

(4) Topsoil Handling

The revised Topsoil Handling Plan is included in Appendix K of this text.

(5) Revegetation Plan

The revised Revegetation Plan is included in Appendix J of this text. The revised plan also includes discussion on the installed test plots and revised seed mixes for contemporaneous reclamation. It should be noted that Spoil Pile II has been reclaimed during 1986 with nonvegetative measures, including regrading and berming. The operator will inspect the site to monitor the effectiveness of the employed stabilization methods.

(6) Applies to underground mining.

(7) Information concerning noncoal waste is contained in Appendix G. The results of the coal seam analysis to detect any acid or toxic forming materials are also included in Appendix G. The Operator will supply analysis for individual seams processed on an annual basis if operations are resumed.

(8) Refer to paragraph (3) for a description of how the River Water Collection Well will be reclaimed.

(9) The activities during reclamation will include, removal of the plant buildings, structures and railroad, demolition of the concrete piers, and foundations, grading to the final surface contour, surface preparation for seeding and reseeding. The Operator will take the following actions during reclamation to comply with the requirements of the Clean Air Act and the Clean Water Act:

1. The materials that will result from demolition will be non-toxic and non-acid forming, will be suitable for burial and will not affect groundwater.

2. The Operator will water unpaved roads as necessary to control fugitive dust.

3. The speed of vehicles will be restricted to reduce fugitive dust caused by travel.

4. The travel of vehicles will be restricted to established roads.

5. The newly graded and seeded areas will be mulched.

Use: Industrial Volume: 0.146 cfs

Owner: Milton Wilson WUC No. 91-233
Location: Section 7 T15S R11E
Direct Source: Underground water well
Use: Dom. & Irr. Volume: 0.015 cfs

Owner: Donald & Janice A. Hamilton WUC No. 91-4122
Location: Section 8 T15S R11E
Direct Source: Price River
Use: Irrigation Volume: 60 af

<u>Downstream from Permit Area</u>

Owner: Arnel S. Milner WUC No. 91-402
Location: Section 16 T15S R11E Status: Dec.
Direct Source: Price River thru Farnham Ditch
Use: Irr. & Stock Volume: 0.177 cfs
Annual: 42.4 af

Owner: Leon and Dixie Thayne WUC No. 91-405
Location: Section 16 T15S R11E Status: Dec.
Direct Source: Price River thru Farnham Ditch
Use: Irr. & Stock Volume: 0.293 cfs
Annual: 8.57 af

Owner: AMCA Coal Leasing, Inc. WUC No. 91-4172
Location: Section 22 T15S R11E Status: Unapproved
Direct Source: Underground water well
Use: Volume: 5 cfs

Owner: Mont Blackburn WUC No. 91-4030
Location: Section 22T15S R11E Status: WUCS
Direct Source: Price River
Use: Volume: 5 cfs

Owner: D & RGW Railroad Co. Wuc No. 91-101
Location: Section 22 T15S R11E Status: Certificate
Direct Source: Price River
Use: Irr. & Stock Volume: 0.16 cfs

Owner: Price Water Improvement District
WUC 91-737
Location: Section 8 T15S R11E
Direct Source: Sewage Plant effluent
Use: Volume:

Within the Permit Area
Owner: Kaiser Coal Corporation WUC 91-371
Location: Section 16 T15S R11E
Direct Source: Price River and Underground well
Use: Irr. & Ind. Volume 5.197 cfs
Annual: 724.4 af

Owner: Kaiser Coal Corporation WUC 91-254
Location: Section 16 T15S R11E
Direct Source: Underground water sump
Use: Industrial Volume: 0.15 cfs

Owner: Kaiser Coal Corporation WUC 91-255
Location: Section 16 T15S R11E
Direct Source: Underground water sump
Use: Industrial Volume: 0.21 cfs

Owner: Kaiser Coal Corporation WUC 91-215
Location: Section 16 T15S R11E
Direct Source: Price River and Underground Well
Use: Irr. & Ind. Volume: 10 cfs
Ind. 2400 af
Irr. 90 ac

Owner: Kaiser Coal Corporation WUC 91-216
Location: Section 16 T15S R11E
Direct Source: Price River and Underground Well
Use: Irr. & Ind. Volume: 5.0 cfs
Ind. 3650 af
Irr. 90.112 ac

The Operator-owned Price River diversions Milner, Pumphouse and Farnham are shown on Map F9-177. The next known diversion is located downstream in Section 23 T17S R13E.

(3) The Cleaning Plant is a surface facility and as such there is no potential for diminution or interruption of river water.

The worst case impact of the Cleaning Plant's effect on the Price River would be if the slurry pipeline ruptured and discharged into the river. The consequences of this unlikely event are considered insignificant. Flow volumes in the Price River from gaging station data indicate a high and low flow to be 42 and 19 cfs during April and July, 1981 respectively. The Operator's water sample test results at monitoring station A are shown below and the influence of a slurry sample evaluated.

	Price River High Flow 5/82	Slurry Constant Flow 6/83	Combined	Net Effect
Conductivity (umhos/cm)	930	3500	975	5 %
Dissolved Iron (mg/l)	6.800	0.020	6.68	(2%)
Dissolved Solids (mg/l)	516	2280	547	6%
Flow (gpm)	167,402	3000	170,402	2%

	7/81	6/83		
Conductivity (umhos/cm)	2850	3500	3019	6%
Dissolved Iron (mg/l)	0.660	0.020	0.493	(25%)
Dissolved Solids (mg/l)	2050	2280	2110	3%
Flow (gpm)	8527	3000	11,527	35%

(4) Does not apply.

(b) (1) Surface drainage through the permit area is described in Appendix B and referenced on F9-177. During reclamation, surface drainage from the reclaimed Upper and Lower Refuse Pond areas will be coursed into the Clear Water Pond for sedimentation control. When a suitable stand of vegetation is established on the reclaimed pond surfaces upstream, the clear water dike will be removed and graded to the configuration shown on Drawing No. E9-3342. A sediment filter, such as silt fence or straw bales, will be placed at the upstream end of the culvert which goes beneath the county road. The permanent diversion ditch adjacent to the North Dike will not be affected during reclamation. When the River Pumphouse area is reclaimed, the structures shown (and proposed) on F9-177 will be maintained until a stand of vegetation is established, then removed.

(2) With the sedimentation control structures described in Appendix B and in item (b) (1) of this section, surface waters will be protected from contamination without further treatment.

(3) The surface water monitoring program has been modified from quarterly to biannual (high and low flow) for points SW-1 to SW-8 exclusive of point SW-3 which remains quarterly. The quality parameters are in accordance with Division guidelines for operational monitoring (see attached table).

TABLE 1

SURFACE WATER BASELINE, OPERATIONAL AND POSTMINING WATER QUALITY PARAMETER LIST

Field Measurements:

	*	-	Water Levels or Flow
	*	-	pH
	*	-	Specific Conductivity (umhos/cm)
	*	-	Temperature (C^o)
	*	-	Dissolved Oxygen (ppm) (perennial streams only)

Laboratory Measurements: (mg/l) (Major, minor ions and trace elements are to be analyzed in total and dissolved forms.)

#	*	-	Total Settleable Solids
#	*	-	Total Suspended Solids
	*	-	Total Dissolved Solids
	*	-	Total Hardness (as $CaCO_3$)
	*		Acidity ($CaCO_3$)
		-	Aluminum (Al)
		-	Arsenic (As)
		-	Barium (Ba)
		-	Boron (B)
	*	-	Carbonate (CO_3^{-2})
	*	-	Bicarbonate (HCO_3^-)
		-	Cadmium (Cd)
	*	-	Calcium (Ca)
	*	-	Chloride (Cl^-)
		-	Chromium (Cr)
		-	Copper (Cu)
		-	Fluoride (F^-)
	*	-	Iron (Fe)
		-	Lead (Pb)
	*	-	Magnesium (Mg)
	*	-	Total Manganese (Mn)
		-	Mercury (Hg)
		-	Molybdenum (Mo)
		-	Nickel (Ni)
		-	Nitrogen: Ammonia (NH_3)
		-	Nitrite (NO_2)
		-	Nitrate (NO_3^-)
	*	-	Potassium (K)
		-	Phosphate (PO_4^{-3})
		-	Selenium (Se)
	*	-	Sodium (Na)
	*	-	Sulfate (SO_4^{-2})
		-	Sulfide (S^-)
		-	Zinc (Zn)
	*	-	Oil and Grease
	*	-	Cation-Anion Balance

Sampling Period:

-Baseline
*Operational, Postmining
#Construction

The following parameters have been added to the monitoring schedule during the fourth quarter 1986 surface water sampling:

(1) Oil and Grease (as Applicable)
(2) Settleable Solids
(3) Field Temperature
(4) Dissolved Oxygen
(5) Cation-Anion Balance
(6) Flow Measurements

The above schedule is per DOGM's letter of May 21, 1986.

It should be noted during 1986 that point SW-3 had no flow. Point BCW monitors flow below the Clear Water Pond while SW-3 monitors seepage from the Upper Refuse Pond (see Map E9-3451, Appendix I).

The 1986 surface water monitoring data is included in pages 784 - 28IV to 784 - 28XII.

The ground water monitoring has remained on a quarterly basis through November 1986. The quality parameters sampled are in accordance with the attached table and include the above points except Dissolved Oxygen. The 1986 ground water sampling data is submitted on pages 784 - 28XIV to 784 - 28XXVII.

This completes the two year baseline monitoring program. Accordingly the operator requests a modification to the groundwater monitoring program s follows:

(1) Sample wells GW-3, GW-6, GW-7, and GW-12 on a semi-annual basis. The remaining points GW-1, GW-2, GW-4, GW-5, GW-8, GW-9, GW-10, GW-11, GW-13 and GW-14 will be sampled on an annual basis.

(2) The quality parameters would be consistent with current Division guidelines for operational monitoring (see attached table).

(c) With the sedimentation control structures described in Appendix B and in item (b) (1) of this section, the quality and quantity of water in the Price River is not expected to be affected. The worst case impact of slurry discharge described in item (a) (3) of this

KAISER COAL COPRORATION - WELLINGTON PREPARATION PLANT - ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-1

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (cfs)			200.		300.							<100.
pH			8.15		8.3							8.81
Temp. (^oC)												3.
Conductiv.			970.		765.							1700.
Aluminum			7.21		1.05							
Arsenic			0.010		0.001							
Barium			0.26		0.10							
Bicarbon.			279.		246.							454.
Boron			0.19		0.06							
Cadmium			<0.001		<0.005							
Calcium			82.		79.							98.2
Carbonate			<0.01		0.							0.
Chloride			24.7		16.							60.1
Chromium			0.040		<0.01							
Copper			0.06		<0.01							
Fluoride			0.19		0.25							
Hardness			366.		366.							1220.
Iron			16.30		7.10							0.68
Lead			0.013		<0.02							
Magnesium			38.60		41.							151.
Manganese			0.63		0.15							0.35
Mercury			<0.0002		<0.0002							
Molybdenum			0.03		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.49		0.21							
Nitrate			0.69		0.40							
Nitrite			0.02									
Oil & Grease												<0.5
Phosphate			0.08		0.06							
Potassium			4.16		2.							8.0
Selenium			<0.001		0.001							
Sodium			75.		48.							330.
Sulfate			269.		177.							1270.
Sulfide			<0.10		<0.2							
TDS			630.		514.							2550.
TSS			918.		438.							6.0
Sett. Solids												<0.1
Zinc			0.215		0.01							
C-A Balance					2.16							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-2

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (cfs)			200.		300.							
pH			8.15		8.3							<100.
Temp. (°C)												8.73
Conductiv.			924.		765.							3.
Aluminum			9.63		1.01							1900.
Arsenic			0.004		0.001							
Barium			0.27		0.10							
Bicarbon.			282.		242.							
Boron			0.30		0.05							509.
Cadmium			<0.001		<0.005							
Calcium			58.		73.							
Carbonate			<0.01		0.							87.9
Chloride			24.1		15.							0.
Chromium			0.030		<0.01							74.7
Copper			0.06		<0.01							
Fluoride			0.19		0.55							
Hardness			372.		355.							
Iron			19.10		6.70							1190.
Lead			0.168		<0.02							0.72
Magnesium			54.50		42.							
Manganese			0.70		0.14							158.
Mercury			<0.0002		<0.0002							0.30
Molybdenum			0.05		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.49		0.14							
Nitrate			0.67		0.32							
Nitrite			<0.01									
Oil & Grease												
Phosphate			0.07		0.05							<0.5
Potassium			4.86		2.							
Selenium			<0.001		0.002							8.9
Sodium			60.		53.							
Sulfate			237.		189.							320.
Sulfide			<0.10		<0.2							1260.
TDS			585.		526.							
TSS			1066.		370.							2680.
Sett. Solids												6.0
Zinc			0.102		0.01							<0.1
C-A Balance					1.34							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012

1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-3

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (gpm)			0		0							0
pH												
Temp. (^{o}C)												
Conductiv.												
Aluminum												
Arsenic												
Barium												
Bicarbon.												
Boron												
Cadmium												
Calcium												
Carbonate												
Chloride												
Chromium												
Copper												
Fluoride												
Hardness												
Iron												
Lead												
Magnesium												
Manganese												
Mercury												
Molybdenum												
Nickel												
Ammonia												
Nitrate												
Nitrite												
Oil & Grease												
Phosphate												
Potassium												
Selenium												
Sodium												
Sulfate												
Sulfide												
TDS												
TSS												
Sett. Solids												
Zinc												
C-A Balance												

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012

1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-4

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (gpm)			187.		112.							40.
pH			7.80		8.3							8.08
Temp. (^oC)												4.
Conductiv.			6900.		1680.							2600.
Aluminum			0.42		0.72							
Arsenic			0.002		0.001							
Barium			<0.01		0.04							
Bicarbon.			539.		282.							581.
Boron			0.78		0.22							
Cadmium			<0.001		<0.005							
Calcium			400.		133.							134.
Carbonate			<0.01		0.							0.
Chloride			90.2		29.							79.6
Chromium			0.030		<0.01							
Copper			0.03		<0.01							
Fluoride			0.29		0.31							
Hardness			2115.		681.							2170.
Iron			0.54		1.75							0.03
Lead			<0.001		<0.02							
Magnesium			267.6		85.							292.
Manganese			0.62		0.10							0.17
Mercury			<0.0002		<0.0002							
Molybdenum			0.05		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.55		0.03							
Nitrate			0.45		0.03							
Nitrite			0.02									
Oil & Grease												<0.5
Phosphate			0.03		<0.02							
Potassium			9.78		5.							13.5
Selenium			<0.001		<0.001							
Sodium			610.		182.							699.
Sulfate			2885.		731.							2600.
Sulfide			<0.10		<0.2							
TDS			4550.		1362.							5320.
TSS			63.		86.							<1.
Sett. Solids												<0.1
Zinc			<0.001		0.01							
C-A Balance					-0.09							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012

1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-5

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Level (ft)			Pond was dry all of 1986.									
pH												
Temp. (°C)												
Conductiv.												
Aluminum												
Arsenic												
Barium												
Bicarbon.												
Boron												
Cadmium												
Calcium												
Carbonate												
Chloride												
Chromium												
Copper												
Fluoride												
Hardness												
Iron												
Lead												
Magnesium												
Manganese												
Mercury												
Molybdenum												
Nickel												
Ammonia												
Nitrate												
Nitrite												
Oil & Grease												
Phosphate												
Potassium												
Selenium												
Sodium												
Sulfate												
Sulfide												
TDS												
TSS												
Sett. Solids												
Zinc												
C-A Balance												

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-6

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Level (ft)			5373.9		5370.2							
pH			8.20		8.3							
Temp. (°C)												P
Conductiv.			4490.		4450.							
Aluminum			0.23		0.35							O
Arsenic			<0.001		<0.001							
Barium			0.04		0.04							N
Bicarbon.			272.		214.							
Boron			0.95		0.95							D
Cadmium			<0.001		<0.005							
Calcium			150.		155.							
Carbonate			<0.01		0.							
Chloride			95.6		130.							D
Chromium			0.020		<0.01							
Copper			0.04		<0.01							R
Fluoride			0.63		0.87							
Hardness			990.		1142.							Y
Iron			0.36		0.80							
Lead			<0.001		<0.02							
Magnesium			147.6		184.							
Manganese			0.04		0.04							
Mercury			<0.0002		<0.0002							
Molybdenum			0.06		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.43		0.03							
Nitrate			0.10		0.02							
Nitrite			0.02									
Oil & Grease												
Phosphate			0.02		<0.02							
Potassium			8.86		12.							
Selenium			0.003		0.003							
Sodium			565.		798.							
Sulfate			1820.		2529.							
Sulfide			<0.10		<0.2							
TDS			2950.		3904.							
TSS			35.0		176.							
Sett. Solids												
Zinc			0.017		0.01							
C-A Balance					-2.32							

784-28IX

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012

1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-7

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Level (ft)			5362.4		5360.8							5353.0
pH			7.85		8.3							8.92
Temp. (^{o}C)												4.
Conductiv.			3800.		3600.							3150.
Aluminum			<0.01		0.05							
Arsenic			<0.001		0.002							
Barium			0.01		0.03							
Bicarbon.			376.		305.							157.
Boron			0.55		0.49							
Cadmium			<0.001		<0.005							
Calcium			218.		226.							124.
Carbonate			<0.01		0.							0.
Chloride			81.2		91.							120.
Chromium			<0.010		<0.01							
Copper			0.04		<0.01							
Fluoride			0.38		0.51							
Hardness			1230.		1336.							1330.
Iron			0.16		0.05							0.07
Lead			<0.001		<0.02							
Magnesium			164.4		188.							216.
Manganese			0.20		0.13							0.25
Mercury			<0.0002		<0.0002							
Molybdenum			0.03		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.76		0.09							
Nitrate			0.36		0.02							
Nitrite			0.03									
Oil & Grease												<0.5
Phosphate			0.16		0.09							
Potassium			5.64		7.							12.4
Selenium			<0.001		0.002							
Sodium			340.		522.							602.
Sulfate			1530.		2021.							2360.
Sulfide			<0.10		0.2							
TDS			2520.		3262.							3890.
TSS			30.		16.							6.0
Sett. Solids												<0.1
Zinc			0.019		<0.01							
C-A Balance					-1.21							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-4

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (gpm)			187.		112.							40.
pH			7.80		8.3							8.08
Temp. (^{o}C)												4.
Conductiv.			6900.		1680.							2600.
Aluminum			0.42		0.72							
Arsenic			0.002		0.001							
Barium			<0.01		0.04							
Bicarbon.			539.		282.							581.
Boron			0.78		0.22							
Cadmium			<0.001		<0.005							
Calcium			400.		133.							134.
Carbonate			<0.01		0.							0.
Chloride			90.2		29.							79.6
Chromium			0.030		<0.01							
Copper			0.03		<0.01							
Fluoride			0.29		0.31							
Hardness			2115.		681.							2170.
Iron			0.54		1.75							0.03
Lead			<0.001		<0.02							
Magnesium			267.6		85.							292.
Manganese			0.62		0.10							0.17
Mercury			<0.0002		<0.0002							
Molybdenum			0.05		<0.05							
Nickel			<0.01		<0.02							
Ammonia			0.55		0.03							
Nitrate			0.45		0.03							
Nitrite			0.02									
Oil & Grease												<0.5
Phosphate			0.03		<0.02							
Potassium			9.78		5.							13.5
Selenium			<0.001		<0.001							
Sodium			610.		182.							699.
Sulfate			2885.		731.							2600.
Sulfide			<0.10		<0.2							
TDS			4550.		1362.							5320.
TSS			63.		86.							<1.
Sett. Solids												<0.1
Zinc			<0.001		0.01							
C-A Balance					-0.09							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: SW-8

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Level (ft)												
pH			7.85		8.0							
Temp. (°C)												P
Conductiv.			10100.		9740.							
Aluminum			0.10		0.40							O
Arsenic			0.015		0.001							
Barium			<0.01		0.02							N
Bicarbon.			414.		360.							
Boron			0.54		0.73							D
Cadmium			<0.001		<0.005							
Calcium			246.		280.							
Carbonate			<0.01		0.							
Chloride			355.		520.							F
Chromium			0.050		<0.01							
Copper			0.04		<0.01							R
Fluoride			0.32		0.50							
Hardness			2260.		3201.							O
Iron			0.20		0.70							
Lead			<0.001		0.02							Z
Magnesium			394.8		610.							
Manganese			0.09		0.12							E
Mercury			<0.0002		<0.0002							
Molybdenum			0.08		<0.05							N
Nickel			<0.01		<0.02							
Ammonia			0.99		0.08							
Nitrate			0.09		0.02							
Nitrite			<0.01									
Oil & Grease												
Phosphate			0.03		0.05							
Potassium			6.24		9.							
Selenium			0.002		0.002							
Sodium			1505.		1920.							
Sulfate			4520.		5935.							
Sulfide			<0.10		0.2							
TDS			6950.		9958.							
TSS			58.		60.							
Sett. Solids												
Zinc			0.015		0.01							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT - ACT/007/012

1986 WATER MONITORING DATA

SAMPLE LOCATION: BCW

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Flow (gpm)			1.		0							0
pH			8.25									
Temp. (°C)												
Conductiv.			12840.									
Aluminum			<0.01									
Arsenic			0.030									
Barium			<0.01									
Bicarbon.			551.									
Boron			1.30									
Cadmium			<0.001									
Calcium			400.									
Carbonate			<0.01									
Chloride			426.									
Chromium			0.030									
Copper			0.09									
Fluoride			0.81									
Hardness			4150.									
Iron			0.18									
Lead			0.003									
Magnesium			756.									
Manganese			0.09									
Mercury			<0.0002									
Molybdenum			0.14									
Nickel			<0.01									
Ammonia			3.32									
Nitrate			0.02									
Nitrite			0.04									
Oil & Grease												
Phosphate			0.12									
Potassium			54.13									
Selenium			0.002									
Sodium			2120.									
Sulfate			7660.									
Sulfide			<0.10									
TDS			12734.									
TSS			33.									
Sett. Solids												
Zinc			0.048									
C-A Balance												

TABLE 3

GROUND WATER BASELINE, OPERATIONAL AND
POSTMINING WATER QUALITY PARAMETER LIST

Field Measurements:

*	-	Water Levels or Flow
*	-	pH
*	-	Specific Conductivity (umhos/cm)
*	-	Temperature (C^o)

Laboratory Measurements: (mg/l) (Major, minor ions and trace elements are to be analyzed in dissolved form only.)

*	-	Total Dissolved Solids
*	-	Total Hardness (as $CaCO_3$)
	-	Aluminum (Al)
	-	Arsenic (As)
	-	Barium (Ba)
	-	Boron (B)
*	-	Carbonate ($CO_3{}^{-2}$)
*	-	Bicarbonate ($HCO_3{}^{-}$)
	-	Cadmium (Cd)
*	-	Calcium (Ca)
*	-	Chloride (CL^-)
	-	Chromium (Cr)
	-	Copper (Cu)
	-	Fluoride (F^-)
*	-	Iron (Fe)
	-	Lead (Pb)
*	-	Magnesium (Mg)
*	-	Manganese (Mn)
	-	Mercury (Hg)
	-	Molybdenum (Mo)
	-	Nickel (Ni)
	-	Nitrogen: Ammonia (NH_3)
	-	Nitrite (NO_2)
	-	Nitrate ($NO_3{}^{-}$)
*	-	Potassium (K)
	-	Phosphate ($PO_4{}^{-3}$)
	-	Selenium (Se)
*	-	Sodium (Na)
*	-	Sulfate ($SO_4{}^{-2}$)
	-	Sulfide (S^-)
	-	Zinc (Zn)

Sampling Period:

-Baseline
*Operational, Postmining

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-1

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		7.7			9.05			7.10				
pH		7.49			7.6			7.4				
Temp. (°C)		4.			11.			10.				N
Conductiv.		5200.			3600.			800.				
Aluminum		0.51			0.79			<0.05				O
Arsenic		0.002			0.001			0.001				
Barium		0.02			0.03			0.03				
Bicarbon.		653.			555.			474.				
Boron		0.89			0.48			0.27				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		342.			510.			221.				A
Carbonate		<0.01			0.			0.				
Chloride		58.6			75.			32.				M
Chromium		0.005			<0.01			<0.01				
Copper		0.03			<0.01			<0.01				P
Fluoride		o.31			0.49			0.4				
Hardness		1510.			2173.			913.				L
Iron		2.24			14.4			1.39				
Lead		0.002			0.02			0.02				E
Magnesium		157.2			219.			88.				
Manganese		3.50			0.51			<0.01				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.03			0.02			<0.02				
Ammonia		<0.01			0.02			0.14				
Nitrate		0.17			0.16			0.24				
Nitrite		<0.01						<0.02				
Phosphate		0.30										
Potassium		7.45			4.			7.				
Selenium		<0.001			<0.001			<0.001				
Sodium		260.			319.			97.				
Sulfate		1352.			2000.			554.				
Sulfide		<0.10			<0.2			0.5				
TDS		3410.			3618.			1170.				
Zinc		0.022			0.02			<0.01				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-2

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		15.7			16.5			17.6				
pH		7.33			7.7			7.0				
Temp. (°C)		9.5			14.			14.				N
Conductiv.		28100.			17200.			17600.				
Aluminum		0.79			0.58			10.9				O
Arsenic		0.002			0.002			<0.001				
Barium		0.03			0.01			0.01				
Bicarbon.		891.			695.			720.				
Boron		0.76			1.61			1.60				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		530.			548.			510.				A
Carbonate		<0.01			0.			0.				
Chloride		751.			840.			832.				M
Chromium		0.01			<0.04			<0.01				
Copper		0.02			<0.01			<0.01				P
Fluoride		0.79			1.14			0.9				
Hardness		5725.			6044.			6810.				L
Iron		0.94			9.45			15.5				
Lead		0.002			0.03			<0.02				E
Magnesium		1056.			1140.			1350.				
Manganese		0.10			1.44			3.45				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		0.01			0.08			<0.05				
Nickel		0.02			0.02			0.05				
Ammonia		2.20			0.68			1.24				
Nitrate		<0.01			0.08			0.08				
Nitrite		<0.01						0.13				
Phosphate		0.02										
Potassium		7.38			34.			30.				
Selenium		0.002			<0.001			<0.001				
Sodium		3700.			3420.			4000.				
Sulfate		11740.			11928.			12347.				
Sulfide		<0.10			<0.2			0.05				
TDS		18356.			18962.			19540.				
Zinc		0.006			0.23			0.04				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-3

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		12.8			13.2			13.5				14.3
pH		7.33			7.7			7.18				8.08
Temp. (°C)		9.			12.			12.				
Conductiv.		44800.			23100.			49800.				2600.
Aluminum		51.75			6.34			4.67				
Arsenic		0.003			0.004			<0.001				
Barium		0.92			0.04			0.02				
Bicarbon.		1183.			915.			1240.				1880.
Boron		0.78			1.06			1.20				
Cadmium		0.002			<0.005			<0.005				
Calcium		430.			459.			490.				362.
Carbonate		<0.01			0.			0.				0.
Chloride		1280.			1390.			2778.				3660.
Chromium		0.09			<0.01			<0.001				
Copper		0.14			0.01			0.01				
Fluoride		0.75			1.20			0.7				
Hardness		6975.			5740.			18035.				23900.
Iron		67.30			79.0			24.3				19.1
Lead		0.02			0.03			0.03				
Magnesium		1416.			1120.			4100.				5200.
Manganese		1.97			2.58			2.71				3.49
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		0.01			0.10			<0.05				
Nickel		0.06			0.06			0.07				
Ammonia		6.20			2.45			2.37				
Nitrate		0.75			0.66			0.11				
Nitrite		<0.01						0.03				
Phosphate		0.09										
Potassium		25.26			62.			150.				218.
Selenium		0.002			<0.001			<0.001				
Sodium		6800.			5500.			16170.				20600.
Sulfate		18700.			15386.			45152.				64000.
Sulfide		<0.10			<0.2			<0.2				
TDS		29150.			24594.			22052.				98000.
Zinc		0.397			0.08			0.17				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-4

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		5.7			6.65			9.35				
pH		7.50			8.0			7.31				
Temp. (^{o}C)		9.			13.			12.				N
Conductiv.		7700.			5480.			2500.				
Aluminum		0.11			0.36			0.33				O
Arsenic		0.002			<0.001			<0.001				
Barium		0.01			0.01			0.01				
Bicarbon.		359.			345.			248.				
Boron		0.59			345.			0.70				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		394.			398.			430.				A
Carbonate		<0.01			0.			0.				
Chloride		112.			126.			115.				M
Chromium		0.009			<0.01			<0.01				
Copper		0.02			<0.01			<0.01				P
Fluoride		1.55			0.91			1.5				
Hardness		2000.			2196.			2100.				L
Iron		2.09			2.80			5.25				
Lead		0.013			0.02			<0.02				E
Magnesium		243.6			293.			250.				
Manganese		1.17			0.18			1.73				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			0.06			<0.05				
Nickel		<0.01			<0.02			<0.02				
Ammonia		0.20			0.09			0.20				
Nitrate		0.15			0.13			0.22				
Nitrite		<0.01						<0.02				
Phosphate		0.02										
Potassium		7.78			9.			10.				
Selenium		0.002			<0.001			<0.001				
Sodium		810.			851.			770.				
Sulfate		3250.			3326.			3128.				
Sulfide		<0.10			<0.2			<0.2				
TDS		5058.			5316.			4820.				
Zinc		0.016			0.01			0.23				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-5

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		20.8			21.4			22.17				
pH		7.36			7.5							
Temp. (°C)		11.			12.			N				N
Conductiv.		10500.			7130.							
Aluminum		16.10			8.39			O				O
Arsenic		0.009			0.005							
Barium		0.26			0.02							
Bicarbon.		355.			305.							
Boron		1.14			0.63			S				S
Cadmium		<0.001			<0.005							
Calcium		412.			483.			A				A
Carbonate		<0.01			0.							
Chloride		136.			144.			M				M
Chromium		0.100			0.01							
Copper		0.17			0.03			P				P
Fluoride		0.74			1.16							
Hardness		2880.			3245.			L				L
Iron		23.50			190.							
Lead		0.005			0.18			E				E
Magnesium		444.			497.							
Manganese		3.47			1.42							
Mercury		<0.0002			<0.0002							
Molybdenum		0.01			0.09							
Nickel		0.11			0.06							
Ammonia		0.20			0.21							
Nitrate		0.74			0.11							
Nitrite		<0.01										
Phosphate		0.03										
Potassium		49.8			20.							
Selenium		0.013			0.003							
Sodium		990.			1130.							
Sulfate		4470.			4721.							
Sulfide		<0.10			0.3							
TDS		6982.			6632.							
Zinc		0.161			0.46							

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-6

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		8.1			7.95			19.51				9.
pH		7.86			7.8			7.09				7.8
Temp. (°C)		9.			12.			16.				13.
Conductiv.		6300.			5200.			2200.				2600.
Aluminum		0.17			0.42			3.84				
Arsenic		0.002			0.004			<0.001				
Barium		0.05			0.01			0.01				
Bicarbon.		395.			290.			302.				352.
Boron		0.49			0.83			0.70				
Cadmium		<0.001			<0.005			<0.005				
Calcium		256.			453.			410.				141.
Carbonate		<0.01			0.			0.				0.
Chloride		115.			110.			132.				116.
Chromium		0.006			<0.01			<0.01				
Copper		<0.01			<0.01			0.02				
Fluoride		0.68			1.89			0.7				
Hardness		1460.			2240.			2214.				1940.
Iron		0.51			5.00			3.35				2.26
Lead		0.019			0.04			0.03				
Magnesium		196.8			270.			290.				228.
Manganese		0.02			1.82			0.45				1.44
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		<0.01			0.02			<0.02				
Ammonia		0.10			0.07			0.20				
Nitrate		0.33			0.32			0.22				
Nitrite		<0.01						<0.02				
Phosphate		0.02										
Potassium		6.10			8.			10.				9.2
Selenium		0.002			<0.001			<0.001				
Sodium		780.			766.			890.				699.
Sulfate		2600.			3217.			3375.				3320.
Sulfide		<0.10			<0.2			0.9				
TDS		4150.			4946.			5214.				4900.
Zinc		0.019			0.01			0.10				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-7

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		7.20			7.05			9.65				9.
pH		7.70			8.2			7.33				8.08
Temp. (°C)		11.			10.			13.				12.
Conductiv.		5700.			4490.			1900.				2200.
Aluminum		2.59			0.10			0.22				
Arsenic		0.002			<0.001			0.002				
Barium		0.09			0.02			0.01				
Bicarbon.		526.			395.			350.				459.
Boron		0.37			0.61			0.40				
Cadmium		<0.001			<0.005			<0.005				
Calcium		184.			184.			190.				98.
Carbonate		<0.01			0.			0.				0.
Chloride		118.			132.			112.				117.
Chromium		0.012			<0.01			<0.01				
Copper		0.04			<0.01			<0.01				
Fluoride		0.44			0.52			0.4				
Hardness		1320.			1370.			1377.				1280.
Iron		4.81			0.67			10.5				3.03
Lead		0.006			0.02			0.02				
Magnesium		206.4			222.			220.				193.
Manganese		0.29			0.07			0.73				0.48
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.03			<0.02			<0.02				
Ammonia		<0.01			0.09			0.59				
Nitrate		0.73			0.56			0.48				
Nitrite		<0.01						<0.02				
Phosphate		0.10										
Potassium		4.71			8.			10.				10.2
Selenium		<0.001			<0.001			<0.001				
Sodium		700.			781.			700.				635.
Sulfate		2220.			2470.			2184.				2440.
Sulfide		<0.10			0.3			0.7				
TDS		3720.			4032.			3592.				3710.
Zinc		0.091			0.02			0.03				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-8

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		23.5			23.2			14.0				
pH		7.30			8.0			7.8				
Temp. (^{o}C)		12.			14.			11.				N
Conductiv.		3700.			2930.			3000.				
Aluminum		1.99			0.09			0.41				O
Arsenic		0.002			<0.001			<0.001				
Barium		0.05			0.04			0.03				
Bicarbon.		270.			220.			216.				
Boron		1.56			0.51			0.30				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		120.			113.			140.				A
Carbonate		<0.01			0.			0.				
Chloride		85.4			89.			97.				M
Chromium		0.034			<0.01			<0.01				
Copper		0.09			<0.01			0.01				P
Fluoride		0.49			0.60			0.5				
Hardness		770.			779.			924.				L
Iron		3.42			0.25			1.77				
Lead		<0.001			0.03			<0.02				E
Magnesium		112.8			121.			140.				
Manganese		1.66			<0.01			0.02				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.04			<0.02			<0.02				
Ammonia		<0.01			0.07			0.06				
Nitrate		0.03			0.02			0.06				
Nitrite		<0.01						<0.02				
Phosphate		<0.01										
Potassium		27.69			7.			10.				
Selenium		0.004			<0.001			<0.001				
Sodium		495.			479.			510.				
Sulfate		1430.			1484.			1488.				
Sulfide		<0.10			0.2			<0.2				
TDS		2354.			2388.			2382.				
Zinc		0.037			0.03			0.05				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-9

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		12.3			11.45			24.15				
pH		7.80			8.1			7.2				
Temp. (°C)		11.			11.			12.				N
Conductiv.		4900.			5620.			2900.				
Aluminum		0.54			0.34			0.55				O
Arsenic		0.002			<0.001			<0.001				
Barium		0.04			0.03			0.02				
Bicarbon.		333.			310.			400.				
Boron		0.56			0.05			0.50				S
Cadmium		0.001			<0.005			<0.005				
Calcium		158.			205.			274.				A
Carbonate		<0.01			0.			0.				
Chloride		154.			230.			382.				M
Chromium		0.006			<0.01			<0.01				
Copper		0.02			<0.01			0.01				P
Fluoride		0.51			0.62			0.6				
Hardness		1120.			1677.			2555.				L
Iron		1.05			1.70			1.87				
Lead		0.012			0.03			<0.02				E
Magnesium		174.			284.			456.				
Manganese		0.04			0.43			0.45				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.02			<0.02			<0.02				
Ammonia		0.20			0.26			0.44				
Nitrate		0.27			0.22			0.85				
Nitrite		<0.01						0.10				
Phosphate		<0.01										
Potassium		6.77			10.			10.				
Selenium		<0.001			<0.001			<0.001				
Sodium		650.			972.			1425.				
Sulfate		1900.			3180.			4750.				
Sulfide		<0.10			0.5			0.3				
TDS		3185.			5168.			8498.				
Zinc		0.500			0.01			0.06				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-10

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		11.1			10.1			13.25				
pH		7.55			8.0			7.48				
Temp. (°C)		12.			8.			8.				N
Conductiv.		3700.			3170.			1300.				
Aluminum		0.40			1.05			0.19				O
Arsenic		<0.001			<0.001			<0.001				
Barium		0.01			0.04			0.03				
Bicarbon.		272.			230.			220.				
Boron		0.30			0.56			0.40				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		114.			129.			140.				A
Carbonate		<0.01			0.			0.				
Chloride		85.1			89.			93.				M
Chromium		0.005			<0.01			<0.01				
Copper		0.02			<0.01			0.02				P
Fluoride		0.51			0.64			0.5				
Hardness		780.			897.			965.				L
Iron		1.09			2.10			0.43				
Lead		0.004			0.02			<0.02				E
Magnesium		118.8			140.			150.				
Manganese		0.07			0.07			0.03				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		<0.01			<0.02			<0.02				
Ammonia		0.10			0.04			0.04				
Nitrate		0.26			0.22			0.06				
Nitrite		<0.01						<0.02				
Phosphate		<0.01										
Potassium		7.10			9.			10.				
Selenium		<0.001			0.002			<0.001				
Sodium		490.			546.			550.				
Sulfate		1482.			1644.			1624.				
Sulfide		<0.10			<0.2			<0.2				
TDS		2466.			2640.			2624.				
Zinc		0.017			0.14			0.21				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-11

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		10.1			8.9			11.1				
pH		7.73			8.0			7.41				
Temp. (°C)		10.			11.			11.				N
Conductiv.		7900.			10900.			3600.				
Aluminum		1.17			0.15			0.11				O
Arsenic		0.003			<0.001			<0.001				
Barium		0.06			0.02			<0.01				
Bicarbon.		378.			485.			456.				
Boron		0.50			0.57			0.40				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		160.			361.			380.				A
Carbonate		<0.01			0.			0.				
Chloride		358.			615.			648.				M
Chromium		0.010			<0.01			<0.01				
Copper		0.03			<0.01			<0.01				P
Fluoride		0.51			0.43			0.4				
Hardness		1470.			3691.			3943.				L
Iron		1.14			6.30			1.17				
Lead		0.016			0.02			<0.02				E
Magnesium		256.8			680.			730.				
Manganese		0.08			0.53			0.37				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.02			<0.02			<0.02				
Ammonia		<0.01			0.37			0.33				
Nitrate		0.16			0.03			0.50				
Nitrite		<0.01						<0.02				
Phosphate		<0.01										
Potassium		8.06			7.			10.				
Selenium		<0.001			<0.001			<0.001				
Sodium		1120.			2080.			2260.				
Sulfate		3050.			6563.			6998.				
Sulfide		<0.10			<0.2			<0.2				
TDS		5166.			11252.			11466.				
Zinc		0.033			0.05			0.17				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-12

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		7.80			6.2			8.60				8.75
pH		7.84			8.0			7.35				7.91
Temp. (^{o}C)		11.			10.			10.				12.
Conductiv.		2600.			2100.			800.				1200.
Aluminum		0.23			0.49			0.15				
Arsenic		0.004			<0.001			<0.001				
Barium		0.04			0.02			<0.01				
Bicarbon.		522.			395.			376.				482.
Boron		0.58			0.27			0.25				
Cadmium		<0.001			<0.005			<0.005				
Calcium		198.			216.			202.				107.
Carbonate		<0.01			0.			0.				0.
Chloride		34.3			35.			37.				36.8
Chromium		0.010			<0.01			<0.01				
Copper		0.03			<0.01			0.01				
Fluoride		0.34			0.43			0.4				
Hardness		920.			979.			931.				882.
Iron		0.38			1.84			0.96				1.14
Lead		<0.001			0.03			0.03				
Magnesium		102.			107.			104.				101.
Manganese		0.02			0.04			0.14				0.20
Mercury		<0.0002			<0.002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		<0.01			<0.02			<0.02				
Ammonia		0.40			0.65			0.49				
Nitrate		2.80			0.03			0.45				
Nitrite		<0.01						<0.02				
Phosphate		0.03										
Potassium		6.59			9.			8.				9.1
Selenium		0.002			<0.001			<0.001				
Sodium		200.			239.			216.				204.
Sulfate		872.			938.			941.				810.
Sulfide		<0.10			0.2			<0.2				
TDS		1706.			1808.			1762.				1780.
Zinc		0.085			0.01			0.05				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-13

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		23.1			22.7			22.65				
pH		7.48			7.9			7.14				
Temp. (^{o}C)		13.			11.			12.				N
Conductiv.		25600.			16800.			4700.				
Aluminum		8.57			3.95			2.31				O
Arsenic		0.011			<0.001			<0.001				
Barium		0.35			0.02			0.01				
Bicarbon.		824.			625.			598.				
Boron		0.54			0.53			0.50				S
Cadmium		<0.001			<0.005			<0.005				
Calcium		440.			431.			440.				A
Carbonate		<0.01			0.			0.				
Chloride		439.			450.			467.				M
Chromium		0.051			<0.01			<0.01				
Copper		0.11			<0.01			<0.01				P
Fluoride		0.23			0.34			0.3				
Hardness		3950.			4173.			4216.				L
Iron		21.30			42.3			30.				
Lead		0.007			0.02			<0.02				E
Magnesium		684.			755.			760.				
Manganese		1.04			0.84			0.78				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		0.08			0.03			0.03				
Ammonia		0.20			0.08			0.13				
Nitrate		56.00			127.81			109.96				
Nitrite		<0.01						0.04				
Phosphate		0.03										
Potassium		29.46			36.			30.				
Selenium		<0.010			0.598			0.339				
Sodium		3948.			3800.			4190.				
Sulfate		10650.			11245.			10826.				
Sulfide		<0.10			0.6			<0.2				
TDS		16796.			17728.			17244.				
Zinc		0.158			0.05			0.03				

KAISER COAL CORPORATION - WELLINGTON PREPARATION PLANT
ACT/007/012
1986 WATER MONITORING DATA

SAMPLE LOCATION: GW-14

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Depth (ft)		12.3			10.1			8.05				
pH		7.58			8.0			7.3				
Temp. (°C)		11.			9.			10.				
Conductiv.		3850.			3220.			1300.				N
Aluminum		0.62			0.61			0.16				
Arsenic		0.003			<0.001			<0.001				O
Barium		0.07			0.05			0.03				
Bicarbon.		276.			235.			224.				
Boron		0.54			0.58			0.40				
Cadmium		<0.001			<0.005			<0.005				S
Calcium		114.			121.			130.				
Carbonate		<0.01			0.			0.				A
Chloride		87.2			92.			95.				
Chromium		0.007			<0.01			<0.01				M
Copper		0.17			<0.01			<0.01				
Fluoride		0.54			0.66			0.6				P
Hardness		735.			848.			858.				
Iron		1.00			1.11			0.36				L
Lead		0.016			<0.02			0.02				
Magnesium		108.			133.			130.				E
Manganese		0.07			0.02			0.01				
Mercury		<0.0002			<0.0002			<0.0002				
Molybdenum		<0.01			<0.05			<0.05				
Nickel		<0.01			<0.02			<0.02				
Ammonia		<0.01			0.06			0.04				
Nitrate		0.31			0.02			0.01				
Nitrite		<0.01						<0.02				
Phosphate		0.02										
Potassium		8.37			10.			10.				
Selenium		0.002			<0.001			<0.001				
Sodium		536.			596.			580.				
Sulfate		1530.			1642.			1632.				
Sulfide		<0.10			<0.2			0.4				
TDS		2492.			2632.			2580.				
Zinc		1.101			0.05			0.05				

TABLE 4 GROUND WATER SAMPLING

	Baseline Monitoring	Operational Monitoring	Postmining Monitoring
Type of Sampling Site	Springs, In-Mine Flows, Boreholes, Observation Wells	Springs, In-Mine Flows, Boreholes, Observation Well	Springs, Observation Wells
Field Measurements (see Table 3)	Yes	Yes	Yes
Sampling Frequency Each Site	At least four samples per annum, at fixed monthly intervals.	Quarterly samples for in-mine flows. For other sites, four samples per annum at fixed monthly intervals.	One sample per annum (spring sampling at low flow).
Sampling Duration	Two years (one complete year of data before submission of PAP).	Every year until two years after surface reclamation activities have ceased.	Every year until termination of bonding.
Type of Data Collected and Reported	Water levels and/or flow and water quality.	Water levels and/or flow. For springs, one water quality sample at low flow.	Water levels and/or flow and water quality per operational parameters.
Comments	First year of baseline monitoring and the year preceding repermitting; spring and seep inventory taken both during the Fall and Spring.	During the year preceding repermitting. For springs, one water quality sample at low flow per baseline parameters. For other sites, one sample per baseline parameter.	

0104R

section is not considered significant. This evaluation is made for both the high and low flow periods. However, to provide additional protection for the environment, the East Side Slurry Catch Basin has been constructed.

(d) Does not apply.

UMC 784.16 **Reclamation Plan: Ponds, Impoundments, Banks, Dams and Embankments**

(a) The coal cleaning plant, refuse disposal areas, and the water clarification ponds are existing and have been in continuous operation since 1958. The site investigations were conducted by Dames and Moore-Soils Mechanics Engineers in 1957.

The impounding structures were investigated in 1978 by Rollins, Brown, and Gunnell, Inc. professional engineers to evaluate slope stability. Appendix C contains a copy of this report.

(1) (i) Ponds, impoundments and embankments have been designed and/or evaluated by a Registered Professional Engineer.

(ii) A description of the function of each pond, impoundment and embankment is included under section 784.11. Maps and cross - sections are as follows:

Upper Refuse Dike - Appendix C, E9-3441
Lower Refuse Dike - Appendix C, E9-3441
- Appendix E
Clear Water Dike - Appendix C, E9-3341
North Dike - Appendix C, E9-3341
Auxiliary Pond - C9-1285
Road Pond - E9-3453
Heat Dryer Pond - A9-1464
East Side Catch Basin - E9-3450

(iii) See Section 783.13, 14, 15 and 16 for hydrologic and geologic information.

(iv) Applies to underground mining.

(v) Refer to Appendix E

2. The Upper Refuse Dike, Lower Refuse Dike and Clear Water Dike meet or exceed the size criteria of the Mine Safety and Health Administration 30 CFR 77.216(a).

(i) The stability of the structures have been accepted by MSHA based on the evaluations and certifications of Rollins, Brown and Gunnell, Inc. (RGBI)

(ii) The geotechnical investigation, design and construction of the structures is discussed in the RGBI report in Appendix C.

The geotechnical investigation, design and construction for the proposed impoundments modifications are included in Appendix E.

The as built drawings for the Lower Refuse Dike are in Appendix E.

(iii) The slurry ponds and impoundments were constructed to require minimal, if any, maintenance. The impoundments and ponds are visited daily to observe the structures for evidence of instability and/or potential required maintenance. Substandard conditions are corrected immediately. A walking reconnaissance is conducted weekly on the impounding structures to inspect and observe the structures for instability or required maintenance. Substandard conditions are corrected immediately. Results of these examinations are recorded in a permanent record by a qualified person at the Sunnyside Mine office. Copies of the annual impoundments report are included in pages 784 - 32i to 784 - 32v in lieu of the annual report.

The operation of the ponds to clarify water for the operation of the coal cleaning plant is as follows:

A. During the operation of the coal cleaning plant, the clear water pumps draw water from the clear water pond and pump the water to the clear water head tanks located in the plant. Clear water is gravity fed from the head tanks for processing of the raw coal into a clean coal product and a waste product. The waste product is crushed to a -3/4 inch size, pulp fed to a refuse pump and pumped through a 12 inch slurry line to the waste disposal area east of the Price River. The coarse material is deposited immediately. The water bearing the fine material passes into ponds with the fine material settling to provide a clarified water passing into the clear water ponds for recirculation to the coal cleaning plant.

KAISER COAL

KAISER COAL CORPORATION
Sunnyside Coal Mines
P.O. Box 10
Sunnyside, Utah 84539
Telephone (801) 888-4421

April 8, 1987

Mr. Lowell P. Braxton, Administrator
Mineral Resource Development & Reclamation Program
Utah Division of Oil, Gas & Mining
355 W. North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Re: Impoundments Report
Wellington Preparation Plant
ACT/007/012

Dear Mr. Braxton:

Attached please find the Annual Impoundments Report submitted to the Mine Safety and Health Administration for the ponds at Wellington which meet the criteria of 30 CFR 77.216(a).

Quarterly inspections were conducted of the ponds at Wellington which do not meet these criteria (namely - the Auxiliary, Dryer, Pipeline, and Road ponds). The banks of all ponds were stable with the only substandard condition found being minor erosion at the inlets to the Pipeline pond. Also, the spillway of the Pipeline pond was improved as required by the Division.

Sincerely,

Carl W. Winters

Carl W. Winters, P. E.
Senior Mining Engineer

attach

cc: B. J. Bourquin

REGISTERED PROFESSIONAL ENGINEER
CARL W. WINTERS
NO. 5110
STATE OF UTAH

KAISER COAL

KAISER COAL CORPORATION
Sunnyside Coal Mines
P.O. Box 10
Sunnyside, Utah 84539
Telephone (801) 888-4421

April 8, 1987

Mr. John W. Barton
District Manager
Mine Safety and Health Administration
P. O. Box 25367
Denver, Colorado 80225

Re: Annual Impoundments Report
Wellington Preparation Plant
I. D. No. 42-00099

Dear Mr. Barton:

Attached please find the subject reports for the Wellington Preparation Plant. The impoundments at Wellington are identified as:

Clear Water Pond	1211-UT-09-00099-02
Lower Refuse Pond	1211-UT-09-00099-03
Upper Refuse Pond	1211-UT-09-00099-04

As you are probably aware, the plant continues in an idle status.

Sincerely,

Carl W. Winters

Carl W. Winters
Senior Mining Engineer

attach (3)

cc: B. J. Bourquin
L. P. Braxton (UDOGM)

KAISER COAL CORPORATION
WELLINGTON PREPARATION PLANT
MSHA I.D. #42-00099

WATER IMPOUNDMENT AND IMPOUNDING STRUCTURE ANNUAL REPORT

IMPOUNDMENT: CLEAR WATER POND

IMPOUNDMENT I.D. 1211-UT-09-00099-02

Changes in the geometry of the impounding structure during this reporting period: No modifications were made to the impounding structure during 1986.

Instrumentation: There is no instrumentation on the impounding structure.

Impounded water, sediment, or slurry level:

	Depth	Elevation
Average	20' 6"	5,358.5
Maximum	26' 0"	5,364.0

Storage capacity of the impounding structure: Design capacity is 185 acre-feet

Average volume of water, sediment, or slurry impounded: Approximately 115 acre-feet

No fires occurred in the construction materials.

Other aspects of the impounding structure affecting its stability which occurred during this reporting period: There were no known changes to the impounding structure which would have affected its stability. However, it is being allowed to dry out.

I, Carl W. Winters, a registered professional engineer in the State of Utah, license number 5118, do hereby certify that all work performed on the Clear Water Pond and Embankment during 1986 was in accordance with the approved plan.

REGISTERED PROFESSIONAL ENGINEER
CARL W. WINTERS
NO. 5118
STATE OF UTAH

Carl W. Winters — 4-8-87

Carl W. Winters   Date

KAISER COAL CORPORATION
WELLINGTON PREPARATION PLANT
MSHA I.D. #42-00099

WATER IMPOUNDMENT AND IMPOUNDING STRUCTURE ANNUAL REPORT

IMPOUNDMENT: LOWER REFUSE POND
IMPOUNDMENT I.D. 1211-UT-09-00099-03

Changes in the geometry of the impounding structure during this reporting period: No modifications were made to the impounding structure during 1986.

Instrumentation: There is no instrumentation on the impounding structure.

Impounded water, sediment, or slurry level:

	Depth	Elevation
Average	31' 0"	5373.0
Maximum	33' 1"	5375.1

Storage capacity of the impounding structure: Design capacity is 1200 acre-feet.

Average volume of water, sediment, or slurry impounded: Approximately 1000 acre-feet.

No fires occurred in the construction materials.

Other aspects of the impounding structure affecting its stability which occurred during this reporting period: A potential deflection of the decant was identified by MSHA. Field investigation identified possible damage. Prior to the pond being returned to active use, an exploratory trench will be excavated and the decant condition evaluated. Repair work, if necessary, will then be performed.

I, Carl W. Winters, a registered professional engineer in the State of Utah, license number 5118, do hereby certify that all work performed on the Lower Refuse Pond and Embankment during 1986 was in accordance with the approved plan.

REGISTERED PROFESSIONAL ENGINEER
CARL W. WINTERS
NO. 5118
STATE OF UTAH

Carl W. Winters — 4-8-87
Date

784-32IV

KAISER COAL CORPORATION
WELLINGTON PREPARATION PLANT
MSHA I.D. #42-00099

WATER IMPOUNDMENT AND IMPOUNDING STRUCTURE ANNUAL REPORT

IMPOUNDMENT: UPPER REFUSE POND
IMPOUNDMENT I.D. 1211-UT-09-00099-04

Changes in the geometry of the impounding structure during this reporting period: No modifications were made to the impounding structure during 1986.

Instrumentation: There is no instrumentation on the impounding structure.

Impounded water, sediment, or slurry level: This structure did not impound water during 1986.

Storage capacity of the impounding structure: The design capacity of this impoundment did not change during 1986.

Average volume of water, sediment, or slurry impounded: This structure did not impound water during 1986.

No fires occurred in the construction materials.

Other aspects of the impounding structure affecting its stability which occurred during this reporting period: There were no known changes to the impounding structure which would have affected its stability. However, it was allowed to dry out.

I, Carl W. Winters, a registered professional engineer in the State of Utah, license number 5118, do hereby certify that all work performed on the Upper Refuse Pond and Embankment during 1986 was in accordance with the approved plan.

REGISTERED PROFESSIONAL ENGINEER
CARL W. WINTERS
NO. 5118
STATE OF UTAH

Carl W. Winters — 4-8-87
Carl W. Winters — Date

784-32V

The principle water loss in the above process is associated with evaporation from the ponds and the coal drying plant. Make up water is pumped from the Price River by pumps located in the Pumphouse. The required water levels in the individual ponds are controlled by gates in the stand pipes passing the water to the succeeding pond as required for water clarification.

(iv) See UMC 784.13(b)(1) for the timetable for reclamation of the pond area.

See UMC 784.13(b)(1) for removal plans.

(3) The remaining ponds within the permit area do not meet the size criteria of 30 CFR 77.216.

(b) The Auxiliary Road and Heat Dryer Ponds are incised ponds and do not require impounding structures. All ponds within the permit area are temporary. Hydrologic design criteria are included in Appendix B.

The East Side Slurry Catch Basin has been sized to handle flows from the area adjacent to the slurry pipeline. This is a temporary structure.

(c) All impoundments are temporary structures which have been accepted by MSHA.

Refer to Appendices C and E for current and modified impoundment stability.

Refer to Appendix E for the hydrologic evaluation.

Refer to item (a)(2)(iii) of this section for operation maintenance of impounding structures.

(d) The disposal of coal processing waste in the designated area east of the Price River does not create waste banks as described in 817.81 - 817.85.

(e) The Upper Refuse Dike is an existing structure constructed of coal processing waste. The structure separates the Upper Refuse Pond from the Lower Refuse Pond. The Rollins, Brown and Gunnell, Inc. report of 1978 contains the information developed in their investigation of this structure.

(1) Figure 3 exhibits the log borings and the test pit that was included in their investigations.

(2) The log borings show the character of the overburden materials.

(3) This is an existing structure. Identification of current springs, seepage and groundwater flow is not possible.

(4) There is no possibility of mudflows, rock debris falls or other landslides into the dam, embankment or impoundment material. The operator commits to notifying the Division within 10 days of the occurrence of a slide which has potential for adverse effect on public property, health, safety or the environment.

Refer to Appendix E for the proposed modification and as constructed drawings for the Lower Refuse Dike.

(f) The stability analyses of the structures is exhibited in Appendix C. Refer to Appendix E for the stability analysis of the proposed modifications.

UMC 784.22 <u>Diversions</u>

Diversion Ditch Adjacent to the North Dike:

The operator established the refuse disposal area and constructed the water impounding structure in a drainage that in prior years had been used to course irrigation return water to the Price River. In 1970, the operator excavated a ditch (see Map E9-3341) that now intercepts any water flowing north and diverts this flow to the Price River.

Proposed modifications and design calculations based on a 100 year 24 hour storm are included in Appendix E. This diversion will not be removed during reclamation for the following reasons:

1. The slurry ponds have been built in the original drainage.

2. The volume of materials which will be contained in the slurry ponds at the time of reclamation will preclude restoring the area to approximate original contour.

3. The diversion ditch will be at an elevation lower than the ultimate elevation of the consolidated fine refuse.

Diversion Ditch West of the Plant Site:

The operator established a diversion west of the coal cleaning plant to intercept runoff from precipitation events to pass this runoff to the south and preclude flooding of the coal cleaning plant.

Hydrologic evaluation of this ditch is contained in Appendix B. This ditch is a temporary structure and will be graded to approximate original contour when a stand of vegetation is achieved at the plant site.

UMC 784.24 Transportation Facilities

(a) The plant roads, conveyors, railroad and refuse pumpline are shown on E9-3341. The road from the gate to the coal cleaning plant is a blacktopped surface some 12 feet wide and is relatively flat. The plant railroad tracks are on engineered grades to facilitate the movement of railroad cars within the plant area. The highway and railroad bridge that span the Price River at the entrance to the plant property are engineered structures. The culverts under the plant railroad tracks were installed in accord with the engineered plans at the time of construction.

The plant road bridge spanning the Price River is an engineered concrete structure which was constructed in 1957-58 along with the coal cleaning plant complex. It is assumed that the specification included passing a design storm runoff. The calculations are not available, however, the bridge provides capacity to pass a larger storm event than the railroad bridges immediately downstream from the plant bridge.

The culverts under the road and plant railroad do not carry peak runoff. They provide an equalization for water accumulation in the relatively flat area.

The North Ditch capacity calculations are included in Appendix E.

The diversion ditch calculations are shown in Appendix B. Refer to Drawing No.'s C9-1286 and A9-1432 for road grades and cross sections.

(b) There are no steep cut slopes within the plant area.

(c) Relocation of any natural waterway is not in the future planning at the coal cleaning plant.

(d) The relatively flat plant area eliminates any requirement for protection of inlay culvert ends.

(e) The plant roads other than the main road into the plant are unimproved with a top cover of coal cleaning waste as necessary for stability.

UMC 817.15 <u>Casing and Sealing of Underground Openings</u>

The fourteen water monitoring wells at the Wellington Preparation Plant, illustrated on Map 1 E9-3451, will be abandoned in accordance with Regulation UMC 817.15.