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Volume IV

Appendices V-W

Remedial Investigation National Smelting of New Jersey, Inc./ NL Industries, Inc. Site

Pedricktown, New Jersey

NL Industries, Inc.
Hightstown, New Jersey

March 1991

O'BRIEN & GERE

NLI 002 0262

VOLUME IV

APPENDICES V-W

REMEDIAL INVESTIGATION
NATIONAL SMELTING OF
NEW JERSEY, INC.,/
NL INDUSTRIES, INC. SITE

PEDRICKTOWN, NEW JERSEY

NL INDUSTRIES, INC.
HIGHTSTOWN, NEW JERSEY

MARCH 1991

NLI 002 0263

APPENDIX V

1990 SAMPLING RESULTS

NLI 002 0264

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APPENDIX V - 1990 ANALYTICAL RESULTS

A Remedial Investigation (RI) Report was submitted to the USEPA and NJDEP on 16 October 1990. Correspondence from the USEPA dated 7 August, 19 September, 5 October, and 19 October 1990 requested the collection of additional samples on-site and on adjacent properties. Section 7.02 of the RI Report recommended additional studies in response to the USEPA correspondence. Sampling was conducted with USEPA oversight during October, November and December 1990.

Three figures have been prepared to illustrate sample locations. Tables have been prepared which present 1990 analytical results as well as relevant results previously generated during the Remedial Investigation. The data generated during 1990 address the above-referenced EPA request.

The supplemental soil testing better defined an area about 1,000 feet east of the site where elevated surface soil lead concentrations of 203 to 1770 mg/kg are present. The supplemental stream sediment testing defined limits of lead contamination downstream in the West Stream. No hazardous substance list (HSL) organics were detected in the stream sediment samples or surface water sample. Surface water quality results for inorganics were comparable to previous data. Ground water quality results for the water table aquifer were consistent with previous results; on-site wells have been affected by manufacturing activities while off-site wells do not demonstrate detectable contamination. In summary, the 1990 results support the site characterization and risk assessment presented in the Remedial Investigation.

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Table V-1
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
On-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)	Lead concentration mg/kg dry weight
201	on-site	9-12-88	T0050	0-3	21
		9-12-88	T0051	3-6	12
202	on-site	9-12-88	T0054	0-3	19
		9-12-88	T0055	3-6	15
203	on-site	9-12-88	T0058	0-3	25
		9-12-88	T0059	3-6	16
204	on-site	9-14-88	T0185	0-3	153
		9-14-88	T0186	3-6	45
205	on-site	9-14-88	T0062	0-3	29
		9-14-88	T0063	3-6	18
206	on-site	9-14-88	T0181	0-3	60
		9-14-88	T0182	3-6	30
207	on-site	9-14-88	T0189	0-3	100
		9-14-88	T0190	3-6	26
208	on-site	9-12-88	T0066	0-3	22
		9-12-88	T0067	3-6	16
209	on-site	9-14-88	T0173	0-3	634
		9-14-88	T0174	3-6	756
		9-14-88	T0175	6-12	131
		9-14-88	T0176	12-18	83
210	on-site	9-12-88	T0070	0-3	33
		9-12-88	T0071	3-6	25
211	on-site	9-14-88	T0169	0-3	7500
		9-14-88	T0170	3-6	5910
		9-14-88	T0171	6-12	5320
		9-14-88	T0172	12-18	1820
		8-17-89	I9418	18-24	22.3
		8-17-89	I9419	24-30	45.3
		11-1-90	L5955	18-24	118
		11-1-90	L5954	24-30	34.5
212	on-site	9-13-88	T0128	0-3	333
		9-13-88	T0129	3-6	172
		9-13-88	T0130	6-12	68
		9-13-88	T0131	12-18	34
213	on-site	9-12-88	T0074	0-3	1800
		9-12-88	T0075	3-6	2040
		9-12-88	T0076	6-12	R
		9-12-88	T0077	12-18	R
		8-17-89	I9430	18-24	891
		11-1-90	L5957	18-24	18.1
214	on-site	9-14-88	T0140	0-3	572
		9-14-88	T0141	3-6	120
215	on-site	9-14-88	T0193	0-3	1730
		9-14-88	T0194	3-6	383
		9-14-88	T0195	6-12	39
		9-14-88	T0196	12-18	28

Table V-1
(continued)
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
On-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)	Lead concentration mg/kg dry weight
216	on-site	9-14-88	T0144	0-3	2080
		9-14-88	T0145	3-6	165
217	on-site	9-14-88	T0165	0-3	12700
		9-14-88	T0166	3-6	12300
		9-14-88	T0167	6-12	6880
		8-17-89	I9424	12-18	2940
		8-17-89	I9427	12-18	246
		8-17-89	I9425	18-24	231
		8-17-89	I9428	18-24	102
		8-17-89	I9426	24-30	302
		8-17-89	I9429	24-30	173
		11-1-90	L5960	12-18	101
		11-1-90	L5970	18-24	298
		11-1-90	L5962	24-30	672
218	on-site	9-14-88	T0197	0-3	9340
		9-14-88	T0198	3-6	1620
		9-14-88	T0199	6-12	4370
		9-14-88	T0200	12-18	R
		8-17-89	I9420	18-24	2.91
		8-17-89	I9421	24-30	6.01
		11-1-90	L5953	18-24	39.2
		11-1-90	L5958	24-30	17.4
219	on-site	9-14-88	T0149	0-3	740
		9-14-88	T0150	3-6	99
220	on-site	9-14-88	T0161	0-3	3590
		9-14-88	T0162	3-6	2840
		9-14-88	T0163	6-12	R
		9-14-88	T0164	12-18	R
		8-17-89	I9422	18-24	15.9
		8-17-89	I9423	24-30	51.5
		11-1-90	L5958	18-24	3.26
		11-1-90	L5959	24-30	277
221	on-site	9-14-88	T0153	0-3	1580
		9-14-88	T0154	3-6	793
		9-14-88	T0155	6-12	117
		9-14-88	T0156	12-18	49
222	on-site	9-14-88	T0157	0-3	4610
		9-14-88	T0158	3-6	226
		9-14-88	T0159	6-12	84
		9-14-88	T0160	12-18	152
223	on-site	9-14-88	T0177	0-3	1220
		9-14-88	T0178	3-6	170
		9-14-88	T0179	6-12	56
		9-14-88	T0180	12-18	20
301	on-site	9-13-88	T0086	0-2	401
302	on-site	9-12-88	T0088	0-2	44.2
303	on-site	9-13-88	T0089	0-2	72.1
304	on-site	9-12-88	T0087	0-2	238
305	on-site	9-13-88	T0090	0-2	367
306	on-site	9-13-88	T0091	0-2	845
307	on-site	9-13-88	T0092	0-2	119
308	on-site	9-13-88	T0093	0-2	1190
308	on-site	9-12-88	T0094	0-2	480

Note: R - indicates data rejected based on data validation
Sample locations identified in Figure 7. This Table includes data previously presented in Table 12 as well as 1990 results.

Table V-2
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Off-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)	Lead concentration mg/kg dry weight
1	off-site	9-16-88	T0371	0-3	22.8
		9-16-88	T0372	3-6	12.9
1	off-site	9-16-88	T0375	0-3	31.2
		9-16-88	T0376	3-6	11.5
2	off-site	9-16-88	T0367	0-3	58.6
		9-16-88	T0368	3-6	24.6
3	off-site	9-16-88	T0359	0-3	35.7
		9-16-88	T0360	3-6	29.7
4	off-site	9-16-88	T0363	0-3	89
		9-16-88	T0364	3-6	23.1
5	off-site	9-16-88	T0355	0-3	55.4
		9-16-88	T0356	3-6	13.4
6	off-site	9-15-88	T0289	0-3	538
		9-15-88	T0290	3-6	88.8
		9-15-88	T0291	6-12	44.4
		9-15-88	T0292	12-18	25
7	off-site	9-15-88	T0285	0-3	685
		9-15-88	T0286	3-6	215
		9-15-88	T0287	6-12	133
		9-15-88	T0288	12-18	21.5
8	off-site	9-15-88	T0281	0-3	121
		9-15-88	T0282	3-6	41.5
9	off-site	9-15-88	T0309	0-3	48.4
		9-15-88	T0310	3-6	23.1
10	off-site	9-15-88	T0305	0-3	26.6
		9-15-88	T0306	3-6	27.8
11	off-site	9-15-88	T0245	0-3	57.9
		9-15-88	T0246	3-6	43.3
11	off-site	9-15-88	T0249	0-3	54.4
		9-15-88	T0250	3-6	42.5
12	off-site	9-15-88	T0233	0-3	72.9
		9-15-88	T0234	3-6	28.4
13	off-site	9-15-88	T0317	0-3	32.3
		9-15-88	T0318	3-6	28.2
14	off-site	9-15-88	T0229	0-3	26.8
		9-15-88	T0230	3-6	26.4
15	off-site	9-12-88	T0078	0-3	32.6
		9-12-88	T0079	3-6	33.1
16	off-site	9-12-88	T0082	0-3	130
		9-12-88	T0083	3-6	21
17	off-site	9-15-88	T0213	0-3	175
		9-15-88	T0214	3-6	44.5

Table V-2
(continued)
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Off-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)	Lead concentration mg/kg dry weight
18	off-site	9-15-88	T0321	0-3	46
		9-15-88	T0322	3-6	29.2
19	off-site	9-15-88	T0329	0-3	45.3
		9-15-88	T0330	3-6	29.5
20	off-site	9-15-88	T0325	0-3	88.4
		9-15-88	T0326	3-6	38.1
21	off-site	9-15-88	T0205	0-3	41.2
		9-15-88	T0206	3-6	40.3
22	off-site	9-15-88	T0201	0-3	46.3
		9-15-88	T0202	3-6	50.8
24	off-site	9-13-88	T0112	3-6	367
		9-13-88	T0113	3-6	132
25	off-site	9-13-88	T0120	0-3	307
		9-13-88	T0121	3-6	317
		9-13-88	T0122	6-12	244
		9-13-88	T0123	12-18	80.6
26	off-site	9-13-88	T0116	0-3	68.4
		9-13-88	T0117	3-6	62.8
27	off-site	9-15-88	T0333	0-3	206
		9-15-88	T0334	3-6	226
		9-15-88	T0335	6-12	142
		9-15-88	T0336	12-18	59.8
28	off-site	9-15-88	T0209	0-3	275
		9-15-88	T0210	3-6	106
29	off-site	9-13-88	T0104	0-3	161
		9-13-88	T0105	3-6	103
30	off-site	9-13-88	T0108	0-3	81.6
		9-13-88	T0109	3-6	74.4
31	off-site	9-15-88	T0241	0-3	77.9
		9-15-88	T0242	3-6	78.2
32	off-site	9-15-88	T0217	0-3	48.1
		9-15-88	T0218	3-6	21.5
33	off-site	9-15-88	T0237	0-3	32.7
		9-15-88	T0238	3-6	32.6
34	off-site	9-15-88	T0221	0-3	30.9
		9-15-88	T0222	3-6	31.6
35	off-site	9-15-88	T0225	0-3	22.9
		9-15-88	T0226	3-6	25.7
36	off-site	9-13-88	T0341	0-3	40.9
		9-13-88	T0342	3-6	40.2

Table V-2
(continued)
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Off-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)	Lead concentration mg/kg dry weight
37	off-site	9-15-88	T0337	0-3	74.7
		9-15-88	T0338	3-6	68.6
38	off-site	9-15-88	T0350	0-3	72.1
		9-15-88	T0351	3-6	71.1
39	off-site	9-15-88	T0346	0-3	48.2
		9-15-88	T0347	3-6	43.1
40	off-site	9-15-88	T0273	0-3	106
		9-15-88	T0274	3-6	98.1
41	off-site	9-15-88	T0269	0-3	145
		9-15-88	T0270	3-6	134
42	off-site	9-15-88	T0261	0-3	175
		9-15-88	T0262	3-6	167
43	off-site	9-15-88	T0257	0-3	221
		9-15-88	T0258	3-6	199
44	off-site	9-15-88	T0265	0-3	1770
		9-15-88	T0266	3-6	833
		8-17-89	I9416	6-12	50.7
		8-17-89	I9417	12-18	68.6
		11-2-90	L5943	6-12	166
		11-2-90	L5944	12-18	46.1
44A	off-site	8-17-89	I9412	0-3	203
		8-17-89	I9413	3-6	31.7
		8-17-89	I9414	6-12	23.1
		8-17-89	I9415	23-28	10.7
45	off-site	9-15-88	T0253	0-3	108
		9-15-88	T0254	3-6	37
46	off-site	9-15-88	T0277	0-3	87
		9-15-88	T0278	3-6	25
47	off-site	9-15-88	T0313	0-3	457
		9-15-88	T0314	3-6	382
		9-15-88	T0315	6-12	55.4
		9-15-88	T0316	12-18	19.2
48	off-site	9-15-88	T0301	0-3	26
		9-15-88	T0302	3-6	35
49	off-site	9-15-88	T0297	0-3	25
		9-15-88	T0298	3-6	28
50	off-site	9-15-88	T0293	0-3	34
		9-15-88	T0294	3-6	29

NOTE: Sample locations identified on Figure 6. This table includes data previously presented in Table 13 as well as 1990 results.

Table V-2
(continued)
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Off-Site Soil Analyses

Sample ID	Sample Type	Sample Date	Laboratory Number	Sample Depth(in)		Lead concentration mg/kg dry weight
51-59 Not Used						
60	off-site	11-2-90	L5929	0-3		294
		11-2-90	L5930	3-6		51.4
		11-2-90	L5927	6-12	J	5.67
		11-2-90	L5928	12-18	J	4.64
61	off-site	11-2-90	L5932	0-3		844
		11-2-90	L5931	3-6		105
		11-2-90	L5933	6-12		17.6
		11-2-90	L5934	12-18	J	3.09
62	off-site	11-2-90	L5935	0-3		221
		11-2-90	L5936	0-3		414
		11-2-90	L5937	3-6		129
		11-2-90	L5938	3-6		46.7
		11-2-90	L5939	6-12	J	2.98
		11-2-90	L5940	6-12	J	9.77
		11-2-90	L5941	12-18	J	2.24
		11-2-90	L5941	12-18	J	4.17
63	off-site	11-2-90	L5949	0-3		1110
		11-2-90	L5950	3-6		353
		11-2-90	L5951	6-12		131
		11-2-90	L5952	12-18		35
64	off-site	11-2-90	L5945	0-3		1240
		11-2-90	L5946	3-6		494
		11-2-90	L5947	6-12		79.5
		11-2-90	L5948	12-18		33.3

NOTE: Sample ID's refer to sample locations as indicated on Figure V-3.

√ = Exceeds NJ-Soil Action Level

TABLE V-3
NATIONAL SMELTING OF NEW JERSEY, INC./
NL INDUSTRIES, INC. SITE
STREAM SEDIMENT ANALYSES (1990)

Sample ID	Sample Date	Laboratory Number	Sample Depth(in.)	Antimony mg/kg	Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/kg	lead mg/kg	Selenium mg/kg	Zinc mg/kg	TOC % w/w	pH S.U.
EPA1	12-11-90	L5970	0-6	<29.4	34.0	3.01		25.5	101	<1.76	471	3.95	6.6
	12-11-90	L5971	6-12	20.0	35.5	10.0	57.6	42.8	587	<0.909	553	0.25	6.7
EPA2	12-11-90	L5972	0-6	44.8	63.3	9.13	46.0	74.8	1340	<2.50	236	23.50	6.0
	12-11-90	L5973	6-12	<29.4	31.1	6.27	35.9	34.9	767	<1.76	143	13.78	5.9
EPA3	12-11-90	L5974	0-6	<15.6	15.7	11.7	34.9	43.0	672	<0.938	464	7.10	6.9
EPA4	12-11-90	L5975	0-6	54.3	90.8	63.3	145	160	2870	2.38	1920	13.15	7.1
	12-11-90	L5976	6-12	34.1	64.7	35.5	114	107	1550	<1.58	778	11.69	6.8
EPA5	12-11-90	L5977	0-6	53.0	14.8	10.5	559	366	643	<3.00	1340	15.33	7.2
	12-11-90	L5978	6-12	25.6	17.3	3.66	290	165	270	<1.43	595	12.74	7.0
EPA6	12-10-90	L5979	0-6	<10.0	9.80	2.56	83.6	58.1	122	1.30	383	3.59	5.7
	12-10-90	L5980	6-12	<8.60	16.7	4.47	51.6	40.2	96.2	0.741	459	2.51	6.5
	12-10-90	L5981	12-18	<13.2	24.7	9.35	104	107	186	0.895	827	3.86	5.6
EPA7	12-10-90	L5982	0-6	<27.8	35.7	34.3	174	163	1030	<1.67	1410	8.18	7.1
	12-10-90	L5983	6-12	<16.6	32.0	27.3	186	176	779	1.51	915	6.61	7.1
	12-10-90	L5984	12-18	<9.60	22.1	3.94	118	81.3	170	2.06	339	4.15	6.7
EPA8	12-10-90	L5985	0-6	<6.20	4.14	1.13	7.17	7.23	13.1	<0.370	49.3	0.24	6.3
	12-10-90	L5986	6-12	<5.90	2.09	1.49	10.5	12.6	7.76	<0.353	6.38	0.77	6.2
EPA9	12-10-90	L5987	0-6	<31.3	68.1	61.5	144	159	1010	<1.88	2920	7.94	7.1
	12-10-90	L5988	6-12	<21.7	45.2	36.7	108	114	772	<1.30	1700	7.35	6.8
	12-10-90	L5989	12-18	<11.7	21.9	16.1	52.3	51.3	264	<0.698	844	1.70	6.7
EPA10	12-10-90	L5990	0-6	<9.25	17.2	1.11	45.6	29.0	69.1	<0.556	209	3.04	6.6
	12-10-90	L5991	6-12	<8.20	18.4	<0.492	33.9	21.7	38.6	0.639	119	8.29	5.5
	12-10-90	L5992	12-18	<8.20	18.5	<0.492	31.6	20.3	39.2	0.853	105	4.18	5.5
EPA11	12-10-90	L5963	0-6	<7.60	39.4	0.638	38.5	26.8	74.0	<0.455	196	2.90	6.5
	12-10-90	L5964	6-12	<6.85	28.9	0.717	37.9	25.8	62.4	<0.411	224	3.42	6.4
	12-10-90	L5965	12-18	<7.60	10.3	0.926	53.8	35.1	64.0	<0.455	242	2.81	6.0
EPA12	12-11-90	L5966	0-6	<6.65	1.35	<0.399	20.7	15.9	21.6	<0.400	63.8	0.83	6.1
	12-11-90	L5967	6-12	<6.10	1.55	0.717	42.9	6.62	6.44	<0.366	54.1	0.94	5.9
EPA13	12-12-90	L5968	0-6	1300	235	37.3	31.7	131	26800	3.80	279	8.81	5.6
ES10	11-1-90	L5993	0-6	NJ SAL	20 ppm	3 ppm	100	170	192	4 ppm	350 ppm		
	11-1-90	L5994	6-12	11 ppm					15				
ES11	11-1-90	L5995	0-6						57.3				
	11-1-90	L5996	6-12						4.51				
ES12	11-1-90	L5997	0-6						4.99				
ES13	11-1-90	L5998	0-6						2.27				
	11-1-90	L5999	6-12						1.31				
ES14	11-1-90	L6000	0-6						151				
	11-1-90	L6001	6-12						218				
ES15	11-1-90	L6002	0-6						24.6				
	11-1-90	L6003	6-12						25.9				
ES16	11-1-90	L6004	0-6						249				
	11-1-90	L6005	6-12						16.2				
WS8	11-1-90	L6006	0-6						2180				
WS9	12-12-90	L6008	0-6						699				
	12-12-90	L6010	6-12						4.12				
WS11	11-1-90	L6012	0-6						22400				
	11-1-90	L6014	6-12						532				

EMS

NL I 002 0273

250-1000

TABLE V-3
(CONTINUED)
NATIONAL SMELTING OF NEW JERSEY, INC./
NL INDUSTRIES, INC. SITE
STREAM SEDIMENT ANALYSES (1990)

Sample ID	Sample Date	Laboratory Number	Sample Depth(in.)	Antimony mg/kg	Arsenic mg/kg	Cadmium mg/kg	Chromium mg/kg	Copper mg/kg	lead mg/kg	Selenium mg/kg	Zinc mg/kg	TOC % w/w	pH S.U.
WS13	11-1-90	L6016	0-6						134				
	11-1-90	L6017	6-12						10.3				
	11-1-90	L6017	12-18						2.45				
WS15	11-1-90	L6019	0-6						867				
	11-1-90	L6020	6-12						4240				
WS16	11-1-90	L6021	0-6						642				
	11-1-90	L5969	6-12						558				

Table V-4
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Surface Water Quality Analyses (1990)

SAMPLE ID	LOCATION ID	SAMPLE DATE	LEAD (mg/l)	ANTIMONY (mg/l)	ARSENIC (mg/l)	CADMIUM (mg/l)	CHROMIUM (mg/l)	COPPER (mg/l)	CYANIDE (mg/l)	ZINC (mg/l)	SULFATE (mg/l)	HARDNESS (mg/las CaC03)
L25714	EPA1	12/11/90	0.012	<0.05	0.0037	<0.003	<0.005	0.017		0.223		210
L21390	EPA2	12/11/90	0.068	<0.05	0.0034	<0.003	<0.005	0.017	<0.01	0.088	130	69
L25715	EPA3	12/11/90	0.027	<0.05	0.004	<0.003	<0.005	0.01		0.19		170
L25716	EPA4	12/11/90	0.024	<0.05	0.003	<0.003	<0.005	0.017		0.159		160
L25717	EPA5	12/11/90	0.029	<0.05	0.0039	<0.003	<0.005	0.027		0.077		73
L25718	EPA6	12/10/90	0.007	<0.05	0.0028	<0.003	<0.005	0.013		0.137		62
L25719	EPA7	12/10/90	0.016	<0.05	0.0043	<0.003	<0.005	0.019		0.086		100
L25720	EPA8	12/10/90	0.012	<0.05	0.0037	<0.003	<0.005	0.008		0.139		180
L25721	EPA9	12/10/90	0.011	<0.05	0.0032	<0.003	<0.005	<0.005		0.197		280
L25722	EPA10	12/10/90	0.009	<0.05	0.0049	<0.003	<0.005	0.009		0.161		240
L25723	EPA11	12/10/90	0.009	<0.05	0.0045	<0.003	<0.005	0.010		0.156		240
L25724	EPA12	12/11/90	0.004	<0.05	0.0022	<0.003	<0.005	0.007		0.069		56
L25725	EPA13	12/12/90	0.206	<0.05	0.0029	<0.003	<0.005	0.017		0.106		55

NOTE: Sample EPA2 was analyzed for organic compounds by EPA Methods 8080,8240, 8270 and for phenolics. All of the constituents that could be detected by these methods were found to be below method detection limits.

Table V-5
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Elevations

WELL ID	SCREEN LENGTHS FT	TOP OF CASING FT MSL	WELL DEPTH FT	8/15/88 WATER FT MSL	10/27/88 WATER FT MSL	12/23/88 WATER FT MSL	12/23/89 WATER FT MSL	11/2/90 WATER FT MSL	12/12/90 WATER FT MSL
1R	28.00	15.26	32.00		6.00	6.75		6.49	6.85
2R2	7.00	11.08	22.10	3.84	3.44	4.42	4.17		3.59
3R	29.00	16.04	34.79	4.64	4.14	5.14	4.96	4.46	4.90
4R	12.00	16.74	23.89	5.25	4.64	5.55	5.37	4.89	5.28
5R	9.00	11.97	18.96	5.21	5.22	5.83	5.58	5.30	5.77
6	10.00	14.17	23.50		5.75	5.76	6.02	5.87	6.37
7	10.00	13.04	49.38	1.55	0.79	1.39	1.38	-3.24	2.02
8R	7.00	18.49	110.90		-13.51	-13.10	-13.90	-13.43	-6.94
9R2	8.00	18.67	67.70	-4.49	-6.13	-5.78	-6.12	-5.67	-3.48
10	30.00	15.66	72.42	-2.30	-3.49	-3.21	-3.50	-2.20	
10R	5.00	14.02	71.24					-3.84	-2.16
11	20.00	11.19	53.99	5.94	5.79	6.33	6.16	5.93	6.04
12	20.00	12.81	78.18	-2.05	-3.49	-3.02	-3.30	1.03	-1.97
13	20.00	11.59	110.00				-15.32	-14.75	-7.71
14	20.00	11.39	46.00				3.11	3.99	4.51
15	15.00	11.32	22.00				4.90	4.30	4.88
16	20.00	10.79	54.00				-0.68	-1.07	0.27
17	15.00	9.31	21.00				3.85	3.43	4.11
18	20.00	12.04	54.00				5.75	5.42	5.58
19	15.00	13.04	120.82					-18.45	-8.69
20	10.00	10.54	69.02					-4.34	-2.42
21	10.00	10.60	75.40					-1.76	-0.62
AR	30.00	13.33	35.00						
BR	6.00	10.82	38.85	5.78	5.47	5.99	5.78	5.52	5.66
CR2	6.00	17.90	33.55	5.37	3.62	4.64	4.60	4.02	3.88
HD	15.00	18.67	41.50	5.48	3.92	4.73	4.65	4.09	3.95
HS	15.00	18.77	26.44	5.48	3.87	4.71	4.65	4.07	3.93
ID	25.00	17.18	35.41	6.81	5.40	6.38	6.14	5.52	5.38
IS	10.00	17.35	15.50			8.71		7.67	7.71
JD	10.00	14.02	27.44	6.56	5.57	6.57	6.19	5.58	5.66
JS	10.00	13.89	17.00		5.54	6.53	6.15	5.55	5.61
KD	10.00	13.64	27.47	6.49	5.63	6.54	6.16	6.70	6.78
KS	10.00	12.45	17.78	6.56	2.70	6.61	6.25	5.77	5.93
LD	7.00	12.83	18.71	5.20	4.58	5.92	5.66	4.89	5.49
LS	7.00	12.68	13.05		4.93	6.29	6.08	5.32	5.98
MD	8.00	10.31	19.69	4.02	3.79	4.70	4.45	3.95	4.39
MS	7.00	11.77	12.11	5.34	3.82	4.72	4.49	4.21	4.69
ND	10.00	12.29	24.20	5.04	4.84	5.55	5.31	4.95	5.31
NS	10.00	13.24	16.85	4.89	4.86	5.66		5.07	5.45
OD	25.00	13.38	37.15	5.40	5.33	5.87	5.59	5.38	5.66
PD	10.00	12.86	29.75	6.43	6.09	6.62	6.40	6.18	6.31
PS	10.00	12.19	21.11		6.54	7.08	6.86	6.65	6.74
QD	10.00	11.08	22.95					4.60	
QS	10.00	12.13	15.73	5.64	5.43	6.21	5.82	5.57	6.02
RD	10.00	15.56	36.03	5.69	4.33	5.93	4.80	4.51	4.48
RS	15.00	15.78	22.00		7.33	8.04	7.93	7.50	7.78
SD	12.00	13.39	28.96	6.18	5.54	6.02		5.53	5.61
SS	10.00	12.70	16.77	6.46	5.59	6.35	6.10	5.76	5.76

Note: MSL represents feet above/below mean seal level
This Table includes data previously presented in Table 15
as well as 1990 results.

Table V-6
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Quality Analyses - Numerical Wells

SAMPLE ID	WELL ID	SAMPLE DATE	TURBIDITY (NTU)	FILTERED	ANTIMONY (mg/l)	ARSENIC (mg/l)	CADMIUM (mg/l)	CHROMIUM (mg/l)	COPPER (mg/l)	LEAD (mg/l)	SELENIUM (mg/l)	TOC (mg/l)	TOX (ppb)	SO4 (mg/l)	CHLORIDE (mg/l)	pH	CONDUCTIVITY (umho/cm)
I9180	1R	8/15/89	30	*	N/A	N/A	J0.003	N/A	N/A	J<0.005	N/A	N/A	N/A	2300	N/A	4.1	4400
T0012	2R2	8/17/88	>90	*	<0.03	R	J0.002	J0.008	<0.020	0.004	R	116	32.5	3340	150	6.6	5500
I9080	2R2	8/14/89	>90	*	N/A	J18.2	<0.010	N/A	N/A	J<0.001	N/A	N/A	N/A	5800	N/A	8.7	13000
J3684	2R2	11/14/89	N/A	*	N/A	4.9	0.01	N/A	N/A	<0.05	N/A	N/A	N/A	6100	N/A	N/A	9700
L4719	2R2	11/27/90	N/A	*		4.57	0.005	0.006		<0.005				2300		7.1	4200
T0009	3R	8/16/88	3	*	<0.03	<0.001	0.012	J0.002	<0.020	J0.01	<0.02	3	<10	147	<1	3.6	260
I9085	3R	8/14/89	18	*	N/A	N/A	J0.008	N/A	N/A	J0.007	N/A	N/A	N/A	770	N/A	3.1	270
T0007	4R	8/16/88	20	*	R<0.003	0.001	0.047	0.013	<0.020	0.031	<0.02	8	26.5	553	5	4.4	900
I9086	4R	8/14/89	4.8	*	N/A	N/A	J0.015	N/A	N/A	J0.011	N/A	N/A	N/A	190	N/A	3.6	650
T0008	5R	8/16/88	45	*	R<0.03	0.001	<0.001	0.012	<0.02	J0.01	<0.02	60	13	283	31	4.3	800
I9077	5R	8/14/89	>90	*	N/A	N/A	J0.001	N/A	N/A	J0.013	N/A	N/A	N/A	180	N/A	3.8	460
I9078	6	8/14/89	>90	*	N/A	N/A	J0.002	N/A	N/A	0.01	N/A	N/A	N/A	240	N/A	4.5	600
T0010	7	8/16/88	12	*	<0.03	<0.001	0.031	0.014	0.113	J0.008	<0.02	7	<10	647	7	4.2	1000
I9181	7	8/16/89	>90	*	N/A	N/A	0.023	N/A	J0.012	J<0.005	N/A	N/A	N/A	490	N/A	5.4	1200
T0032	9R2	8/18/88	45	*	J<0.003	<0.001	<0.001	J0.003	<0.020	J0.003	<0.002	3	<10	3	<1	4.7	80
I9380	9R2	8/15/89	N/A	*	N/A	N/A	<0.001	N/A	N/A	R	N/A	N/A	N/A	J2	N/A	5.0	100
L4713	9R2		N/A	*		0.0035	<0.003	<0.003		0.0014				<1		7.4	100
T0006	10	8/16/88	>90	*	<0.003	<0.001	0.045	0.010	0.028	0.012	<0.02	10	<10	284	5	4.9	550
I9381	10	8/17/89	N/A	*	N/A	N/A	0.041	N/A	N/A	R	N/A	N/A	N/A	J170	N/A	6.0	440
L4718	10R	11/26/90	N/A	*		0.003	<0.003	0.005		0.09				510		7.2	1100
T0003	11	8/15/88	53	*	<0.003	R	0.134	J0.005	0.042	J0.006	R	22	1750	2760	170	5.2	4500
I9256	11	8/16/89	N/A	*	N/A	<0.003	0.210	N/A	N/A	R	N/A	N/A	N/A	1800	N/A	5.7	4100
I9257	11	8/16/89	N/A	*	N/A	<0.003	0.213	N/A	N/A	J<0.005	N/A	N/A	N/A		N/A	N/A	N/A
T0011	12	8/16/88	13	*	<0.03	0.002	<0.001	J0.001	<0.020	J0.027	<0.002	1	<10	4	3	8.0	5.2
I9182	12	8/15/89	27	*	N/A	N/A	<0.001	N/A	N/A	R	N/A	N/A	N/A	<1	N/A	5.7	125
L4716	12	11/26/90	N/A	*		0.0023				0.0023				1		8.1	100
J2621	13	10/16/89	N/A	*	N/A	J<0.001	J<0.001	J0.003	N/A	R	N/A	N/A	N/A	3	N/A	6.0	75
L4723	13	11/27/90	N/A	*		0.0027	<0.003	<0.005		0.0023				<1		4.2	1000
J2622	14	10/16/89	N/A	*	N/A	J<0.001	J<0.001	R	N/A	R	N/A	N/A	N/A	30	N/A	5.2	115
L2664	14	10/31/90	N/A	*		0.002	0.003	0.005		0.0034				30		5.1	100
J2623	15	10/16/89	N/A	*	N/A	J<0.001	<0.001	R	N/A	R	N/A	N/A	N/A	22	N/A	5.2	110
L2662	15	10/30/90	8.7	*		0.002	<0.003	0.005		0.0021				15		4.7	100
J2619	16	10/17/89	N/A	*	N/A	J<0.001	J<0.001	R	N/A	R	N/A	N/A	N/A	31	N/A	7.0	125
L2665	16	10/31/90	N/A	*		0.002	<0.003	>0.005		0.002				27		5.6	100
J2620	17	10/17/89	N/A	*	N/A	0.006	<0.001	R	N/A	R	N/A	N/A	N/A	13	N/A	7.0	40
L2663	17	10/30/90	10	*		0.002	<0.003	<0.005		0.0026				10		5.1	100
L2661	18	10/30/90	2.6	*		<0.002	<0.003	<0.005		0.0061				59		4.6	300
L4711	19	11/26/90	N/A	*		0.0041	<0.003	<0.005		0.0045				4		8.9	100
L4715	20	11/26/90	N/A	*		0.004	<0.003	<0.005		0.0011				830		9.4	2100
L4712	21	11/27/90	N/A	*		0.003	<0.003	<0.005		0.001				51		9.0	400

NOTE: N/A - Not Analyzed
J - Indicates data considered approximate based on data validation
R - Indicates data rejected based on data validation
This Table includes data previously presented in Table 16 as well as 1990 results.

Table V-7
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Quality Analyses - Alphabetical Wells

SAMPLE ID	WELL ID	SAMPLE DATE	TURBIDITY (NTU)	FILTERED	ANTIMONY (mg/l)	ARSENIC (mg/l)	CADMIUM (mg/l)	CHROMIUM (mg/l)	COPPER (mg/l)	LEAD (mg/l)	SELENIUM (mg/l)	TOC (mg/l)	TOX (ppb)	SO4 (mg/l)	CHLORIDE (mg/l)	pH	CONDUCTIVITY (umho/cm)
T0004	BR	8/16/88	1.5		<0.003	<0.001	0.015	J0.002	0.039	0.018	<0.02	6	<10	1100	59	5.7	2000
19249	BR	8/16/89	N/A	*	N/A	N/A	J<0.001	N/A	N/A	J 0.005	N/A	N/A	N/A	J89	N/A	4.1	310
T0016	CR2	8/15/88	>90	*	<0.003	<0.001	<0.001	0.010	<0.020	J 0.028	<0.002	7	<10	4	<1	5.7	110
19252	CR2	8/16/89	N/A	*	N/A	N/A	J<0.001	N/A	N/A	J 0.006	N/A	N/A	N/A	J3	N/A	5.7	130
T0040	HD	8/19/88	10	*	0.005	0.003	0.064	0.013	0.040	J 0.079	<0.02	9	27	1140	18	4.2	265
19238	HD	8/16/89	>90	*	J<0.03	N/A	J0.379	N/A	N/A	J 0.009	N/A	N/A	N/A	J650	N/A	10.0	12,500
T0041	HS	8/19/88	>90	*	0.122	0.002	J0.010	J0.003	0.024	J 6.290	<0.002	12	15	84	3	3.8	300
19237	HS	8/16/89	>90	*	J0.092	N/A	J0.0063	N/A	N/A	4.400	N/A	N/A	N/A	J69	N/A	4.4	220
T0025	ID	8/18/88	12	*	J<0.003	<0.001	0.004	0.001	<0.020	J 0.026	<0.02	1	<10	54	<1	3.4	170
19241	ID	8/16/89	N/A	*	N/A	N/A	J0.003	N/A	N/A	J 0.011	N/A	N/A	N/A	J65	N/A	4.0	170
T0024	JD	8/15/88	44	*	<0.03	0.001	0.103	0.027	0.143	0.014	<0.02	8	15	741	5	4.0	510
19242	JD	8/16/89	N/A	*	N/A	N/A	0.049	J0.009	J0.062	J<0.003	N/A	N/A	N/A	270	N/A	3.6	700
T0022	KD	8/18/88	>90	*	J<0.03	R	0.291	0.246	0.513	J 0.061	R	8	61	8460	110	2.5	12,000
19245	KD	8/16/89	N/A	*	N/A	N/A	0.113	J0.081	J0.152	J 0.019	N/A	N/A	N/A	2700	N/A	3.4	500
L2660	KD	10/29/90	3.7			0.021	0.103	0.082		0.014				5700		3.2	1000
T0023	KS	8/18/88	>90	*	<0.03	R	0.178	0.060	0.219	3.130	R	28	27.5	3070	57	2.9	5000
19243	KS	8/16/89	N/A	*	N/A	N/A	0.079	J0.016	J0.092	J 2.400	N/A	N/A	N/A	1300	N/A	4.2	N/A
19244	KS	8/16/89	N/A	*	N/A	N/A	0.078	J0.015	J0.091	J 2.350	N/A	N/A	N/A	1300	N/A	N/A	N/A
T0013	LD	8/17/88	>5	*	<0.03	0.002	J0.002	0.011	<0.020	0.044	<0.02	18	<10	170	<1	4.0	340
19083	LD	8/14/89	2.7		N/A	N/A	0.002	N/A	N/A	J 0.024	N/A	N/A	N/A	41	N/A	3.5	120
T0028	MD	8/18/88	>90	*	<0.003	R	0.008	J0.005	<0.020	0.002	R	23	99.5	1730	140	5.7	4000
19081	MD	8/14/89	>90	*	N/A	J<0.001	J0.008	N/A	N/A	J<0.005	N/A	N/A	N/A	570	N/A	4.9	1400
L2657	MD	10/30/90	48			J0.003	0.005	<0.005		0.001				1400		5.2	2800
T0029	MS	8/18/88	46	*	J<0.003	<0.001	0.011	J0.004	<0.020	J 0.198	<0.02	14	29	321	5	4.0	700
19079	MS	8/14/89	22	*	N/A	N/A	J0.016	N/A	N/A	J 0.219	N/A	N/A	N/A	N/A	N/A	4.1	700
T0034	ND	8/19/88	22	*	<0.03	0.001	J0.008	0.012	0.068	J 0.064	<0.02	38	58	1580	45	3.4	270
19076	ND	8/14/89	>90	*	N/A	N/A	0.006	N/A	N/A	J 0.014	N/A	N/A	N/A	2000	N/A	3.8	3400
T0037	NS	8/19/88	19	*	<0.03	<0.001	0.009	0.013	<0.020	J 0.045	<0.02	15	97.5	367	3	3.6	710
19075	NS	8/14/89	>90	*	N/A	N/A	0.004	N/A	N/A	J 0.01	N/A	N/A	N/A	200	N/A	3.9	4800
T0036	OD	8/17/88	49	*	<0.03	0.002	J0.002	0.045	<0.020	0.030	<0.02	56	46	5630	48	4.0	10,000
19239	OD	8/16/89	N/A	*	N/A	N/A	J<0.001	J0.121	N/A	J<0.003	N/A	N/A	N/A	980	N/A	4.1	2000
T0001	PD	8/15/88	20	*	J<0.003	0.017	J0.001	J0.002	<0.020	J 0.039	<0.02	11	81.5	1140	100	5.6	2300
19240	PD	8/16/89	<5		N/A	0.003	J0.001	N/A	N/A	J 0.009	N/A	N/A	N/A	J740	N/A	5.7	1600
T0035	QS	8/19/88	26	*	<0.003	0.002	0.007	J0.003	<0.020	0.090	<0.002	54	40	328	<1	4.2	335
T0026	RD	8/17/88	>90	*	<0.003	<0.001	<0.001	J0.003	<0.020	J 0.004	0.004	4	<10	46	6	5.0	200
19247	RD	8/16/89	N/A	*	N/A	N/A	J<0.001	N/A	N/A	J<0.001	N/A	N/A	N/A	J32	N/A	5.9	240
19246	RS	8/16/89	N/A	*	N/A	N/A	J<0.001	N/A	N/A	J 0.002	N/A	N/A	N/A	J12	N/A	6.1	170
T0038	SD	8/19/88	>90	*	<0.03	<0.01	1.01	3.250	3.84	0.294	R	N/A	235	N/A	N/A	3.7	20,000
19250	SD	8/16/89	N/A	*	N/A	R	0.963	J4.340	J4.680	J 0.084	N/A	N/A	N/A	24000	N/A	2.3	24,000
19251	SD	8/16/89	N/A	*	N/A	N/A	0.899	J4.030	J4.360	J 0.06	N/A	N/A	N/A	24000	N/A	N/A	N/A
L2656	SD	10/30/90	>90	*	N/A	0.029	0.997	3.66		0.056				25000		2.5	10,000
T0039	SS	8/19/88	81	*	<0.03	0.020	0.119	0.021	0.011	J 0.086	<0.02	91	73	1090	92	4.1	3800
19248	SS	8/16/89	N/A	*	N/A	0.005	J0.015	J0.010	N/A	R	N/A	N/A	N/A	940	N/A	5.4	1800

NOTE: N/A - Not Analyzed
R - Indicates data rejected based on data validation, J - Indicates results should be considered approximate
This table includes data previously presented in Table 16 as well as 1990 results.

Table V-8
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Analyses - Radiologic Indicators - Numerical Wells

Sample ID	Well ID	Filtered	Date	Gross Alpha	Gross Beta	Total Radium
T0012	2R2	X	8/17/88	<20.0	<90.0	
T5566	2R2	X	8/14/89	<70.0	<100.0	
21471	2R2	X	11/27/90	<10	23 +/- 11	
T0009	3R		8/16/88	<4.0	9.0 +/- 3.5	
T0007	4R	X	8/18/88	<3.0	13.0 +/- 8.0	
T0008	5R	X	8/16/88	<4.0	<20.0	
T0010	7	X	8/16/88	<6.0	<20.0	
T5556	7	X	8/15/89	<3.0		3.6 +/- 2.1
T0032	9R2	X	8/18/88	<0.9	<2.0	
T0006	10	X	8/16/88	<4.0	<10.0	
21470	10R	X	11/16/90	<4.0	9.8 +/- 1.5	
T0003	11	X	8/15/88	<10.0	<50.0	
T5573	11	X	8/16/89	<40.0		61.0 +/- 7.0
75574	11-DUP	X	8/16/89			67.0 +/- 8.0
T0011	12	X	8/18/88	<2.0	2.6 +/- 1.6	
81170	13	X	10/16/89	<1.0	1.3 +/- 0.2	
81171	14	X	10/16/89	<1.0	6.2 +/- 1.4	
81172	15	X	10/16/89	<1.0	4.5 +/- 1.3	
81169	16	X	10/17/89	<1.0	4.9 +/- 1.4	
81168	17	X	10/17/89	1.0 +/- 0.4	2.1 +/- 0.4	
21469	20	X	11/26/90	<2.0	49 +/- 2	
21472	21	X	11/27/90	<5.0	240 +/- 10	
T0020	PW2		8/17/88	<3.0	<4.0	
T0018	PW3		8/17/88	<1.0	3.1 +/- 1.4	
T0019	PW3		8/17/88	1.6 +/- 1.3	3.4 +/- 1.7	
T0014	PW4		8/17/88	<1.0	<2.0	
T0015	PW6		8/17/88	<1.0	6.5 +/- 1.7	
T0031	PW7		8/18/88	<1.0	4.8 +/- 1/6	
T0030	PW9		8/18/88	<5.0	3.9 +/- 7.0	
81173	RINSE BLANK		10/17/89	<7.0	1.8 +/- 1.0	

NOTE: Units in pCi/l

+/- = Represents the uncertainty of the value determined
This Table includes data previously presented in Table 18 was well as 1990 results

Table V-9
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Analyses - Radiologic Indicators - Alphabetical Wells

SAMPLE ID	WELL ID	FILTERED	DATE	GROSS ALPHA	GROSS BETA	TOTAL RADIUM
T0004	BR		8/17/88	<8.0	<20.0	
75562	BR	X	8/16/89	3.6 +/- 1.2		3.8 +/- 1.8
T0016	CR2	X	8/17/88	<1.0	<2.0	
T0040	HD	X	8/18/88	<7.0	<20.0	
75570	HD	X	8/16/89	17.0 +/- 12.0		30.0 +/- 5.0
T0041	HS	X	8/19/88	<3.0	9.3 +/- 6.0	
T0025	ID	X	8/18/88	<1.0	7.1 +/- 1.9	
T0024	JD	X	8/18/88	<8.0	<20.0	
75569	JD	X	8/16/89	<4.0		6.3 +/- 2.6
T0022	KD	X	8/18/88	43.0 +/- 26.0	<100.0	
75575	KD	X	8/16/89	<60.0	<100.0	
18994	KD	X	10/29/90	57 +/- 21	<20	
T0023	KS	X	8/18/88	<10.0	<60.0	
75577	KS	X	8/16/89	<20.0	<40.0	
75576	KS	X	8/16/89	<30.0	<60.0	
T0013	LD	X	8/17/88	<4.0	7.6 +/- 3.7	
T0028	MD	X	8/18/88	<10.0	<50.0	
75555	MD	X	8/14/89	<5.0		<2.0
T0029	MS	X	8/18/88	<4.0	<9.0	
T0034	ND	X	8/19/88	8.5 +/- 4.9	27.0 +/- 11.0	
T0037	NS	X	8/19/88	<3.0	<10.0	
T0036	OD	X	8/19/88	<20.0	<40.0	
75557	OD	X	8/16/89	<40.0		100.0 +/- 10.0
T0001	PD	X	8/15/88	<20.0	44.0 +/- 29.0	
75571	PD		8/16/89	<7.0		10.0 +/- 3.0
T0035	QS	X	8/19/88	<3.0	6.0 +/- 2.9	
T0026	RD	X	8/18/88	<3.0	7.7 +/- 2.8	
T0038	SD	X	8/19/88	260. +/- 110.	420. +/- 210.	
75564	SD	X	8/16/89	570.0 +/- 180	580.0 +/- 170.0	
75565	SD	X	8/16/89	530.0 +/- 180	700.0 +/- 180	
18998	SD	X	10/30/90	13 +/- 10	21 +/- 5	
T0039	SS	X	8/19/88	<20.0	<40.0	
75567	SS	X	8/16/89	<20.0		7.0 +/- 2.6
75568	SS-DUP	X	8/16/89			6.6 +/- 2.6
T0005	BR(RB)		8/16/88	<2.0	4.0 +/- 2.4	
T0021	KD(RB)		8/18/88	<3.0	<4.0	
T0033	ND(RB)	X	8/19/88	<5.0	<5.0	
T0002	PD(RB)	X	8/15/88	3.0	3.7 +/- 2.5	
81173	RB		10/17/89	<7.0	1.8 +/- 1.0	
18999	Fld. Blnk		10/30/90	<0.9	<2.0	

NOTES:
Units in pCi/l
(RB) = Rinse Blank
+/- = Represents the uncertainty of the value determined
DUP = Duplicate sample
This Table includes data previously presented in Table 8
as well as 1990 results.

Table V-9a
National Smelting of New Jersey, Inc/NL Industries, Inc. Site
Suspended Solids Analyses* - Specific Radionuclides

Well ID: Sample Date	2R2 11/27/90	KD 10/29/90	SD 10/30/90
RA-226	<1	<1	1.3 +/- 0.5
K-40	<40	<0.4	15 +/- 2
PB-210	<20	<6	14 +/- 9
U-234	<0.8	--	--
U-235	<0.4	<0.7	<2
U-238	<0.7	4.2 +/- 1.7	<3
TH-230	<3	--	--
TH-232	<3	<0.9	11 +/- 2
TH-228	8.5 +/- 3.9	<3	12 +/- 3

Legend:

* - Solid phase retained from filtering ground water through a 0.45 um filter.

-- - Not analyzed

Table V-10
National Smelting of New Jersey, Inc./
NL Industries, Inc. Site
Ground Water Analyses - Specific Radionuclides

Well ID:	2R2	2R2	2R2	KS	KS	KD	KD	RD	SD	SD	SD
Sample Date:	8/17/88	8/14/89	11/27/90	8/16/89	8/16/89	8/16/89	10/29/90	8/18/88	8/16/89	8/16/89	10/30/90
GR-A	<20.0	<70	<10	<20	<30.0	<60	57 +/- 21	<3	570 +/- 180	530.0 +/- 180	13 +/- 10
GR-B	<90.0	<100	23 +/- 10	<40	<60.0	<100	<20	7.7 +/- 2.8	580 +/- 170	700.0 +/- 180	21 +/- 5
PB-210	<10.0	<5	<4.0	<5	<4.0	<5	<20	<10	5.6 +/- 3.8	8.5 +/- 3.6	<10
RA-226	<0.1	<1	<1.0	<1	<1.0	<1	<1.0	<0.1	<1	<1.0	
RA-228	1.0 +/- 0.6	<1		1.7 +/- 0.5	1.3 +/- 0.5	1.8 +/- 0.6		<0.8	<80	<0.8	
BE-7		<40		<30	<40.0	<50.0			<40	<50.0	
K-40	14.0 +/- 1.0	<90	10 +/- 0.1	<60	<60.0	<40.0	10 +/- 1	5.3 +/- 0.1	60.6 +/- 32.5	<90.0	10 +/- 1
MN-54		<4		<3	<3.0	<3.0			<3	<4.0	
CO-58		<4		<3	<3.0	<4.0			<4	<5.0	
FE-59		<10		<8	<8.0	<10.0			<10	<10.0	
CO-60		<4		<3	<4.0	<3.0			<4	<5.0	
ZN-65		<9		<7	<7.0	<7.0			<8	<9.0	
ZR-95		<5		<4	<4.0	<5.0			<4	<5.0	
RU-103		<6		<4	<5.0	<7.0			<5	<7.0	
RU-106		<30		<30	<30.0	<30.0			<30	<40.0	
I-131		<40		<20	<30.0	<200.0			<30	<40.0	
CS-134		<4		<3	<3.0	<3.0			<3	<5.0	
CS-137		<4		<3	<4.0	<3.0			<4	<5.0	
BA-140		<20		<20	<20.0	<50.0			<10	<20.0	
CE-141		<10		<10	<10.0	<10.0			<10	<10.0	
CE-144		<40		<30	<30.0	<20.0			<30	<40.0	
TH-228	1.3 +/- 0.4	<20	<50	<6	<6.0	<5.0	3.2 +/- 1.4	<2.0	70.2 +/- 7.0	29.0 +/- 13.0	130 +/- 10
U-234	3.4 +/- 0.5	24.0 +/- 4.0	9.5 +/- 1.1	1.3 +/- 0.2	1.5 +/- 0.4	2.3 +/- 0.3		<0.2	98.0 +/-40.0	100.0 +/- 10.0	
TH-230	.48 +/- 0.29	38.0 +/- 14.0	<10	28.0 +/- 3.0	44.0 +/- 9.0	44.0 +/- 11.0		1.1 +/- 0.7	84.0 +/- 15.0	74.0 +/- 17.0	
TH-232	<.07	180.0 +/- 30.0	<10	<0.3	16.0 +/- 7.0	<4.0	1.4 +/- 0.9	.72 +/- 0.57	69.0 +/- 14.0	100.0 +/- 20.0	150 +/- 10
U-235	.14 +/- 0.1	<1.0	47 +/- 26	<0.1	<0.3	<0.1	0.06	<0.8	3.6 +/- 0.7	4.3 +/- 0.6	4 +/- 0.5
U-238	3.2 +/- .04	22.0 +/- 4.0	10 +/- 1	1.1 +/- 0.2	1.1 +/- 0.4	2.1 +/- 0.3	1.2 +/- 0.2	<0.1	100.0 +/- 10.0	100.0 +/- 10.0	110 +/- 10

Note: Units in pCi/l
+/- = Represents the uncertainty of the value determined
This Table includes data previously presented in Table 19 as well as 1990 results.

TABLE V-11

GROUND WATER QUALITY
ORGANIC ANALYSIS SUMMARY[1]

	VOLATILE ORGANICS			SEMI-VOLATILE	PEST/PCBS
Well I.D.	502/ 503 (1989)	601/ 602 (1990)	8240 (1990)	8270 (1990)	8080 (1990)
2R2	ND	NA	D	ND	ND
9R2	NA	NA	ND	ND	ND
10R	NA	NA	ND	ND	ND
11	D	D	D	ND	ND
12	NA	NA	ND	ND	ND
13	NA	D	NA	NA	NA
18	NA	D	NA	NA	NA
19	NA	NA	ND	ND	ND
20	NA	NA	D	ND	ND
21	NA	NA	ND	ND	ND
BR	NA	D	NA	NA	NA
KD	NA	ND	NA	NA	NA
MD	ND	ND	ND	ND	ND
OD	NA	ND	NA	NA	NA
OS	NA	ND	NA	NA	NA
DS	NA	ND	NA	NA	NA
SS	NA	ND	NA	NA	NA
SD	D	D	D	D	ND

[1] EPA Analytical Method Identified

D At least one parameter above method detection limit for this well, see Table V-12.

NA Not analyzed using this protocol.

ND No parameter tested by this method above method detection limit.

TABLE V-12

GROUND WATER QUALITY
DETECTED ORGANICS[1]

Organics above MCL

Parameter	MONITORING WELL 2R2 (1989)	2R2 (1990)	11[2] (1989)	11[2] (1990)	13 (1990)	18 (1990)	20 (1990)	BR[2] (1989)	SD (1989)	SD (1990)
Acetone	--	14	--	50u	--	--	12	--	--	10u
1,1,1-Trichloroethane	2.5u	21	4700	2500	0.5u	0.5u	5u	5u	0.5u	0.5u
1,1-Dichloroethene	2.5u	5u	170	210	0.5u	0.5u	5u	5u	0.5u	0.5u
Chloroform	2.5u	5u	50u	25u	0.5u	0.5u	5u	5u	2.7	7
1,2-Dibromomethane	2.5u	--	50u	50u	2J	0.5u	--	5u	0.5u	0.5u
Vinyl Chloride	2.5u	10u	50u	50u	0.5u	0.5u	10u	76	0.5u	0.5u
Toluene	2.5u	5u	5u	5u	0.5u	0.5u	5u	1.4	1.3	1.8
Ethylbenzene	2.5u	5u	5u	5u	0.5u	0.5u	5u	0.5	0.5	0.6
m-Xylene	2.5u	5u	5u	5u	0.5u	0.5u	5u	4.0	0.9	2.3
o-Xylene	2.5u	5u	5u	5u	0.5u	0.5u	5u	1.6	0.6	0.8
1,3,5-Trimethylbenzene	2.5u	--	5u	5u	0.5u	0.5u	--	0.8	0.5u	1.0u
1,2,4-Trimethylbenzene	2.5u	10u	5u	5u	0.5u	0.5u	10u	2.7	0.5u	0.5
Napthalene	2.5u	10u	5u	5u	0.5u	0.5u	10u	2.3	0.5u	1.0u
1,1, Dichloroethane	2.5u	5u	74	54	0.5u	0.5u	5u	5u	0.5u	0.5u
Tetrachloroethene	2.5u	5u	180	210	0.5u	0.5u	5u	5u	0.5u	0.5u
1,2-Dichloropropane	2.5u	5u	50u	50u	0.5u	0.5	5u	5u	0.5u	0.5u
N-Nitroso-di-n-propylamine	--	10u	--	10u	--	--	10u	--	--	11
Bis(2-ethylhexyl)phthalate	--	10u	--	10u	--	--	10u	--	--	13

(1) Parameters not listed were not detected at any well monitored using protocols presented in Tablve V-11. Where two 1990 values available, reported highest concentration or lowest detection limit. All values reported in micrograms/liter. u means not detected at the reported method detection limit.

(2) Test samples in 1989 using EPA Method 601/602 not reported.

McCallum Testing Laboratories, Inc.

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CHESAPEAKE, VIRGINIA 23325-0337
804/420-2520
FAX # 804/424-2874

TABLE V-13a

File No.

L-2245-2

1/7/91

TO: O'Brien & Gere Engineers, Inc.
440 Viking Drive, Suite 250
Virginia Beach, VA 23452

Report of

For: NL Industries
New Jersey

PERCENT PASSING

Sample Depth	EPA-1 0"-6"	EPA-1 6"-12"	EPA-2 0"-6"	EPA-2 6"-12"	EPA-3 0"-6"	EPA-4 0"-6"	EPA-4 6"-12"
Sieve Size							
3/8"	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#8	100.0	100.0	100.0	100.0	100.0	99.7	100.0
#16	99.2	100.0	99.6	99.5	99.6	98.8	99.9
#30	89.5	100.0	98.4	97.5	96.2	96.5	99.8
#50	53.4	99.6	94.1	89.7	83.3	87.0	99.1
#100	24.7	99.1	87.8	78.2	56.6	71.4	97.2
#200	15.0	95.3	80.7	69.4	35.7	60.8	92.2

NLI 002 0285

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Lab No.

Per

Kenneth K. Ward

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ORM L-105 PIP PRINTING, CHESAPEAKE, VA 23325

McCallum Testing Laboratories, Inc.

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804/420-2520
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TABLE V-13 b

File No.

L-2245-2

1/7/91

TO: O'Brien & Gere Engineers, Inc.
440 Viking Drive, Suite 250
Virginia Beach, VA 23452

Report of

For: NL Industries
New Jersey

Sample Depth	EPA-5 0"-6"	EPA-5 6"-12"	EPA-6 0"-6"	EPA-6 6"-12"	EPA-6 12"-18"
Sieve Size					
3/8"	100.0	100.0	100.0	100.0	100.0
#4	100.0	100.0	100.0	100.0	100.0
#8	100.0	99.1	99.9	99.9	100.0
#16	100.0	96.5	99.5	99.5	100.0
#30	98.7	90.2	97.9	95.1	99.7
#50	92.2	74.6	91.1	74.1	96.1
#100	84.6	60.6	82.1	52.9	83.7
#200	79.1	52.3	72.3	41.3	64.8

NLI 002 0286

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McCallum Testing Laboratories, Inc.

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TABLE V-13c

File No.

L-2245-2

1/7/91

TO: O'Brien & Gere Engineers, Inc.
440 Viking Drive, Suite 250
Virginia Beach, VA 23452

Report of

For: NL Industries
New Jersey

Sample Depth	EPA-7 0"-6"	EPA-7 6"-12"	EPA-7 12"-18"	EPA-8 0"-6"	EPA-8 6"-12"
Sieve Size					
3/8"	100.0	100.0	100.0	100.0	100.0
#4	100.0	100.0	100.0	99.5	99.6
#8	99.9	100.0	100.0	98.3	98.9
#16	99.7	99.9	99.7	96.1	97.4
#30	98.4	99.6	97.8	86.4	89.1
#50	91.6	97.6	86.5	52.6	56.0
#100	79.4	91.2	73.0	16.1	19.6
#200	65.9	77.4	62.4	4.8	6.6

NL1 002 0287

McCallum Testing Laboratories, Inc.

Lab No.

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Kenneth K. Ward

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FORM L-105 PIP PRINTING, CHESAPEAKE, VA 23325

McCallum Testing Laboratories, Inc.

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804/420-2520
FAX # 804/424-2874

TABLE V-13d

File No.
L-2245-2
1/8/91

TO: O'Brien & Gere Engineers, Inc.
440 Viking Drive, Suite 250
Virginia Beach, VA 23452

Report of

For: NL Industries
New Jersey

Sample Depth	EPA-9 0"-6"	EPA-9 6"-12"	EPA-9 12"-18"	EPA-10 0"-6"	EPA-10 6"-12"	EPA-10 12"-18"
Sieve Size						
3/8"	100.0	100.0	100.0	100.0	100.0	100.0
#4	100.0	100.0	100.0	100.0	99.6	100.0
#8	100.0	100.0	99.6	98.4	98.8	99.8
#16	100.0	100.0	98.2	97.3	97.3	99.3
#30	99.9	100.0	91.5	94.6	93.6	96.3
#50	99.5	100.0	71.0	82.9	83.1	80.1
#100	97.5	99.6	48.2	61.0	64.6	57.2
#200	90.6	96.2	36.7	43.2	54.2	48.7

NLI 002 0288

McCallum Testing Laboratories, Inc.

Lab No.

Per

Kenneth K. Ward

Our letters and reports are for the exclusive use of the client to whom they are addressed. The use of our name must receive our prior written approval. Our letters and reports apply only to the sample tested and/or inspected, and are not necessarily indicative of the qualities of apparently identical or similar products.

FORM L-105 P&P PRINTING, CHESAPEAKE, VA 23325

McCallum Testing Laboratories, Inc.

1808 Hayward Avenue
P.O. Box 13337
CHESAPEAKE, VIRGINIA 23325-0337
804/420-2520
FAX # 804/424-2874

TABLE V-13e

File No.
L-2245-2

1/7/91

TO: O'Brien & Gere Engineers, Inc.
440 Viking Drive, Suite 250
Virginia Beach, VA 23452

Report of

For: NL Industries
New Jersey

Sample Depth	EPA-11 0"-6"	EPA-11 6"-12"	EPA-11 12"-18"	EPA-12 0"-6"	EPA-12 6"-12"	EPA-13 0"-6"
Sieve Size						
3/8"	100.0	100.0	100.0	100.0	100.0	100.0
#4	100.0	99.4	100.0	99.1	100.0	100.0
#8	99.3	99.0	100.0	97.3	99.2	100.0
#16	96.7	98.0	99.9	94.4	97.3	99.7
#30	86.7	92.2	98.9	79.6	83.4	95.5
#50	54.6	71.1	90.9	33.4	48.5	78.6
#100	27.4	47.5	65.1	6.5	18.7	58.9
#200	20.4	35.5	42.5	2.0	6.0	42.8

NLI 002 0289

McCallum Testing Laboratories, Inc.

Lab No.

Per

Kenneth K. Ward

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ORM L-105 PIP PRINTING, CHESAPEAKE, VA 23325

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 19 Sheet 1 of 4
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Hollow Stem Auger	SAMPLER Type: 2" O.D. Spoon Wireline Sampler Hammer: 85 lbs. Fall: 36"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Chris Selfridge OBG Geologist: John D. Conway	Boring Location: LP-14 Dates: Started: 10/17/90	Ended: 10/26/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
		74-76*	100			Fine, light tan SAND with silt.					
		76-78	200			Red, white, brown/tan mottled stiff CLAY					
		80-81.5	100/100/100	18/10		Stiff red-purple CLAY.					
		81.5-83.5	54/251	24/20		Stiff red-purple CLAY.					
		83.5-85	119/205	18/18		Primarily red changing to primarily white CLAY with purple mottling and yellow white. Clay contains a very small amount of silt.					
		85-86	257	18/18		Silty CLAY, blue-white to gray.					
		86.5-88	351	18/20		0-3 White grayish, clayey SAND. 3-20 Predominantly white CLAY with golden yellow and red clay.					
		88-89.5	301	18/18		0-3 White grayish, clayey SAND. 3-20 Predominantly white CLAY with golden yellow and red clay.					
		89.5-91	308	18/18		0-3 White grayish, clayey SAND. 3-20 Predominantly white CLAY with golden yellow and red clay.					
		91-92.5	225	18/18		0-3 White grayish, clayey SAND. 3-20 Predominantly white CLAY with golden yellow and red clay, with a little very fine to fine sand.					
		92.5-94	300	18/18		0-3 White grayish, clayey SAND. 3-20 Predominantly white CLAY with golden yellow and red clay, with a little very fine to fine sand.					

* For description of materials at depth less than 74 feet below grade, refer to the bore log for Well 12.

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 19 Sheet 2 of 4
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Hollow Stem Auger	SAMPLER Type: 2" O.D. Spoon Wireline Sampler Hammer: 85 lbs. Fall: 36"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Chris Selfridge OBG Geologist: John D. Conway	Boring Location: LP-14 Dates: Started: 10/17/90	Ended: 10/26/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
		94-95.5	300	16/12		Gray-white sandy CLAY with red and yellow clay mottling, very slight. Bottom 4" is a fine sandy silt, gray.					
		95.5-97	300	18/10		Gray-white clayey/silty, fine-grained SAND, well rounded. Quartz grain with 5% heavies.					
		97-98.5	300	18/16		Gray with hive of blue silty CLAY.					
		98.5-100	300	18/14		Red CLAY with white silty clay and purple clay, very stiff and hard.					
		100-101.5	145	18/18		Red CLAY with white silty clay and purple clay, very stiff and hard.					
		101.5-103	197	18/18		0-3 Red CLAY with white silty clay and purple clay, very stiff and hard. 3-18 Gray silt with fine SAND and CLAY.					
		103-104.5	300	18/12		Gray silt with a little very fine SAND.					
		104.5-105	400	6/8		0-2 Red-white, purple mottled CLAY. 2-8 Fine, gray SAND with 5% heavies.					
		105-106	115-102	12/10		0-2 Red-white, purple mottled CLAY. 2-8 Fine, gray SAND with 5% heavies. Very little silt and an increase in heavy materials to 10% and some pebbles.					
		106-107	30	12/8		Gray fine SAND to corase sand with a laminae of yellow coloration 3" from top of screen.					
		107-108	300	12/10		Coarse SAND to fine pebbles, gray with 5-10% heavy minerals, a laminae of black coloration from bottom of core.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 19 Sheet 3 of 4
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Hollow Stem Auger	SAMPLER Type: 2" O.D. Spoon Wireline Sampler Hammer: 85 lbs. Fall: 36"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Chris Selfridge OBG Geologist: John D. Conway	Boring Location: LP-14 Dates: Started: 10/17/90	Ended: 10/26/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
		108-108.5	300	6/4		Coarse quartz SAND with some pebbles, 5-10% heavies, sub-rounded, poorly sorted.					
		108.5-109.5	300	12/8		Fine to medium quartz SAND with 5-10% heavies.					
		109.5-110.5	300	12/8		Coarse SAND to fine pebbles with 5-10% heavies. Heavies concentrated into bands or laminae throughout.					
		110.5-111.5	300	12/8		Coarse SAND to fine pebbles with 5-10% heavies. Heavies concentrated into bands or laminae throughout.					
		111.5-112.5	321	12/10		Coarse SAND to medium pebbles, gray with a white clay matrix. Bottom 2" a yellow brown, coarse sand to pebble, all of spoon very poorly sorted with 5-10% heavies.					
		112.5-113.5	313	12/8		Gray medium to coarse SAND with 5% heavies.					
		113.5-114.5	300	12/10		Yellowish brown to red coarse SAND.					
		114.5-116.5		12/10		Coarse white SAND and pebbles. Some yellow color in top of screen.					
		116-117	300	12/10		Buff with red, very coarse SAND with pebbles, poorly sorted angular 1/2" red clay.					
		117-118	300	12/8		Reddish buff, very coarse SAND mostly quartz, poorly sorted.					

TABLE V-14

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 19 Sheet 4 of 4
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Hollow Stem Auger	SAMPLER Type: 2" O.D. Spoon Wireline Sampler Hammer: 85 lbs. Fall: 36"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Chris Selfridge OBG Geologist: John D. Conway	Boring Location: LP-14 Dates: Started: 10/17/90	Ended: 10/26/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
		118-119	300	12/8		Very coarse SAND, buff, yellow at top, poorly sorted, subangular.					
		119-119.5	300	6/16		Coarse SAND grading to medium gray sand with silty clay stringers.					
		119.5-120	300	6/5		Medium to fine gray SAND with heavies.					
		120-121	266	12/6		Medium SAND to fine grained sand to silt with clay to 1" clay with silt and some sand grains.					
		121 122	243	12/11		Gray CLAY, stiff and hard.					

NLI 002 0293

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 20 Sheet 1 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Spoon Hammer: 300# Fall: 30"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Steve Steffen OBG Geologist: Tina Bickerstaff	Boring Location: Dates: Started: 10/22/90	Ended: 10/24/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
30		30-32		24/14		Light gray with very fine sandy CLAY (6"), to light gray and red mottled clay with silt.					
		32-34	11/9/10/24	24/24		Predominantly red CLAY mottled with gray silt.					
34		34-36	12/19/21/22	24/10		Predominantly red CLAY with silt, mottled with light gray clayey silt.					
36		36-38	9/16/16/22	24/24		Sugar SAND, fine white, gray silty sand with clay. Clay lamina are spuratic throughout the spoon, not more than 1/8" thick.					
		38-40	15/28/32/26	24/22		Fine to very fine, light gray SAND with silt and heavies 6" at tip of red clay, mottled with light gray silt.					
40		40-42	7/21/40/31	24/18		Light gray, silty SAND with red clay lamina, grading to 6" fine grained light gray sand, banded with heavies.					
		42-44	17/22/29/45	24/18		Silty red and white CLAY, grading to light gray very fine sand, grading to gray coarse sand with heavies.					
44		44-46	19/26/15/16	24/		Medium grading to very coarse, gray SAND with heavies and few quartz pebbles.					

NLI 002 0294

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 20 Sheet 2 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Spoon Hammer: 300# Fall: 30"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Steve Steffen OBG Geologist: Tina Bickerstaff	Boring Location: Dates: Started: 10/22/90	Ended: 10/24/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
46		46-48	10/11/8/16	24/8		Coarse to very coarse red, white and yellow SAND with pebbles.					
		48-50	11/9/9/16/24	24/8		Very coarse, gray SAND with pebbles grading to coarse red sand. Bottom 3" gray silt with clay and fines with yellow banding.					
50		50-52	15/10/9/16	24/20		White silt with CLAY and clay laminae, yellow and orange banding with heavies.					
		52-54	14/14/12/17	24/24		Light gray, very fine SAND with silt and clay, dark gray and yellow banding. Bottom 8" silt and bottom 3" gray and pink clay with silt.					
54		54-56	7/8/9/10	24/8		Gray and yellow silty, very fine grained SAND, grading to medium grained gray sand with a 1.5" pink and white silty clay layer.					
		56-58	23/16/26/18	24/12		Medium grained gray SAND with some silt laminae on brown and yellow.					
		58-60	11/14/28/32	24/12		Top 6" is gray medium to fine grained SAND with silt and clay. Bottom 6" is orange and brown medium grained sand with white clay stringers and some silt.					
60		60-62	14/20/20/45	24/12		Top 6" fine grained with silt, gray SAND, fractured pieces of pyritic weathered surface. Bottom 6" orange very coarse sand to red very coarse sand.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 20 Sheet 3 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Spoon Hammer: 300# Fall: 30"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Steve Steffen OBG Geologist: Tina Bickerstaff	Boring Location: Dates: Started: 10/22/90	Ended: 10/24/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
62		62-64	14/19/29/64	24/8		Orange, very coarse and coarse SAND with yellow and brown banding.					
		64-66	21/18/23/24	24/12		Orange, very coarse SAND, poorly sorted with mottled pyritic banding.					
66		66-68	16/20/23/32	24/12		6" orange very coarse SAND, 6" buff coarse grained sand.					
		68-70	29/14/18/18	24/12		Orange with red bands of medium to coarse SAND, bottom 4" buff coarse sand.					
70		70-72	12/14/22/38	24/12		Top coarse orangey brown SAND, grading to light gray silt and silty clay interbeds. 1" brown fine to medium sand bottom 1.5" is orange clay.					
		72-74	19/27/19/42	24/11		Red medium grained SAND, 8" of light gray to white silt and silty clay interbeds with weathered pylitic surface, at bottom 2" brown-orange medium to coarse grined sand.					
74		74-76	25/28/30/28	24/13		Orange clay 1st 2", light gray silty SAND grading to buff pinkish coarse sand. Pylitic layer 1/2" thick last 4" deep orange coarse grained sand.					
		76-78	15/14/9/14	24/13		Top 3" white silt with orange and red CLAY contact and 8" coarse brown orange sand with pyritic layer.					
78		78-80		24/9		4" medium to coarse orange-brownish SAND, 4" buff coarse to very coarse sand.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. 21 Sheet 1 of 3
Project Location: Pedricktown, New Jersey Client: NL Industries, Inc. Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer: 300# Fall: 30"	Ground Water Depth Date Depth Date File No.

Boring Co. WC Services
Foreman: Steve Steffan
OBG Geologist: T. Bickerstaff

Boring Location:
Ground Elevation:
Dates: Started: 10/24/90 Ended:10/25/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
35		35-37	4/10/10/14	24/2		Red and yellwo CLAY with silty and sand grains.					
		38-40	14/16/16/24	24/14		Red, white and brown mottled CLAY.					
40		40-42	16/21/15/21	24/2		Red, brown and white mottled CLAY.					
		42-44	15/17/4/25	24/18		Red/white CLAY grading to coarse light gray silt and fine gray sand.					
56		56-58		24/10		Light gray to white, fine to coarse grained SAND with heavies (in bands).					
		58-60	17/25/56/80	24/12		Poorly sorted medium to coarse grained light gray SAND with dark gray banding (heavies).					
60		60-62	16/16/12/16	24/13		Buff to white poorly sorted coarse grained SAND with pebbles. Bottom 1" yellowish gray clayey silt with sand grains.					
		62-64	16/19/21/36	24/24		CLAY with silt and sand. 12" silt and clayey silt interbeds (gray) grading to fine grained gray sand. 3/4" orange and white clay lamina. 6" medium grained orange sand.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. 21 Sheet 2 of 3
Project Location: Pedricktown, New Jersey Client: NL Industries, Inc. Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer:300# Fall: 30"	Ground Water Depth Date Depth Date File No.

Boring Co. WC Services
Foreman: Steve Steffan
OBG Geologist: T. Bickerstaff

Boring Location:
Ground Elevation:
Dates: Started: 10/25/90 Ended:10/25/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
64		64-66	21/24/22/44	24/20		1" silt with CLAY at top, medium grained gray sand.					
		66-68	16/32/42/39	24/14		Medium grained grading to coarse and very coarse brown SAND, poorly sorted angular.					
		68-70	37/59/85/65	24/24		Light brown to yellowish medium to coarse grained SAND. Bottom 6" buff to white coarse to very coarse sand. Poorly sorted angular.					
70		70-72	16/24/24/32	24/13		Yellowish/light brown grading to buff/white coarse to very coarse SAND.					
		72-74	15/17/20/31	24/24		Yellow very coarse SAND. Bottom 6" light gray very coarse sand with white clay ribbons and orange banding.					
74		74-76	23/24/34/55	24/20		Gray very coarse SAND with white clay and medium sand throughout. 4" gray clay with coarse sand ribboned and sand grains. Bottom 1.5" dark orange very coarse sand.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No. 21 Sheet 3 of 3
Project Location: Pedricktown, New Jersey Client: NL Industries, Inc. Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer: 300# Fall: 30"	Ground Water Depth Date Depth Date File No.

Boring Co: W.C. Services
Foreman: Steve Steffan
OBG Geologist: T. Bickerstaff

Boring Location:
Ground Elevation:
Dates: Started: 10/24/90 Ended: 10/24/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
76		76-78	19/18/36/69	24/18		2" at top, light gray SAND with clay. 5" of very coarse poorly sorted sand, orange with pebbles. 4" medium grained light brown/orange sand. 4" at bottom dark orange medium sand with pebbles.					
		78-80	15/11/14 45	24/24		Top 6" silty CLAY and silt interbeds, light gray. 4" very coarse orange sand with pebbles. 5" yellow to light gray medium to coarse sand. 3" orange medium to coarse sand with with pebbles. 5" medium grained buff with orange dark banding.					
80		80-82	55-143	12/10		Orangey brown medium grained SAND.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 10R Sheet 1 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer: 85# Fall: 36"	File No.: 2844.014

Boring Co.: WC Services, Inc.
Foreman: Joe Majewsky
OBG Geologist: Tina Bickerstaff

Boring Location:

Dates: Started: 10/17/90 Ended: 10/22/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks
40		40-42	50 total	24/18		Light gray with red mottling, silty CLAY with few pebbles.					
42		42-44	15/42/50	24/0		Nothing in spoon.					
			32								
			120	24/2		Second attempt 2" medium to coarse grained SAND.					
43		43-45	63	24/0		Nothing in spoon.					

NLI 002 0300

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 10R Sheet 2 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer: 300# Fall: 30"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Joe Majewsky OBG Geologist: Tina Bickerstaff	Boring Location: Dates: Started: 10/17/90	Ended: 10/22/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Remarks
44		44-46	8/14/24/28	24/24		16" silty red CLAY with sand grains, 8" of coarse to very coarse grained sand, poorly sorted, orange to yellow, angular grains.					
46		46-48	4/11/22/20	24/10		Coarse grading to very coarse, angular, poorly sorted, mostly quartz SAND.					
48		48-50	13/18/17/13	24/10		Very coarse yellow with gravel, angular, poorly sorted grading to medium grained SAND, grading to coarse angular, poorly sorted, with some heavies, gray sand.					
50		50-52	4/14/18/15	24/8		Very coarse, poorly sorted, angular red SAND, grading to medium grained, rounded sand, orange.					
		52-54	10/16/22/26	24/10		Very coarse with pebbles and gravel grading to medium grained SAND with heavies, orange.					
54		54-56	10/14/14/13	24/11		Coarse to very coarse, orange SAND.					
58		56-58	8/11/17/19	24/8		Very coarse, grading to coarse, grading to fine grained, orange SAND.					
		58-60	10/16/15/11	24/4		Medium to fine grained, white, gray and orange banded SAND. Three bands of lignites, some silt.					

O'BRIEN & GERE ENGINEERS, INC.	TEST BORING LOG	Report of Boring No.: 10R Sheet 3 of 3
Project Location: Pedricktown, New Jersey Client: NL Drilling Type: Mud Rotary	SAMPLER Type: 2" O.D. Split Spoon Hammer: 300# Fall: 30"	File No.: 2844.014
Boring Co.: WC Services, Inc. Foreman: Joe Majewsky OBG Geologist: Tina Bickerstaff	Boring Location: Dates: Started: 10/17/90	Ended: 10/22/90

Depth	Sample No	Sample Depth	Blows /6"	Penetr/ Recovry	"N" Value	Sample Description	Stratum Change General Descript	Equipment Installed		Equipment Installed	Rmks*
60		60-62	8/12/12/9	24/11		Very fine to medium grained SAND with orange, white and lignite, thin banding, some silt.					
		62-64	11/13/16/23	24/12		Ribbon of red CLAY 1/8" thick, orange coarse to very coarse sand with pebbles, poorly sorted.					
64		64-66	13/22/14/15	24/8		Coarse to very coarse red SAND.					
		66-68	20/21/29/23	24/12		Red clayey silt and fine grained SAND, 8" white and gray banded very fine grained sand.					
68		68-70	8/13/18/32	24/12		Coarse, very coarse SAND with pebbles, 6" white, red and purples clay with silt and sand grains.					
70		Bottom of well									

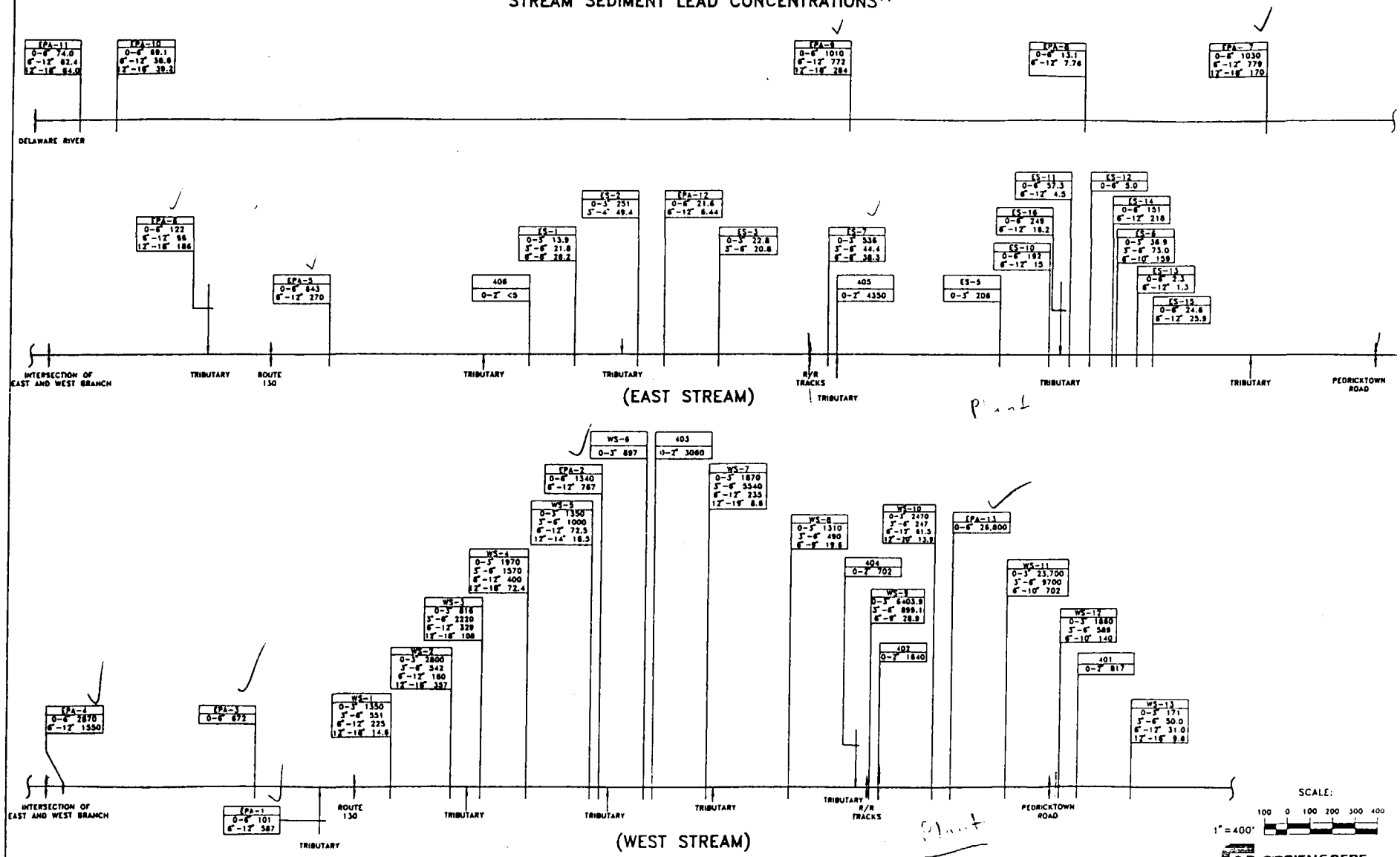
70' deep - 5" screen - 65' casing Outer casing at 61'

Sand to 63', bentonite to 59'

NLI 002 0302

FIGURE V-1

STREAM SEDIMENT LEAD CONCENTRATIONS[1]

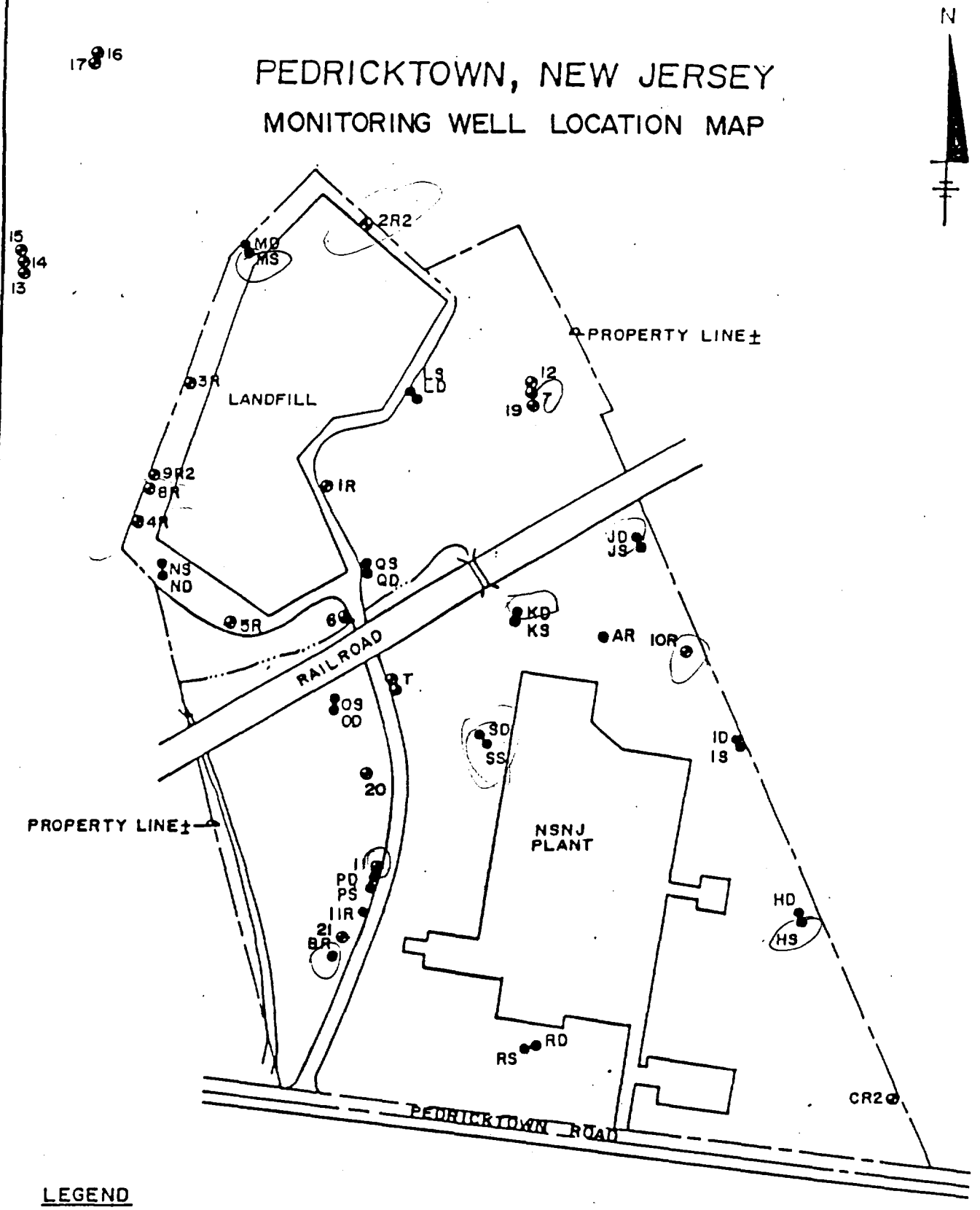


(1) ALL LEAD CONCENTRATIONS REPORTED IN MG/KG ON A DRY WEIGHT BASIS

NL1 002 0303

PEDRICKTOWN, NEW JERSEY

MONITORING WELL LOCATION MAP



LEGEND

- ● 2" WELL NESTED PAIR
- ● 4" WELL

SCALE IN FEET

1" = 300' 300 100 0 100 500

NL I 002 0304

O'BRIEN & GERE ENGINEERS, INC.

063397

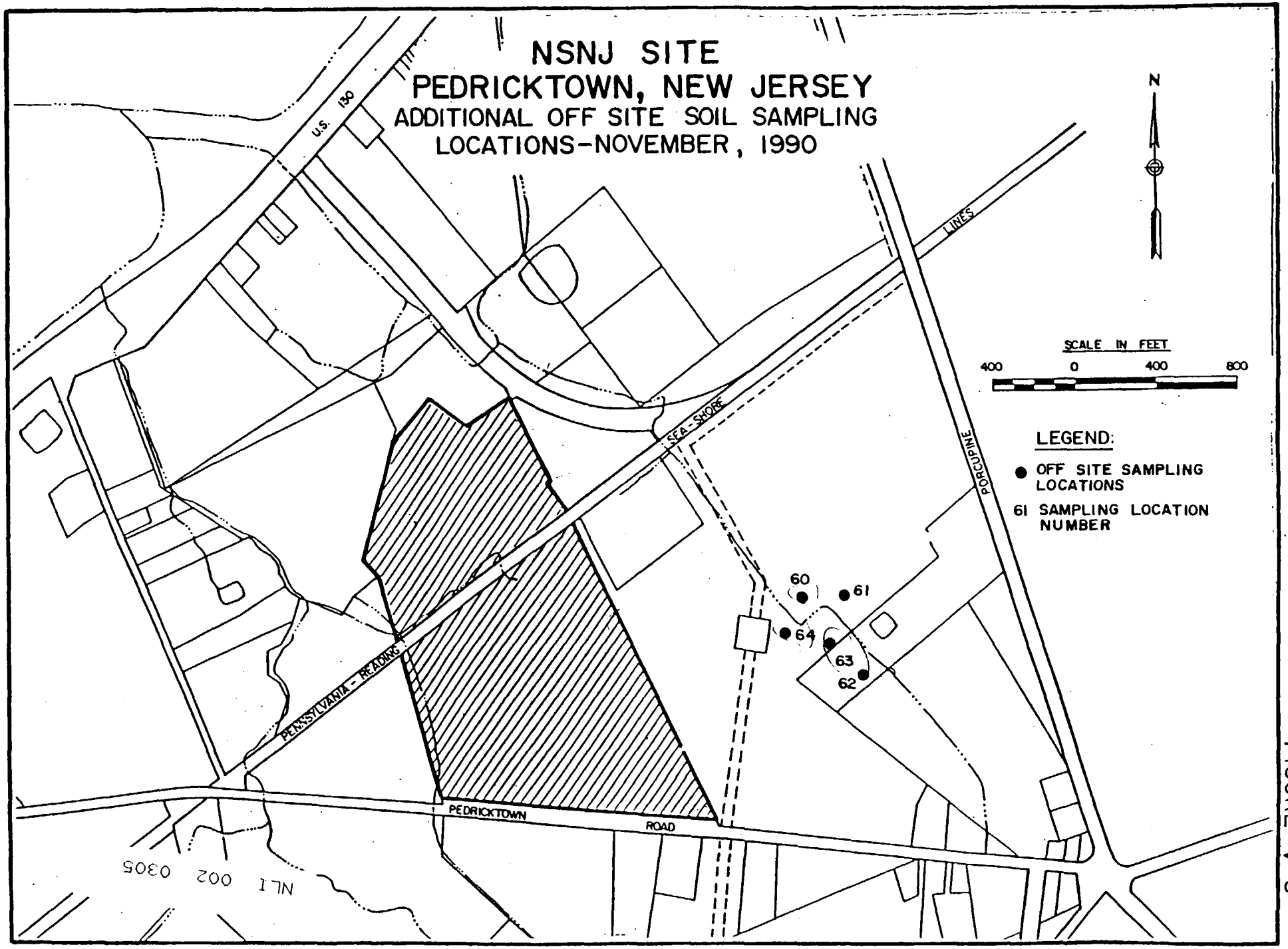


FIGURE V-3

O'BRIEN & GERE ENGINEERS, INC.

APPENDIX W

SUPPLEMENTAL RISK EVALUATION

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W-21 Chronic Hazard Index Estimate for an On-Site Adult Resident

W-53 Toxicity Values for Potential Non-Carcinogenic Effects (Chronic Oral Exposures)

W-55 Toxicity Values for Potential Non-Carcinogenic Effects (Subchronic Oral Exposures)

W-58 Toxicity Value Adjustments for Dermal Exposures

W-59 Exposure Estimate Adjustments

W-63 Subchronic Hazard Index Estimate for an Off-Site Child Resident (Ages 10-12)

W-64 Chronic Hazard Index Estimate for an Off-Site Adult Resident

W-65 Chronic Hazard Index Estimate for an Off-Site Industrial Worker

W-67 Chronic Hazard Index Estimate for an On-Site Worker

FIGURE

W-1 Paved and Wetland Areas

APPENDIX W
SUPPLEMENTAL RISK EVALUATION

Future Residential Land Use - Absent Remediation

In the baseline risk assessment prepared for the Remedial Investigation Report, it was concluded that industrial, residential, or agricultural land uses would not be implemented at the site without remedial activities. This conclusion was based on the following:

- Industrial Use - Due to the deteriorating condition of the on-site buildings, the presence of large amounts of surface water within the manufacturing area, and the character and large quantity of the wastes, industrial operations could not commence on the site until new buildings were constructed and equipment was installed, and the surface water and wastes were removed from the site. Since these types of activities are not consistent with a "baseline" risk assessment, it was concluded that, in the absence of site remediation, industrial use would not be implemented at the site.

- Residential and Agricultural Uses - Due to the physical characteristics of the site (the presence of a closed RCRA landfill, surface piling of waste materials, ponded surface water, designated wetlands, and buildings), residential or agricultural uses could not be implemented at the site without remediation (e.g., removal of surface water and wastes). Figure W-1 illustrates the portions of the site which are paved, landfill, wetlands, or wetland buffer. Since these types of activities are not consistent with a "baseline" risk assessment, it was concluded that, in the absence of site remediation, residential or agricultural land uses would not be implemented at the site.

Of the three types of potential future land uses evaluated (industrial, residential, and agricultural) industrial land use is the most probable (although unlikely). For purposes of discussion and establishment of a realistic worst-case scenario, exposures to hypothetical future on-site industrial workers were quantified in

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the risk assessment. This approach is consistent with USEPA Guidance (page 6-7 USEPA 1989) which states "If the site is industrial and is located in a very rural area with a low population density and projected low growth, future residential use would probably be unlikely".

At the request of the USEPA, presented in a letter dated 6 March 1991, health risks associated with hypothetical future residential land use of the site were quantified for adults and children ages 1-6. The following tables, W-1 through W-22, are those which are associated with the hypothetical residential land use on-site without site remediation. It should be noted that the exposure concentrations used in the hypothetical future residential scenario are the same as those used for the future on-site industrial worker scenario (see Section 6.08.3 of the Remedial Investigation Report). This residential scenario, in the absence of site remediation is not realistic, however, this has been presented at the direction of the USEPA Region II.

Risk Assessment Without Lead

As part of the Remedial Investigation Report for the National Smelting of New Jersey/NL Industries Site in Pedricktown, New Jersey, a baseline risk assessment was prepared in October 1990. In the absence of an EPA approved reference dose for lead, a value of $8x10^{-4}$ mg/kg/day was used in the Risk Characterization Section of the risk assessment. This value was calculated based on the current Maximum Contaminant Level (MCL) for lead in drinking water (50 micrograms/liter) and the Center for Disease Control's proposed

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acceptable blood lead concentration (15 micrograms/deciliter blood).

Supplemental tables have been prepared at the specific request of the USEPA by removing the calculated reference dose for lead from the tables originally presented in the risk assessment. Accordingly these supplemental tables do not address risks to lead. Each Table presented in Volume I of this Remedial Investigation (RI) Report which contains a calculated reference dose for lead, has a unique Table number (e.g. Table 53). Tables in this Appendix, similar to those in Volume I of the RI Report, prepared without reference to lead are prefixed with W (e.g. Table W-53). Where a Table in Volume I does not contain a calculated reference dose for lead (e.g. Table 54) no Table is included in this Appendix. These tables should be reviewed concurrently with Section 6 of the Remedial Investigation Report (risk assessment).

As a result of removing the calculated reference dose for lead, the calculated non-carcinogenic health risks were reduced. For current exposure by off-site residents and workers, the non-carcinogenic hazard indices remain within the Superfund site remediation goal (1.0). For future exposures by off-site residents and workers, the hazard indices remain at levels not within the Superfund site remediation goal. For future exposures by hypothetical on-site industrial workers, the hazard index remains within the Superfund site remediation goal.

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TABLE W-1
NSNJ, INC./NL INDUSTRIES, INC. SITE
INHALATION OF SITE AIR
FOR FUTURE RESIDENTIAL SITE USE

Chemical	CA (mg/m^3)	IR (m^3/hr)	ET (hr/dy)	EF (dys/yr)	ED (yrs)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
Adult Resident										
Antimony	2.51E-06	1.25	24	365	30	70	30	1.08E-06		
Arsenic	3.08E-07	1.25	24	365	30	70	30	1.32E-07	70	5.66E-08
Cadmium	9.14E-08	1.25	24	365	30	70	30	3.92E-08	70	1.68E-08
Chromium	4.94E-07	1.25	24	365	30	70	30	2.12E-07	70	9.07E-08
Copper	6.32E-07	1.25	24	365	30	70	30	2.71E-07		
Lead	1.73E-04	1.25	24	365	30	70	30	7.41E-05	70	3.18E-05
Zinc	1.47E-06	1.25	24	365	30	70	30	6.30E-07		
Child Resident (ages 1-6)										
Antimony	2.51E-06	2	24	365	6	16	6	7.53E-06		
Arsenic	3.08E-07	2	24	365	6	16	6	9.24E-07	70	7.92E-08
Cadmium	9.14E-08	2	24	365	6	16	6	2.74E-07	70	2.35E-08
Chromium	4.94E-07	2	24	365	6	16	6	1.48E-06	70	1.27E-07
Copper	6.32E-07	2	24	365	6	16	6	1.90E-06		
Lead	1.73E-04	2	24	365	6	16	6	5.19E-04	70	4.45E-05
Zinc	1.47E-06	2	24	365	6	16	6	4.41E-06		

CA = contaminant concentration in air; IR = inhalation rate;
ET = exposure time; EF = exposure frequency; ED = exposure duration;
BW = body weight; AT = averaging time

$$\frac{CA \times IR \times ET \times EF \times ED}{BW \times AT \times 365 \text{ days/yr}} = \text{Intake (mg/kg-day)}$$

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TABLE W-2

NSNJ, INC./NL INDUSTRIES, INC. SITE
INGESTION OF CHEMICALS IN DRINKING WATER

Chemical	CW (mg/l)	IR (l/day)	EF (dy/yr)	ED (years)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
SITE-WIDE GROUND WATER QUALITY									
Adult Resident									
Antimony	0.077	2	365	30	70	30	2.200E-03	-	-
Arsenic	0.017	2	365	30	70	30	4.9E-04	70	2.1E-04
Beryllium	0.007	2	365	30	70	30	2.000E-04	70	8.571E-05
Cadmium	0.180	2	365	30	70	30	5.14E-03	-	-
Chromium	0.113	2	365	30	70	30	3.229E-03	-	-
Copper	0.256	2	365	30	70	30	7.314E-03	-	-
Lead	2.467	2	365	30	70	30	7.05E-02	70	3.02E-02
Nickel	0.14	2	365	30	70	30	4.00E-03	-	-
Selenium	0.02	2	365	30	70	30	5.714E-04	-	-
Sulfate	3687	2	365	30	70	30	105	-	-
Thallium	0.001	2	365	30	70	30	2.857E-05	-	-
Zinc	0.603	2	365	30	70	30	1.72E-02	-	-
1,1-Dichloroethane	0.074	2	365	30	70	30	2.114E-03	70	9.061E-04
1,1-Dichloroethene	0.170	2	365	30	70	30	4.857E-03	70	2.082E-03
Tetrachloroethene	0.180	2	365	30	70	30	5.143E-03	70	2.204E-03
1,1,1-Trichloroethane	4.700	2	365	30	70	30	1.343E-01	-	-
Vinyl chloride	0.009	2	365	30	70	30	2.571E-04	70	1.102E-04
Child Resident (Ages 1-6)									
Antimony	0.077	1	365	6	16	6	4.813E-03	-	-
Arsenic	0.017	1	365	6	16	6	1.1E-03	70	9.1E-05
Beryllium	0.007	1	365	6	16	6	4.375E-04	70	3.750E-05
Cadmium	0.180	1	365	6	16	6	1.13E-02	-	-
Chromium	0.113	1	365	6	16	6	7.063E-03	-	-
Copper	0.256	1	365	6	16	6	1.600E-02	-	-
Lead	2.467	1	365	6	16	6	1.54E-01	70	1.32E-02
Nickel	0.14	1	365	6	16	6	8.75E-03	-	-
Selenium	0.02	1	365	6	16	6	1.250E-03	-	-
Sulfate	3687	1	365	6	16	6	230	-	-
Thallium	0.001	1	365	6	16	6	6.250E-05	-	-
Zinc	0.603	1	365	6	16	6	3.77E-02	-	-
1,1-Dichloroethane	0.074	1	365	6	16	6	4.625E-03	70	3.964E-04
1,1-Dichloroethene	0.170	1	365	6	16	6	1.063E-02	70	9.107E-04
Tetrachloroethene	0.180	1	365	6	16	6	1.125E-02	70	9.643E-04
1,1,1-Trichloroethane	4.700	1	365	6	16	6	2.938E-01	-	-
Vinyl chloride	0.009	1	365	6	16	6	5.625E-04	70	4.821E-05

TABLE W-2

NSMJ, INC./NL INDUSTRIES, INC. SITE
INGESTION OF CHEMICALS IN DRINKING WATER

Chemical	CW (mg/l)	IR (l/day)	EF (dy/yr)	ED (years)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
WELL 2R2 WATER QUALITY									
Adult Resident									
Arsenic	18.2	2	365	30	70	30	5.2E-01	70	2.2E-01
Cadmium	0.01	2	365	30	70	30	2.86E-04	-	-
Chromium	0.008	2	365	30	70	30	2.286E-04	-	-
Lead	0.004	2	365	30	70	30	1.143E-04	70	4.898E-05
Sulfate	6100	2	365	30	70	30	174	-	-
Child Resident (Ages 1-6)									
Arsenic	18.2	1	365	6	16	6	1.1E+00	70	9.8E-02
Cadmium	0.01	1	365	6	16	6	6.25E-04	-	-
Chromium	0.008	1	365	6	16	6	5.000E-04	-	-
Lead	0.004	1	365	6	16	6	2.500E-04	70	2.143E-05
Sulfate	6100	1	365	6	16	6	381	-	-

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TABLE W-2

NSNJ, INC./NL INDUSTRIES, INC. SITE
INGESTION OF CHEMICALS IN DRINKING WATER

Chemical	CW (mg/l)	IR (l/day)	EF (dy/yr)	ED (years)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
WELL SD WATER QUALITY									
Adult Resident									
Beryllium	0.156	2	365	30	70	30	4.457E-03	70	1.910E-03
Cadmium	1.01	2	365	30	70	30	2.89E-02	-	-
Chromium	4.340	2	365	30	70	30	1.240E-01	-	-
Copper	4.680	2	365	30	70	30	1.337E-01	-	-
Lead	0.294	2	365	30	70	30	8.400E-03	70	3.600E-03
Nickel	1.93	2	365	30	70	30	5.51E-02	-	-
Sulfate	24000	2	365	30	70	30	686	-	-
Thallium	0.003	2	365	30	70	30	8.571E-05	-	-
Zinc	8.64	2	365	30	70	30	2.47E-01	-	-
Child Resident (Ages 1-6)									
Beryllium	0.156	1	365	6	16	6	9.750E-03	70	8.357E-04
Cadmium	1.01	1	365	6	16	6	6.31E-02	-	-
Chromium	4.340	1	365	6	16	6	2.713E-01	-	-
Copper	4.680	1	365	6	16	6	2.925E-01	-	-
Lead	0.294	1	365	6	16	6	1.838E-02	70	1.575E-03
Nickel	1.93	1	365	6	16	6	1.21E-01	-	-
Sulfate	24000	1	365	6	16	6	1500	-	-
Thallium	0.003	1	365	6	16	6	1.875E-04	-	-
Zinc	8.64	1	365	6	16	6	5.40E-01	-	-

CW = chemical concentration in water; IR = ingestion rate; EF = exposure frequency
ED = exposure duration; BW = body weight; AT = averaging time

$$\frac{CW \times IR \times EF \times ED}{BW \times AT \times 365 \text{ days/yr}} = \text{Intake (mg/kg-day)}$$

TABLE W-3

NSNJ, INC./NL INDUSTRIES, INC. SITE
DERMAL CONTACT WITH CHEMICALS IN GROUND WATER

Chemical	CW (mg/l)	SA (cm2)	PC (cm/hr)	ET (hr/dy)	EF (dy/yr)	ED (years)	CF (l/cm3)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
Adult Resident												
Antimony	0.077	19400	0.0008	0.25	365	30	0.001	70	30	4.27E-06	-	-
Arsenic	0.017	19400	0.0008	0.25	365	30	0.001	70	30	9.42E-07	70	4.0E-07
Beryllium	0.007	19400	0.0008	0.25	365	30	0.001	70	30	3.88E-07	70	1.66E-07
Cadmium	0.180	19400	0.0008	0.25	365	30	0.001	70	30	9.98E-06	-	-
Chromium	0.113	19400	0.0008	0.25	365	30	0.001	70	30	6.26E-06	-	-
Copper	0.256	19400	0.0008	0.25	365	30	0.001	70	30	1.42E-05	-	-
Lead	2.467	19400	0.0008	0.25	365	30	0.001	70	30	1.37E-04	70	5.86E-05
Nickel	0.14	19400	0.0008	0.25	365	30	0.001	70	30	7.76E-06	-	-
Selenium	0.02	19400	0.0008	0.25	365	30	0.001	70	30	1.11E-06	-	-
Sulfate	3687	19400	0.0008	0.25	365	30	0.001	70	30	2E-01	-	-
Thallium	0.001	19400	0.0008	0.25	365	30	0.001	70	30	5.54E-08	-	-
Zinc	0.603	19400	0.0008	0.25	365	30	0.001	70	30	3.34E-05	-	-
1,1-Dichloroethane	0.074	19400	0.0008	0.25	365	30	0.001	70	30	4.10E-06	70	1.76E-06
1,1-Dichloroethene	0.170	19400	0.0008	0.25	365	30	0.001	70	30	9.42E-06	70	4.04E-06
Tetrachloroethene	0.180	19400	0.0008	0.25	365	30	0.001	70	30	9.98E-06	70	4.28E-06
1,1,1-Trichloroethane	4.700	19400	0.0008	0.25	365	30	0.001	70	30	2.61E-04	-	-
Vinyl chloride	0.009	19400	0.0008	0.25	365	30	0.001	70	30	4.99E-07	70	2.14E-07
Adult Resident - Well 2R2												
Arsenic	18.2	19400	0.0008	0.25	365	30	0.001	70	30	1.01E-03	70	4.32E-04
Cadmium	0.01	19400	0.0008	0.25	365	30	0.001	70	30	5.54E-07	-	-
Chromium	0.008	19400	0.0008	0.25	365	30	0.001	70	30	4.43E-07	-	-
Lead	0.004	19400	0.0008	0.25	365	30	0.001	70	30	2.22E-07	70	9.50E-08
Sulfate	6100	19400	0.0008	0.25	365	30	0.001	70	30	3.38E-01	-	-
Adult Resident - Well SD												
Beryllium	0.156	19400	0.0008	0.25	365	30	0.001	70	30	8.65E-06	70	3.71E-06
Cadmium	1.01	19400	0.0008	0.25	365	30	0.001	70	30	5.60E-05	-	-
Chromium	4.340	19400	0.0008	0.25	365	30	0.001	70	30	2.41E-04	-	-
Copper	4.680	19400	0.0008	0.25	365	30	0.001	70	30	2.59E-04	-	-
Lead	0.294	19400	0.0008	0.25	365	30	0.001	70	30	1.63E-05	70	6.98E-06
Nickel	1.93	19400	0.0008	0.25	365	30	0.001	70	30	1.07E-04	-	
Sulfate	24000	19400	0.0008	0.25	365	30	0.001	70	30	1.33E+00	-	
Thallium	0.003	19400	0.0008	0.25	365	30	0.001	70	30	1.66E-07	-	
Zinc	8.64	19400	0.0008	0.25	365	30	0.001	70	30	4.79E-04	-	

TABLE W-3

NSNJ, INC./NL INDUSTRIES, INC. SITE
DERMAL CONTACT WITH CHEMICALS IN GROUND WATER

Chemical	CW (mg/l)	SA (cm2)	PC (cm/hr)	ET (hr/dy)	EF (dy/yr)	ED (years)	CF (l/cm3)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
Child Resident (Ages 1-6)												
Antimony	0.077	7280	0.0008	0.25	365	6	0.001	16	6	7.01E-06	-	-
Arsenic	0.017	7280	0.0008	0.25	365	6	0.001	16	6	1.55E-06	70	1.33E-07
Beryllium	0.007	7280	0.0008	0.25	365	6	0.001	16	6	6.37E-07	70	5.46E-08
Cadmium	0.180	7280	0.0008	0.25	365	6	0.001	16	6	1.64E-05	-	-
Chromium	0.113	7280	0.0008	0.25	365	6	0.001	16	6	1.03E-05	-	-
Copper	0.256	7280	0.0008	0.25	365	6	0.001	16	6	2.33E-05	-	-
Lead	2.467	7280	0.0008	0.25	365	6	0.001	16	6	2.24E-04	70	1.92E-05
Nickel	0.14	7280	0.0008	0.25	365	6	0.001	16	6	1.27E-05	-	-
Selenium	0.02	7280	0.0008	0.25	365	6	0.001	16	6	1.82E-06	-	-
Sulfate	3687	7280	0.0008	0.25	365	6	0.001	16	6	3E-01	-	-
Thallium	0.001	7280	0.0008	0.25	365	6	0.001	16	6	9.10E-08	-	-
Zinc	0.603	7280	0.0008	0.25	365	6	0.001	16	6	5.49E-05	-	-
1,1-Dichloroethane	0.074	7280	0.0008	0.25	365	6	0.001	16	6	6.73E-06	70	5.77E-07
1,1-Dichloroethene	0.170	7280	0.0008	0.25	365	6	0.001	16	6	1.55E-05	70	1.33E-06
Tetrachloroethene	0.180	7280	0.0008	0.25	365	6	0.001	16	6	1.64E-05	70	1.40E-06
1,1,1-Trichloroethane	4.700	7280	0.0008	0.25	365	6	0.001	16	6	4.28E-04	-	-
Vinyl chloride	0.009	7280	0.0008	0.25	365	6	0.001	16	6	8.19E-07	70	7.02E-08
Child Resident (Ages 1-6) - Well 2R2												
Arsenic	18.2	7280	0.0008	0.25	365	6	0.001	16	6	1.66E-03	70	1.42E-04
Cadmium	0.01	7280	0.0008	0.25	365	6	0.001	16	6	9.10E-07	-	-
Chromium	0.008	7280	0.0008	0.25	365	6	0.001	16	6	7.28E-07	-	-
Lead	0.004	7280	0.0008	0.25	365	6	0.001	16	6	3.64E-07	70	3.12E-08
Sulfate	6100	7280	0.0008	0.25	365	6	0.001	16	6	5.55E-01	-	-
Child Resident (Ages 1-6) - Well SD												
Beryllium	0.156	7280	0.0008	0.25	365	6	0.001	16	6	1.42E-05	70	1.22E-06
Cadmium	1.01	7280	0.0008	0.25	365	6	0.001	16	6	9.19E-05	-	-
Chromium	4.340	7280	0.0008	0.25	365	6	0.001	16	6	3.95E-04	-	-
Copper	4.680	7280	0.0008	0.25	365	6	0.001	16	6	4.26E-04	-	-
Lead	0.294	7280	0.0008	0.25	365	6	0.001	16	6	2.68E-05	70	2.29E-06
Nickel	1.93	7280	0.0008	0.25	365	6	0.001	16	6	1.76E-04	-	-
Sulfate	24000	7280	0.0008	0.25	365	6	0.001	16	6	2.18E+00	-	-
Thallium	0.003	7280	0.0008	0.25	365	6	0.001	16	6	2.73E-07	-	-
Zinc	8.64	7280	0.0008	0.25	365	6	0.001	16	6	7.86E-04	-	-

TABLE W-3

NSNJ, INC./NL INDUSTRIES, INC. SITE
DERMAL CONTACT WITH CHEMICALS IN GROUND WATER

Chemical	CW (mg/l)	SA (cm2)	PC (cm/hr)	ET (hr/dy)	EF (dy/yr)	ED (years)	CF (l/cm3)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake

CW = chemical concentration in water; SA = skin surface area; PC = dermeability constant; ET = exposure time
EF = exposure frequency; ED = exposure duration; CF = volumetric conversion factor; BW = body weight; AT = averaging time

$$\frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT \times 365 \text{ days/yr}} = \text{Intake (mg/kg-day)}$$

TABLE W-4

NSNJ, INC./NL INDUSTRIES INC. SITE
DERMAL CONTACT WITH CHEMICALS IN SURFACE WATER

Chemical	CW (mg/l)	SA (cm2)	PC (cm/hr)	ET (hr/dy)	EF (dy/yr)	ED (years)	CF (l/cm3)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
Adult Resident												
Lead	3	3120	0.0008	0.5	34	30	0.001	70	30	5.0E-06	70	2.1E-06
Sulfate	140	3120	0.0008	0.5	34	30	0.001	70	30	2.3E-04	-	-
Child Resident (Ages 1-6)												
Lead	3	7280	0.0008	0.5	34	6	0.001	16	6	5.1E-05	70	4.4E-06
Sulfate	140	7280	0.0008	0.5	34	6	0.001	16	6	2.4E-03	-	-

CW = chemical concentration in water
SA = skin surface area
PC = permeability constant
ET = exposure time
EF = exposure frequency
ED = exposure duration
CF = volumetric conversion factor
BW = body weight
AT = averaging time

$$\frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT \times 365 \text{ days/yr}} = \text{Intake (mg/kg-day)}$$

TABLE W-5

NSNJ, INC./NL INDUSTRIES, INC. SITE
INGESTION OF CHEMICALS IN SOIL

Chemical	CS (mg/kg)	IR (mg/day)	CF (kg/mg)	FI	EF (dy/yr)	ED (years)	BW (kg)	AT (yrs)	Intake	AT (years)	Intake
Adult Resident											
Antimony	96	100	1.00E-06	1	52	30	70	30	2E-05	-	-
Arsenic	11.8	100	1.00E-06	1	52	30	70	30	2.4E-06	70	1.0E-06
Cadmium	3.50	100	1.00E-06	1	52	30	70	30	7.12E-07	-	-
Chromium	18.91	100	1.00E-06	1	52	30	70	30	3.85E-06	-	-
Copper	24.2	100	1.00E-06	1	52	30	70	30	4.9E-06	-	-
Lead	6636	100	1.00E-06	1	52	30	70	30	1E-03	70	6E-04
Zinc	56.5	100	1.00E-06	1	52	30	70	30	1.1E-05	-	-
Child Resident (ages 1-6)											
Antimony	96	200	1.00E-06	1	152	6	16	6	5E-04	-	-
Arsenic	11.8	200	1.00E-06	1	152	6	16	6	6.1E-05	70	5.3E-06
Cadmium	3.50	200	1.00E-06	1	152	6	16	6	1.82E-05	-	-
Chromium	18.91	200	1.00E-06	1	152	6	16	6	9.84E-05	-	-
Copper	24.2	200	1.00E-06	1	152	6	16	6	1.3E-04	-	-
Lead	6636	200	1.00E-06	1	152	6	16	6	3E-02	70	3E-03
Zinc	56.5	200	1.00E-06	1	152	6	16	6	2.9E-04	-	-

CS = chemical concentration in soil; IR = ingestion rate
CF = conversion factor (10e-6 kg/mg); FI = fraction ingested from contaminated source
EF = exposure frequency; ED = exposure duration
BW = body weight; AT = averaging time
- = not a carcinogen by this exposure pathway

$$\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT \times 365\ days/yr} = \text{Intake (mg/kg-day)}$$

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TABLE W-6

NSNJ, INC./NL INDUSTRIES, INC. SITE
DERMAL CONTACT WITH CHEMICALS IN SOIL

Chemical	CS (mg/kg)	CF (kg/mg)	SA (cm2/event)	AF (mg/cm2)	ABS	EF (event/yr)	ED (years)	BW (kg)	AT (yrs)	Intake	AT (yrs)	Intake
Adult Resident												
Antimony	96	1.00E-06	3120	0.51	0.01	52	30	70	30	3.11E-06	-	-
Arsenic	11.8	1.00E-06	3120	0.51	0.01	52	30	70	30	3.82E-07	70	1.64E-07
Cadmium	3.50	1.00E-06	3120	0.51	0.01	52	30	70	30	1.13E-07	-	-
Chromium	18.91	1.00E-06	3120	0.51	0.01	52	30	70	30	6.12E-07	-	-
Copper	24.2	1.00E-06	3120	0.51	0.01	52	30	70	30	7.84E-07	-	-
Lead	6636	1.00E-06	3120	0.51	0.0006	52	30	70	30	1E-05	70	6E-06
Zinc	56.5	1.00E-06	3120	0.51	0.01	52	30	70	30	1.8E-06	-	-
Child Resident (ages 1-6)												
Antimony	96	1.00E-06	7280	0.51	0.01	152	6	16	6	9.28E-05	-	-
Arsenic	11.8	1.00E-06	7280	0.51	0.01	152	6	16	6	1.14E-05	70	9.77E-07
Cadmium	3.50	1.00E-06	7280	0.51	0.01	152	6	16	6	3.38E-06	-	-
Chromium	18.91	1.00E-06	7280	0.51	0.01	152	6	16	6	1.83E-05	-	-
Copper	24.2	1.00E-06	7280	0.51	0.01	152	6	16	6	2.34E-05	-	-
Lead	6636	1.00E-06	7280	0.51	0.0006	152	6	16	6	4E-04	70	3E-05
Zinc	56.5	1.00E-06	7280	0.51	0.01	152	6	16	6	5.5E-05	-	-

CS = chemical concentration in soil; CF = conversion factor (10-6 kg/mg)
SA = skin surface area contacted; AF = soil to skin aherence factor
ABS= absorption factor; EF = exposure frequency
ED = exposure duration; BW = body weight
AT = averaging time

$$\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT \times 365 \text{ days/yr}} = \text{Intake (mg/kg-day)}$$

TABLE W-7

NSMJ, INC./NL INDUSTRIES, INC. SITE

SUMMARY OF VALUES USED TO ESTIMATE SOIL EXPOSURES

Variable	Range	Midpoint	Value Used	Rationale
Chemical concentration			(see Table 5)	95% upperbound estimate of mean concentration (EPA 1989a)
Ingestion rate (mg/dy)				
Adult	0 - 170	17 (arith. mean)	100	EPA 1989a
Child (ages 1-6)			200	EPA 1989a
Skin surface area (m2) contacted				
Adult			0.312	arms & hands (EPA 1989b)
Child (ages 1-6)			0.728	total body (EPA 1989b)
Skin absorption factor				
Lead	0 - 100%	50%	0.06%	Moore et al. 1980
Other metals	0 - 100%	50%	1%	Ryan 1987
% of soil contacted which is contaminated	0 - 100%	50%	100%	Best professional judgment
Exposure Frequency (days/year)				
Adult	0 - 365	183	52	EPA 1989b Part I:2-54
Child (ages 1-6)	0 - 365	183	152	EPA 1989b Part I:2-52
Exposure Duration (yrs)				
Adult	1 - 70	35	30	EPA 1989a
Child (ages 1-6)	1 - 6	3	6	Best professional judgment

TABLE W-8

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUMMARY OF VALUES USED TO ESTIMATE GROUND WATER EXPOSURES

Variable	Range	Midpoint	Value Used	Rationale
Chemical conc.			(see Table 2)	95% upperbound estimate of mean conc. (EPA 1989a)
Ingestion rates (l/day)				
Adult	1.24 - 1.73	1.4	2	Reasonable worst case (EPA 1989a)
Child (ages 1-6)			1	Best professional judgment
Skin surface area (m2) contacted				
Adult	1.16 - 2.28	1.94	1.94	total body (EPA 1989b)
Child (ages 1-6)			0.728	total body (EPA 1989b)
Dermal permeability constant			8E-4	Permeability constant for water
Exposure Frequency (days/year)	0 - 365	183	365	Maximum value (EPA 1989a)
Dermal exposure time (minutes)		15	15	Average (EPA 1988)
Exposure Duration (years)				
Adult	1 - 70	35	30	Reasonable worst case (EPA 1989a)
Child (ages 1-6)	1 - 6	3	6	Best professional judgment

TABLE W-9

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUMMARY OF VALUES USED TO ESTIMATE SURFACE WATER EXPOSURES

Variable	Range	Midpoint	Value Used	Rationale
Chemical conc.			(see Table 4)	95% upperbound estimate of mean conc. (EPA 1989a)
Skin surface area contacted (m^2)				
Adult			0.312	arms & hands (EPA 1989b)
Child (ages 1-6)			0.728	total body (EPA 1989b)
Dermal permeability constant			8E-4	Permeability constant for water
Exposure time (hrs/dy)	0 - 24	12	0.50	Best professional judgment
Exposure Frequency (days/year)	0 - 365	183	34	Best professional judgment
Exposure Duration (yr)				
Adult	0 - 70	35	30	Best professional judgment
Child (ages 1-6)	0-6	3	6	Best professional judgment

TABLE W-10

NSNJ, INC./NL INDUSTRIES, INC. SITE
SUMMARY OF VALUES USED TO ESTIMATE AIR EXPOSURES

Variable	Range	Midpoint	Value Used	Rationale
Chemical concentration			(see Table 1)	Modeled - see Appendix L
Inhalation rate (m^3/hr)				
Adult	0.3 - 4.8	2.25	1.25	Upper bound (EPA 1989a)
Child (ages 1-6)			2	Mean - moderate activity (EPA 1989b)
Exposure time (hrs/event)	0 - 24	12	24	Maximum value (EPA 1989a)
Exposure Frequency (dy/yr)	0 - 365	183	365	Maximum value (EPA 1989a)
Exposure Duration (yrs)				
Adult	1-70	35	30	Reasonable worst case (EPA 1989a)
Child (ages 1-6)	1-6	3	6	Best professional judgment

APPENDIX W

SUPPLEMENTAL RISK EVALUATION
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W-9 Summary of Values Used to Estimate Surface Water Exposures

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TABLE W-11

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC
EFFECTS (CHRONIC ORAL EXPOSURES)

Chemical	Chronic RfD (mg/kg-day)	Confidence Level *	Critical Effect	RfD Basis/ RfD Source	Uncertainty & Modifying Factors
Antimony	4E-04	low	longevity, blood chemistry	water/IRIS	UF=1000 (A,H,L), MF=1
Arsenic	1E-03		keratosis	HEAST	UF=1
Beryllium	5E-03	low	none observed	water/IRIS	UF=100 (A,H), MF=1
Cadmium	5E-04	high	renal damage	water/IRIS	UF=10 (H),MF=1
Chromium	5E-03	low	not defined	water/IRIS	UF=500 (A,H,S), MF=1
Copper	NA				
Lead	NA				
Nickel	2E-02	medium	decreased organ wt	diet/IRIS	UF=100 (A,H), MF=3
Selenium	3E-03		hair/nail loss	diet/HEAST	UF=15
Thallium	7E-05		incr. SGOT/serum LDH	diet/HEAST	UF=3000
Zinc	2E-01		anemia	drug/HEAST	UF=10
Sulfate	NA				
1,1-Dichloroethane	1E-01		none	air/HEAST	UF=1000
1,1-Dichloroethene	9E-03	medium	liver lesions	water/IRIS	UF=1000 (A,H,L), MF=1
Tetrachloroethene	1E-02	medium	hepatotoxicity	gavage/IRIS	UF=1000 (A,H,S), MF=1
1,1,1-trichloroethane	9E-02	medium	hepatotoxicity	air/IRIS	UF=1000 (A,H,S), MF=1
vinyl chloride	NA				

* - confidence level from IRIS, either high, medium, or low
NA = not available

Uncertainty adjustments:
- H = variation in human sensitivity
- A = animal to human extrapolation
- S = extrapolation from subchronic to chronic NOAEL
- L = extrapolation from LOAEL to NOAEL

TABLE W-12

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC
EFFECTS (CHRONIC INHALATION EXPOSURES)

Chemical	Chronic RfD (mg/kg-day)	Confidence Level *	Critical Effect	RfD Basis/ RfD Source	Uncertainty & Modifying Factors
1,1-Dichloroethane	1E-01		kidney damage	air/HEAST	UF=1000
1,1-Dichloroethene	NA				
Tetrachloroethene	NA				
1,1,1-trichloroethane	3E-01		hepatotoxicity	air/HEAST	UF=1000
vinyl chloride	NA				
Antimony	NA				
Arsenic	NA				
Cadmium	NA				
Chromium	NA				
Lead	NA				
Zinc	NA				

* - confidence level from IRIS, either high, medium, or low

NA = not available

Uncertainty adjustments:
A = animal to human extrapolation
H = variation in human sensitivity
L = extrapolation from LOAEL to NOAEL
S = extrapolation from subchronic to chronic NOAEL

TABLE W-13

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC
EFFECTS (SUBCHRONIC ORAL EXPOSURES)

Chemical	Subchronic RfD (mg/kg-day)	Confidence Level *	Critical Effect	RfD Basis/ RfD Source	Uncertainty Factors	Comments
Antimony	4E-04		longevity, blood chemistry	water/HEAST	UF=1000	
Arsenic	1E-03		keratosis	HEAST	UF=1	
Beryllium	5E-03		none observed	water/HEAST	UF=100	
Cadmium	5E-04		renal damage	water/IRIS	UF=10	a
Chromium	2E-02		not defined	water/HEAST	UF=100	
Copper	NA					
Lead	NA					
Nickel	2E-02		decreased organ wt	diet/HEAST	UF=300	
Selenium	4E-03		mortality	diet/HEAST	UF=100	
Thallium	7E-04		incr. SGOT/serum LDH	HEAST	UF=300	
Zinc	2E-01		anemia	drug/HEAST	UF=10	
Sulfate						
1,1-Dichloroethane	1E+00		none	air/HEAST	UF=100	
1,1-Dichloroethene	9E-03		liver lesions	water/HEAST	UF=1000	
Tetrachloroethene	1E-01		hepatotoxicity	gavage/HEAST	UF=100	
1,1,1-trichloroethane	9E-01		hepatotoxicity	air/HEAST	UF=100	
vinyl chloride	NA					

* - confidence level from IRIS, either high, medium, or low

a - the toxicity value for chronic exposures was used

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TABLE W-14

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC
EFFECTS (SUBCHRONIC INHALATION EXPOSURES)

Chemical	Chronic RfD (mg/kg-day)	* Confidence Level	Critical Effect	RfD Basis/ RfD Source	Uncertainty Factors
1,1-Dichloroethane	1E+00		kidney damage	air/HEAST	UF=100
1,1-Dichloroethene	NA				
Tetrachloroethene	NA				
1,1,1-Trichloroethane	3E+00		hepatotoxicity	air/HEAST	UF=100
Vinyl chloride	NA				
Antimony	NA				
Arsenic	NA				
Cadmium	NA				
Chromium	NA				
Lead	NA				
Zinc	NA				

* - confidence level from IRIS, either high, medium, or low

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TABLE W-15

NSNJ, INC./NL INDUSTRIES, INC. SITE

TOXICITY VALUES FOR POTENTIAL CARCINOGENIC EFFECTS

Chemical	Slope Factor (SF) (mg/kg-day)-1	Weight-of Evidence Classification	* Type of Cancer	SF Basis/ SF Source	Comment	Based on Absorbed (ABS)/ Admin. (ADM) dose
ORAL						
Arsenic	1.7E+00	A	skin	water/IRIS	a	ADM
Beryllium	4.3E+00	B2		water/IRIS		ADM
Lead	NA	B2			b	
1,1-Dichloroethane	9.1E-02	C		gavage/HEAST		ADM
1,1-Dichloroethene	6E-01	C		water/IRIS		ADM
Tetrachloroethene	5E-02	B2		gavage/HEAST		ADM
Vinyl chloride	2.3E+00	A	lung	diet/HEAST		ADM
INHALATION						
Arsenic	5.0E+01	A	resp. tract	air/HEAST		ABS
Cadmium	6.1E+00	B1		occup/IRIS		ADM
Chromium	4.1E+01	A	lung	occup/IRIS		ADM
Lead	NA				b	
1,1-Dichloroethene	1.2E+00	C		air/IRIS		ABS
Tetrachloroethene	3.3E-03	B2		air/HEAST		ADM
Vinyl chloride	2.95E-01	A	liver	air/HEAST		ADM

Comments:

a = calculated from the proposed unit risk (see Appendix K)

b = not available per EPA personnel (EPA 1990d)

* - types of cancer for Class A carcinogens only

TABLE W-16

NSMJ, INC./NL INDUSTRIES, INC. SITE

TOXICITY VALUE ADJUSTMENTS FOR DERMAL EXPOSURES

Chemical	Toxicity Value (RfD) (mg/kg-day)	Based on Absorb. (ABS)/ Admin. (ADM)	Study Species	Absorption Efficiency in Species	Adjusted Toxicity Value (mg/kg-day)
Chronic Exposures					
Antimony	4E-04	ADM	rat	0.05	2E-05
Arsenic	1E-03	ADM	human	0.95	1E-03
Beryllium	5E-03	ADM	rat	0.01	5E-05
Cadmium	5E-04	ABS	human		-
Chromium	5E-03	ADM	rat	0.03	2E-04
Nickel	2E-02	ADM	rat	0.01	2E-04
Selenium	3E-03	ADM	human	0.90	3E-03
Thallium	7E-05	ADM	rat	0.05	4E-06
Zinc	2E-01	ADM	human	0.20	4E-02
1,1-Dichloroethane	1E-01	ADM	rat	0.50	5E-02
1,1-Dichloroethene	9E-03	ADM	rat	1.00	9E-03
Tetrachloroethene	1E-02	ADM	mouse	1.00	1E-02
1,1,1-trichloroethane	9E-02	ABS	guinea pig		-
Subchronic Exposures					
Antimony	4E-04	ADM	rat	0.05	2E-05
Arsenic	1E-03	ADM	human	0.95	1E-03
Beryllium	5E-03	ADM	rat	0.01	5E-05
Cadmium	5E-04	ABS	human		-
Chromium	2E-02	ADM	rat	0.03	6E-04
Nickel	2E-02	ADM	rat	0.01	2E-04
Selenium	3E-03	ADM	human	0.90	3E-03
Thallium	7E-04	ADM	rat	0.05	4E-05
Zinc	2E-01	ADM	human	0.20	4E-02
1,1-Dichloroethane	1E+00	ADM	rat	0.50	5E-01
1,1-Dichloroethene	9E-03	ADM	rat	1.00	9E-03
Tetrachloroethene	1E-01	ADM	mouse	1.00	1E-01
1,1,1-trichloroethane	9E-01	ABS	guinea pig		-

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TABLE W-17

NSNJ, INC./NL INDUSTRIES, INC. SITE
EXPOSURE ESTIMATE ADJUSTMENTS

Exposure/Receptor/Matrix	Exposure Estimate (mg/kg-day)	Human Absorption Efficiency for Pathway of Interest	Adjusted Exposure Estimate (mg/kg-day)
NONCARCINOGENIC EFFECTS			
ORAL - CHILD (AGES 1-6)			
SITE-WIDE GROUND WATER			
Cadmium	1.13E-02	0.05 #	5.65E-04
1,1,1-Trichloroethane	2.938E-01	0.90 *	2.64E-01
WELL 2R2			
Cadmium	6.25E-04	0.05 #	3.13E-05
WELL SD			
Cadmium	6.31E-02	0.05 #	3.16E-03
SITE SOIL			
Cadmium	1.82E-05	0.05 #	9.10E-07
ORAL - ADULT			
SITE-WIDE GROUND WATER			
Cadmium	5.14E-03	0.05 #	2.57E-04
1,1,1-Trichloroethane	1.343E-01	0.90 *	1.21E-01
WELL 2R2			
Cadmium	2.86E-04	0.05 #	1.43E-05
WELL SD			
Cadmium	2.89E-02	0.05 #	1.45E-03
SITE SOIL			
Cadmium	7.12E-07	0.05 #	3.56E-08

TABLE W-17

NSNJ, INC./NL INDUSTRIES, INC. SITE
EXPOSURE ESTIMATE ADJUSTMENTS

Exposure/Receptor/Matrix	Exposure Estimate (mg/kg-day)	Human Absorption Efficiency for Pathway of Interest	Adjusted Exposure Estimate (mg/kg-day)
CARCINOGENIC EFFECTS			
INHALATION - CHILD (AGES 1-6)			
SITE AIR			
Arsenic	7.92E-08	0.30 #	2.38E-08
GROUND WATER			
1,1-Dichloroethene	9.107E-04	0.50 *	4.55E-04
INHALATION - ADULT			
SITE AIR			
Arsenic	5.66E-08	0.30 #	1.70E-08
GROUND WATER			
1,1-Dichloroethene	2.082E-03	0.50 *	1.04E-03

Note: Exposure estimates were adjusted only for those chemicals for which toxicity values are based on absorbed doses (see Tables 15 & 16)

* = estimated based on information contained in ATSDR Toxicological Profiles.
# = based on information contained in IRIS.

TABLE W-18

NSNJ, INC./NL INDUSTRIES, INC. SITE

CANCER RISK ESTIMATE FOR AN ON-SITE CHILD RESIDENT (AGES 1-6)

Exposure Pathway	CDI (mg/kg-day)	SF (mg/kg-dy)-1	Wt. of Evidence	Type of Cancer	SF Source	SF Basis	Chemical-Specific Risk	Total Pathway Risk	Total Exposure Risk
FUTURE EXPOSURES - TYPE 1									
GW INGESTION									
Arsenic	9.1E-05	1.7E+00	A	skin	IRIS	water	2E-04		
Beryllium	3.750E-05	4.3E+00	B2		IRIS	water	2E-04		
1,1-Dichloroethane	3.964E-04	9.1E-02	C		HEAST	gavage	4E-05		
1,1-Dichloroethene	9.107E-04	6E-01	C		IRIS	water	5E-04		
Tetrachloroethene	9.643E-04	5E-02	B2		HEAST	gavage	5E-05		
Vinyl chloride	4.821E-05	2.3E+00	A	lung	HEAST	diet	1E-04		
								1E-03	
GW DERMAL									
Arsenic	1.33E-07	1.8E+00 *	A	skin	IRIS	water	2E-07		
Beryllium	5.46E-08	4.3E+02 *	B2		IRIS	water	2E-05		
1,1-Dichloroethane	5.77E-07	1.8E-01 *	C		HEAST	gavage	1E-07		
1,1-Dichloroethene	1.33E-06	6E-01 *	C		IRIS	water	8E-07		
Tetrachloroethene	1.40E-06	5E-02 *	B2		HEAST	gavage	7E-08		
Vinyl chloride	7.02E-08	2.3E+00 *	A	lung	HEAST	diet	2E-07		
								2E-05	
GW INHALATION									
1,1-Dichloroethene	4.55E-04 *	1.2E+00	C		IRIS	air	5E-04		
Tetrachloroethene	9.643E-04	3.3E-03	B2		HEAST	air	3E-06		
Vinyl chloride	4.821E-05	2.95E-01	A	liver	HEAST	air	1E-05		
								6E-04	
SITE SOIL INGESTION									
Arsenic	5.3E-06	1.7E+00	A	skin	IRIS	water	9E-06		
								9E-06	
SITE SOIL DERMAL									
Arsenic	9.77E-07	1.8E+00 *	A	skin	IRIS	water	2E-06		
								2E-06	
AIR INHALATION									
Arsenic	2.38E-08 *	5.0E+01	A	respir.	HEAST	air	1E-06		
Cadmium	2.35E-08	6.1E+00	B1		IRIS	occup.	1E-07		
Chromium	1.27E-07	4.1E+01	A	lung	IRIS	occup.	5E-06		
								7E-06	
									2E-03
FUTURE EXPOSURES - TYPE 2									
GW INGESTION (WELL 2R2)									
Arsenic	9.8E-02	1.7E+00	A	skin	IRIS	water	2E-01		
								2E-01	

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TABLE W-18

NSNJ, INC./NL INDUSTRIES, INC. SITE

CANCER RISK ESTIMATE FOR AN ON-SITE CHILD RESIDENT (AGES 1-6)

Exposure Pathway	CDI (mg/kg-day)	SF (mg/kg-dy)-1	Wt. of Evidence	Type of Cancer	SF Source	SF Basis	Chemical-Specific Risk	Total Pathway Risk	Total Exposure Risk
GW DERMAL (WELL 2R2)									
Arsenic	1.42E-04	1.8E+00 *	A	skin	IRIS	water	3E-04		
								3E-04	
SITE SOIL INGESTION									
Arsenic	5.3E-06	1.7E+00	A	skin	IRIS	water	9E-06		
								9E-06	
SITE SOIL DERMAL									
Arsenic	9.77E-07	1.8E+00 *	A	skin	IRIS	water	2E-06		
								2E-06	
AIR INHALATION									
Arsenic	2.38E-08 *	5.0E+01	A	respir.	HEAST	air	1E-06		
Cadmium	2.35E-08	6.1E+00	B1		IRIS	occup.	1E-07		
Chromium	1.27E-07	4.1E+01	A	lung	IRIS	occup.	5E-06		
								7E-06	
									2E-01
FUTURE EXPOSURES - TYPE 3									
GW INGESTION (WELL SD)									
Beryllium	8.357E-04	4.3E+00	B2		IRIS	water	4E-03		
								4E-03	
GW DERMAL (WELL SD)									
Beryllium	1.22E-06	4.3E+02 *	B2		IRIS	water	5E-04		
								5E-04	
SITE SOIL INGESTION									
Arsenic	5.3E-06	1.7E+00	A	skin	IRIS	water	9E-06		
								9E-06	
SITE SOIL DERMAL									
Arsenic	9.77E-07	1.8E+00 *	A	skin	IRIS	water	2E-06		
								2E-06	
AIR INHALATION									
Arsenic	2.38E-08 *	5.0E+01	A	respir.	HEAST	air	1E-06		
Cadmium	2.35E-08	6.1E+00	B1		IRIS	occup.	1E-07		
Chromium	1.27E-07	4.1E+01	A	lung	IRIS	occup.	5E-06		
								7E-06	
									4E-03

* = adjusted for absorption

Future - Type 1 = Ground water exposures are based on site-wide ground water quality

Future - Type 2 = Ground water exposures are based on Well 2R2 ground water quality

Future - Type 3 = Ground water exposures are based on Well SD ground water quality

TABLE W-19

NSNJ, INC./NL INDUSTRIES, INC. SITE

CANCER RISK ESTIMATE FOR AN ON-SITE ADULT RESIDENT

Exposure Pathway	CDI (mg/kg/day)	SF (mg/kg-dy)-1	Wt. of Evidence	Type of Cancer	SF Source	SF Basis	Chemical-Specific Risk	Total Pathway Risk	Total Exposure Risk
FUTURE EXPOSURES - TYPE 1									
GW INGESTION									
Arsenic	2.1E-04	1.7E+00	A	skin	IRIS	water	4E-04		
Beryllium	8.571E-05	4.3E+00	B2		IRIS	water	4E-04		
1,1-Dichloroethane	9.061E-04	9.1E-02	C		HEAST	gavage	8E-05		
1,1-Dichloroethene	2.082E-03	6E-01	C		IRIS	water	1E-03		
Tetrachloroethene	2.204E-03	5E-02	B2		HEAST	gavage	1E-04		
Vinyl chloride	1.102E-04	2.3E+00	A	lung	HEAST	diet	3E-04		
								2E-03	
GW DERMAL ABSORPTION									
Arsenic	4.0E-07	1.8E+00 *	A	skin	IRIS	water	7E-07		
Beryllium	1.66E-07	4.3E+02 *	B2		IRIS	water	7E-05		
1,1-Dichloroethane	1.76E-06	1.8E-01 *	B2		HEAST	gavage	3E-07		
1,1-Dichloroethene	4.04E-06	6E-01 *	C		IRIS	water	2E-06		
Tetrachloroethene	4.28E-06	5E-02 *	C		HEAST	gavage	2E-07		
Vinyl chloride	2.14E-07	2.3E+00 *	A	lung	HEAST	diet	5E-07		
								8E-05	
GW INHALATION									
1,1-Dichloroethene	1.04E-03 *	1.2E+00	C		IRIS	air	1E-03		
Tetrachloroethene	2.204E-03	3.3E-03	B2		HEAST	air	7E-06		
Vinyl chloride	1.102E-04	2.95E-01	A	liver	HEAST	air	3E-05		
								1E-03	
SITE SOIL INGESTION									
Arsenic	1.0E-06	1.7E+00	A	skin	IRIS	water	2E-06		
								2E-06	
SITE SOIL DERMAL									
Arsenic	1.64E-07	1.8E+00 *	A	skin	IRIS	water	3E-07		
								3E-07	
SITE AIR INHALATION									
Arsenic	1.70E-08 *	5.0E+01	A	respir.	HEAST	air	9E-07		
Cadmium	1.68E-08	6.1E+00	B1		IRIS	occup	1E-07		
Chromium	9.07E-08	4.1E+01	A	lung	IRIS	occup	4E-06		
								5E-06	
									4E-03
FUTURE EXPOSURES - TYPE 2									
GW INGESTION - WELL 2R2									
Arsenic	2.2E-01	1.7E+00	A	skin	IRIS	water	3E-01		
								3E-01	

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TABLE W-19

NSNJ, INC./NL INDUSTRIES, INC. SITE

CANCER RISK ESTIMATE FOR AN ON-SITE ADULT RESIDENT

Exposure Pathway	CDI (mg/kg/day)	SF (mg/kg-dy)-1	Wt. of Evidence	Type of Cancer	SF Source	SF Basis	Chemical-Specific Risk	Total Pathway Risk	Total Exposure Risk
GW DERMAL - WELL 2R2									
Arsenic	4.32E-04	1.8E+00 *	A	skin	IRIS	water	8E-04		
								8E-04	
SITE SOIL INGESTION									
Arsenic	1.0E-06	1.7E+00	A	skin	IRIS	water	2E-06		
								2E-06	
SITE SOIL DERMAL									
Arsenic	1.64E-07	1.8E+00 *	A	skin	IRIS	water	3E-07		
								3E-07	
SITE AIR INHALATION									
Arsenic	1.70E-08 *	5.0E+01	A	respir.	HEAST	air	9E-07		
Cadmium	1.68E-08	6.1E+00	B1		IRIS	occup	1E-07		
Chromium	9.07E-08	4.1E+01	A	lung	IRIS	occup	4E-06		
								5E-06	
									3E-01
FUTURE EXPOSURES - TYPE 3									
GW INGESTION - WELL SD									
Beryllium	1.910E-03	4.3E+00	B2		IRIS	water	8E-03		
								8E-03	
GW DERMAL - WELL SD									
Beryllium	3.71E-06	4.3E+02 *	B2		IRIS	water	2E-03		
								2E-03	
SITE SOIL INGESTION									
Arsenic	1.0E-06	1.7E+00	A	skin	IRIS	water	2E-06		
								2E-06	
SITE SOIL DERMAL									
Arsenic	1.64E-07	1.8E+00 *	A	skin	IRIS	water	3E-07		
								3E-07	
SITE AIR INHALATION									
Arsenic	1.70E-08 *	5.0E+01	A	respir.	HEAST	air	9E-07		
Cadmium	1.68E-08	6.1E+00	B1		IRIS	occup	1E-07		
Chromium	9.07E-08	4.1E+01	A	lung	IRIS	occup	4E-06		
								5E-06	
									1E-02

* = adjusted for absorption

Future - Type 1 = Ground water exposures are based on site-wide ground water quality

Future - Type 2 = Ground water exposures are based on Well 2R2 ground water quality

Future - Type 3 = Ground water exposures are based on Well SD ground water quality

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TABLE W-20

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE CHILD RESIDENT (AGES 1-6)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
FUTURE EXPOSURES - TYPE 1									
GROUND WATER INGESTION									
Antimony	4.813E-03	4E-04	longevity	HEAST	water	1000	1E+01		
Arsenic	1.1E-03	1E-03	keratosis	HEAST	water	1	1E+00		
Beryllium	4.375E-04	5E-03	none observed	HEAST	water	100	9E-02		
Cadmium	5.65E-04 *	5E-04	renal damage	IRIS	water	10	1E+00		
Chromium	7.063E-03	2E-02	not defined	HEAST	water	100	4E-01		
Nickel	8.75E-03	2E-02	decr. organ wt.	HEAST	diet	300	4E-01		
Selenium	1.250E-03	4E-03	mortality	HEAST	diet	100	3E-01		
Thallium	6.250E-05	7E-04	blood effects	HEAST	?	300	9E-02		
Zinc	3.77E-02	2E-01	anemia	HEAST	drug	10	2E-01		
1,1-Dichloroethane	4.625E-03	1E+00	none	HEAST	air	100	5E-03		
1,1-Dichloroethene	1.063E-02	9E-03	liver lesions	HEAST	water	1000	1E+00		
Tetrachloroethene	1.125E-02	1E-01	hepatotoxicity	HEAST	gavage	100	1E-01		
1,1,1-Trichloroethane	2.64E-01 *	9E-01	hepatotoxicity	HEAST	air	100	3E-01		
								17.32	
GROUND WATER DERMAL									
Antimony	7.01E-06	2E-05 *	longevity	HEAST	water	1000	4E-01		
Arsenic	1.55E-06	9E-04 *	keratosis	HEAST	water	1	2E-03		
Beryllium	6.37E-07	5E-05 *	none observed	HEAST	water	100	1E-02		
Cadmium	1.64E-05	5E-04	renal damage	IRIS	water	10	3E-02		
Chromium	1.03E-05	6E-04 *	not defined	HEAST	water	100	2E-02		
Nickel	1.27E-05	2E-04 *	decr. organ wt.	HEAST	diet	300	6E-02		
Selenium	1.82E-06	3E-03 *	mortality	HEAST	diet	100	6E-04		
Thallium	9.10E-08	4E-05 *	blood effects	HEAST	?	300	2E-03		
Zinc	5.49E-05	4E-02 *	anemia	HEAST	drug	10	1E-03		
1,1-Dichloroethane	6.73E-06	5E-01 *	none	HEAST	air	100	1E-05		
1,1-Dichloroethene	1.55E-05	9E-03 *	liver lesions	HEAST	water	1000	2E-03		
Tetrachloroethene	1.64E-05	1E-01 *	hepatotoxicity	HEAST	gavage	100	2E-04		
1,1,1-Trichloroethane	4.28E-04	9E-01	hepatotoxicity	HEAST	air	100	5E-04		
								0.49	
GROUND WATER INHALATION									
1,1-Dichloroethane	4.625E-03	1E+00	kidney damage	HEAST	air	100	5E-03		
1,1,1-Trichloroethane	2.938E-01	3E+00	hepatotoxicity	HEAST	air	100	1E-01		
								0.10	
SITE SOIL INGESTION									
Antimony	5E-04	4E-04	longevity	HEAST	water	1000	1E+00		
Arsenic	6.1E-05	1E-03	keratosis	HEAST	water	1	6E-02		
Cadmium	9.10E-07 *	5E-04	renal damage	IRIS	water	10	2E-03		
Chromium	9.84E-05	2E-02	not defined	HEAST	water	100	5E-03		
Zinc	2.9E-04	2E-01	anemia	HEAST	drug	10	1E-03		
								1.3E+00	

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TABLE W-20

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE CHILD RESIDENT (AGES 1-6)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
SITE SOIL DERMAL									
Antimony	9.28E-05	2E-05 *	longevity	HEAST	water	1000	5E+00		
Arsenic	1.14E-05	9E-04 *	keratosis	HEAST	water	1	1E-02		
Cadmium	3.38E-06	5E-04	renal damage	IRIS	water	10	7E-03		
Chromium	1.83E-05	6E-04 *	not defined	HEAST	water	100	3E-02		
Zinc	5.5E-05	4E-02 *	anemia	HEAST	drug	10	1E-03		
								4.7E+00	
									23.92
FUTURE EXPOSURES - TYPE 2									
WELL 2R2 - INGESTION									
Arsenic	1.1E+00	1E-03	keratosis	HEAST	water	1	1E+03		
Cadmium	3.13E-05 *	5E-04	renal damage	IRIS	water	10	6E-02		
Chromium	5.000E-04	2E-02	not defined	HEAST	water	100	3E-02		
								1100.09	
WELL 2R2 - DERMAL									
Arsenic	1.66E-03	9E-04 *	keratosis	HEAST	water	1	2E+00		
Cadmium	9.10E-07	5E-04	renal damage	IRIS	water	10	2E-03		
Chromium	7.28E-07	6E-04 *	not defined	HEAST	water	100	1E-03		
								1.85	
SITE SOIL INGESTION									
Antimony	5E-04	4E-04	longevity	HEAST	water	1000	1E+00		
Arsenic	6.1E-05	1E-03	keratosis	HEAST	water	1	6E-02		
Cadmium	9.10E-07 *	5E-04	renal damage	IRIS	water	10	2E-03		
Chromium	9.84E-05	2E-02	not defined	HEAST	water	100	5E-03		
Zinc	2.9E-04	2E-01	anemia	HEAST	drug	10	1E-03		
								1.3E+00	
SITE SOIL DERMAL									
Antimony	9.28E-05	2E-05 *	longevity	HEAST	water	1000	5E+00		
Arsenic	1.14E-05	9E-04 *	keratosis	HEAST	water	1	1E-02		
Cadmium	3.38E-06	5E-04	renal damage	IRIS	water	10	7E-03		
Chromium	1.83E-05	6E-04 *	not defined	HEAST	water	100	3E-02		
Zinc	5.5E-05	4E-02 *	anemia	HEAST	drug	10	1E-03		
								4.7E+00	
									1107.95
FUTURE EXPOSURES - TYPE 3									
WELL SD - INGESTION									
Beryllium	9.750E-03	5E-03	none observed	HEAST	water	100	2E+00		
Cadmium	3.16E-03 *	5E-04	renal damage	IRIS	water	10	6E+00		

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TABLE W-20

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE CHILD RESIDENT (AGES 1-6)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Chromium	2.713E-01	2E-02	not defined	HEAST	water	100	1E+01		
Nickel	1.21E-01	2E-02	decr. organ wt.	HEAST	diet	300	6E+00		
Thallium	1.875E-04	7E-04	blood effects	HEAST	?	300	3E-01		
Zinc	5.40E-01	2E-01	anemia	HEAST	drug	10	3E+00		
								30.85	
WELL SD - DERMAL									
Beryllium	1.42E-05	5E-05 *	none observed	HEAST	water	100	3E-01		
Cadmium	9.19E-05	5E-04	renal damage	IRIS	water	10	2E-01		
Chromium	3.95E-04	6E-04 *	not defined	HEAST	water	100	7E-01		
Nickel	1.76E-04	2E-04 *	decr. organ wt.	HEAST	diet	300	9E-01		
Thallium	2.73E-07	4E-05 *	blood effects	HEAST	?	300	7E-03		
Zinc	7.86E-04	4E-02 *	anemia	HEAST	drug	10	2E-02		
								2.03	
SITE SOIL INGESTION									
Antimony	5E-04	4E-04	longevity	HEAST	water	1000	1E+00		
Arsenic	6.1E-05	1E-03	keratosis	HEAST	water	1	6E-02		
Cadmium	9.10E-07 *	5E-04	renal damage	IRIS	water	10	2E-03		
Chromium	9.84E-05	2E-02	not defined	HEAST	water	100	5E-03		
Zinc	2.9E-04	2E-01	anemia	HEAST	drug	10	1E-03		
								1.32	
SITE SOIL DERMAL									
Antimony	9.28E-05	2E-05 *	longevity	HEAST	water	1000	5E+00		
Arsenic	1.14E-05	9E-04 *	keratosis	HEAST	water	1	1E-02		
Cadmium	3.38E-06	5E-04	renal damage	IRIS	water	10	7E-03		
Chromium	1.83E-05	6E-04 *	not defined	HEAST	water	100	3E-02		
Zinc	5.5E-05	4E-02 *	anemia	HEAST	drug	10	1E-03		
								4.7E+00	
									38.90

* = adjusted for absorption

SDIs and RfDs expressed in mg/kg-day

TABLE W-21

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
FUTURE EXPOSURES - TYPE 1									
GROUND WATER INGESTION									
Antimony	2.200E-03	4E-04	longevity	IRIS	water	1000	6E+00		
Arsenic	4.9E-04	1E-03	keratosis	HEAST	water	1	5E-01		
Beryllium	2.000E-04	5E-03	none observed	IRIS	water	100	4E-02		
Cadmium	2.57E-04 *	5E-04	renal damage	IRIS	water	10	5E-01		
Chromium	3.229E-03	5E-03	not defined	IRIS	water	500	6E-01		
Nickel	4.00E-03	2E-02	decr. organ wt.	IRIS	diet	100	2E-01		
Selenium	5.714E-04	3E-03	hair/nail loss	HEAST	diet	15	2E-01		
Thallium	2.857E-05	7E-05	blood effects	HEAST	diet	3000	4E-01		
Zinc	1.72E-02	2E-01	anemia	HEAST	drug	10	9E-02		
1,1-Dichloroethane	2.114E-03	1E-01	none	HEAST	air	1000	2E-02		
1,1-Dichloroethene	4.857E-03	9E-03	liver lesions	IRIS	water	1000	5E-01		
Tetrachloroethene	5.143E-03	1E-02	hepatotoxicity	IRIS	gavage	1000	5E-01		
1,1,1-Trichloroethane	1.21E-01 *	9E-02	hepatotoxicity	IRIS	air	1000	1E+00		
								10	
GROUND WATER DERMAL									
Antimony	4.27E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	9.42E-07	9E-04 *	keratosis	HEAST	water	1	1E-03		
Beryllium	3.88E-07	5E-05 *	none observed	IRIS	water	100	8E-03		
Cadmium	9.98E-06	5E-04	renal damage	IRIS	water	10	2E-02		
Chromium	6.26E-06	1E-04 *	not defined	IRIS	water	500	6E-02		
Nickel	7.76E-06	2E-04 *	decr. organ wt.	IRIS	diet	100	4E-02		
Selenium	1.11E-06	3E-03 *	hair/nail loss	HEAST	diet	15	4E-04		
Thallium	5.54E-08	3E-06 *	blood effects	HEAST	diet	3000	2E-02		
Zinc	3.34E-05	4E-02 *	anemia	HEAST	drug	10	8E-04		
1,1-Dichloroethane	4.10E-06	5E-02 *	none	HEAST	air	1000	8E-05		
1,1-Dichloroethene	9.42E-06	9E-03 *	liver lesions	IRIS	water	1000	1E-03		
Tetrachloroethene	9.98E-06	1E-02 *	hepatotoxicity	IRIS	gavage	1000	1E-03		
1,1,1-Trichloroethane	2.61E-04	9E-02	hepatotoxicity	IRIS	air	1000	3E-03		
								4E-01	
GROUND WATER INHALATION									
1,1-Dichloroethane	2.114E-03	1E-01	kidney damage	HEAST	air	1000	2E-02		
1,1,1-Trichloroethane	1.343E-01	3E-01	hepatotoxicity	HEAST	air	1000	4E-01		
								5E-01	
SITE SOIL INGESTION									
Antimony	2E-05	4E-04	longevity	IRIS	water	1000	5E-02		
Arsenic	2.4E-06	1E-03	keratosis	HEAST	water	1	2E-03		

TABLE W-21

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Cadmium	3.56E-08 *	5E-04	renal damage	IRIS	water	10	7E-05		
Chromium	3.85E-06	5E-03	not defined	IRIS	water	500	8E-04		
Zinc	1.1E-05	2E-01	anemia	HEAST	drug	10	6E-05		
								0.05	
SITE SOIL DERMAL									
Antimony	3.11E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	3.82E-07	9E-04 *	keratosis	HEAST	water	1	4E-04		
Cadmium	1.13E-07	5E-04	renal damage	IRIS	water	10	2E-04		
Chromium	6.12E-07	1E-04 *	not defined	IRIS	water	500	6E-03		
Zinc	1.8E-06	4E-02 *	anemia	HEAST	drug	10	5E-05		
								0.16	
									12
FUTURE EXPOSURES - TYPE 2									
WELL 2R2 - INGESTION									
Arsenic	5.2E-01	1E-03	keratosis	HEAST	water	1	5E+02		
Cadmium	1.43E-05 *	5E-04	renal damage	IRIS	water	10	3E-02		
Chromium	2.286E-04	5E-03	not defined	IRIS	water	500	5E-02		
								520.1	
WELL 2R2 - DERMAL									
Arsenic	1.01E-03	9E-04 *	keratosis	HEAST	water	1	1E+00		
Cadmium	5.54E-07	5E-04	renal damage	IRIS	water	10	1E-03		
Chromium	4.43E-07	1E-04 *	not defined	IRIS	water	500	4E-03		
								1.1	
SITE SOIL INGESTION									
Antimony	2E-05	4E-04	longevity	IRIS	water	1000	5E-02		
Arsenic	2.4E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Cadmium	3.56E-08 *	5E-04	renal damage	IRIS	water	10	7E-05		
Chromium	3.85E-06	5E-03	not defined	IRIS	water	500	8E-04		
Zinc	1.1E-05	2E-01	anemia	HEAST	drug	10	6E-05		
								0.05	
SITE SOIL DERMAL									
Antimony	3.11E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	3.82E-07	9E-04 *	keratosis	HEAST	water	1	4E-04		
Cadmium	1.13E-07	5E-04	renal damage	IRIS	water	10	2E-04		
Chromium	6.12E-07	1E-04 *	not defined	IRIS	water	500	6E-03		
Zinc	1.8E-06	4E-02 *	anemia	HEAST	drug	10	5E-05		
								0.16	
									521.4

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TABLE W-21

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
FUTURE EXPOSURES - TYPE 3									
WELL SD - INGESTION									
Beryllium	4.457E-03	5E-03	none observed	IRIS	water	100	9E-01		
Cadmium	1.45E-03 *	5E-04	renal damage	IRIS	water	10	3E+00		
Chromium	1.240E-01	5E-03	not defined	IRIS	water	500	2E+01		
Nickel	5.51E-02	2E-02	decr. organ wt.	IRIS	diet	100	3E+00		
Thallium	8.571E-05	7E-05	blood effects	HEAST	diet	3000	1E+00		
Zinc	2.47E-01	2E-01	anemia	HEAST	drug	10	1E+00		
								33.8	
WELL SD - DERMAL									
Beryllium	8.65E-06	5E-05 *	none observed	IRIS	water	100	2E-01		
Cadmium	5.60E-05	5E-04	renal damage	IRIS	water	10	1E-01		
Chromium	2.41E-04	1E-04 *	not defined	IRIS	water	500	2E+00		
Nickel	1.07E-04	2E-04 *	decr. organ wt.	IRIS	diet	100	5E-01		
Thallium	1.66E-07	3E-06 *	blood effects	HEAST	diet	3000	6E-02		
Zinc	4.79E-04	4E-02 *	anemia	HEAST	drug	10	1E-02		
								3.3	
SITE SOIL INGESTION									
Antimony	2E-05	4E-04	longevity	IRIS	water	1000	5E-02		
Arsenic	2.4E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Cadmium	3.56E-08 *	5E-04	renal damage	IRIS	water	10	7E-05		
Chromium	3.85E-06	5E-03	not defined	IRIS	water	500	8E-04		
Zinc	1.1E-05	2E-01	anemia	HEAST	drug	10	6E-05		
								0.05	
SITE SOIL DERMAL									
Antimony	3.11E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	3.82E-07	9E-04 *	keratosis	HEAST	water	1	4E-04		
Cadmium	1.13E-07	5E-04	renal damage	IRIS	water	10	2E-04		
Chromium	6.12E-07	1E-04 *	not defined	IRIS	water	500	6E-03		
Zinc	1.8E-06	4E-02 *	anemia	HEAST	drug	10	5E-05		
								0.16	
									37.3

Note: CDIs and RfDs expressed in mg/kg-day

* = adjusted for absorption

ING = ingestion, DERM = dermal absorption

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TABLE W-53

NSNJ, INC./NL INDUSTRIES, INC. SITE

TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC EFFECTS (CHRONIC ORAL EXPOSURES)

Chemical	Chronic RfD (mg/kg-day)	* Confidence Level	Critical Effect	RfD Basis/ RfD Source	Uncertainty & Modifying Factors
Antimony	4E-04	low	longevity, blood chemistry	water/IRIS	UF=1000 (A,H,L), MF=1
Arsenic	1E-03		keratosis	HEAST	UF=1
Beryllium	5E-03	low	none observed	water/IRIS	UF=100 (A,H), MF=1
Cadmium	5E-04	high	renal damage	water/IRIS	UF=10 (H),MF=1
Chromium	5E-03	low	not defined	water/IRIS	UF=500 (A,H,S), MF=1
Copper	NA				
Lead	NA				
Nickel	2E-02	medium	decreased organ wt	diet/IRIS	UF=100 (A,H), MF=3
Selenium	3E-03		hair/nail loss	diet/HEAST	UF=15
Thallium	7E-05		incr. SGOT/serum LDH	diet/HEAST	UF=3000
Zinc	2E-01		anemia	drug/HEAST	UF=10
Sulfate	NA				
1,1-Dichloroethane	1E-01		none	air/HEAST	UF=1000
1,1-Dichloroethene	9E-03	medium	liver lesions	water/IRIS	UF=1000 (A,H,L), MF=1
Tetrachloroethene	1E-02	medium	hepatotoxicity	gavage/IRIS	UF=1000 (A,H,S), MF=1
1,1,1-trichloroethane	9E-02	medium	hepatotoxicity	air/IRIS	UF=1000 (A,H,S), MF=1
vinyl chloride	NA				

* - confidence level from IRIS, either high, medium, or low
NA = not available

Uncertainty adjustments:
- H = variation in human sensitivity
- A = animal to human extrapolation
- S = extrapolation from subchronic to chronic NOAEL
- L = extrapolation from LOAEL to NOAEL

TABLE W-55

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUES FOR POTENTIAL NONCARCINOGENIC
EFFECTS (SUBCHRONIC ORAL EXPOSURES)

Chemical	Subchronic RfD (mg/kg-day)	* Confidence Level	Critical Effect	RfD Basis/ RfD Source	Uncertainty Factors	Comments
Antimony	4E-04		longevity, blood chemistry	water/HEAST	UF=1000	
Arsenic	1E-03		keratosis	HEAST	UF=1	
Beryllium	5E-03		none observed	water/HEAST	UF=100	
Cadmium	5E-04		renal damage	water/IRIS	UF=10	a
Chromium	2E-02		not defined	water/HEAST	UF=100	
Copper	NA					
Lead	NA					
Nickel	2E-02		decreased organ wt	diet/HEAST	UF=300	
Selenium	4E-03		mortality	diet/HEAST	UF=100	
Thallium	7E-04		incr. SGOT/serum LDH	HEAST	UF=300	
Zinc	2E-01		anemia	drug/HEAST	UF=10	
Sulfate						
1,1-Dichloroethane	1E+00		none	air/HEAST	UF=100	
1,1-Dichloroethene	9E-03		liver lesions	water/HEAST	UF=1000	
Tetrachloroethene	1E-01		hepatotoxicity	gavage/HEAST	UF=100	
1,1,1-trichloroethane	9E-01		hepatotoxicity	air/HEAST	UF=100	
vinyl chloride	NA					

* - confidence level from IRIS, either high, medium, or low

a - the toxicity value for chronic exposures was used

TABLE W-58

NSNJ, INC./NL INDUSTRIES, INC. SITE

TOXICITY VALUE ADJUSTMENTS FOR DERMAL EXPOSURES

Chemical	Toxicity Value (RfD) (mg/kg-day)	Based on Absorb. (ABS)/ Admin. (ADM)	Study Species	Absorption Efficiency in Species	Adjusted Toxicity Value (mg/kg-day)
Chronic Exposures					
Antimony	4E-04	ADM	rat	0.05	2E-05
Arsenic	1E-03	ADM	human	0.95	1E-03
Beryllium	5E-03	ADM	rat	0.01	5E-05
Cadmium	5E-04	ABS	human		-
Chromium	5E-03	ADM	rat	0.03	2E-04
Nickel	2E-02	ADM	rat	0.01	2E-04
Selenium	3E-03	ADM	human	0.90	3E-03
Thallium	7E-05	ADM	rat	0.05	4E-06
Zinc	2E-01	ADM	human	0.20	4E-02
1,1-Dichloroethane	1E-01	ADM	rat	0.50	5E-02
1,1-Dichloroethene	9E-03	ADM	rat	1.00	9E-03
Tetrachloroethene	1E-02	ADM	mouse	1.00	1E-02
1,1,1-trichloroethane	9E-02	ABS	guinea pig		-
Subchronic Exposures					
Antimony	4E-04	ADM	rat	0.05	2E-05
Arsenic	1E-03	ADM	human	0.95	1E-03
Beryllium	5E-03	ADM	rat	0.01	5E-05
Cadmium	5E-04	ABS	human		-
Chromium	2E-02	ADM	rat	0.03	6E-04
Nickel	2E-02	ADM	rat	0.01	2E-04
Selenium	3E-03	ADM	human	0.90	3E-03
Thallium	7E-04	ADM	rat	0.05	4E-05
Zinc	2E-01	ADM	human	0.20	4E-02
1,1-Dichloroethane	1E+00	ADM	rat	0.50	5E-01
1,1-Dichloroethene	9E-03	ADM	rat	1.00	9E-03
Tetrachloroethene	1E-01	ADM	mouse	1.00	1E-01
1,1,1-trichloroethane	9E-01	ABS	guinea pig		-

TABLE W-58

NSNJ, INC./NL INDUSTRIES, INC. SITE
TOXICITY VALUE ADJUSTMENTS FOR DERMAL EXPOSURES

Chemical	Toxicity Value (Slope Factor)	Based on Absorb. (ABS)/ Admin. (ADM)	Study Species	Absorption Efficiency in Species	Adjusted Toxicity Value (Slope Factor)
Arsenic	1.7E+00	ADM	human	0.95	1.8E+00
Beryllium	4.3E+00	ADM	rat	0.01	4.3E+02
1,1-Dichloroethane	9.1E-02	ADM	rat	0.50	1.8E-01
1,1-Dichloroethene	6E-01	ADM	rat	1.00	6E-01
Tetrachloroethene	5E-02	ADM	rat	1.00	5E-02
Vinyl chloride	2.3E+00	ADM	rat	1.00	2.3E+00

Notes: Only toxicity values based on administered doses were adjusted

Absorption efficiencies were obtained from ATSDR Toxicological Profiles

Slope factors expressed in (mg/kg-day)-1

TABLE W-59

NSNJ, INC./NL INDUSTRIES, INC. SITE

EXPOSURE ESTIMATE ADJUSTMENTS

Exposure/Receptor/Matrix	Exposure Estimate (mg/kg-day)	Human Absorption Efficiency for Pathway of Interest	Adjusted Exposure Estimate (mg/kg-day)
NONCARCINOGENIC EFFECTS			
ORAL - ADULT RESIDENT (OFF-SITE)			
SITE-WIDE GROUND WATER			
Cadmium	5.14E-03	0.05 #	2.57E-04
1,1,1-Trichloroethane	1.343E-01	0.90 *	1.21E-01
WELL 2R2			
Cadmium	2.86E-04	0.05 #	1.43E-05
WELL SD			
Cadmium	2.89E-02	0.05 #	1.45E-03
ORAL - CHILD AGES 10-12 (OFF-SITE)			
SITE-WIDE GROUND WATER			
Cadmium	1.00E-02	0.05 #	5.00E-04
1,1,1-Trichloroethane	2.611E-01	0.90 *	2.35E-01
WELL 2R2			
Cadmium	5.56E-04	0.05 #	2.78E-05
WELL SD			
Cadmium	5.61E-02	0.05 #	2.81E-03
SITE SOIL			
Cadmium	1.01E-07	0.05 #	5.05E-09
ORAL - WORKER (OFF-SITE)			
SITE-WIDE GROUND WATER			
Cadmium	1.83E-03	0.05 #	9.15E-05
1,1,1-Trichloroethane	4.783E-02	0.90 *	4.30E-02

TABLE W-59

NSNJ, INC./NL INDUSTRIES, INC. SITE

EXPOSURE ESTIMATE ADJUSTMENTS

Exposure/Receptor/Matrix	Exposure Estimate (mg/kg-day)	Human Absorption Efficiency for Pathway of Interest	Adjusted Exposure Estimate (mg/kg-day)
WELL 2R2			
Cadmium	1.018E-04	0.05 #	5.09E-06
WELL SD			
Cadmium	1.028E-02	0.05 #	5.14E-04
CARCINOGENIC EFFECTS			
INHALATION - ADULT RESIDENT (OFF-SITE)			
GROUND WATER			
1,1-Dichloroethene	2.082E-03	0.50 *	1.04E-03
INHALATION - CHILD AGES 10-12 (OFF-SITE)			
GROUND WATER			
1,1-Dichloroethene	4.048E-04	0.50 *	2.02E-04
INHALATION - WORKER (ON-SITE)			
SITE AIR			
Arsenic	3.630E-08	0.30 #	1.09E-08

Note: Exposure estimates were adjusted only for those chemicals for which toxicity values are based on absorbed doses (see Tables 57 & 58)

* = estimated based on information contained in ATSDR Toxicological Profiles.

= based on information contained in IRIS.

TABLE W-63

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE CHILD RESIDENT (AGES 10-12)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
CURRENT EXPOSURES									
RESIDENTIAL SOIL ING									
Arsenic	1.11E-05	1E-03	keratosis	HEAST	water	1	1.1E-02		
Chromium	7.24E-06	2E-02	not defined	HEAST	water	100	3.6E-04		
Zinc	4.4E-05	2E-01	anemia	HEAST	drug	10	2.2E-04		
								1.2E-02	
RESIDENTIAL SOIL DERM									
Arsenic	1.16E-06	9E-04 *	keratosis	HEAST	water	1	1.3E-03		
Chromium	7.53E-07	6E-04 *	not defined	HEAST	water	100	1.3E-03		
Zinc	4.6E-06	4E-02 *	anemia	HEAST	drug	10	1.2E-04		
								2.7E-03	
SITE SOIL ING									
Antimony	8E-07	4E-04	longevity	HEAST	water	1000	2.0E-03		
Arsenic	3.5E-07	1E-03	keratosis	HEAST	water	1	3.5E-04		
Cadmium	5.05E-09 *	5E-04	renal damage	IRIS	water	10	1.0E-05		
Chromium	2.52E-07	2E-02	not defined	HEAST	water	100	1.3E-05		
Zinc	1.7E-06	2E-01	anemia	HEAST	drug	10	8.5E-06		
								2.4E-03	
SITE SOIL DERM									
Antimony	8E-08	2E-05 *	longevity	HEAST	water	1000	4.0E-03		
Arsenic	3.7E-08	9E-04 *	keratosis	HEAST	water	1	4.1E-05		
Cadmium	1.05E-08	5E-04	renal damage	IRIS	water	10	2.1E-05		
Chromium	2.63E-08	6E-04 *	not defined	HEAST	water	100	4.4E-05		
Zinc	1.8E-07	4E-02 *	anemia	HEAST	drug	10	4.5E-06		
								4.1E-03	
									0.02

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TABLE W-63

NSMJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE CHILD RESIDENT (AGES 10-12)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
FUTURE EXPOSURES - TYPE 1									
GROUND WATER INGESTION									
Antimony	4.444E-03	4E-04	longevity	HEAST	water	1000	1E+01		
Arsenic	9.4E-04	1E-03	keratosis	HEAST	water	1	9E-01		
Beryllium	3.889E-04	5E-03	none observed	HEAST	water	100	8E-02		
Cadmium	5.00E-04 *	5E-04	renal damage	IRIS	water	10	1E+00		
Chromium	6.278E-03	2E-02	not defined	HEAST	water	100	3E-01		
Nickel	7.78E-03	2E-02	decr. organ wt.	HEAST	diet	300	4E-01		
Selenium	1.111E-03	4E-03	mortality	HEAST	diet	100	3E-01		
Thallium	5.556E-05	7E-04	blood effects	HEAST	?	300	8E-02		
Zinc	3.35E-02	2E-01	anemia	HEAST	drug	10	2E-01		
1,1-Dichloroethane	4.111E-03	1E+00	none	HEAST	air	100	4E-03		
1,1-Dichloroethene	9.444E-03	9E-03	liver lesions	HEAST	water	1000	1E+00		
Tetrachloroethene	1.000E-02	1E-01	hepatotoxicity	HEAST	gavage	100	1E-01		
1,1,1-Trichloroethane	2.35E-01 *	9E-01	hepatotoxicity	HEAST	air	100	3E-01		
								15.78	
GROUND WATER DERM									
Antimony	5.16E-06	2E-05 *	longevity	HEAST	water	1000	3E-01		
Arsenic	1.10E-06	9E-04 *	keratosis	HEAST	water	1	1E-03		
Beryllium	4.51E-07	5E-05 *	none observed	HEAST	water	100	9E-03		
Cadmium	1.16E-05	5E-04	renal damage	IRIS	water	10	2E-02		
Chromium	7.28E-06	6E-04 *	not defined	HEAST	water	100	1E-02		
Nickel	9.02E-06	2E-04 *	decr. organ wt.	HEAST	diet	300	5E-02		
Selenium	1.29E-06	3E-03 *	mortality	HEAST	diet	100	4E-04		
Thallium	6.44E-08	4E-05 *	blood effects	HEAST	?	300	2E-03		
Zinc	3.89E-05	4E-02 *	anemia	HEAST	drug	10	1E-03		
1,1-Dichloroethane	4.77E-06	5E-01 *	none	HEAST	air	100	1E-05		
1,1-Dichloroethene	1.10E-05	9E-03 *	liver lesions	HEAST	water	1000	1E-03		
Tetrachloroethene	1.16E-05	1E-01 *	hepatotoxicity	HEAST	gavage	100	1E-04		
1,1,1-Trichloroethane	3.03E-04	9E-01	hepatotoxicity	HEAST	air	100	3E-04		
								0.35	
GROUND WATER INHALATION									
1,1-Dichloroethane	4.11E-03	1E+00	kidney damage	HEAST	air	100	4E-03		
1,1,1-Trichloroethane	2.611E-01	3E+00	hepatotoxicity	HEAST	air	100	9E-02		
								0.09	
RESIDENTIAL SOIL ING									
Arsenic	1.11E-05	1E-03	keratosis	HEAST	water	1	1.1E-02		

TABLE W-63

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE CHILD RESIDENT (AGES 10-12)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Chromium	7.24E-06	2E-02	not defined	HEAST	water	100	3.6E-04		
Zinc	4.4E-05	2E-01	anemia	HEAST	drug	10	2.2E-04		
								1.2E-02	
RESIDENTIAL SOIL DERM									
Arsenic	1.16E-06	9E-04 *	keratosis	HEAST	water	1	1.3E-03		
Chromium	7.53E-07	6E-04 *	not defined	HEAST	water	100	1.3E-03		
Zinc	4.6E-06	4E-02 *	anemia	HEAST	drug	10	1.2E-04		
								2.7E-03	
SITE SOIL ING									
Antimony	8E-07	4E-04	longevity	HEAST	water	1000	2.0E-03		
Arsenic	3.5E-07	1E-03	keratosis	HEAST	water	1	3.5E-04		
Cadmium	5.05E-09 *	5E-04	renal damage	IRIS	water	10	1.0E-05		
Chromium	2.52E-07	2E-02	not defined	HEAST	water	100	1.3E-05		
Zinc	1.7E-06	2E-01	anemia	HEAST	drug	10	8.5E-06		
								2.4E-03	
SITE SOIL DERM									
Antimony	8E-08	2E-05 *	longevity	HEAST	water	1000	4.0E-03		
Arsenic	3.7E-08	9E-04 *	keratosis	HEAST	water	1	4.1E-05		
Cadmium	1.05E-08	5E-04	renal damage	IRIS	water	10	2.1E-05		
Chromium	2.63E-08	6E-04 *	not defined	HEAST	water	100	4.4E-05		
Zinc	1.8E-07	4E-02 *	anemia	HEAST	drug	10	4.5E-06		
								4.1E-03	
									16.24
FUTURE EXPOSURES - TYPE 2									
WELL 2R2 - INGESTION									
Arsenic	1.0E+00	1E-03	keratosis	HEAST	water	1	1E+03		
Cadmium	2.78E-05 *	5E-04	renal damage	IRIS	water	10	6E-02		
Chromium	4.444E-04	2E-02	not defined	HEAST	water	100	2E-02		
								1000.08	
WELL 2R2 - DERMAL									
Arsenic	1.17E-03	9E-04 *	keratosis	HEAST	water	1	1E+00		
Cadmium	6.44E-07	5E-04	renal damage	IRIS	water	10	1E-03		
Chromium	5.16E-07	6E-04 *	not defined	HEAST	water	100	9E-04		
								1.30	
RESIDENTIAL SOIL ING									

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TABLE W-63

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE CHILD RESIDENT (AGES 10-12)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Arsenic	1.11E-05	1E-03	keratosis	HEAST	water	1	1.1E-02		
Chromium	7.24E-06	2E-02	not defined	HEAST	water	100	3.6E-04		
Zinc	4.4E-05	2E-01	anemia	HEAST	drug	10	2.2E-04		
								1.2E-02	
RESIDENTIAL SOIL DERM									
Arsenic	1.16E-06	9E-04 *	keratosis	HEAST	water	1	1.3E-03		
Chromium	7.53E-07	6E-04 *	not defined	HEAST	water	100	1.3E-03		
Zinc	4.6E-06	4E-02 *	anemia	HEAST	drug	10	1.2E-04		
								2.7E-03	
									1001.39
FUTURE EXPOSURES - TYPE 3									
WELL SD - INGESTION									
Beryllium	8.667E-03	5E-03	none observed	HEAST	water	100	2E+00		
Cadmium	2.81E-03 *	5E-04	renal damage	IRIS	water	10	6E+00		
Chromium	2.411E-01	2E-02	not defined	HEAST	water	100	1E+01		
Nickel	1.07E-01	2E-02	decr. organ wt.	HEAST	diet	300	5E+00		
Thallium	1.667E-04	7E-04	blood effects	HEAST	?	300	2E-01		
Zinc	4.80E-01	2E-01	anemia	HEAST	drug	10	2E+00		
								27.40	
WELL SD - DERMAL									
Beryllium	1.01E-05	5E-05 *	none observed	HEAST	water	100	2E-01		
Cadmium	6.51E-05	5E-04	renal damage	IRIS	water	10	1E-01		
Chromium	2.80E-04	6E-04 *	not defined	HEAST	water	100	5E-01		
Nickel	1.24E-04	2E-04 *	decr. organ wt.	HEAST	diet	300	6E-01		
Thallium	1.93E-07	4E-05 *	blood effects	HEAST	?	300	5E-03		
Zinc	5.57E-04	4E-02 *	anemia	HEAST	drug	10	1E-02		
								1.44	
RESIDENTIAL SOIL ING									
Arsenic	1.11E-05	1E-03	keratosis	HEAST	water	1	1.1E-02		
Chromium	7.24E-06	2E-02	not defined	HEAST	water	100	3.6E-04		
Zinc	4.4E-05	2E-01	anemia	HEAST	drug	10	2.2E-04		
								1.2E-02	
RESIDENTIAL SOIL DERM									
Arsenic	1.16E-06	9E-04 *	keratosis	HEAST	water	1	1.3E-03		
Chromium	7.53E-07	6E-04 *	not defined	HEAST	water	100	1.3E-03		

TABLE W-63

NSNJ, INC./NL INDUSTRIES, INC. SITE

SUBCHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE CHILD RESIDENT (AGES 10-12)

	SDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Zinc	4.6E-06	4E-02 *	anemia	HEAST	drug	10	1.2E-04		
								2.7E-03	
									28.85

* = adjusted for absorption

SDIs and RfDs expressed in mg/kg-day

TABLE W-64

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
CURRENT EXPOSURES									
RESIDENTIAL SOIL ING									
Arsenic	1.96E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Chromium	1.27E-06	5E-03	not defined	IRIS	water	500	3E-04		
Zinc	7.8E-06	2E-01	anemia	HEAST	drug	10	4E-05		
								2E-03	
RESIDENTIAL SOIL DERM									
Arsenic	3.12E-07	9E-04 *	keratosis	HEAST	water	1	3E-04		
Chromium	2.03E-07	1E-04 *	not defined	IRIS	water	500	2E-03		
Zinc	1.2E-06	4E-02 *	anemia	HEAST	drug	10	3E-05		
								2E-03	
									0.005
FUTURE EXPOSURES - TYPE 1									
GROUND WATER INGESTION									
Antimony	2.286E-03	4E-04	longevity	IRIS	water	1000	6E+00		
Arsenic	4.9E-04	1E-03	keratosis	HEAST	water	1	5E-01		
Beryllium	2.000E-04	5E-03	none observed	IRIS	water	100	4E-02		
Cadmium	2.57E-04 *	5E-04	renal damage	IRIS	water	10	5E-01		
Chromium	3.229E-03	5E-03	not defined	IRIS	water	500	6E-01		
Nickel	4.00E-03	2E-02	decr. organ wt.	IRIS	diet	100	2E-01		
Selenium	5.714E-04	3E-03	hair/nail loss	HEAST	diet	15	2E-01		
Thallium	2.857E-05	7E-05	blood effects	HEAST	diet	3000	4E-01		
Zinc	1.72E-02	2E-01	anemia	HEAST	drug	10	9E-02		
1,1-Dichloroethane	2.114E-03	1E-01	none	HEAST	air	1000	2E-02		
1,1-Dichloroethene	4.857E-03	9E-03	liver lesions	IRIS	water	1000	5E-01		
Tetrachloroethene	5.143E-03	1E-02	hepatotoxicity	IRIS	gavage	1000	5E-01		
1,1,1-Trichloroethane	1.21E-01 *	9E-02	hepatotoxicity	IRIS	air	1000	1E+00		
								11	
GROUND WATER DERMAL									
Antimony	4.43E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	9.42E-07	9E-04 *	keratosis	HEAST	water	1	1E-03		
Beryllium	3.88E-07	5E-05 *	none observed	IRIS	water	100	8E-03		
Cadmium	9.98E-06	5E-04	renal damage	IRIS	water	10	2E-02		

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TABLE W-64

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Chromium	6.26E-06	1E-04 *	not defined	IRIS	water	500	6E-02		
Nickel	7.76E-06	2E-04 *	decr. organ wt.	IRIS	diet	100	4E-02		
Selenium	1.11E-06	3E-03 *	hair/nail loss	HEAST	diet	15	4E-04		
Thallium	5.54E-08	3E-06 *	blood effects	HEAST	diet	3000	2E-02		
Zinc	3.34E-05	4E-02 *	anemia	HEAST	drug	10	8E-04		
1,1-Dichloroethane	4.10E-06	5E-02 *	none	HEAST	air	1000	8E-05		
1,1-Dichloroethene	9.42E-06	9E-03 *	liver lesions	IRIS	water	1000	1E-03		
Tetrachloroethene	9.98E-06	1E-02 *	hepatotoxicity	IRIS	gavage	1000	1E-03		
1,1,1-Trichloroethane	2.61E-04	9E-02	hepatotoxicity	IRIS	air	1000	3E-03		
								4E-01	
GROUND WATER INHALATION									
1,1-Dichloroethane	2.114E-03	1E-01	kidney damage	HEAST	air	1000	2E-02		
1,1-Dichloroethene	4.857E-03	4.86E-03		ECAO			1E+00		
1,1,1-Trichloroethane	1.343E-01	3E-01	hepatotoxicity	HEAST	air	1000	4E-01		
								1E+00	
RESIDENTIAL SOIL ING									
Arsenic	1.96E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Chromium	1.27E-06	5E-03	not defined	IRIS	water	500	3E-04		
Zinc	7.8E-06	2E-01	anemia	HEAST	drug	10	4E-05		
								2E-03	
RESIDENTIAL SOIL DERM									
Arsenic	3.12E-07	9E-04 *	keratosis	HEAST	water	1	3E-04		
Chromium	2.03E-07	1E-04 *	not defined	IRIS	water	500	2E-03		
Zinc	1.2E-06	4E-02 *	anemia	HEAST	drug	10	3E-05		
								2E-03	
									13
FUTURE EXPOSURES - TYPE 2									
WELL 2R2 - INGESTION									
Arsenic	5.2E-01	1E-03	keratosis	HEAST	water	1	5E+02		
Cadmium	1.43E-05 *	5E-04	renal damage	IRIS	water	10	3E-02		
Chromium	2.286E-04	5E-03	not defined	IRIS	water	500	5E-02		
								520.1	
WELL 2R2 - DERMAL									
Arsenic	1.01E-03	9E-04 *	keratosis	HEAST	water	1	1E+00		
Cadmium	5.54E-07	5E-04	renal damage	IRIS	water	10	1E-03		
Chromium	4.43E-07	1E-04 *	not defined	IRIS	water	500	4E-03		

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TABLE W-64

NSMJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
								1.1	
RESIDENTIAL SOIL ING									
Arsenic	1.96E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Chromium	1.27E-06	5E-03	not defined	IRIS	water	500	3E-04		
Zinc	7.8E-06	2E-01	anemia	HEAST	drug	10	4E-05		
								0.002	
RESIDENTIAL SOIL DERM									
Arsenic	3.12E-07	9E-04 *	keratosis	HEAST	water	1	3E-04		
Chromium	2.03E-07	1E-04 *	not defined	IRIS	water	500	2E-03		
Zinc	1.2E-06	4E-02 *	anemia	HEAST	drug	10	3E-05		
								2E-03	
									521.2
FUTURE EXPOSURES - TYPE 3									
WELL SD - INGESTION									
Beryllium	4.457E-03	5E-03	none observed	IRIS	water	100	9E-01		
Cadmium	1.45E-03 *	5E-04	renal damage	IRIS	water	10	3E+00		
Chromium	1.240E-01	5E-03	not defined	IRIS	water	500	2E+01		
Nickel	5.51E-02	2E-02	decr. organ wt.	IRIS	diet	100	3E+00		
Thallium	8.571E-05	7E-05	blood effects	HEAST	diet	3000	1E+00		
Zinc	2.47E-01	2E-01	anemia	HEAST	drug	10	1E+00		
								33.8	
WELL SD - DERMAL									
Beryllium	8.65E-06	5E-05 *	none observed	IRIS	water	100	2E-01		
Cadmium	5.60E-05	5E-04	renal damage	IRIS	water	10	1E-01		
Chromium	2.41E-04	1E-04 *	not defined	IRIS	water	500	2E+00		
Nickel	1.07E-04	2E-04 *	decr. organ wt.	IRIS	diet	100	5E-01		
Thallium	1.66E-07	3E-06 *	blood effects	HEAST	diet	3000	6E-02		
Zinc	4.79E-04	4E-02 *	anemia	HEAST	drug	10	1E-02		
								3.3	
RESIDENTIAL SOIL ING									
Arsenic	1.96E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Chromium	1.27E-06	5E-03	not defined	IRIS	water	500	3E-04		
Zinc	7.8E-06	2E-01	anemia	HEAST	drug	10	4E-05		
								2E-03	
RESIDENTIAL SOIL DERM									
Arsenic	3.12E-07	9E-04 *	keratosis	HEAST	water	1	3E-04		

TABLE W-64

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE ADULT RESIDENT

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Chromium	2.03E-07	1E-04 *	not defined	IRIS	water	500	2E-03		
Zinc	1.2E-06	4E-02 *	anemia	HEAST	drug	10	3E-05		
								2E-03	
									37.1

Note: CDIs and RfDs expressed in mg/kg-day

* = adjusted for absorption

ING = ingestion, DERM = dermal absorption

TABLE W-65

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE INDUSTRIAL WORKER

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
CURRENT EXPOSURES									
INDUSTRIAL SOIL ING.									
Arsenic	1.28E-06	1E-03	keratosis	HEAST	water	1	1.3E-03		
Chromium	2.14E-06	5E-03	not defined	IRIS	water	500	4.3E-04		
Zinc	4.5E-06	2E-01	anemia	HEAST	drug	10	2.3E-05		
								1.7E-03	
INDUSTRIAL SOIL DERMAL									
Arsenic	2.04E-07	9E-04 *	keratosis	HEAST	water	1	2.3E-04		
Chromium	3.40E-07	1E-04 *	not defined	IRIS	water	500	3.4E-03		
Zinc	7.1E-07	4E-02 *	anemia	HEAST	drug	10	1.8E-05		
								3.6E-03	
									0.01
FUTURE EXPOSURES - TYPE 1									
GROUND WATER INGESTION									
Antimony	8.141E-04	4E-04	longevity	IRIS	water	1000	2E+00		
Arsenic	1.7E-04	1E-03	keratosis	HEAST	water	1	2E-01		
Beryllium	7.123E-05	5E-03	none observed	IRIS	water	100	1E-02		
Cadmium	9.15E-05 *	5E-04	renal damage	IRIS	water	10	2E-01		
Chromium	1.150E-03	5E-03	not defined	IRIS	water	500	2E-01		
Nickel	1.42E-03	2E-02	decr. organ wt.	IRIS	diet	100	7E-02		
Selenium	2.035E-04	3E-03	hair/nail loss	HEAST	diet	15	7E-02		
Thallium	1.018E-05	7E-05	blood effects	HEAST	diet	3000	1E-01		
Zinc	6.14E-03	2E-01	anemia	HEAST	drug	10	3E-02		
1,1-Dichloroethane	7.530E-04	1E-01	none	HEAST	air	1000	8E-03		
1,1-Dichloroethene	1.730E-03	9E-03	liver lesions	IRIS	water	1000	2E-01		
Tetrachloroethene	1.832E-03	1E-02	hepatotoxicity	IRIS	gavage	1000	2E-01		
1,1,1-Trichloroethane	4.30E-02 *	9E-02	hepatotoxicity	IRIS	air	1000	5E-01		
								3.81	
INDUSTRIAL SOIL INGESTION									
Arsenic	1.28E-06	1E-03	keratosis	HEAST	water	1	1E-03		
Chromium	2.14E-06	5E-03	not defined	IRIS	water	500	4E-04		

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TABLE W-65

NSNJ, INC./NL INDUSTRIES, INC. SITE

CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE INDUSTRIAL WORKER

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Zinc	4.5E-06	2E-01	anemia	HEAST	drug	10	2E-05		
								2E-03	
INDUSTRIAL SOIL DERMAL									
Arsenic	2.04E-07	9E-04 *	keratosis	HEAST	water	1	2E-04		
Chromium	3.40E-07	1E-04 *	not defined	IRIS	water	500	3E-03		
Zinc	7.1E-07	4E-02 *	anemia	HEAST	drug	10	2E-05		
								4E-03	
									3.82
FUTURE EXPOSURES - TYPE 2									
WELL 2R2 INGESTION									
Arsenic	1.852E-01	1E-03	keratosis	HEAST	water	1	2E+02		
Cadmium	5.09E-06 *	5E-04	renal damage	IRIS	water	10	1E-02		
Chromium	8.141E-05	5E-03	not defined	IRIS	water	500	2E-02		
								185	
INDUSTRIAL SOIL INGESTION									
Arsenic	1.28E-06	1E-03	keratosis	HEAST	water	1	1E-03		
Chromium	2.14E-06	5E-03	not defined	IRIS	water	500	4E-04		
Zinc	4.5E-06	2E-01	anemia	HEAST	drug	10	2E-05		
								2E-03	
INDUSTRIAL SOIL DERMAL									
Arsenic	2.04E-07	9E-04 *	keratosis	HEAST	water	1	2E-04		
Chromium	3.40E-07	1E-04 *	not defined	IRIS	water	500	3E-03		
Zinc	7.1E-07	4E-02 *	anemia	HEAST	drug	10	2E-05		
								4E-03	
									185
FUTURE EXPOSURES - TYPE 3									
WELL SD INGESTION									
Beryllium	1.587E-03	5E-03	none observed	IRIS	water	100	3E-01		
Cadmium	5.14E-04 *	5E-04	renal damage	IRIS	water	10	1E+00		
Chromium	4.416E-02	5E-03	not defined	IRIS	water	500	9E+00		
Nickel	1.964E-02	2E-02	decr. organ wt.	IRIS	diet	100	1E+00		

TABLE W-65
NSNJ, INC./NL INDUSTRIES, INC. SITE
CHRONIC HAZARD INDEX ESTIMATE FOR AN OFF-SITE INDUSTRIAL WORKER

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
Thallium	3.053E-05	7E-05	blood effects	HEAST	diet	3000	4E-01		
Zinc	8.792E-02	2E-01	anemia	HEAST	drug	10	4E-01		
								12	
INDUSTRIAL SOIL INGESTION									
Arsenic	1.28E-06	1E-03	keratosis	HEAST	water	1	1E-03		
Chromium	2.14E-06	5E-03	not defined	IRIS	water	500	4E-04		
Zinc	4.5E-06	2E-01	anemia	HEAST	drug	10	2E-05		
								2E-03	
INDUSTRIAL SOIL DERMAL									
Arsenic	2.04E-07	9E-04 *	keratosis	HEAST	water	1	2E-04		
Chromium	3.40E-07	1E-04 *	not defined	IRIS	water	500	3E-03		
Zinc	7.1E-07	4E-02 *	anemia	HEAST	drug	10	2E-05		
								4E-03	
									12

* = adjusted for absorption

CDIs and RfDs expressed in mg/kg-day

TABLE W-67
NSNJ, INC./NL INDUSTRIES, INC. SITE
CHRONIC HAZARD INDEX ESTIMATE FOR AN ON-SITE WORKER

Exposure Pathway	CDI	RfD	Critical Effect	RfD Source	RfD Basis	RfD Uncert. Factor Adjust.	Hazard Quotient	Pathway Hazard Index	Total Exposure Hazard Index
FUTURE EXPOSURES									
SITE SOIL INGESTION									
Antimony	2E-05	4E-04	longevity	IRIS	water	1000	5E-02		
Arsenic	2.4E-06	1E-03	keratosis	HEAST	water	1	2E-03		
Cadmium	3.56E-08 *	5E-04	renal damage	IRIS	water	10	7E-05		
Chromium	3.85E-06	5E-03	not defined	IRIS	water	500	8E-04		
Zinc	1.1E-05	2E-01	anemia	HEAST	drug	10	6E-05		
								0.05	
SITE SOIL DERMAL									
Antimony	3.11E-06	2E-05 *	longevity	IRIS	water	1000	2E-01		
Arsenic	3.82E-07	9E-04 *	keratosis	HEAST	water	1	4E-04		
Cadmium	1.13E-07	5E-04	renal damage	IRIS	water	10	2E-04		
Chromium	6.12E-07	1E-04 *	not defined	IRIS	water	500	6E-03		
Zinc	1.8E-06	4E-02 *	anemia	HEAST	drug	10	5E-05		
								0.16	
									0.2

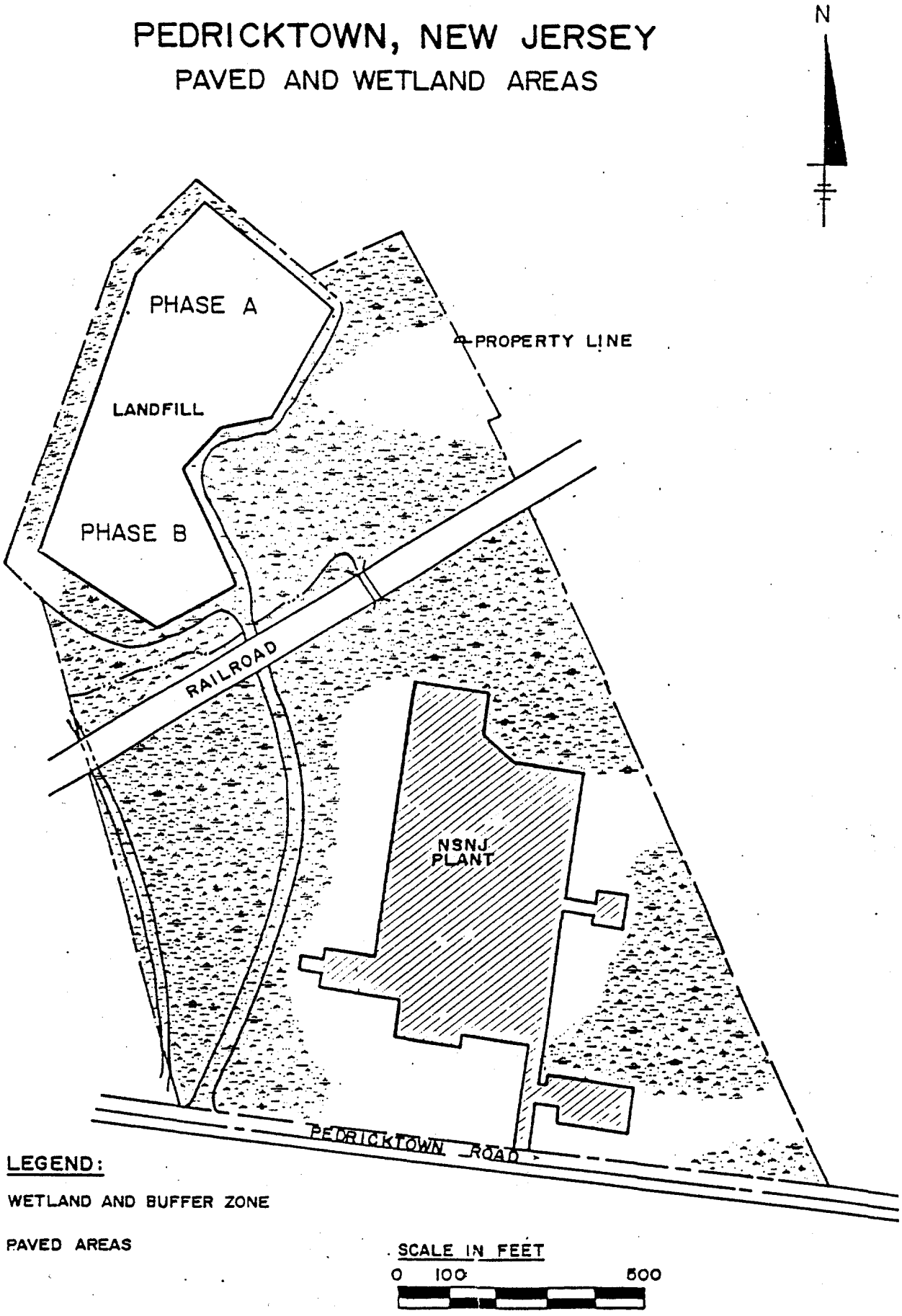
Note: CDIs and RfDs expressed in mg/kg-day

* = adjusted for absorption

FIGURE W-1

PEDRICKTOWN, NEW JERSEY

PAVED AND WETLAND AREAS



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