FARO AND VANGORDA PLATEAU
GROUNDWATER MONITORING SECTIONS

E. Denholm, May 2000

The attached groundwater monitoring sections were developed to illustrate the location of existing groundwater monitoring wells with respect to surface, bedrock, tailings, dams, and other relevant structures. They can also be used to illustrate water chemistry results spatially.

Sections are attached for: (1) the Down Valley tailings impoundments, (2) the Faro Northeast/Zone II/Main/Intermediate rock dumps, (3) the Vangorda rock dump, and (4) well P96-9A/B at the toe of the Grum rock dump. Section locations are illustrated on the plans which accompany each section.

The vertical exaggeration for the four sections is 10X, 20X or 25X.

For each of the four sections, five copies are attached which show: the basic section, sulphate concentrations for spring 1999, sulphate concentrations for fall 1999, dissolved zinc concentrations for spring 1999, and dissolved zinc concentrations for fall 1999. Additionally, two additional copies of the Down Valley tailings impoundment section are attached which show dissolved iron for spring 1999 and dissolved iron for fall 1999.

No interpretation of the information is presented here, but this information may be useful in future groundwater or hydrogeology studies.

1. Down Valley Tailings Impoundments

This section runs along the length and approximate centreline of the Rose Creek Valley from the pumphouse pond at the upstream end of the Rose Creek diversion canal to just downstream of surface monitoring location X14 below the tailings area. The section is looking approximately northeast. The section includes information developed by Vic Enns of Environment Canada.

The depths to bedrock are taken from various sources as identified on the section. The depth to bedrock varies with location across the width of the Rose Creek valley and, therefore, caution should be exercised in interpreting the depth to bedrock at any given location.

2. Faro Northeast/Zone II/Main/Intermediate Rock Dumps

This section runs around the toe of some of the Faro rock dumps from the Faro Creek diversion canal at the toe of the northeast rock dump to below the toe of the Zone II rock dumps to the Vangorda haul road rock drain to the old Faro Creek channel at surface monitoring location X23. The section is looking inwards towards the rock dumps.

3. Vangorda Rock Dump

This section runs around the toe of the Vangorda rock dump from just south of drain #1 to Little Creek Dam. The section is looking inwards towards the rock dump.

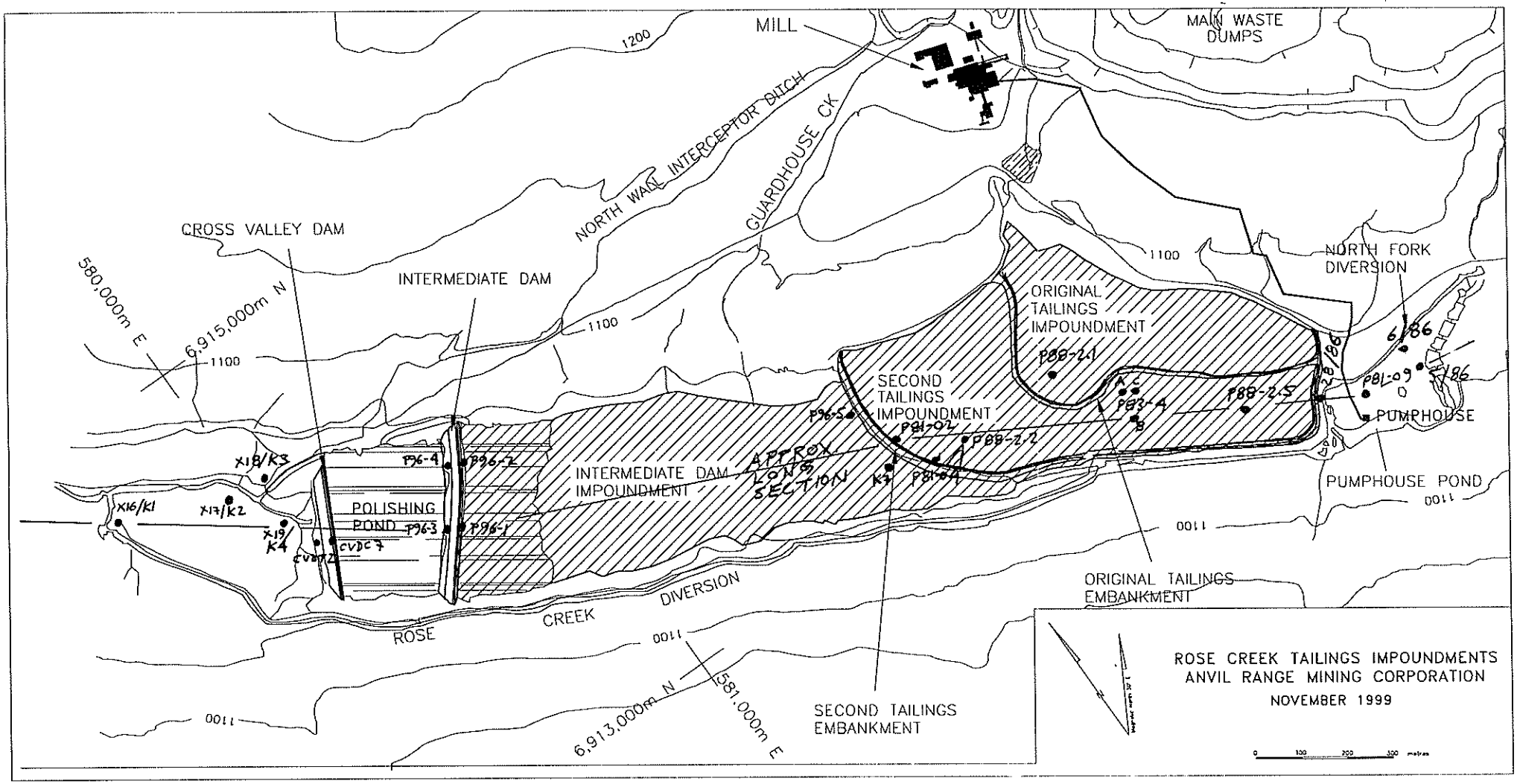
The estimated depths to bedrock shown on the section are taken from the Vangorda Plateau IEE documents and are considered crude estimates. Caution should be exercised, therefore, when interpreting the depth to bedrock along this section.

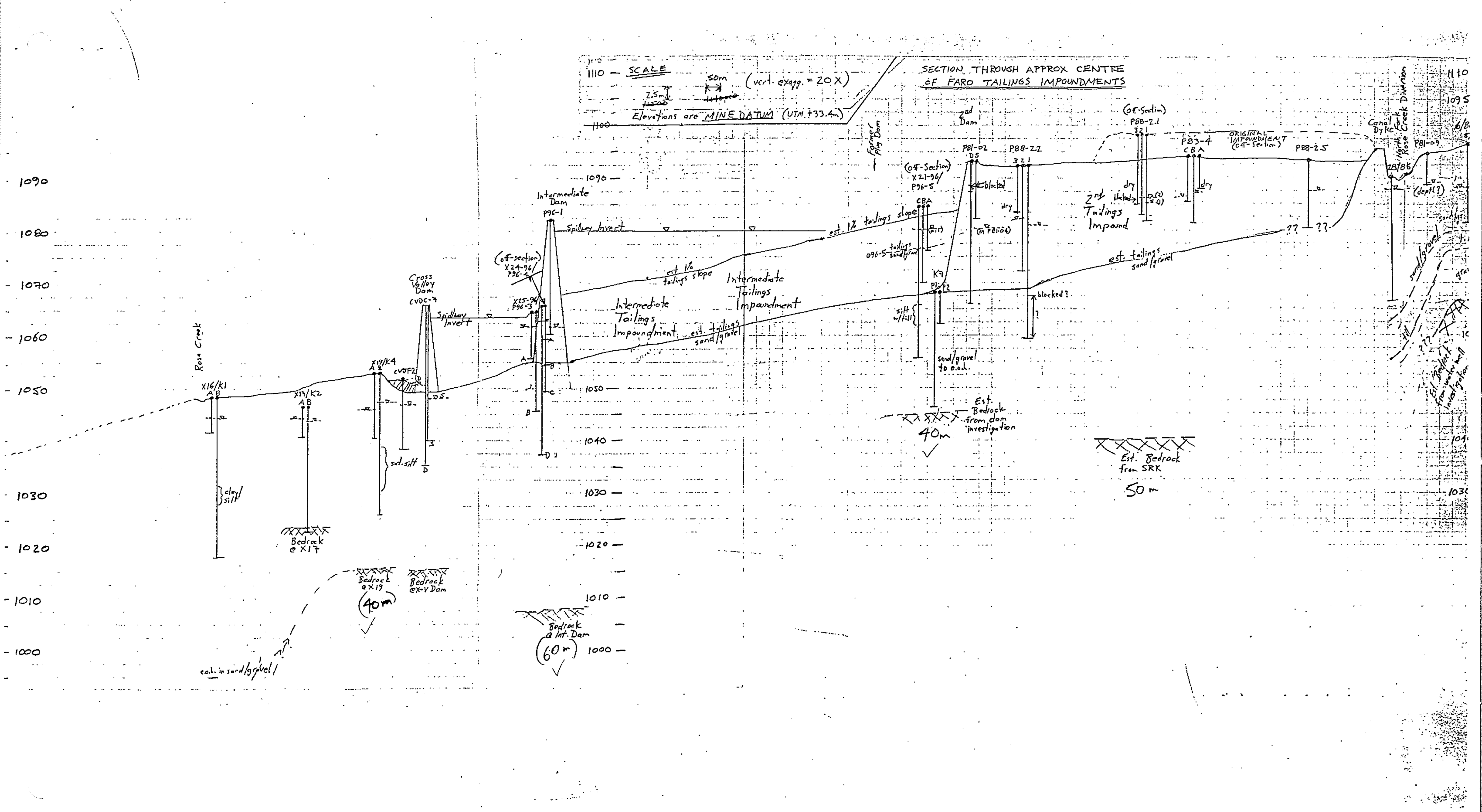
4. Well P96-9A/B at the Toe of the Grum Rock Dump

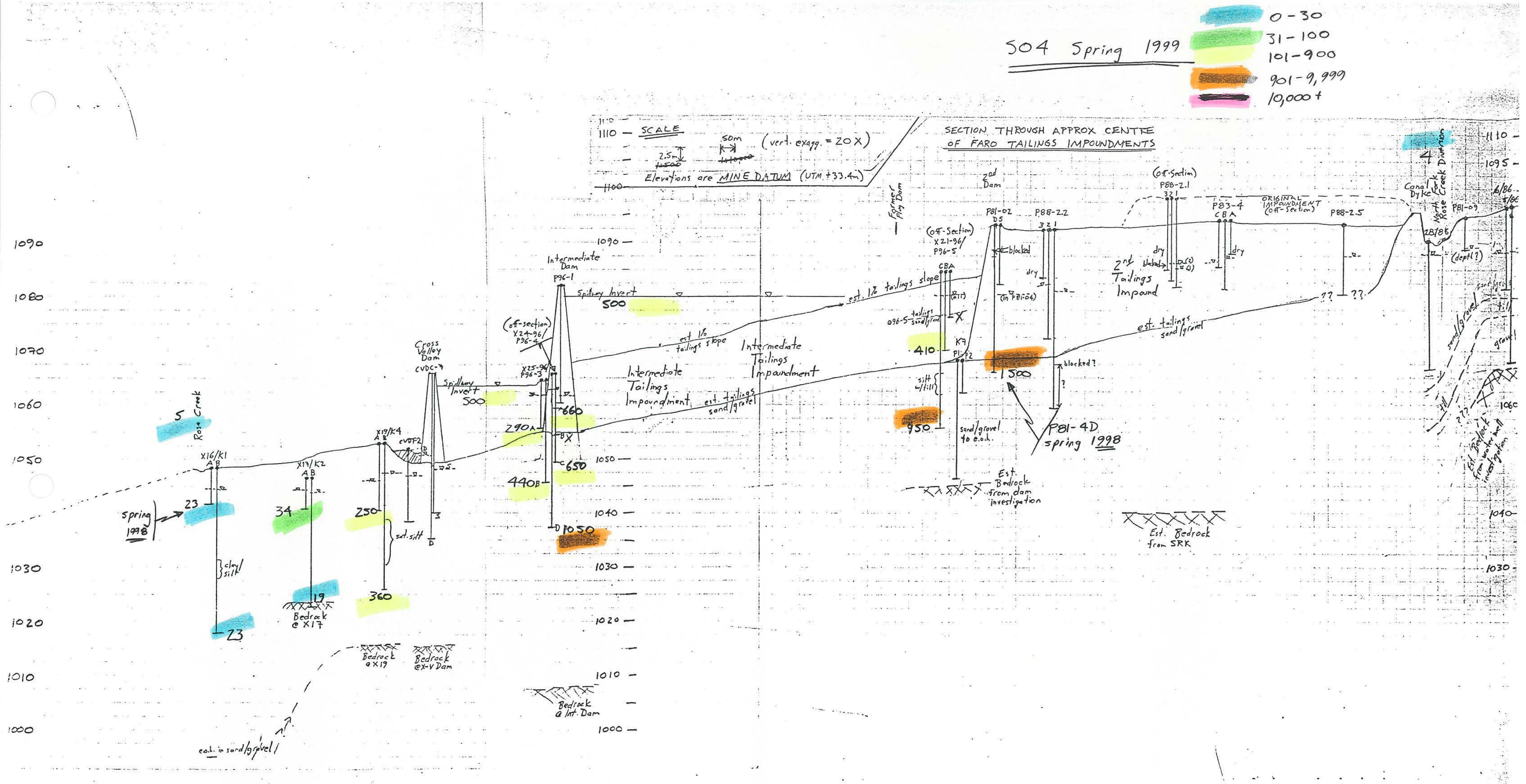
This short section runs parallel to the toe of the Grum rock dump in the Grum Creek channel and is looking north towards the Grum rock dump.

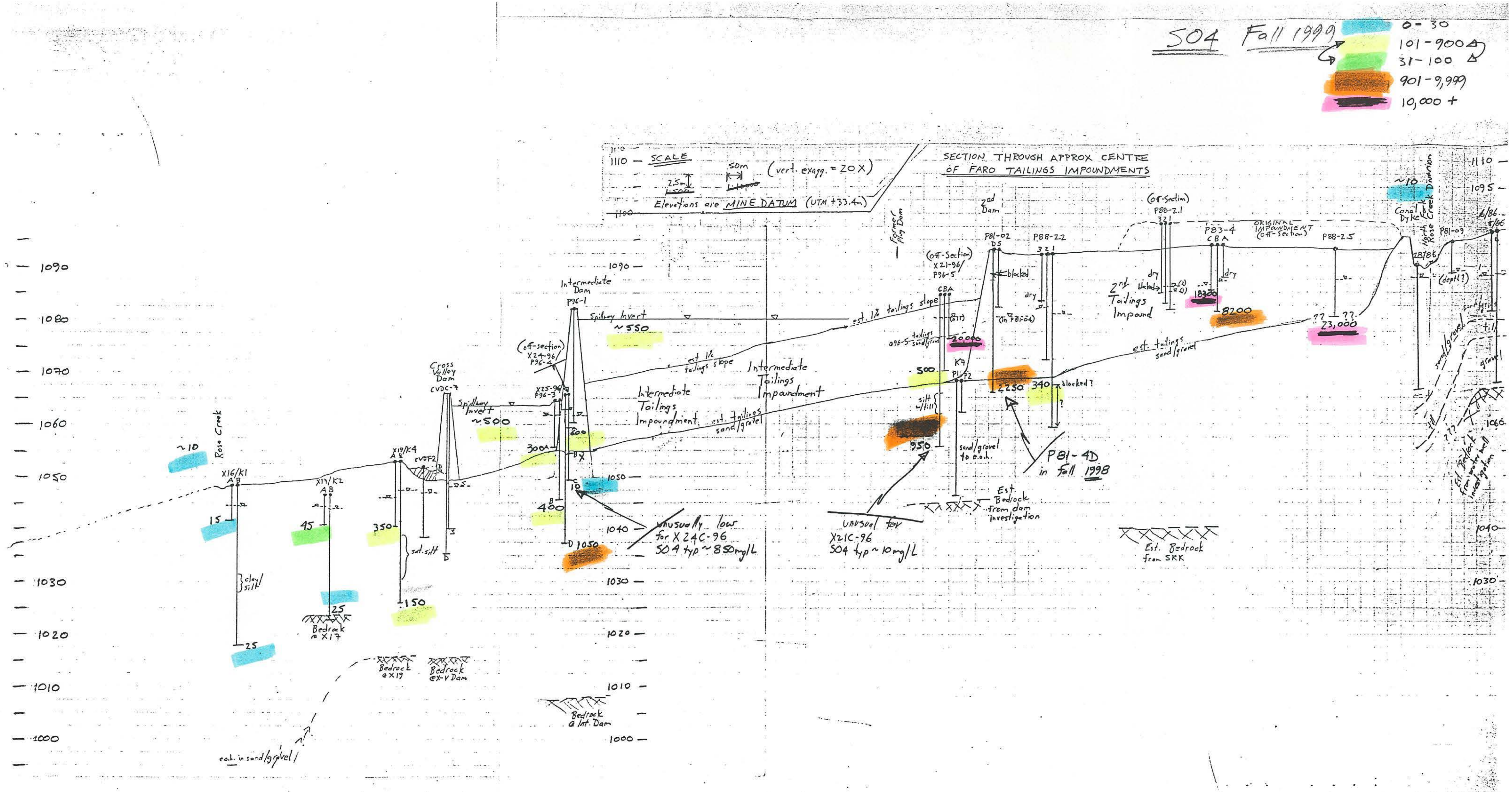
Groundwater monitoring well P96-9A/B was installed in 1996 and is located in a buried bedrock valley approximately 20 metres deep located in the Grum Creek channel. This location is suspected to be a natural collection area for surface and shallow groundwater from a substantial portion of the Grum rock dump including the area occupied by the sulphide cell.

One of the two installations, P96-9B, typically flows (artesian) during the spring and summer seasons.

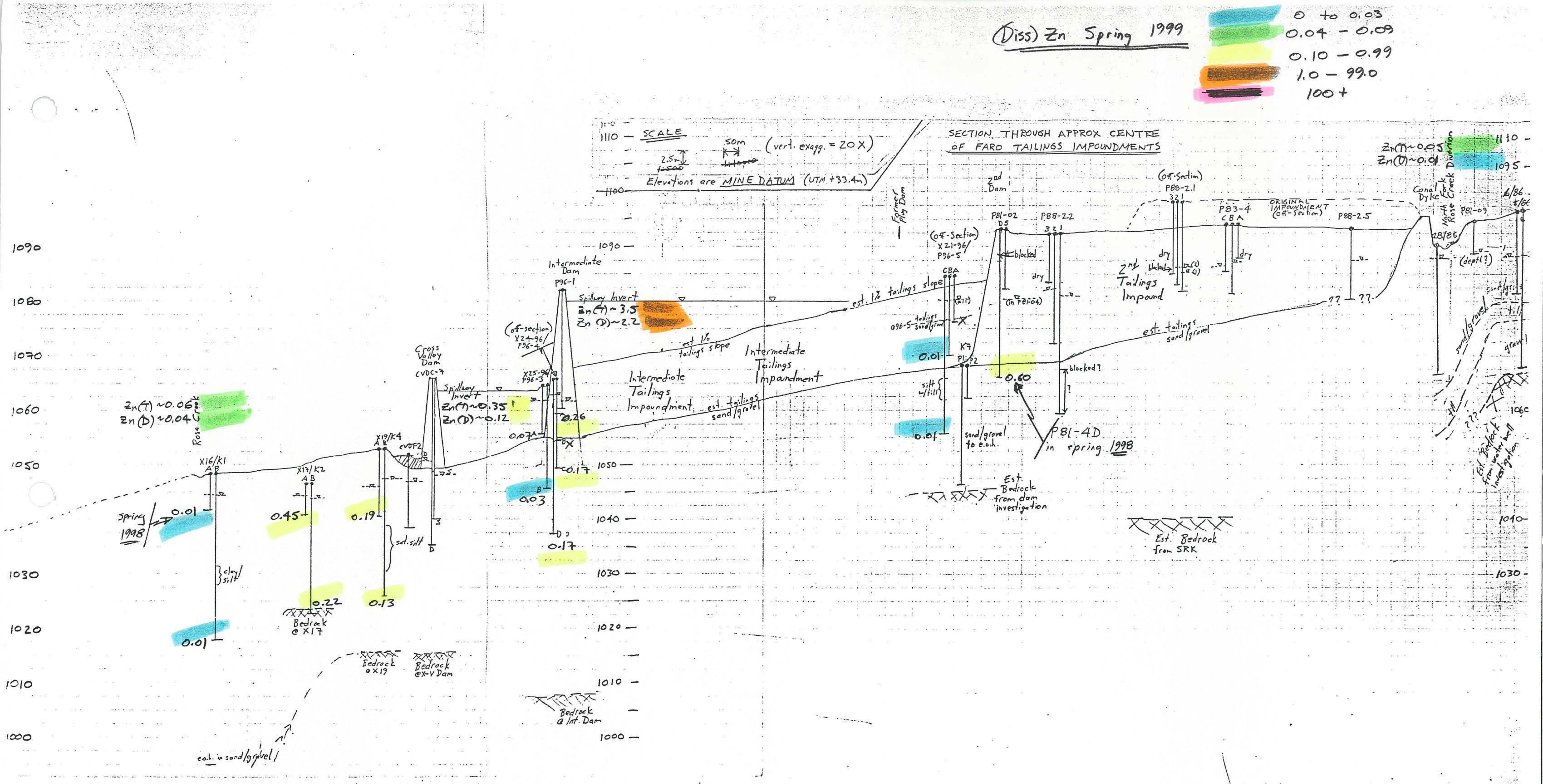

MILL
MAIN WASTE DUMPS
1200
NORTH WALL INTERCEPTOR DITCH
GUARDHOUSE CK
CROSS VALLEY DAM
INTERMEDIATE DAM
580,000m E
6,915,000m N
1100
NORTH FORK DIVERSION
ORIGINAL TAILINGS IMPOUNDMENT
SECOND TAILINGS IMPOUNDMENT
P88-2-1
P88-2-2
P88-2-3
P83-4
P96-5
P81-02
P81-04
P81-09
6186
PUMPHOUSE
PUMPHOUSE POND
X18/K3
X16/K1
X17/K2
X19/K4
P96-4
P96-2
P96-3
P96-1
POLISHING POND
INTERMEDIATE DAM IMPOUNDMENT
APPROX LONG SECTION
K5
CVDC7
CVDC2
ROSE CREEK DIVERSION
ORIGINAL TAILINGS EMBANKMENT
SECOND TAILINGS EMBANKMENT
6,913,000m N
581,000m E
ROSE CREEK TAILINGS IMPOUNDMENTS
ANVIL RANGE MINING CORPORATION
NOVEMBER 1999
0 100 200 300 metres


SCALE
2.5m
50m
(vert. exagg. = 20X)
Elevations are MINE DATUM (UTM +33.4m)
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
Rose Creek
X16/K1
A B
clay/silt
X17/K2
Bedrock @ X17
X19/K4
sat. silt
CVDF2
Cross Valley Dam
CVDC-7
Spillway Invert
Bedrock @ X19
Bedrock @ X-V Dam
40m
e.o.h. in sand/gravel
(off-section) X24-96/ P96-4
X25-96/ P96-3
Intermediate Dam
P96-1
Spillway Invert
Bedrock @ Int. Dam
60m
est. 1% tailings slope
Intermediate Tailings Impoundment
est. tailings sand/gravel
Former Pig Dam
(off-Section) X21-96/ P96-5
C B A
est. 1% tailings slope
096-5 tailings sand/gravel
K7
P1-P2
silt w/till
sand/gravel to e.o.h.
Est. Bedrock from dam investigation
40m
2nd Dam
P81-02
D S
blocked
P88-22
3 2 1
dry
blocked?
(off-Section)
P88-2.1
P83-4
C B A
dry
2nd Tailings Impound
ORIGINAL IMPOUNDMENT (off-Section)
P88-25
est. tailings sand/gravel
Est. Bedrock from SRK
50m
Canal Dyke
North Fork Rose Creek Diversion
P81-09
(depth?)
sand/gravel
till
Est. Bedrock from water well investigation
1095

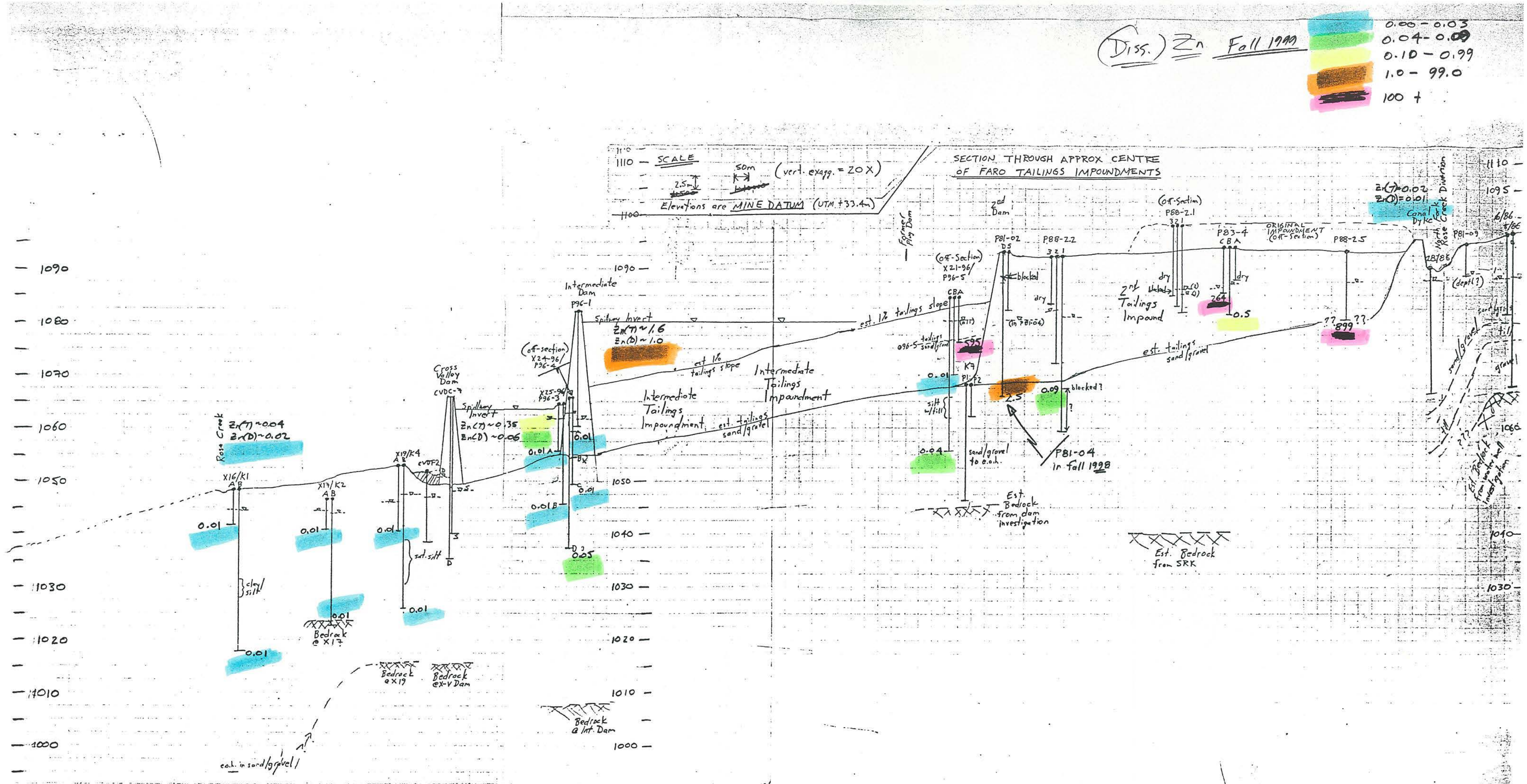

SO4 Spring 1999
0 - 30
31 - 100
101 - 900
901 - 9,999
10,000 +
SCALE
(vert. exagg. = 20 X)
Elevations are MINE DATUM (UTM + 33.4m)
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
Rose Creek
X16/K1
X17/K2
X19/K4
Cross Valley Dam
Intermediate Dam
P96-1
Spillway Invert
Intermediate Tailings Impoundment
est. 1% tailings slope
est. tailings sand/gravel
2nd Dam
P81-02
P88-2.2
P88-2.1
P83-4
P88-2.5
ORIGINAL IMPOUNDMENT (off-section)
2nd Tailings Impound
Canal Dyke
North Fork Rose Creek Diversion
P81-4D spring 1998
Est. Bedrock from dam investigation
Est. Bedrock from SRK
Bedrock @ X17
Bedrock @ X19
Bedrock @ X-V Dam
Bedrock @ Int. Dam
Spring 1998
5
23
34
250
19
360
500
290
440
660
650
1050
410
950
1500
4



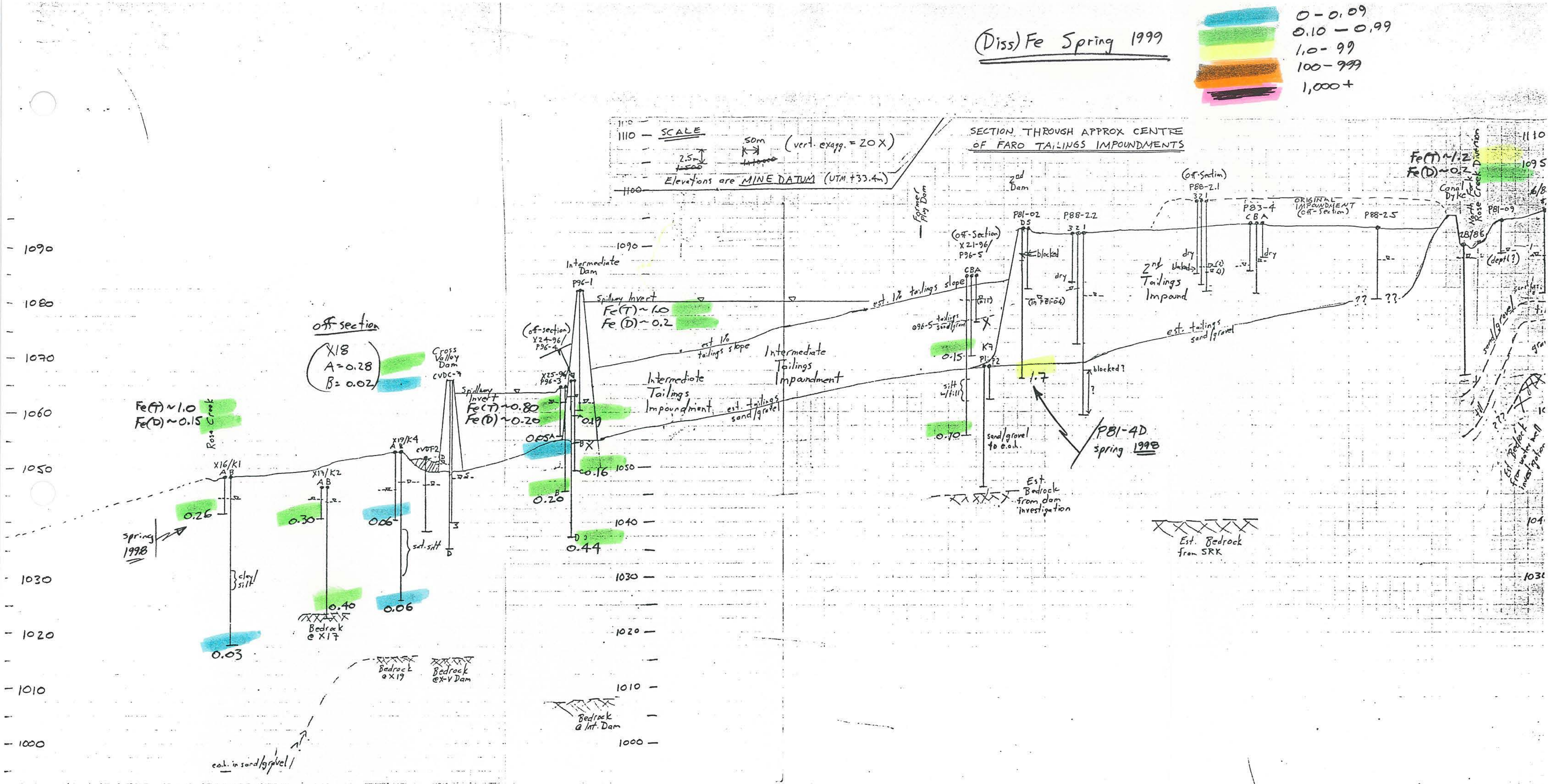
SO4 Fall 1999
0-30
101-900
31-100
901-9,999
10,000 +
SCALE
50m
(vert. exagg. = 20X)
Elevations are MINE DATUM (UTM +33.4m)
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
Rose Creek
Cross Valley Dam
Intermediate Dam
Intermediate Tailings Impoundment
2nd Tailings Impound
ORIGINAL IMPOUNDMENT (off-Section)
Spillway Invert
est. tailings sand/gravel
est. 1% tailings slope
Bedrock @ X17
Bedrock @ X19
Bedrock @X-V Dam
Bedrock @ Int. Dam
Est. Bedrock from dam investigation
Est. Bedrock from SRK
e.o.h. in sand/gravel
unusually low for X24C-96 SO4 typ ~850mg/L
unusual for X21C-96 SO4 typ ~10mg/L
P81-4D in Fall 1998
Canal Dyke
North Fork Rose Creek Diversion
~10
15
25
45
25
350
150
~500
300
400
10
1050
~550
500
950
20,000
2250
340
18300
8200
23,000



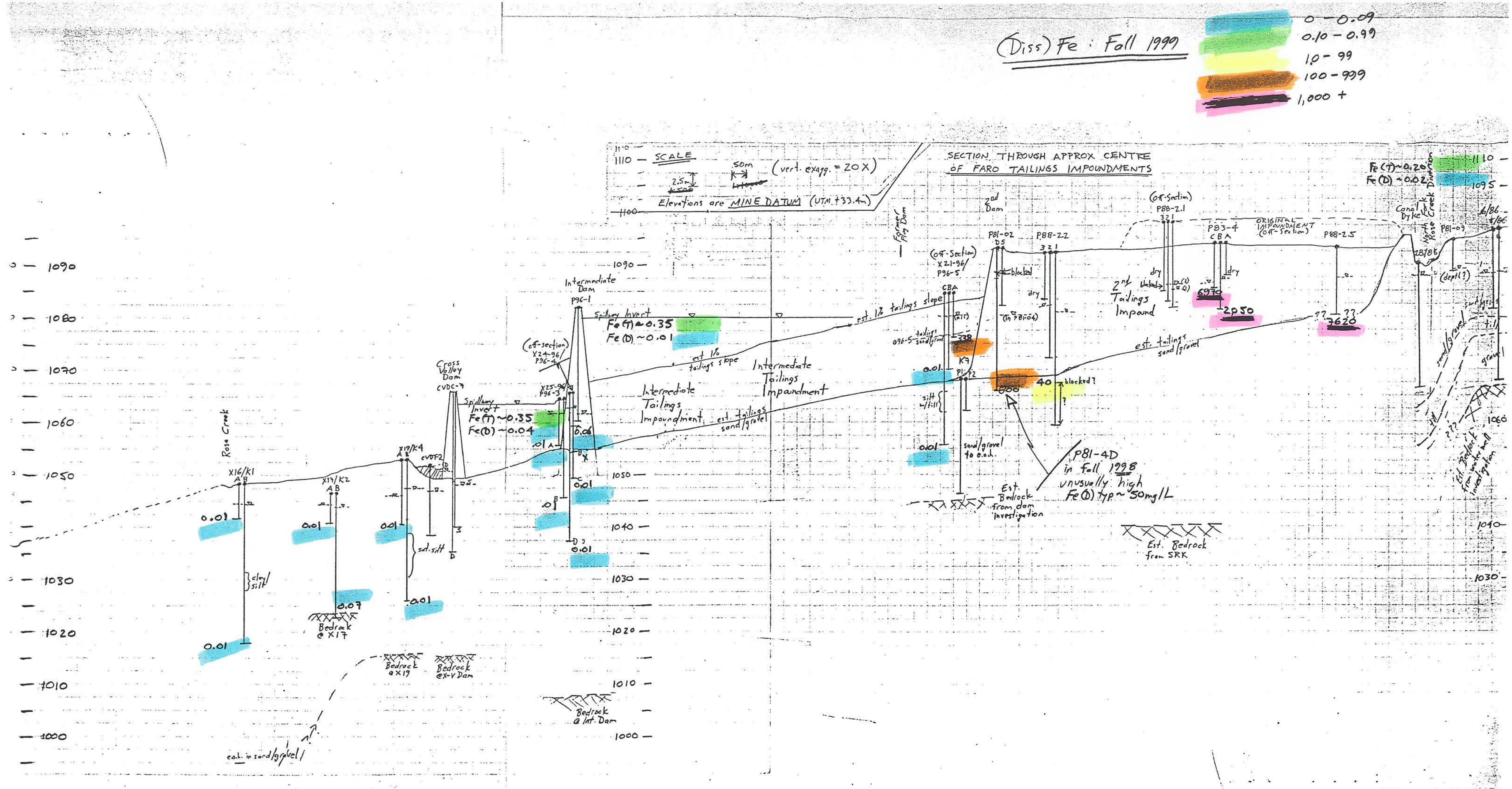
(Diss) Zn Spring 1999
0 to 0.03
0.04 – 0.09
0.10 – 0.99
1.0 – 99.0
100 +
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
SCALE
(vert. exagg. = 20 X)
Elevations are MINE DATUM (UTM +33.4m)
Intermediate Dam
P96-1
Spillway Invert
Zn(T) ~ 3.5
Zn(D) ~ 2.2
Cross Valley Dam
CVDC-7
Spillway Invert
Zn(T) ~ 0.35
Zn(D) ~ 0.12
Zn(T) ~ 0.06
Zn(D) ~ 0.04
Rose Creek
X16/K1
X13/K2
X19/K4
Spring 1998
clay/silt
Bedrock @ X17
Bedrock @ X19
Bedrock @ X-V Dam
Bedrock @ Int. Dam
e.o.h. in sand/gravel
Intermediate Tailings Impoundment
est. tailings sand/gravel
est. 1% tailings slope
2nd Dam
P81-02
P88-2.2
P83-4
P88-2.1
P88-2.5
ORIGINAL IMPOUNDMENT (Off-Section)
2nd Tailings Impound
est. tailings sand/gravel
blocked
dry
P81-4D in spring 1998
sand/gravel to e.o.h.
Est. Bedrock from dam investigation
Est. Bedrock from SRK
Canal Dyke
North Fork Rose Creek Diversion
Zn(T) ~ 0.05
Zn(D) ~ 0.01
P81-09
Est. Bedrock from water well investigation
0.01
0.45
0.19
0.22
0.13
0.071
0.26
0.17
0.03
0.60



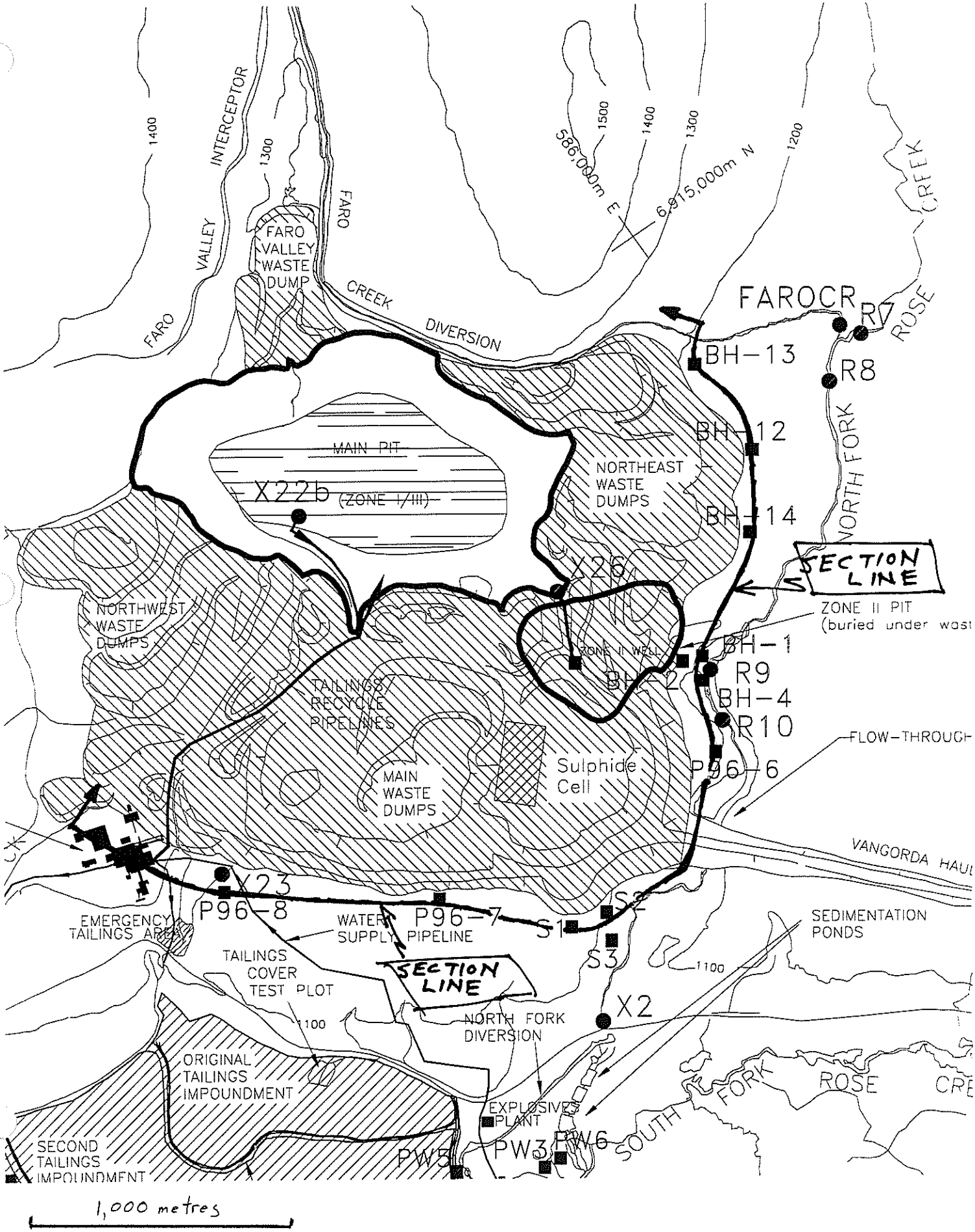
(Diss.) Zn Fall 1999
0.00 - 0.03
0.04 - 0.09
0.10 - 0.99
1.0 - 99.0
100 +
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
SCALE
50m
2.5m
(vert. exagg. = 20X)
Elevations are MINE DATUM (UTM +33.4m)
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
Rose Creek
Zn(T)~0.04
Zn(D)~0.02
X16/K1
X17/K2
X19/K4
Bedrock @X17
Bedrock @X19
Bedrock @X-V Dam
Cross Valley Dam
CVDC-7
CVDF2
Spillway Invert
Zn(T)~0.35
Zn(D)~0.06
Intermediate Dam
P96-1
Spillway Invert
Zn(T)~1.6
Zn(D)~1.0
(off-section) X24-96/ P96-4
X25-96/ P96-3
Bedrock @ Int. Dam
Intermediate Tailings Impoundment
est. 1% tailings slope
est. tailings sand/gravel
Former Plug Dam
(off-Section) X21-96/ P96-5
2nd Dam
P81-02
P88-22
blocked
dry
P81-04 in fall 1998
Est. Bedrock from dam investigation
sand/gravel to e.o.h.
silt w/fill
(off-Section) P88-21
P83-4
ORIGINAL IMPOUNDMENT (off-Section)
P88-25
2nd Tailings Impound
est. tailings sand/gravel
Est. Bedrock from SRK
Zn(T)=0.02
Zn(D)=0.01
Canal Dyke
North Rose Creek Diversion
P81-09
0.01
0.05
0.01
0.04
0.09
2.5
264
0.5
899
e.o.h. in sand/gravel

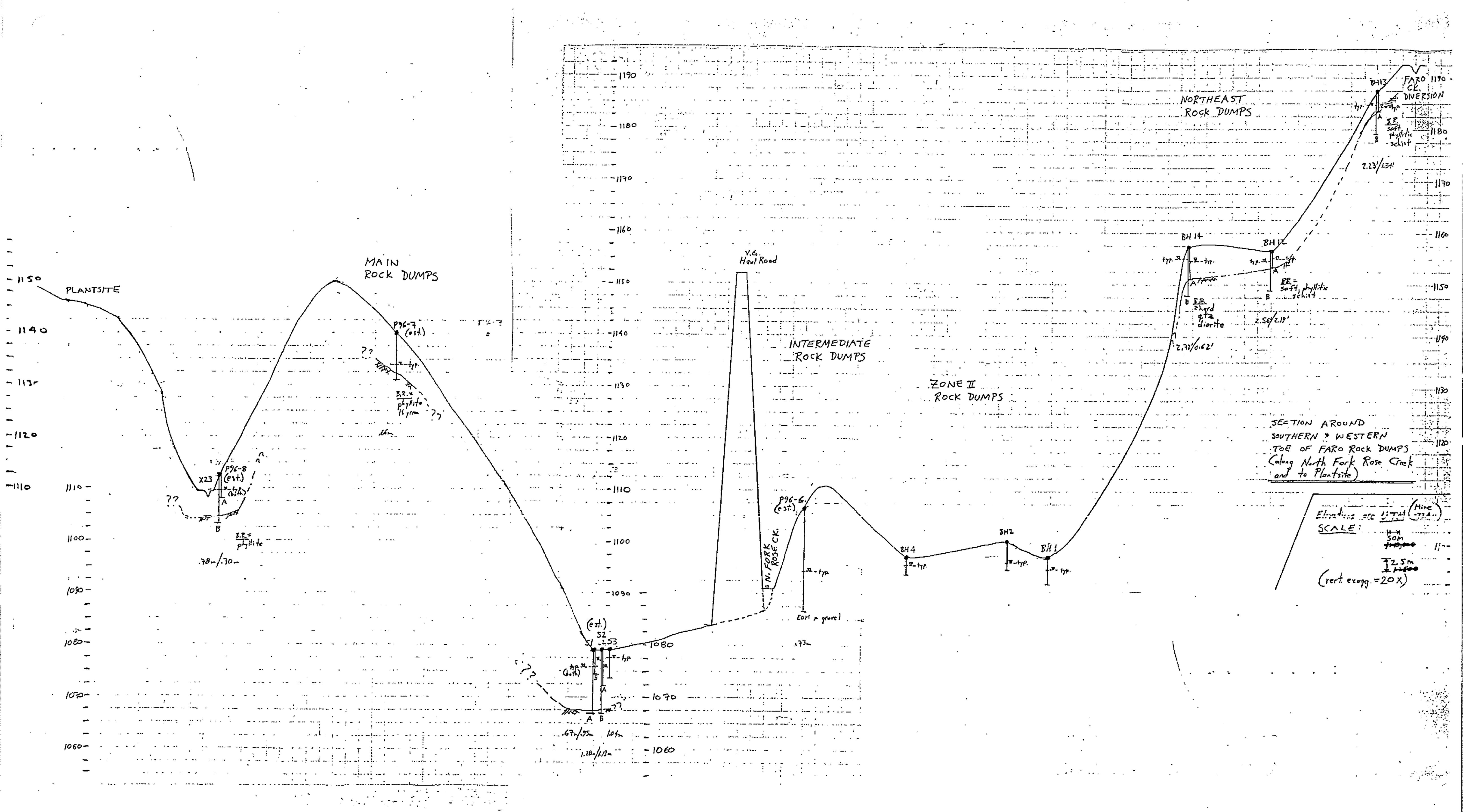


(Diss) Fe Spring 1999
0 - 0.09
0.10 - 0.99
1.0 - 99
100 - 999
1,000 +
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
SCALE
2.5m
50m
(vert. exagg. = 20X)
Elevations are MINE DATUM (UTM + 33.4m)
1110
1100
1090
1080
1070
1060
1050
1040
1030
1020
1010
1000
off section
X18
A = 0.28
B = 0.02
Fe(T) ~ 1.0
Fe(D) ~ 0.15
Rose Creek
X16/K1
A B
0.26
spring 1998
clay/silt
0.03
X17/K2
A B
0.30
0.40
Bedrock @ X17
X19/K4
A B
0.06
0.06
sat. silt
Bedrock @ X19
Bedrock @ X-V Dam
Cross Valley Dam
CVDC-7
Spillway Invert
Fe(T) ~ 0.80
Fe(D) ~ 0.20
(off-section)
X24-96/
P96-4
X25-96/
P96-3
0.05
0.19
0.16
0.20
0.44
Bedrock @ Int. Dam
Intermediate Dam
P96-1
Spillway Invert
Fe(T) ~ 1.0
Fe (D) ~ 0.2
est 1% tailings slope
Intermediate Tailings Impoundment
Intermediate Tailings Impoundment
est. tailings sand/gravel
e.o.h. in sand/gravel
est. 1% tailings slope
(off-Section)
X21-96/
P96-5
C B A
0.15
silt w/fill
0.70
K7
sand/gravel to e.o.h.
Est. Bedrock from dam investigation
2nd Dam
P81-02
D S
blocked
dry
1.7
P81-4D
spring 1998
P88-2.2
3 2 1
blocked?
2nd Tailings Impound
(off-Section)
P88-2.1
3 2 1
dry
P83-4
C B A
ORIGINAL IMPOUNDMENT (off-Section)
P88-2.5
est. tailings sand/gravel
Est. Bedrock from SRK
Fe(T) ~ 1.2
Fe(D) ~ 0.2
Canal Dyke
North Fork Rose Creek Diversion
P81-09
(dept(?)
Est. Bedrock from water well investigation



(Diss) Fe : Fall 1999
0 – 0.09
0.10 – 0.99
1.0 – 99
100 – 999
1,000 +
SECTION THROUGH APPROX CENTRE OF FARO TAILINGS IMPOUNDMENTS
SCALE
50m
2.5m
(vert. exagg. = 20 X)
Elevations are MINE DATUM (UTM +33.4m)
Rose Creek
Cross Valley Dam
Intermediate Dam
Spillway Invert
Fe(T) ~ 0.35
Fe(D) ~ 0.01
Fe(T) ~ 0.35
Fe(D) ~ 0.04
Intermediate Tailings Impoundment
est. tailings sand/gravel
est. 1% tailings slope
Former Plug Dam
2nd Dam
2nd Tailings Impound
ORIGINAL IMPOUNDMENT (Off-Section)
Canal Dyke
Fe(T) ~ 0.20
Fe(D) ~ 0.02
P81-4D in Fall 1998 unusually high Fe(D) typ ~ 50mg/L
Est. Bedrock from dam investigation
Est. Bedrock from SRK
Bedrock @ X17
Bedrock @ X19
Bedrock @ X-V Dam
Bedrock @ Int. Dam
0.01
0.07
0.06
338
40
6970
2050
7620

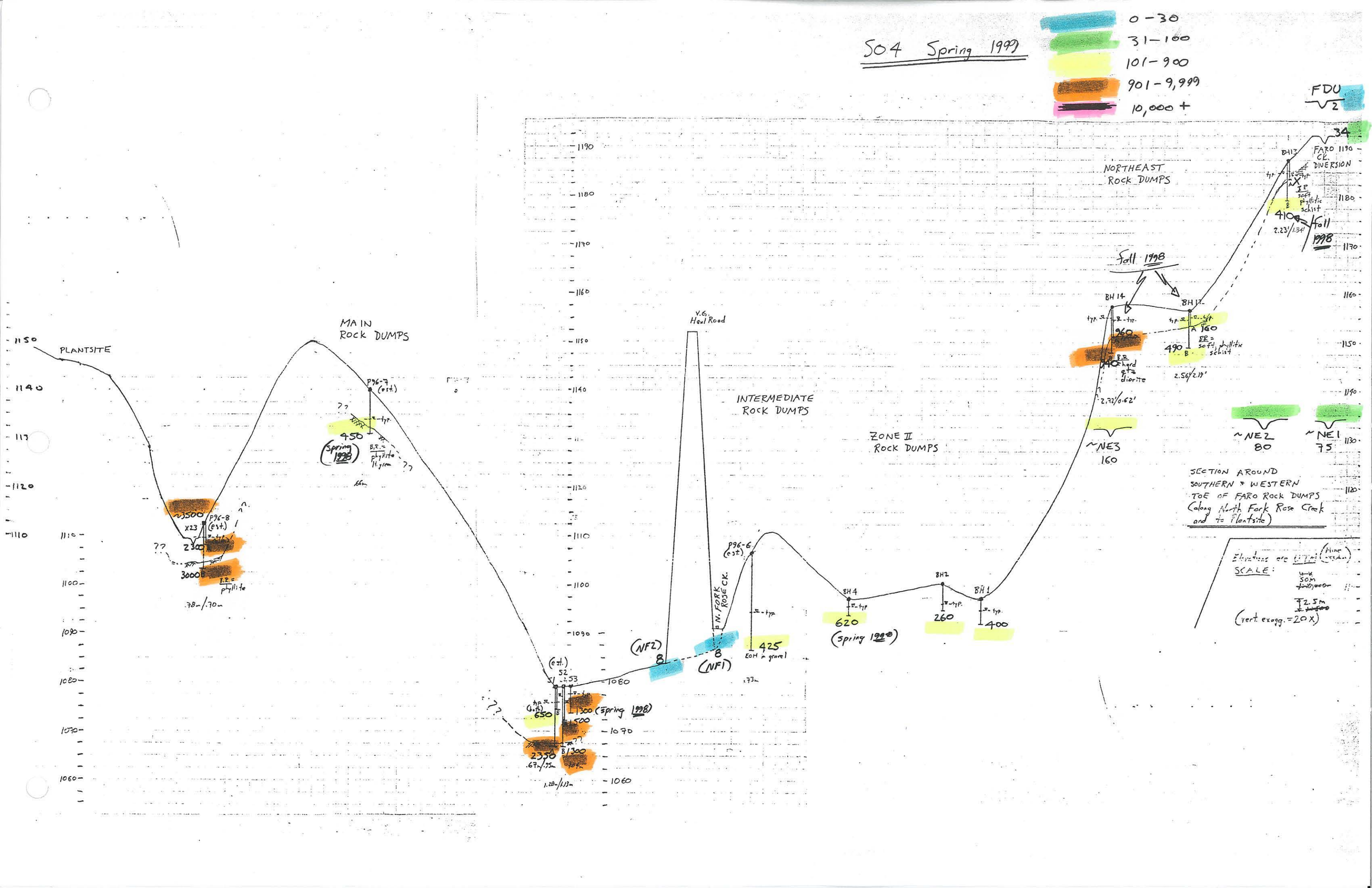

FARO VALLEY INTERCEPTOR
FARO VALLEY WASTE DUMP
FARO CREEK DIVERSION
586,000m E
6,915,000m N
1400
1300
1500
1200
FAROCR
R7
ROSE CREEK
R8
BH-13
BH-12
BH-14
NORTH FORK
SECTION LINE
MAIN PIT
X22b (ZONE I/III)
NORTHEAST WASTE DUMPS
X26
ZONE II PIT (buried under wast
ZONE II WELL
BH-1
BH-2
R9
BH-4
R10
FLOW-THROUGH
P96-6
NORTHWEST WASTE DUMPS
TAILINGS RECYCLE PIPELINES
MAIN WASTE DUMPS
Sulphide Cell
VANGORDA HAUL
X23
P96-8
P96-7
S1
S2
S3
EMERGENCY TAILINGS AREA
WATER SUPPLY PIPELINE
SEDIMENTATION PONDS
TAILINGS COVER TEST PLOT
SECTION LINE
1100
X2
NORTH FORK DIVERSION
ORIGINAL TAILINGS IMPOUNDMENT
EXPLOSIVES PLANT
PW6
PW3
PW5
SOUTH FORK ROSE CRE
SECOND TAILINGS IMPOUNDMENT
1,000 metres



PLANTSITE
MAIN ROCK DUMPS
P96-7 (est.)
B.R. = phyllite
X23
P96-8 (est.)
B.R. = phyllite
V.G. Haul Road
N. FORK ROSE CK.
INTERMEDIATE ROCK DUMPS
P96-6 (est.)
EOH @ gravel
ZONE II ROCK DUMPS
BH4
BH2
BH1
NORTHEAST Rock DUMPS
BH14
B.R. Shard qtz diorite
BH12
B.R. = soft phyllitic schist
BH13
FARO CK. DIVERSION
B.R. soft phyllitic schist
S1
S2
S3
SECTION AROUND SOUTHERN & WESTERN TOE OF FARO Rock DUMPS (along North Fork Rose Creek and to Plantsite)
Elevations are UTM (Mine)
SCALE:
50m
2.5m
(vert. exagg. = 20X)

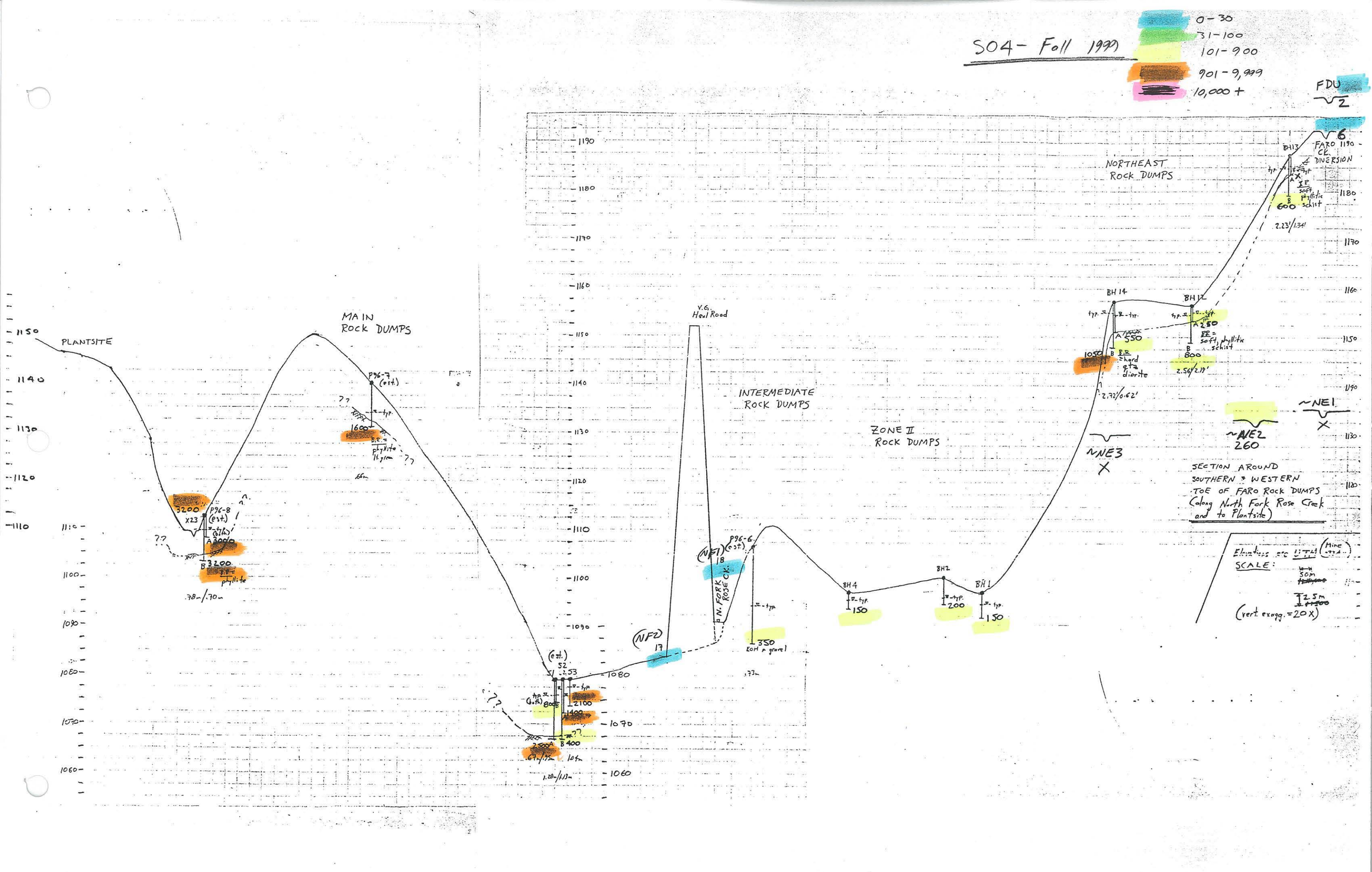
S04 Spring 1999

0 - 30
31 - 100
101 - 900
901 - 9,999
10,000 +



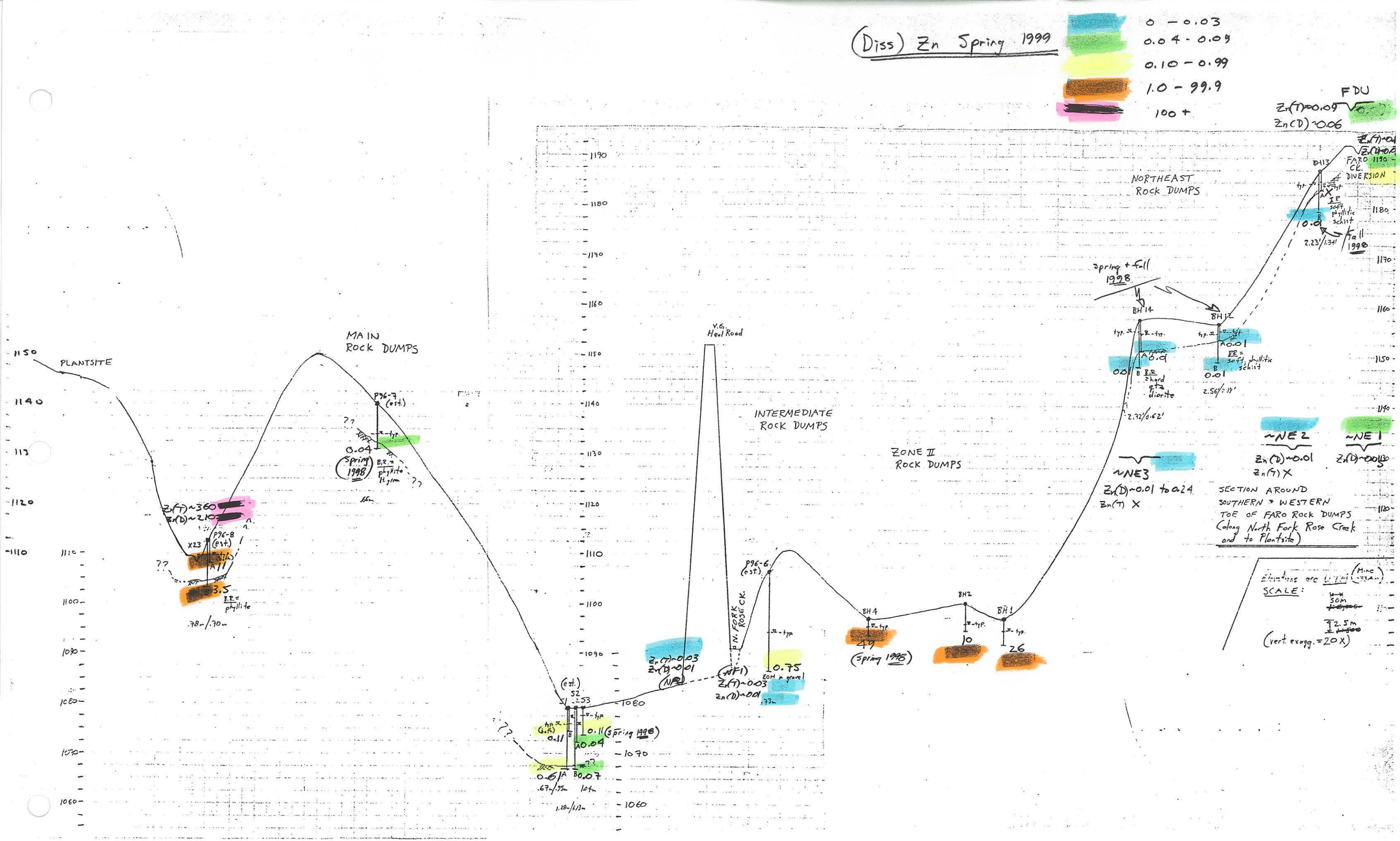
S04 - Fall 1997

0 - 30
31 - 100
101 - 900
901 - 9,999
10,000 +



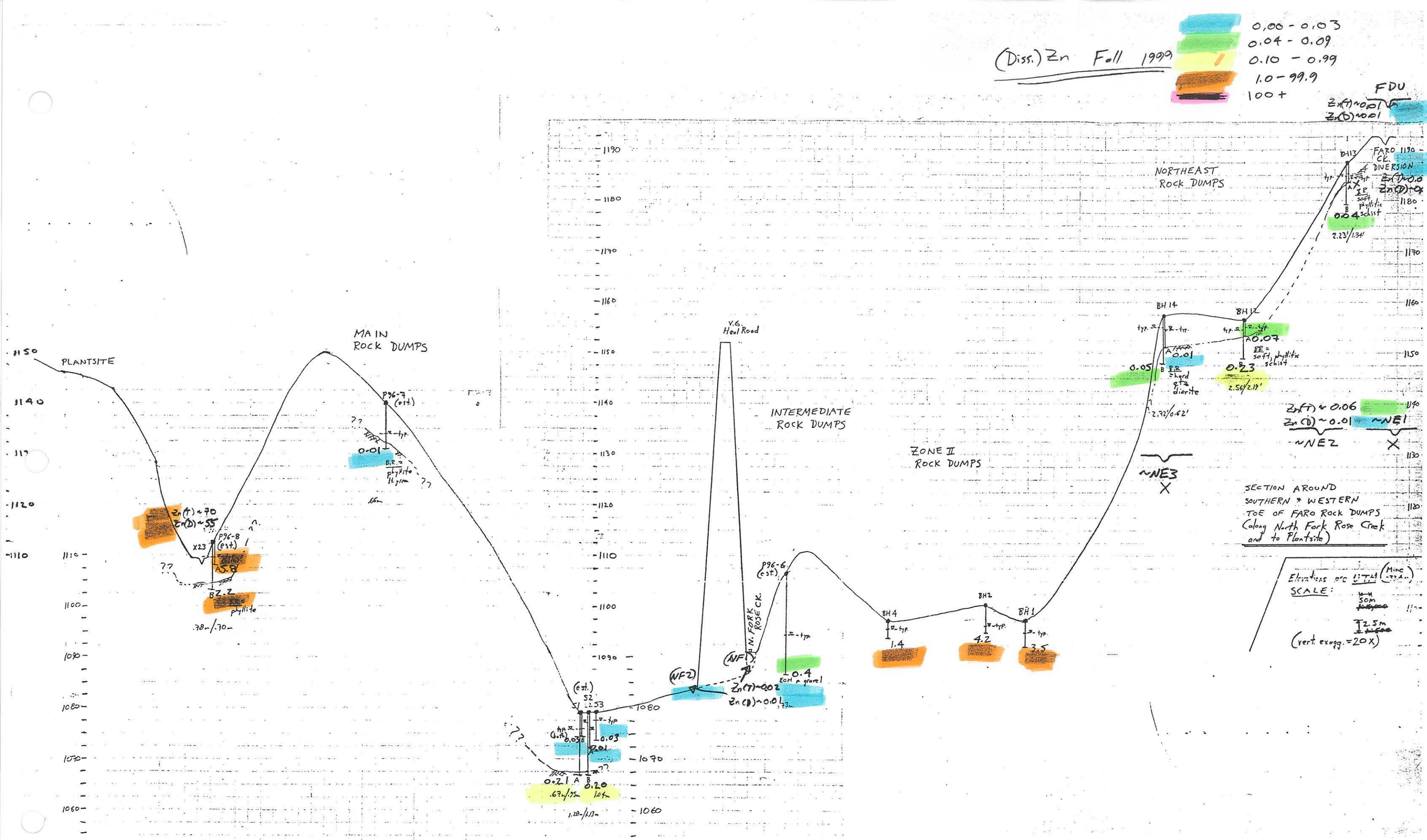
(Diss) Zn Spring 1999

0 - 0.03
0.04 - 0.09
0.10 - 0.99
1.0 - 99.9
100 +



(Diss.) Zn Fall 1999

0.00 - 0.03
0.04 - 0.09
0.10 - 0.99
1.0 - 99.9
100 +



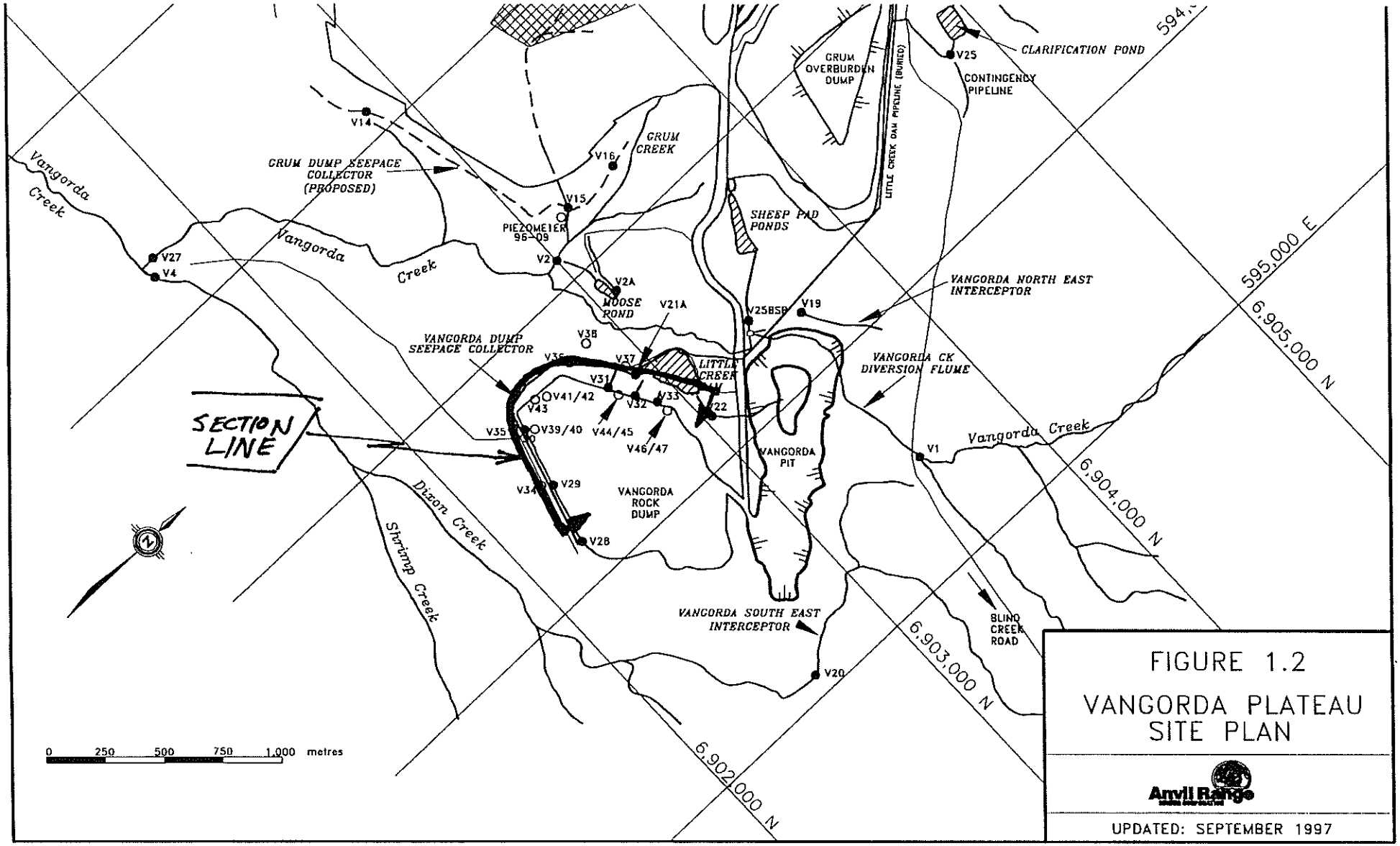
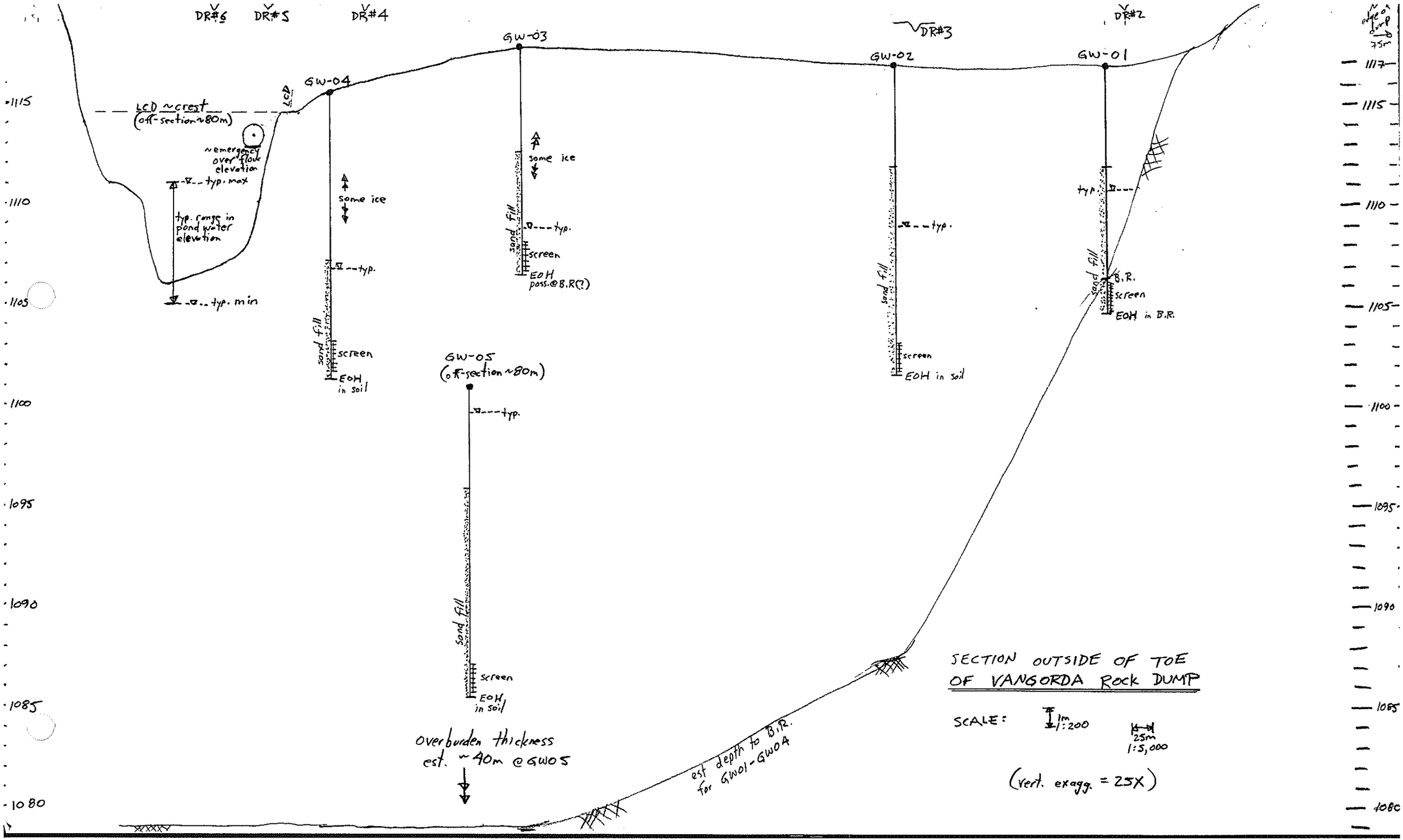


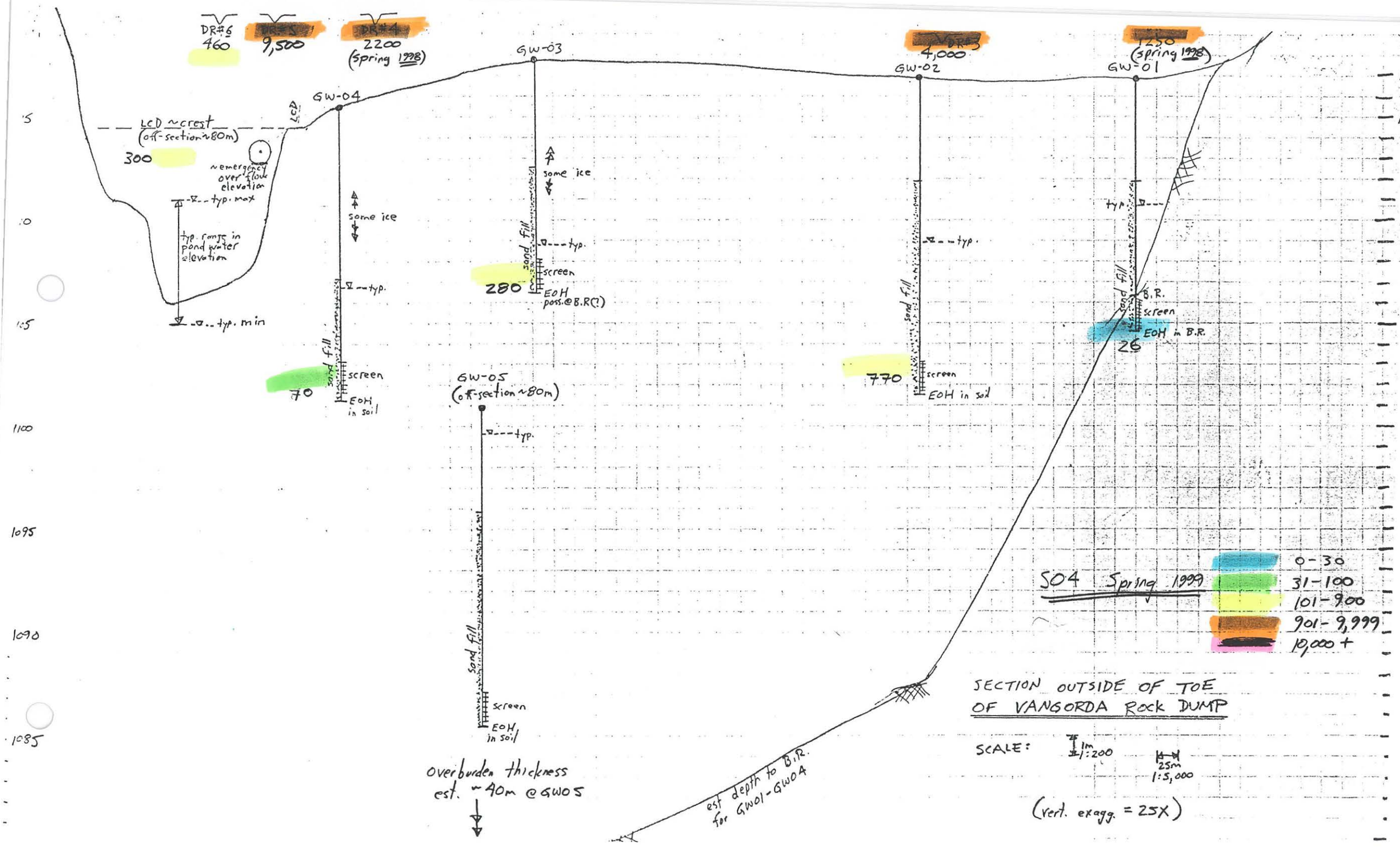
FIGURE 1.2

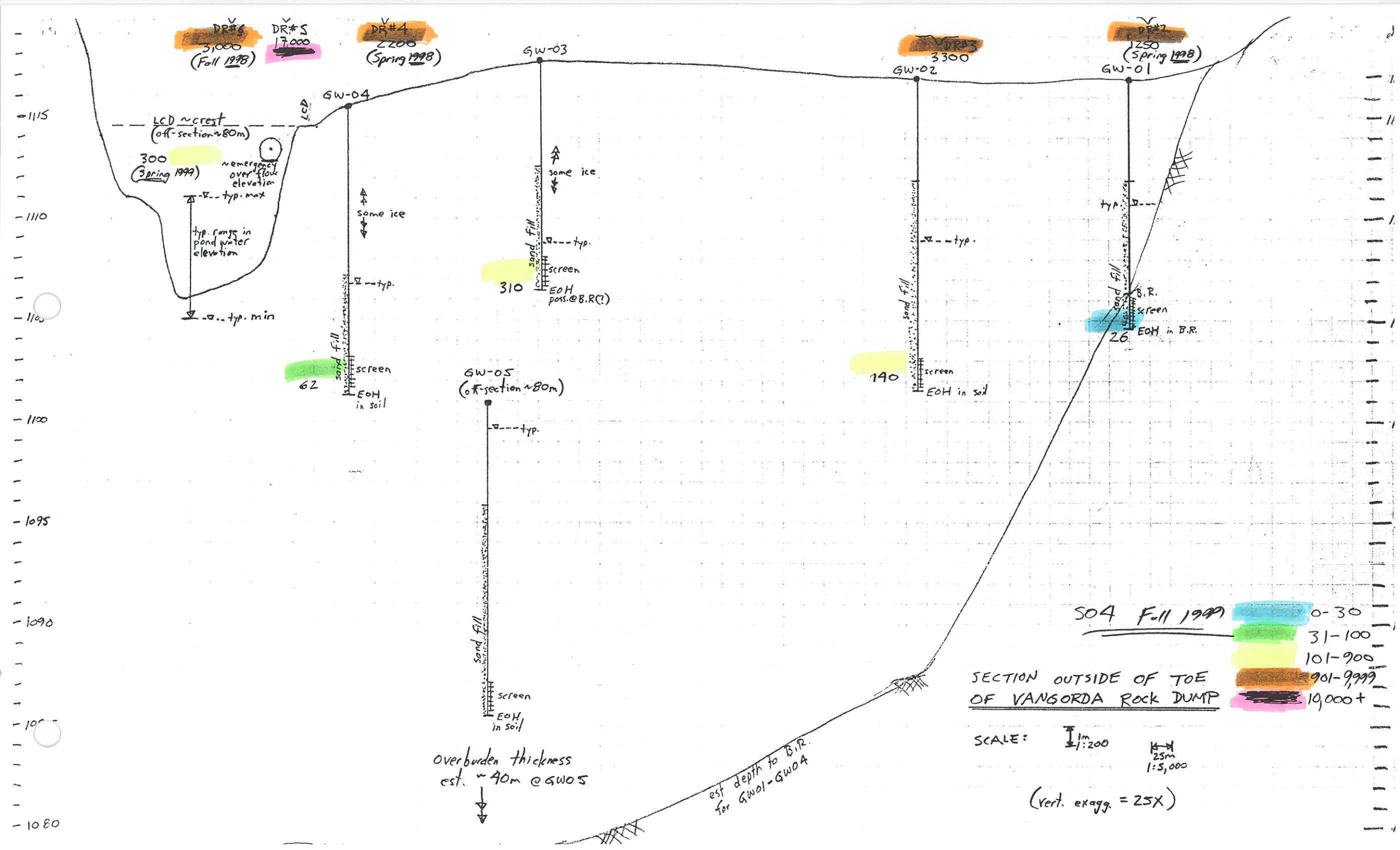
VANGORDA PLATEAU SITE PLAN

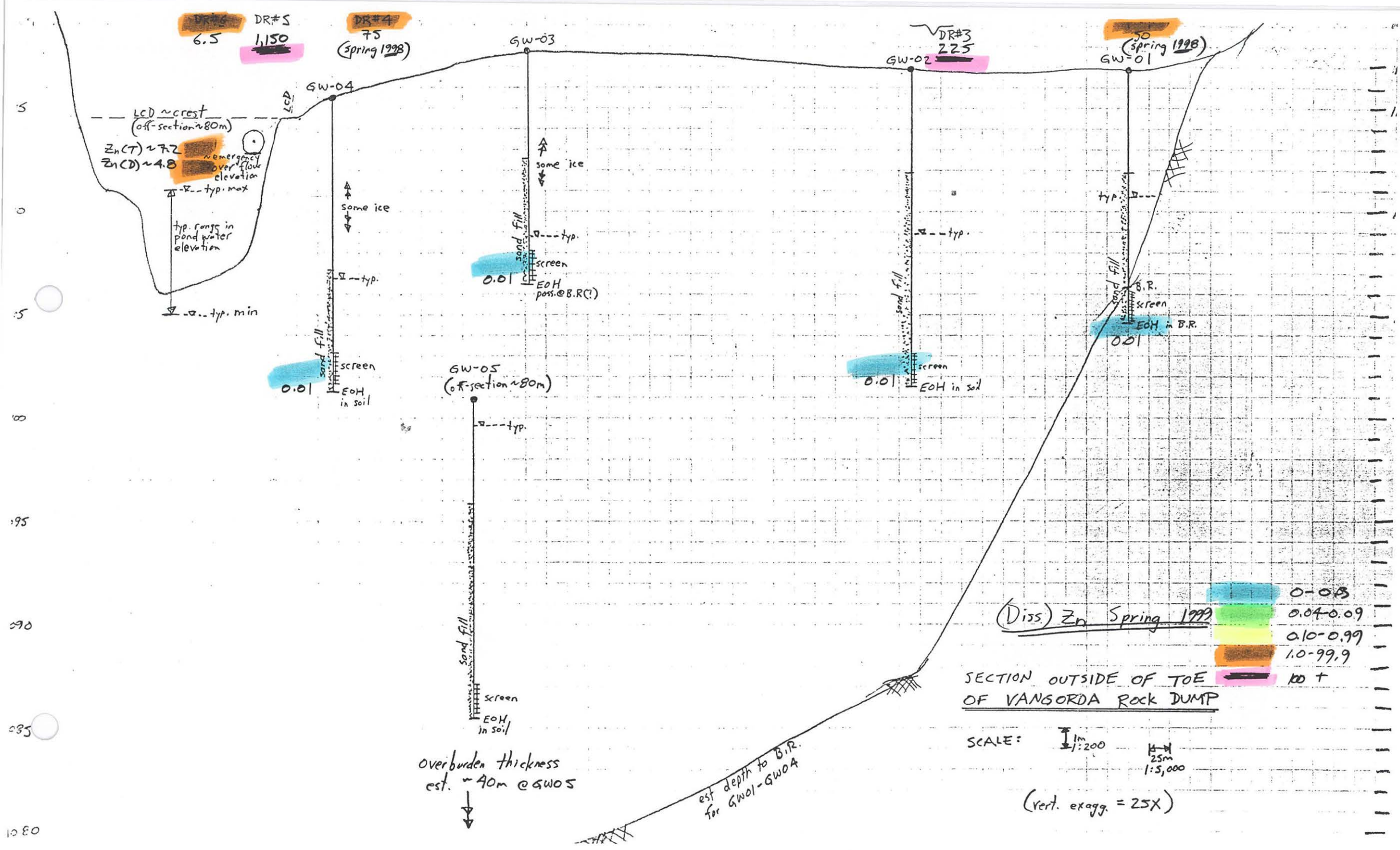
Anvil Range

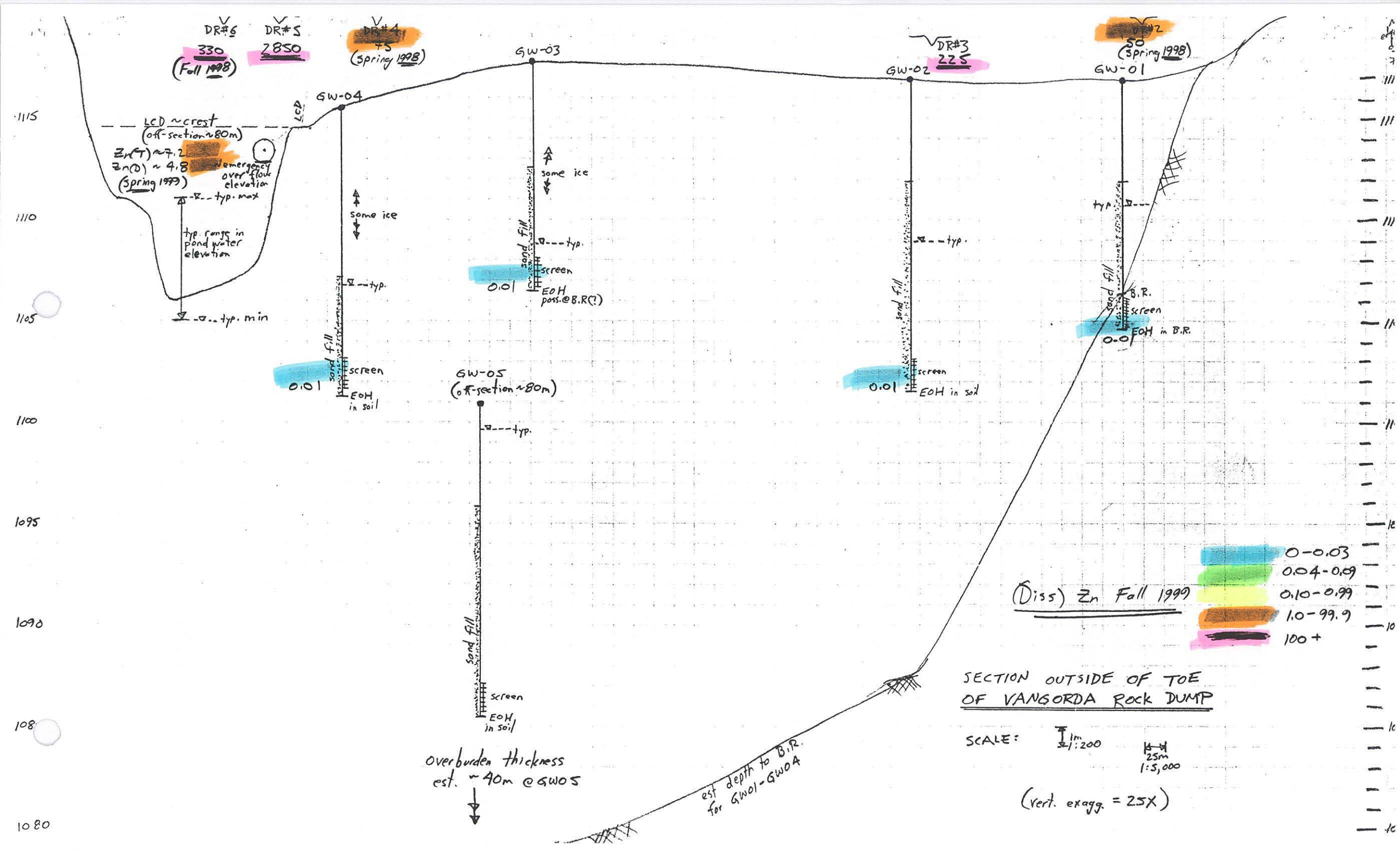
UPDATED: SEPTEMBER 1997

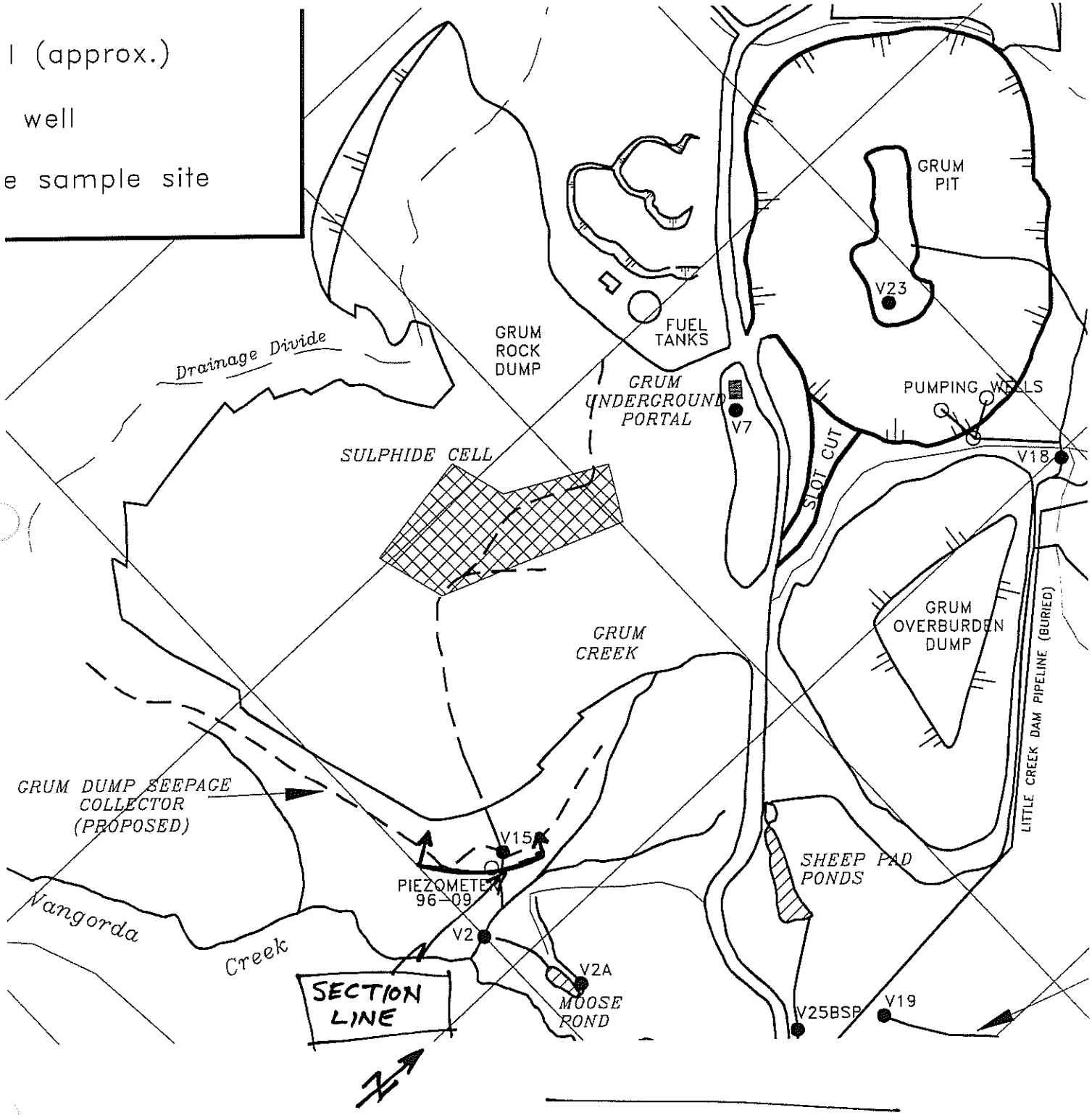

DR#6
DR#5
DR#4
DR#3
DR#2
GW-01
GW-02
GW-03
GW-04
GW-05
LCD ~crest
(off-section ~80m)
LCD
~emergency overflow elevation
typ. max
typ. min
typ. range in pond water elevation
some ice
typ.
sand fill
screen
EOH in soil
EOH poss. @ B.R(?)
B.R.
EOH in B.R.
overburden thickness est. ~40m @ GW05
est depth to B.R. for GW01-GW04
SECTION OUTSIDE OF TOE OF VANGORDA Rock DUMP
SCALE:
1m
1:200
25m
1:5,000
(vert. exagg. = 25X)
1115
1110
1105
1100
1095
1090
1085
1080


DR#6
460
DR#5
9,500
DR#4
2200
(Spring 1998)
DR#3
4,000
1250
(Spring 1998)
GW-01
GW-02
GW-03
GW-04
GW-05
LCD ~crest
(off-section ~80m)
LCD
300
~emergency overflow elevation
typ. max
typ. range in pond water elevation
typ. min
some ice
typ.
sand fill
screen
EOH in soil
70
some ice
typ.
sand fill
screen
280
EOH poss. @ B.R.(?)
typ.
sand fill
screen
EOH in soil
770
typ.
sand fill
B.R.
screen
EOH in B.R.
26
overburden thickness est. ~40m @ GW05
est depth to B.R. for GW01-GW04
1105
1100
1095
1090
1085
SO4 Spring 1999
0-30
31-100
101-900
901-9,999
10,000+
SECTION OUTSIDE OF TOE OF VANGORDA Rock DUMP
SCALE: 1m 1:200
25m 1:5,000
(vert. exagg. = 25X)

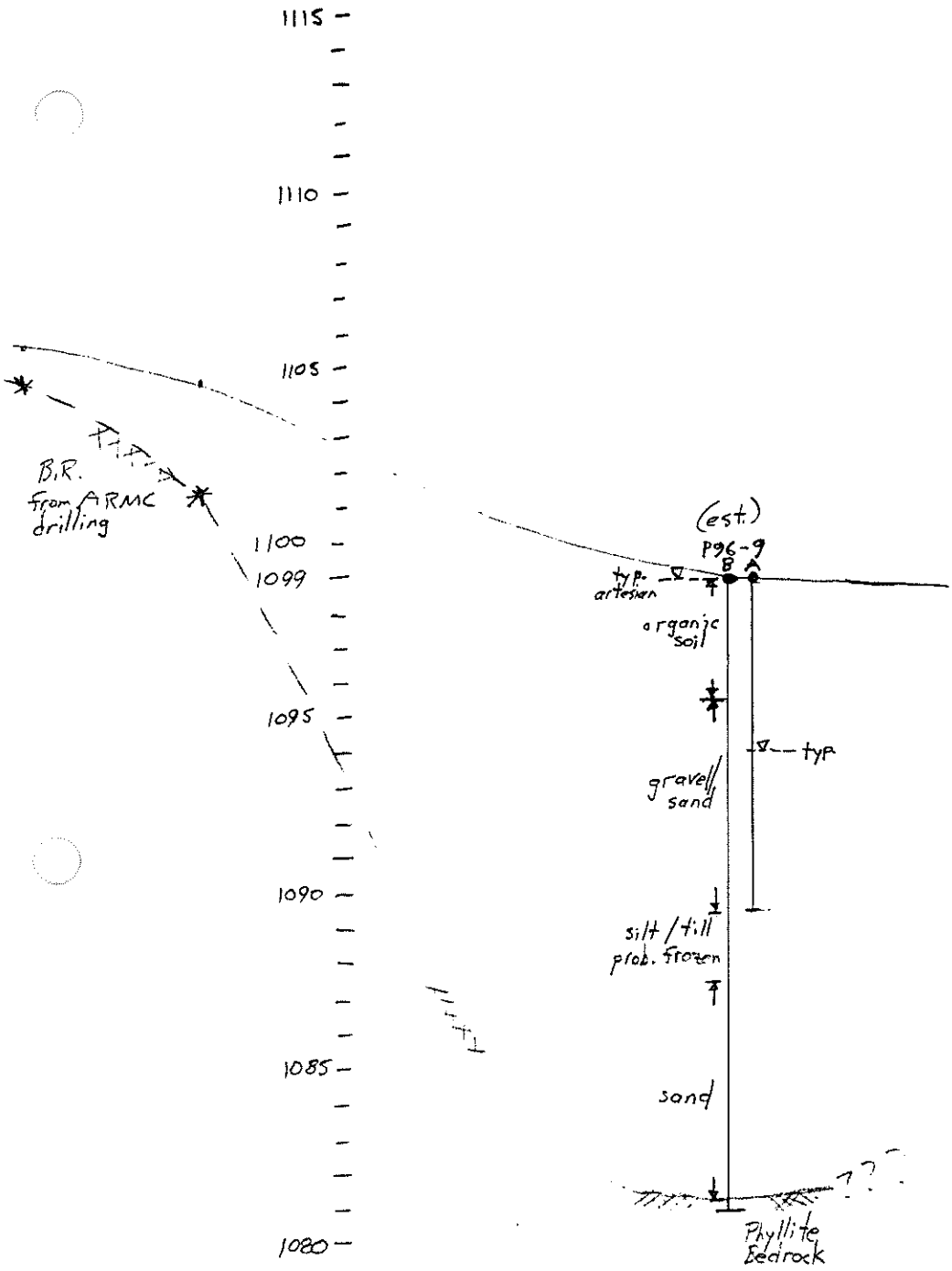

DR#6
3,000
(Fall 1998)
DR#5
17,000
DR#4
2200
(Spring 1998)
DR#3
3300
DR#7
1250
(Spring 1998)
GW-01
GW-02
GW-03
GW-04
GW-05
(off-section ~80m)
LCD ~crest
(off-section ~80m)
LCD
300
(Spring 1999)
emergency overflow elevation
typ. max
typ. range in pond water elevation
typ. min
some ice
typ.
sand fill
screen
EOH in soil
62
some ice
typ.
sand fill
screen
EOH poss. @ B.R(?)
310
typ.
sand fill
screen
EOH in soil
140
typ.
sand fill
B.R.
screen
EOH in B.R.
26
overburden thickness
est. ~40m @ GW05
est depth to B.R.
for GW01-GW04
1115
1110
1100
1095
1090
1080
S04 Fall 1999
0-30
31-100
101-900
901-9,999
10,000+
SECTION OUTSIDE OF TOE
OF VANGORDA Rock DUMP
SCALE:
1m
1:200
25m
1:5,000
(vert. exagg. = 25X)


DR#6
6.5
DR#5
1,150
DR#4
75
(spring 1998)
GW-03
DR#3
225
GW-02
GW-01
(spring 1998)
GW-04
LCD ~crest
(off-section ~80m)
LCD
Zn(T) ~ 7.2
Zn(D) ~ 4.8
emergency overflow elevation
typ. max
typ. range in pond water elevation
typ. min
some ice
typ.
sand fill
screen
0.01
EOH in soil
some ice
typ.
sand fill
screen
0.01
EOH poss. @ B.R.(?)
typ.
sand fill
screen
0.01
EOH in soil
typ.
sand fill
B.R.
screen
EOH in B.R.
0.01
GW-05
(off-section ~80m)
typ.
sand fill
screen
EOH in soil
overburden thickness
est. ~40m @ GW05
est depth to B.R.
for GW01-GW04
(Diss) Zn Spring 1999
0-0.03
0.04-0.09
0.10-0.99
1.0-99.9
100 +
SECTION OUTSIDE OF TOE
OF VANGORDA Rock DUMP
SCALE:
1m
1:200
25m
1:5,000
(vert. exagg. = 25X)


DR#6
330
(Fall 1998)
DR#5
2850
DR#4
+S
(Spring 1998)
GW-03
GW-04
GW-02
DR#3
225
DR#2
50
(Spring 1998)
GW-01
LCD ~ crest
(off-section ~80m)
LCD
Zn(T) ~ 7.2
Zn(D) ~ 4.8
(Spring 1999)
emergency overflow elevation
typ. max
typ. min
typ. range in pond water elevation
some ice
typ.
sand fill
screen
EOH in soil
0.01
some ice
typ.
sand fill
screen
EOH poss. @ B.R.(?)
0.01
typ.
sand fill
screen
EOH in soil
0.01
typ.
sand fill
B.R.
screen
EOH in B.R.
0.0
GW-05
(off-section ~80m)
typ.
sand fill
screen
EOH in soil
overburden thickness est. ~40m @ GW05
est depth to B.R. for GW01-GW04
1115
1110
1105
1100
1095
1090
1080
0-0.03
0.04-0.09
0.10-0.99
1.0-99.9
100+
(Diss) Zn Fall 1999
SECTION OUTSIDE OF TOE OF VANGORDA Rock DUMP
SCALE:
1m
1:200
25m
1:5,000
(vert. exagg. = 25X)



Grid Spacing
= 1,000 metres



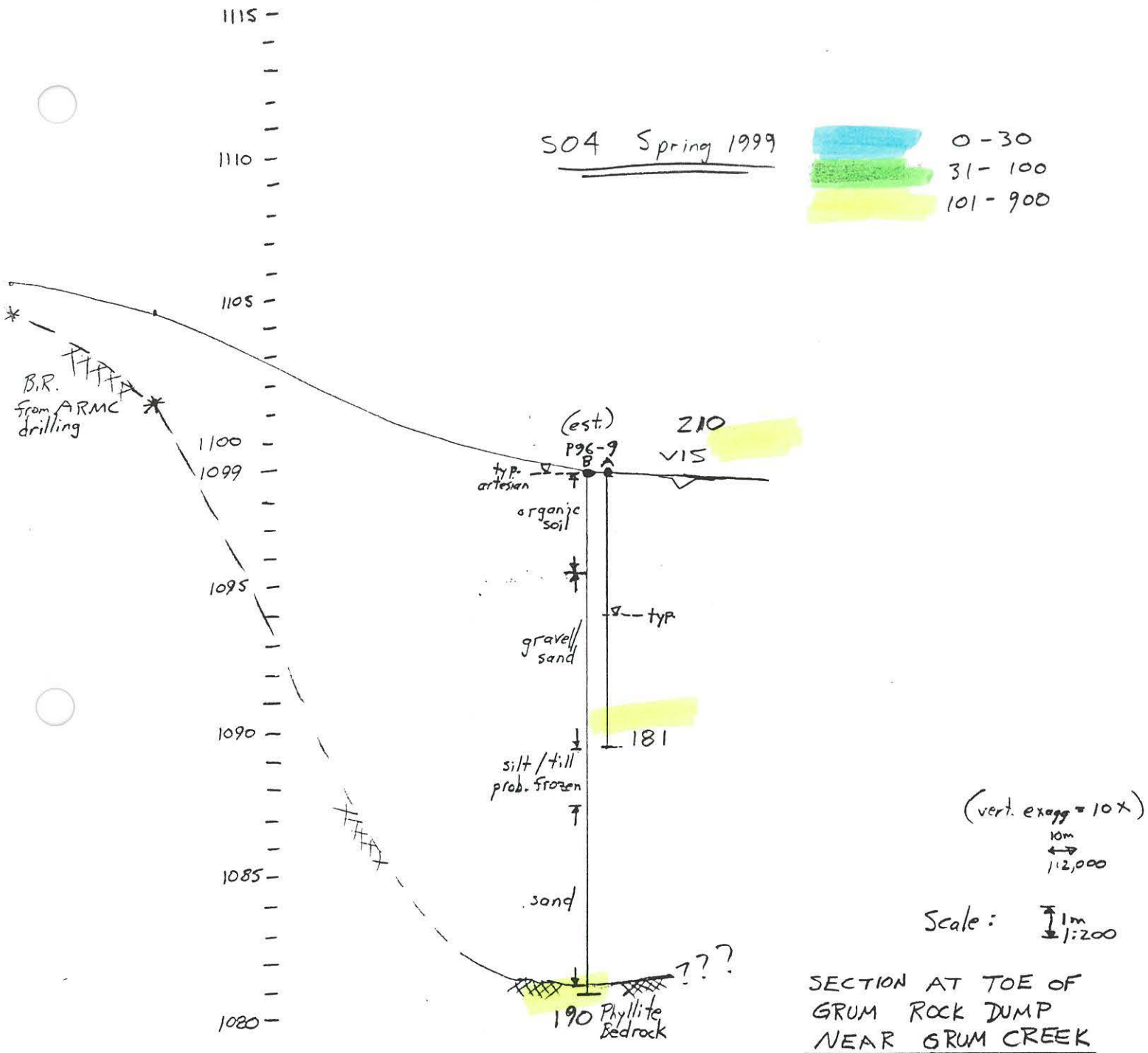
(vert. exagg = 10X)

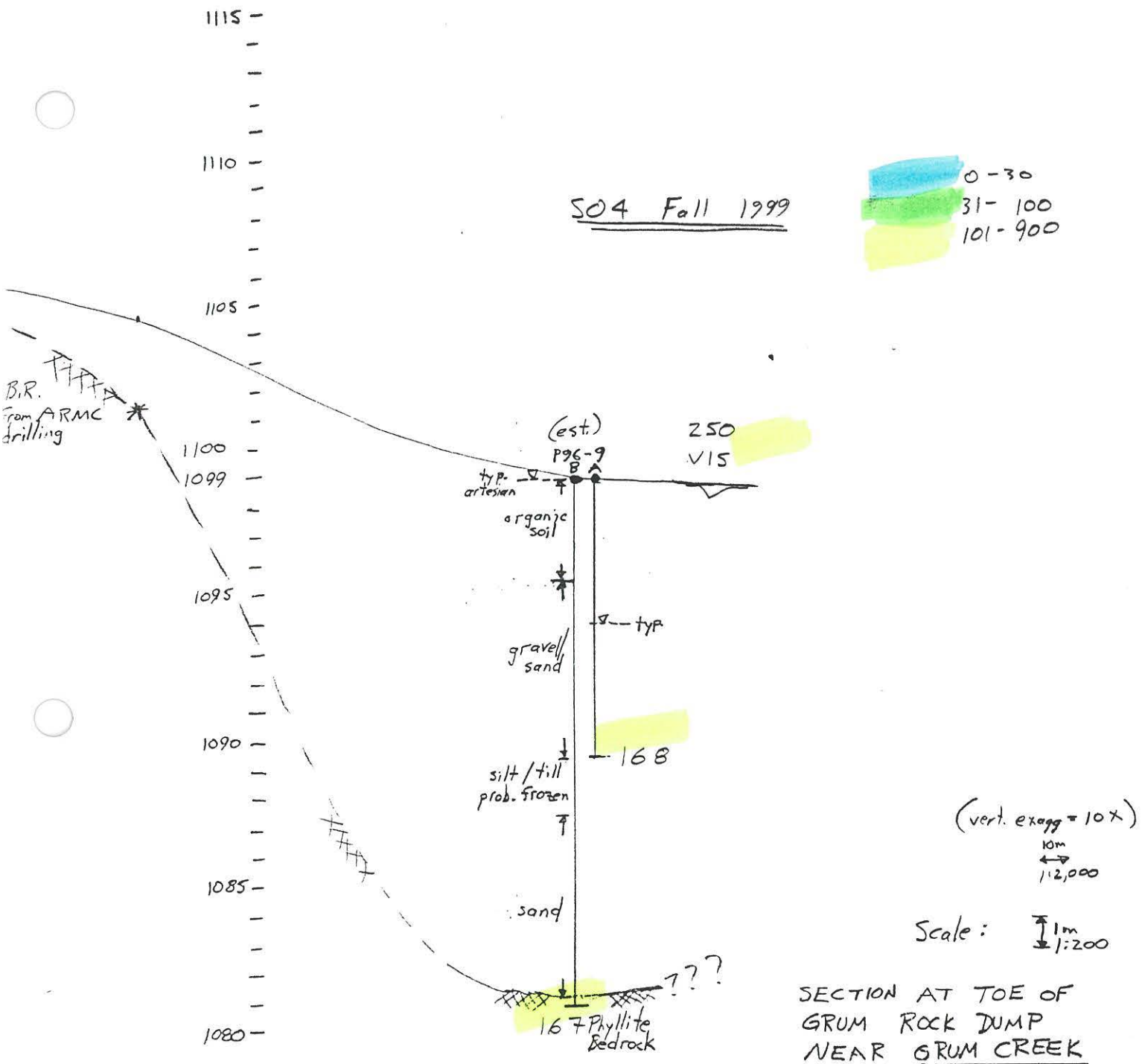
10m ↔ 1:2,000

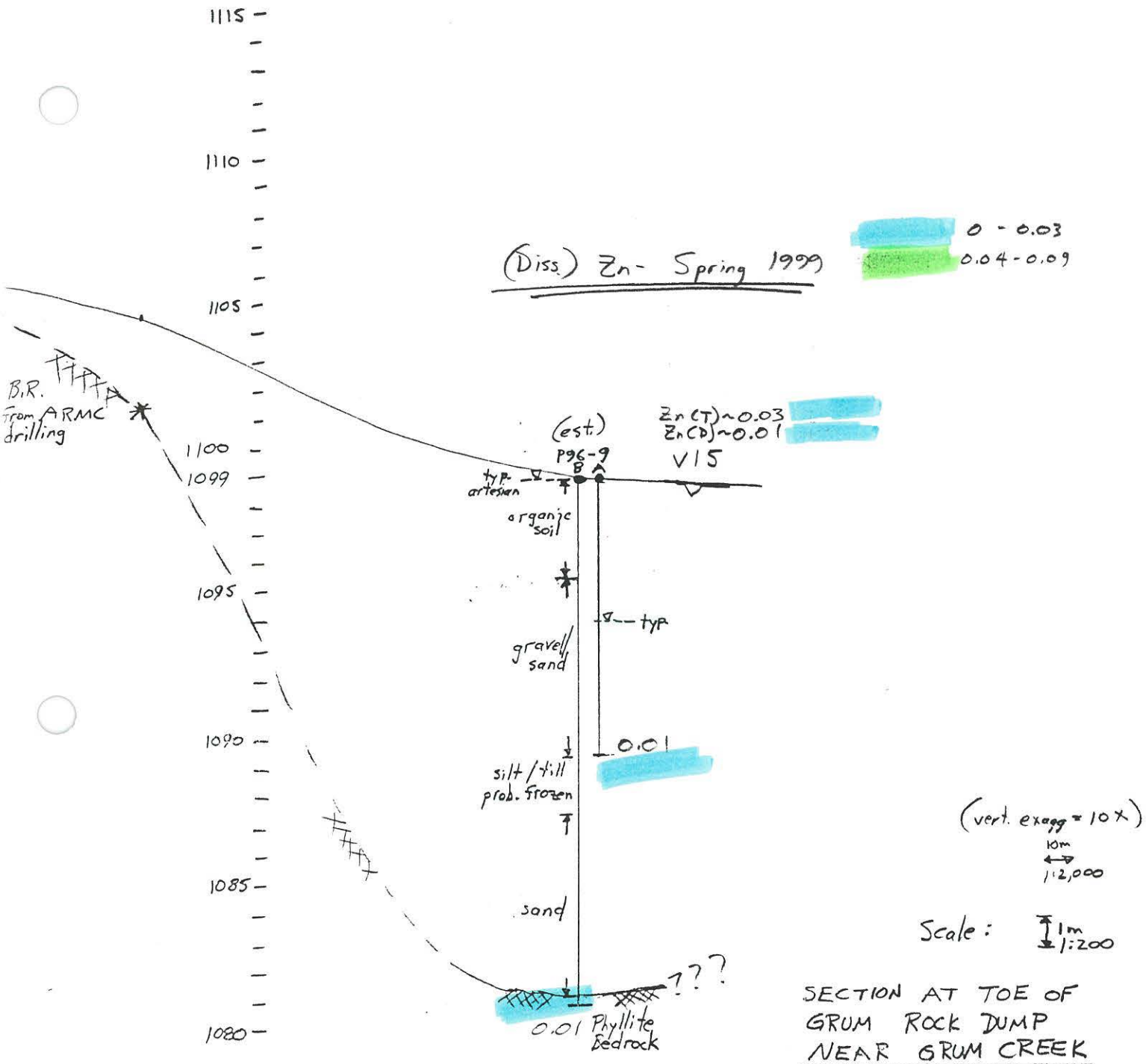
Scale: 1m / 1:200

SECTION AT TOE OF GRUM ROCK DUMP NEAR GRUM CREEK

(elevations are UTM)


1115
1110
1105
1100
1095
1090
1085
1080
S04 Spring 1999
0 - 30
31 - 100
101 - 900
B.R. from ARMC drilling
(est.)
P96-9 B
210
V15
typ. artesian
organic soil
typ.
gravel/ sand
181
silt/till prob. frozen
sand
???
190
Phyllite Bedrock
(vert. exagg = 10x)
10m
1:2,000
Scale:
1m
1:200
SECTION AT TOE OF GRUM ROCK DUMP NEAR GRUM CREEK
(elevations are UTM)


1115
1110
1105
1100
1099
1095
1090
1085
1080
S04 Fall 1999
0 - 30
31 - 100
101 - 900
B.R. from ARMC drilling
(est.)
P96-9 B
250
V15
typ. artesian
organic soil
typ
gravel/ sand
168
silt/till prob. frozen
sand
???
167 Phyllite bedrock
(vert. exagg = 10x)
10m
1:2,000
Scale: 1m 1:200
SECTION AT TOE OF GRUM ROCK DUMP NEAR GRUM CREEK
(elevations are UTM)



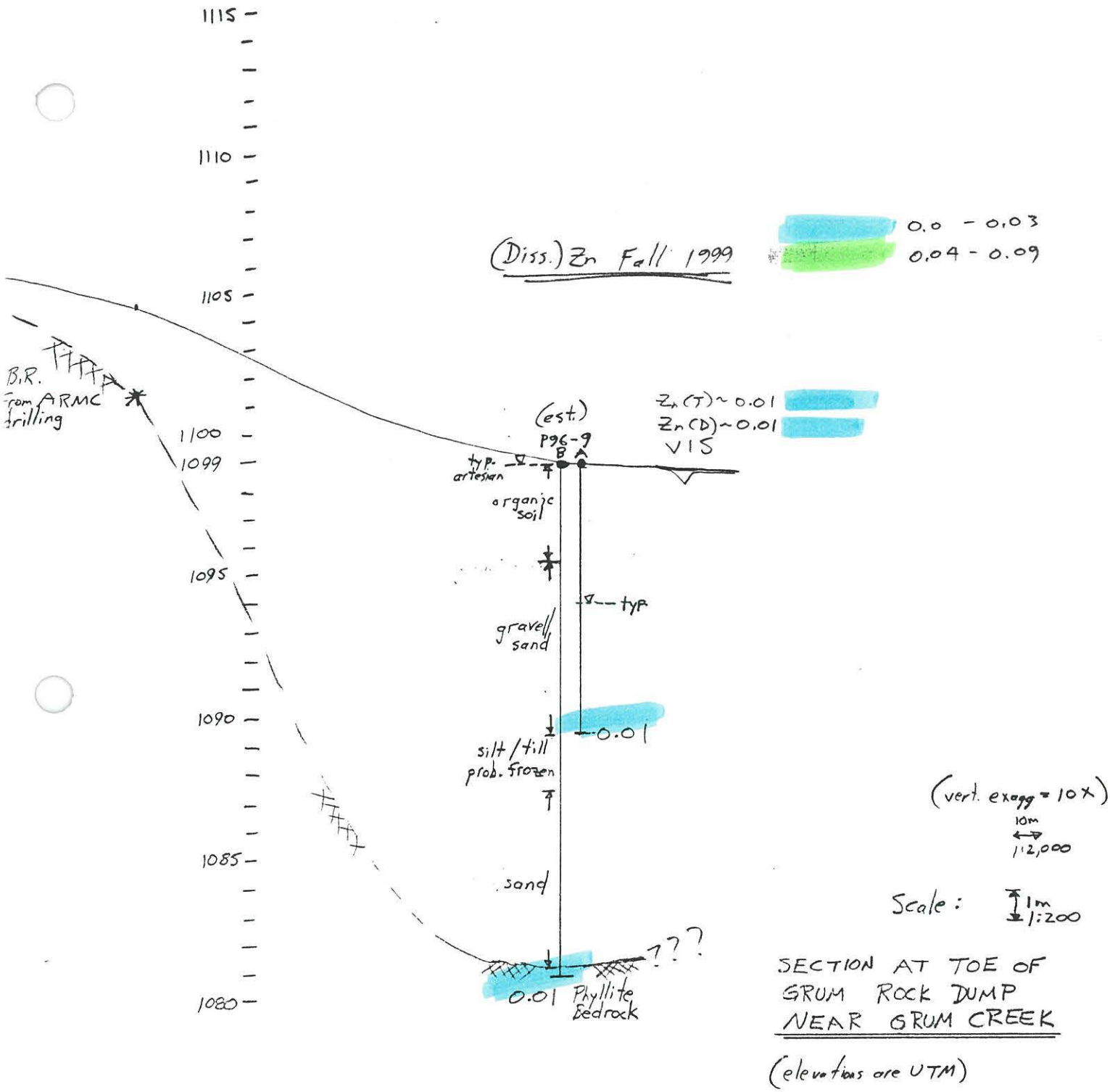
(vert. exagg = 10x)

10m ↔ 1:2,000

Scale: 1m ↕ 1:200

SECTION AT TOE OF GRUM ROCK DUMP NEAR GRUM CREEK

(elevations are UTM)


(Diss.) Zn Fall 1999
0.0 - 0.03
0.04 - 0.09
1115
1110
1105
1100
1099
1095
1090
1085
1080
B.R. from ARMC drilling
(est.)
P96-9
B
A
typ. artesian
organic soil
typ
gravel/ sand
silt/till prob. frozen
sand
Phyllite bedrock
0.01
0.01
Zn (T) ~ 0.01
Zn (D) ~ 0.01
V15
???
(vert. exagg = 10x)
10m
1:2,000
Scale: 1m
1:200
SECTION AT TOE OF GRUM ROCK DUMP NEAR GRUM CREEK
(elevations are UTM)