# Appendix C-2

Wicks 1983: Evaluation of Potential Soil and Ground Water Contamination at the Isaacson Corporation Property, Seattle, Washington

816

# EVALUATION OF POTENTIAL
# SOIL AND GROUND WATER CONTAMINATION
# AT THE ISAACSON CORPORATION PROPERTY
# SEATTLE, WASHINGTON

December 21, 1983

Submitted to:

Isaacson Corporation
8620 East Marginal Way South
Seattle, WA 98108

and

Graham & Dunn
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Submitted by:

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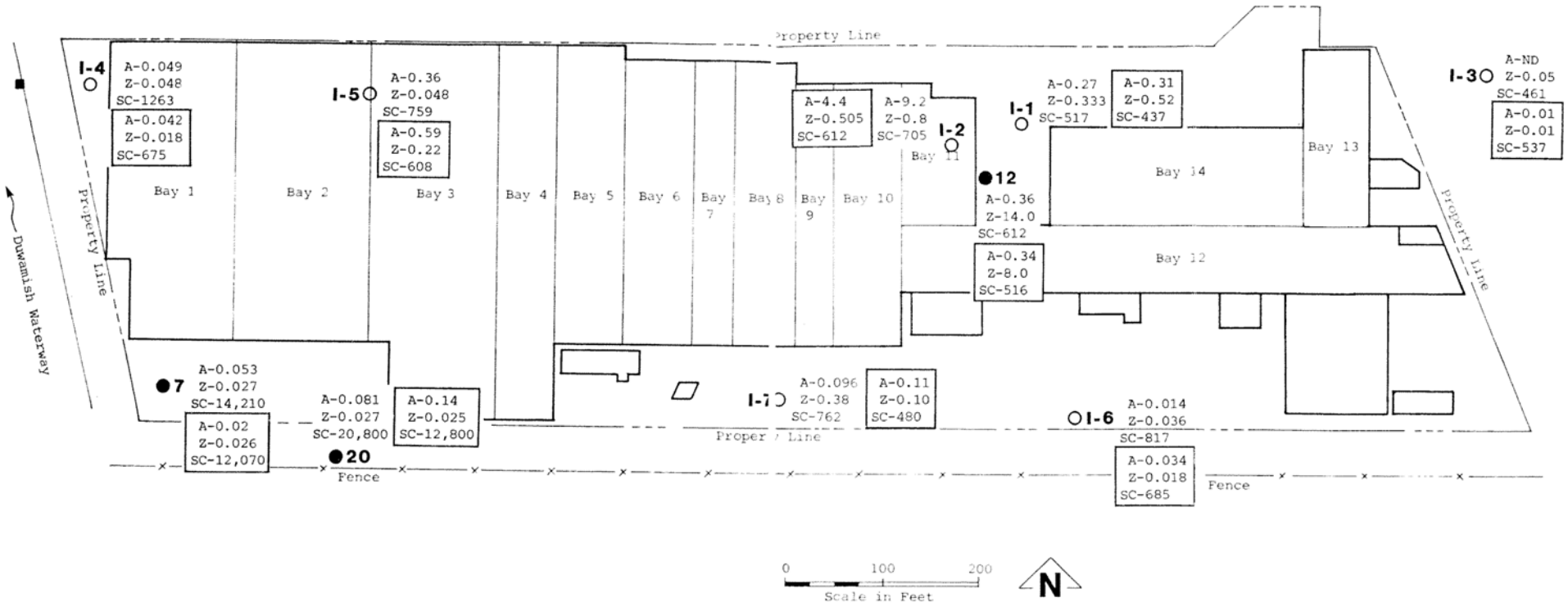


EXPLANATION

| | |
|---|---|
| A- | Arsenic concentration (mg/l) |
| Z- | Zinc concentration (mg/l) |
| SC- | Specific Conductivity (µmho/cm) |
| 7● | Monitoring well: Previous study |
| I-1○ | Monitoring well: Present study |

Notes:

1. First water quality data is based on lab results from 10/25/83 and 10/26/83 sampling run.
2. Second sampling run is from 12/9/83 and 12/10/83 (results enclosed by box in this figure).

**Figure 9**

## Isaacson Corporation

**ARSENIC, ZINC and SPECIFIC CONDUCTIVITY**
**Ground Water Data**


**Patrick H. Wicks**
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TABLE 1. SUMMARY OF SOIL AND FILL ANALYSES DATA[1]

| BORING NUMBER | SAMPLE DEPTH FT | SAMPLE NUMBER[2] S-E | SAMPLE NUMBER[2] LAB | TOTAL METALS ANALYSES,[3] ppm Arsenic As | Barium Ba | Cadmium Cd | Total Chromium Cr | Copper Cu | Lead Pb |
|---|---|---|---|---|---|---|---|---|---|
| I-1 | 2.5- 3.5 | S-2 | 12 | 8 | -- | -- | 39 | 21 | 9. |
| | 5.0- 8.0 | S-4 | 1 | 1300 | -- | -- | 25 | 1400 | 97 |
| | 10.0-11.5 | S-7 | 2 | 1000 | -- | -- | 25 | 2400 | 23 |
| | 13.0-14.5 | S-9 | 13 | 9 | -- | -- | 9.5 | 520 | 6. |
| I-2 | 4.0- 7.0 | S-3 | 3 | 290 | -- | -- | 70 | 390 | 39 |
| | 7.0- 8.5 | S-4 | 14 | 1100 | -- | -- | 23 | 450 | 440 |
| | 8.5-10.0 | S-5 | 4 | 3800 | -- | -- | 26 | 450 | 32 |
| | 13.5-15.0 | S-6 | 15 | 1200 | -- | -- | 9.3 | 420 | 4. |
| I-3 | 9.5-11.0 | S-2 | 10 | 11 | -- | -- | 47 | 45 | 36 |
| I-4 | 3.0 | TP-2 | 5 | 510 | -- | -- | 16 | 280 | 150 |
| I-5 | 3.0 | TP-2 | 6 | 130 | -- | -- | 29 | 90 | 21 |
| I-6 | 9.0-11.0 | TP-5 | 7 | 79 | -- | -- | 540 | 390 | 150 |
| I-7 | 2.0- 4.0 | TP-1 | 8 | 30 | 89 | 2 | 580 | 360 | 3900 |
| | 4.0- 6.0 | TP-2 | 11 | 23 | -- | -- | 740 | 340 | 630 |
| I-4 & I-6 | Slag Composite | | 9 | 18 | 440 | 2.2 | 1300 | 430 | 240 |
| I-4 | Slag | | 16 | 120 | -- | -- | 920 | 370 | 630 |
| I-6 | Slag | | 17 | 33 | | | 2200 | 1200 | 1400 |
| I-7 | Slag | | 18 | 26 | | | 1700 | 160 | 120 |

| | DATA FROM PREVIOUS EVALUATION | | TOTAL METALS ANALYSES, ppm | | | | | |
|---|---|---|---|---|---|---|---|---|
| BORING[5] NUMBER | BORING NUMBER | SAMPLE DEPTH ft | Arsenic As | Barium Ba | Cadmium Cd | Total Chromium Cr | Copper Cu | Lead Pb |
| I-1 | 11 | 6.5 | 2880 | -- | -- | -- | -- | -- |
| I-1 | 11 | 11.5 | 1210 | -- | -- | -- | -- | -- |
| I-2 | 3 | 6.5 | 932 | 43 | 0.4 | 12 | -- | 3. |
| | 12 | 6.5 | 44 | -- | -- | -- | -- | -- |
| I-2 | 3 | 10.5 | 200 | 60 | 0.2 | 16 | -- | 4. |
| | 4 | 10.5 | 15 | -- | -- | -- | -- | -- |
| | 12 | 9.0 | 31-13 | -- | -- | -- | -- | -- |
| I-4 | 6 | 2.0 | 18 | 520 | 8 | 466 | -- | 580 |
| I-5 | 9 | 3.0 | 47 | 63 | 1 | 31 | -- | 16 |
| I-6 | 19 | 9.0 | 36 | 63 | 3 | 835 | -- | 220 |
| I-7 | 5 | 2.5 | 33 | 650 | 16 | 1130 | -- | 1170 |
| Slag | | | ND | 1350 | ND | 4330 | 62 | 105 |

TABLE 1. SUMMARY OF SOIL AND FILL ANALYSES DATA[1]

| SAMPLE[2] NUMBER S-E | LAB | EP TOXICITY ANALYSES,[4] mg/l Arsenic As | Barium Ba | Cadmium Cd | Total Chromium Cr | Hexaval. Chromium Cr(VI) | Lead Pb | Mercury Hg | Selenium Se | Silver Ag |
|---|---|---|---|---|---|---|---|---|---|---|
| S-2 | 12 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| S-4 | 1 | 7.8 | ND | ND | ND | ND | ND | ND | ND | ND |
| S-7 | 2 | 7.3 | ND | ND | ND | ND | ND | ND | ND | ND |
| S-9 | 13 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| S-3 | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| S-4 | 14 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| S-5 | 4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| S-6 | 15 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| S-2 | 10 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TP-2 | 5 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TP-2 | 6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TP-5 | 7 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TP-1 | 8 | ND | ND | .02 | 0.1 | ND | 6.1 | ND | ND | ND |
| TP-2 | 11 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| osite | 9 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 16 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 17 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| | 18 | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| EP TOXICITY ANALYSES, MAXIMUM CONCENTRATION LIMIT,[6] mg/l | | 5 | 100 | 1 | 5(EPA) | 5(DOE) | 5 | 0.2 | 1 | 5 |

(1) -- denotes analysis not performed.

(2) S-E column lists sample numbers assigned by Sweet, Edwards and Associates as samples were taken in the field. LAB column lists sample numbers assigned by the laboratory.

(3) Dry weight basis.

(4) ND denotes non-detectible above detection limit; for laboratory sample numbers 1, 2, 8, and 9, EP toxicity analyses lower detection limits are: As, 0.5; Ba, 0.5; Cd, 0.01; Cr. 0.1; Cr(VI), 0.1; Pb, 0.2; Hg, 0.005; Se, 0.5; Ag, 0.1. For laboratory sample numbers 11 through 18, EP toxicity analyses lower detection limits of detection are: As, 0.2; Ba, Cd, CrVI, Pb, and Hg are same as above; Se, 0.1; Ag, 0.2.

(5) Borings in this evaluation which are nearest to borings in previous evaluation.

(6) Soil/fill analyses results exceeding any one of these maximum concentration limits classifies that soil/fill as a hazardous waste under EPA regulations and/or as dangerous waste under DOE regulations.

TABLE 2. SUMMARY OF WATER QUALITY DATA

| DATA SOURCE | LOCATION | mg/l(4) Arsenic As 10/83 | Arsenic As 12/83 | Total Chromium Cr 10/83 | Total Chromium Cr 12/83 | Copper Cu 10/83 | Copper Cu 12/83 | Nickel Ni 10/83 | Nickel Ni 12/83 | Lead Pb 10/83 | Lead Pb 12/83 | Zinc Zn 10/83 | Zinc Zn 12/83 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) | Background | <0.005 | | <0.02 | | ≤0.016 | | ≤0.052 | | <0.005 | | ≤0.032 | |
| This evaluation (October through December 1983) | I-3 (background) | ND | 0.010 | ND | 0.010 | 0.004 | ND | ND | 0.01 | ND | -- | 0.05 | 0.010 |
| | SITE WELLS | | | | | | | | | | | | |
| | [ I-1 | 0.27 | 0.31 | ND | ND | 0.049 | 0.027 | ND | 0.01 | ND | ND | 0.27 | 0.52 |
| This evaluation | [ I-1 (S) | 0.235 | -- | 0.0043 | -- | 0.062 | -- | 0.005 | -- | 0.003 | -- | 0.333 | -- |
| (October through | [ I-2 | 9.2 | 4.4 | 0.01 | ND | 0.016 | 0.008 | 0.03 | 0.02 | ND | ND | 0.8 | 0.18 |
| December 1983) | [ I-2 (S) | -- | 3.0 | -- | 0.0109 | -- | 0.008 | -- | 0.044 | -- | 0.004 | -- | 0.505 |
| | [ 12 | 0.36 | 0.34 | ND | ND | 0.7 | 0.47 | 0.06 | 0.04 | ND | ND | 14.0 | 8.0 |
| | [ I-6 | 0.014 | 0.034 | ND | ND | ND | ND | ND | 0.01 | ND | ND | 0.036 | 0.018 |
| | [ I-7 | 0.096 | 0.11 | ND | ND | 0.026 | ND | ND | ND | ND | ND | 0.38 | 0.10 |
| | [ I-7 (S) | -- | 0.0085 | -- | 0.0081 | -- | 0.004 | -- | ND | -- | 0.003 | -- | 0.058 |
| | [ I-5 | 0.36 | 0.59 | ND | ND | 0.004 | ND | ND | ND | ND | ND | 0.048 | 0.22 |
| This evaluation | [ I-4 | 0.041 | 0.042 | ND | ND | ND | ND | ND | ND | ND | ND | 0.041 | 0.018 |
| (October through | [ I-4 (S) | 0.049 | -- | 0.0041 | -- | 0.003 | -- | 0.003 | -- | 0.004 | -- | 0.048 | -- |
| December 1983) | [ 20 | 0.056 | 0.14 | ND | 0.030 | 0.06 | 0.013 | ND | 0.04 | 0.03 | ND | ND | 0.025 |
| | [ 20 (S) | 0.081 | -- | 0.0416 | -- | 0.034 | -- | 0.005 | -- | 0.002 | -- | 0.027 | -- |
| | [ 7 | 0.053 | 0.020 | ND | 0.029 | 0.005 | 0.011 | ND | 0.04 | 0.002 | ND | 0.027 | 0.026 |
| Previous | [ 12 | 0.26 | | 0.0 | | -- | | -- | | 0.001 | | -- | |
| Evaluation | [ 20 | 0.30(5) | | 0.1(5) | | -- | | -- | | 0.017 | | -- | |
| (August to | [ 20 (S) | 0.31(5) | | 0.01 | | -- | | -- | | 0.038 | | -- | |
| October 1983) | [ 7 | 0.028 | | 0.0 | | -- | | 0.01 | | 0.095(5) | | 0.11 | |
| STANDARDS(2) | | | | | | | | | | | | | |
| Primary Drinking Water Standard | | 0.05 | | 0.0 | | -- | | -- | | 0.05 | | -- | |
| Secondary Drinking Water Standard | | -- | | -- | | 1.0 | | -- | | -- | | 5.0 | |
| | DUWAMISH RIVER | | | | | | | | | | | | |
| | [ Allentown - 10/14 | ND | -- | 0.005 | -- | -- | -- | -- | -- | ND | -- | 0.023 | -- |
| This evaluation | [ Bridge - 10/25 | ND | -- | ND | -- | 0.049 | -- | -- | -- | ND | -- | 0.007 | -- |
| (October 1983) | [ 16th Ave. S. - 10/14 | ND | -- | 0.016 | -- | -- | -- | -- | -- | ND | -- | 0.028 | -- |
| | [ Bridge - 10/25 | ND | -- | 0.11 | -- | -- | -- | -- | -- | 0.003 | -- | 0.017 | -- |
| | [ Allentown - Mean | 0.0035 | | 0.036 | | 0.0126 | | 0.02 | | 0.034 | | 0.0106 | |
| (3) | [ - Max | 0.009 | | 0.0 | | 0.023 | | 0.02 | | 0.06 | | 0.02 | |
| | [ 16th Ave. S. - Mean | 0.004 | | 0.006 | | 0.0125 | | 0.058 | | 0.052 | | 0.0134 | |
| | [ - Max | 0.012 | | 0.0 | | 0.02 | | 0.14 | | 0.1 | | 0.026 | |

TABLE 2. Continued

FOOTNOTES

1. These data are from a ground water evaluation performed at a location approximately 2.2 miles north in 1982 and 1983. Accordingly, they do not represent background, but do give a measure of ground water in the vicinity that may be uncontaminated."
2. Primary drinking water standards are based on human health considerations, as adopted through 1983. Secondary drinking water standards are based on aesthetics not health considerations; accordingly, values at or somewhat above these standards are considered safe to humans in drinking water, but may be displeasing to the taste/odor.
3. Metro has collected water quality data on the Duwamish River for 10 years. The values shown in this table are for the October data over the 10-year period of record, except for Arsenic. Arsenic analyses have not been performed by Metro. Accordingly, the values shown for Arsenic are from limited data available from other sources and as collected as part of this evaluation. The Arsenic data reported here for the 16th Avenue South Bridge are actually for 2-6 km from the river mouth, and the Arsenic data reported here for the Allentown Bridge are for 7-10 km from the river mouth.
4. Detection limits used for water analysis reported in this table which were performed during this evaluation are as follows:

| | mg/l | | |
|---|---|---|---|
| | Non-Split Samples | | Split Samples(S) |
| | 10/83 | 12/83 | |
| Arsenic | 0.005 | 0.005 | 0.001 |
| Barium | 0.02 | --- | --- |
| Cadmium | 0.001 | --- | --- |
| Chromium | 0.005 | 0.008 | 0.0005 |
| Copper | 0.004 | 0.004 | 0.001 |
| Nickel | 0.01* | 0.01 | 0.001 |
| Lead | 0.001 | 0.005 | 0.001 |
| Zinc | 0.03 | 0.005 | 0.01 |

*Except for B-20 and field blank, where detection limit was 0.03 mg/l.

-- Denotes analysis not performed.

5. These heavy metal concentrations are not considered to be representative of in-situ ground water quality because the samples were reportedly not field filtered prior to being placed in the acide fixed sample bottle. See report RESULTS, Ground Water Quality section for detailed discussion.

# Appendix C-3

Landau 1986: First Annual Report, Ground Water Monitoring Program, Boeing Isaacson Property

Landau 1987: Second Annual Report, Ground Water Monitoring Program, Boeing Isaacson Property

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# FIRST ANNUAL REPORT
# GROUND WATER MONITORING PROGRAM
# BOEING ISAACSON PROPERTY
# 8541 EAST MARGINAL WAY SOUTH
# SEATTLE, WASHINGTON

Prepared by

Landau Associates, Inc.

for

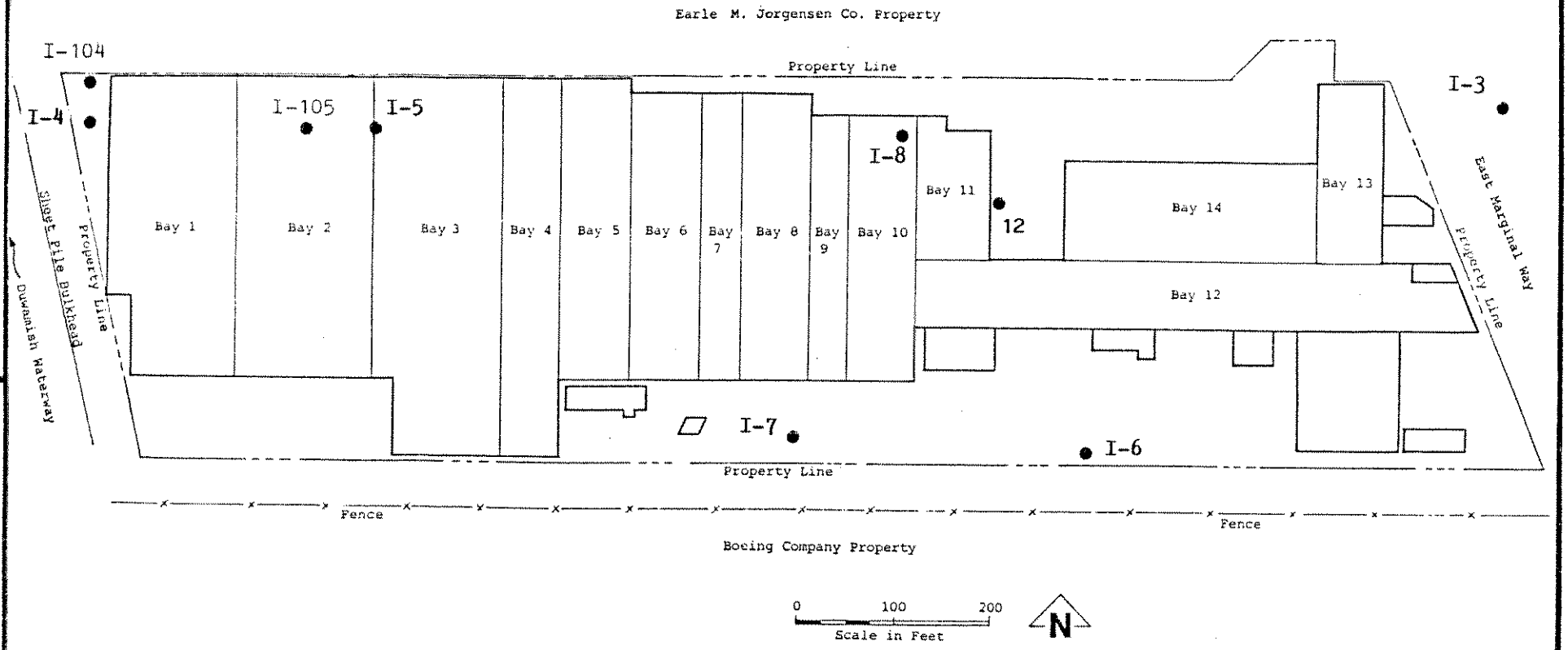
The Boeing Company

Seattle, Washington

June 1986

LANDAU ASSOCIATES

MONITORING WELL LOCATIONS




LEGEND

● MONITORING WELLS

Figure 2

TABLE I

ARSENIC CONCENTRATIONS

IN GROUND WATER

ISAACSON PROPERTY[a]

| Well | 10/83[b] | 12/83[b] | 6/85 | 12/85 |
|---|---|---|---|---|
| I-3 | ND[c] | 0.01 | <0.005 (0.015)[d] | <0.005 (0.012) |
| I-4 | 0.041 | 0.042 | ----[e] | ---- |
| I-104 | ---- | ---- | ---- | 0.005 (0.018) |
| I-5 | 0.36 | 0.59 | ---- | ---- |
| I-105 | ---- | ---- | ---- | 1.2 (2.4) |
| I-6 | 0.014 | 0.034 | ---- | 0.005 (0.048) |
| I-7 | 0.096 | 0.11 | 0.080 (0.11) | 0.025 (0.11) |
| I-8 | ---- | ---- | ---- | 0.021 (0.21) |
| B-12 | 0.36 | 0.34 | 0.31 (0.62) | 0.022 (1.2) |

---

(a) Expressed in mg/l (parts per million); all values are for dissolved arsenic unless otherwise denoted.
(b) From Wicks (1983).
(c) ND denotes Non-Detectable.
(d) X(Y): X = dissolved arsenic, and (Y) = total arsenic.
(e) --- denotes analysis not performed.

# SECOND ANNUAL REPORT
# GROUND WATER MONITORING PROGRAM

BOEING ISAACSON PROPERTY
8541 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON

Prepared by

Landau Associates, Inc.

for

The Boeing Company

Seattle, Washington

29 May 1987

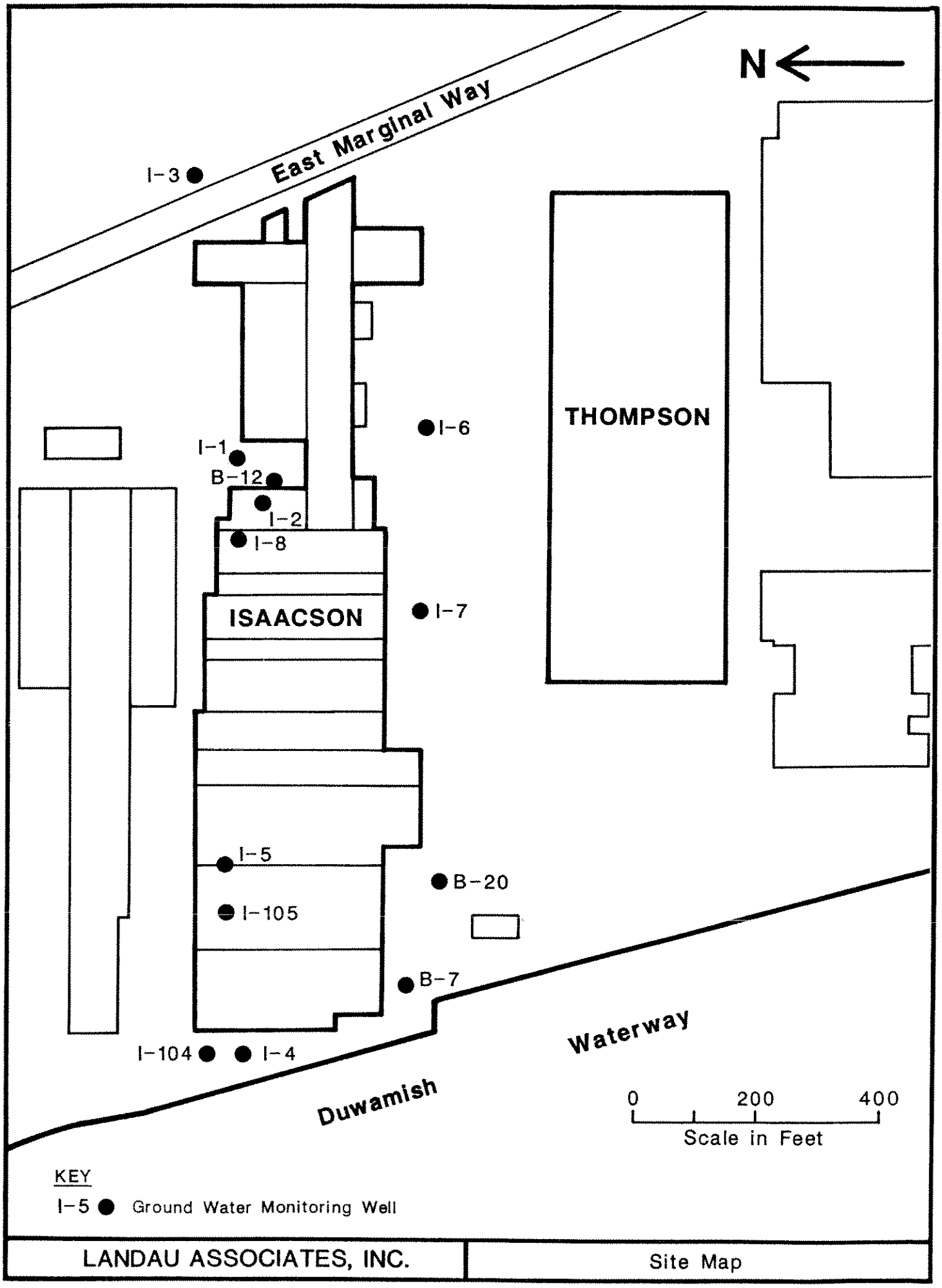
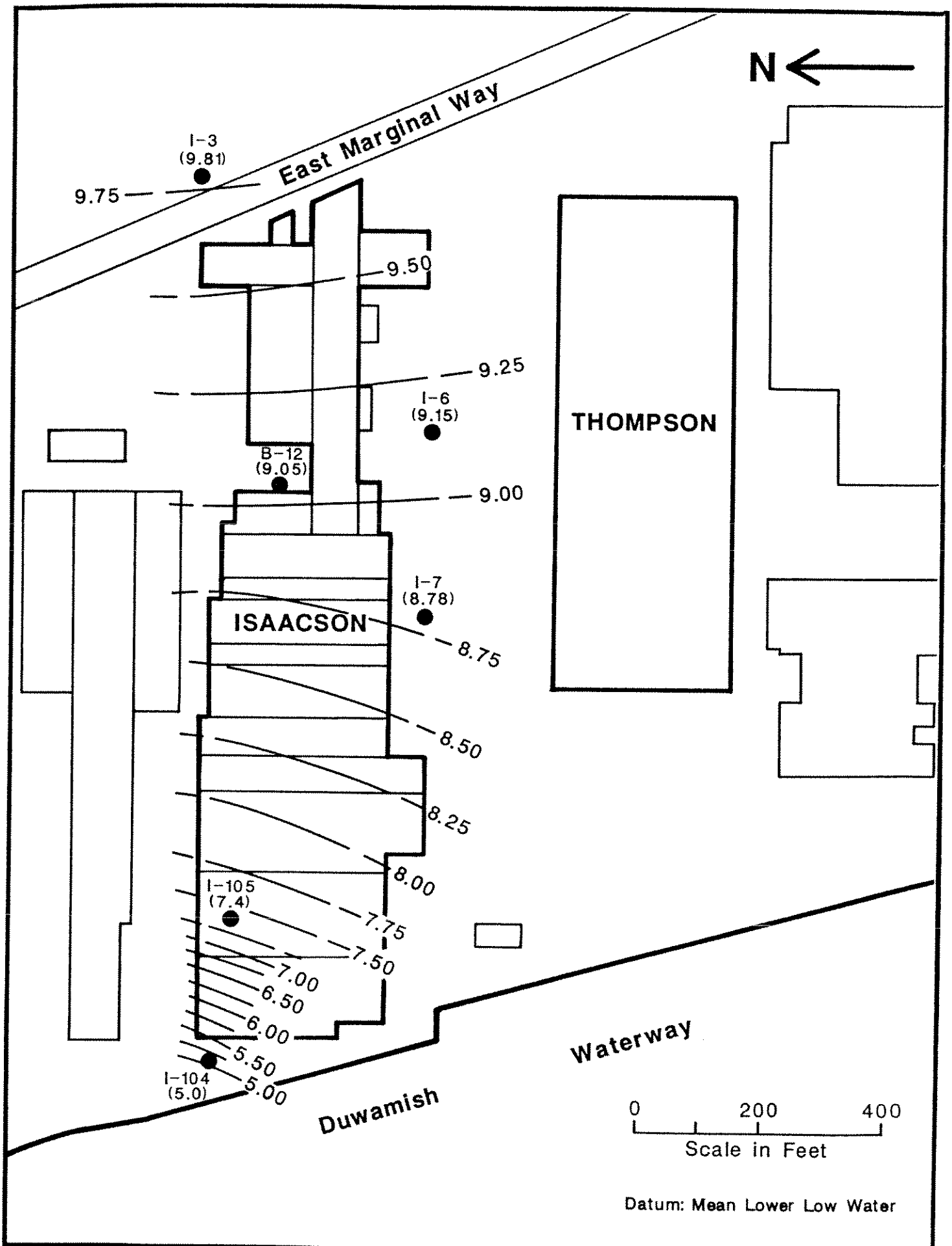

N
East Marginal Way
I-3
THOMPSON
I-6
I-1
B-12
I-2
I-8
ISAACSON
I-7
I-5
B-20
I-105
B-7
I-104
I-4
Waterway
Duwamish
0
200
400
Scale in Feet
KEY
I-5 Ground Water Monitoring Well
LANDAU ASSOCIATES, INC.
Site Map



Figure 2




| LANDAU ASSOCIATES, INC. | Water Level Contours<br>Low Tide |
|---|---|



Figure 3

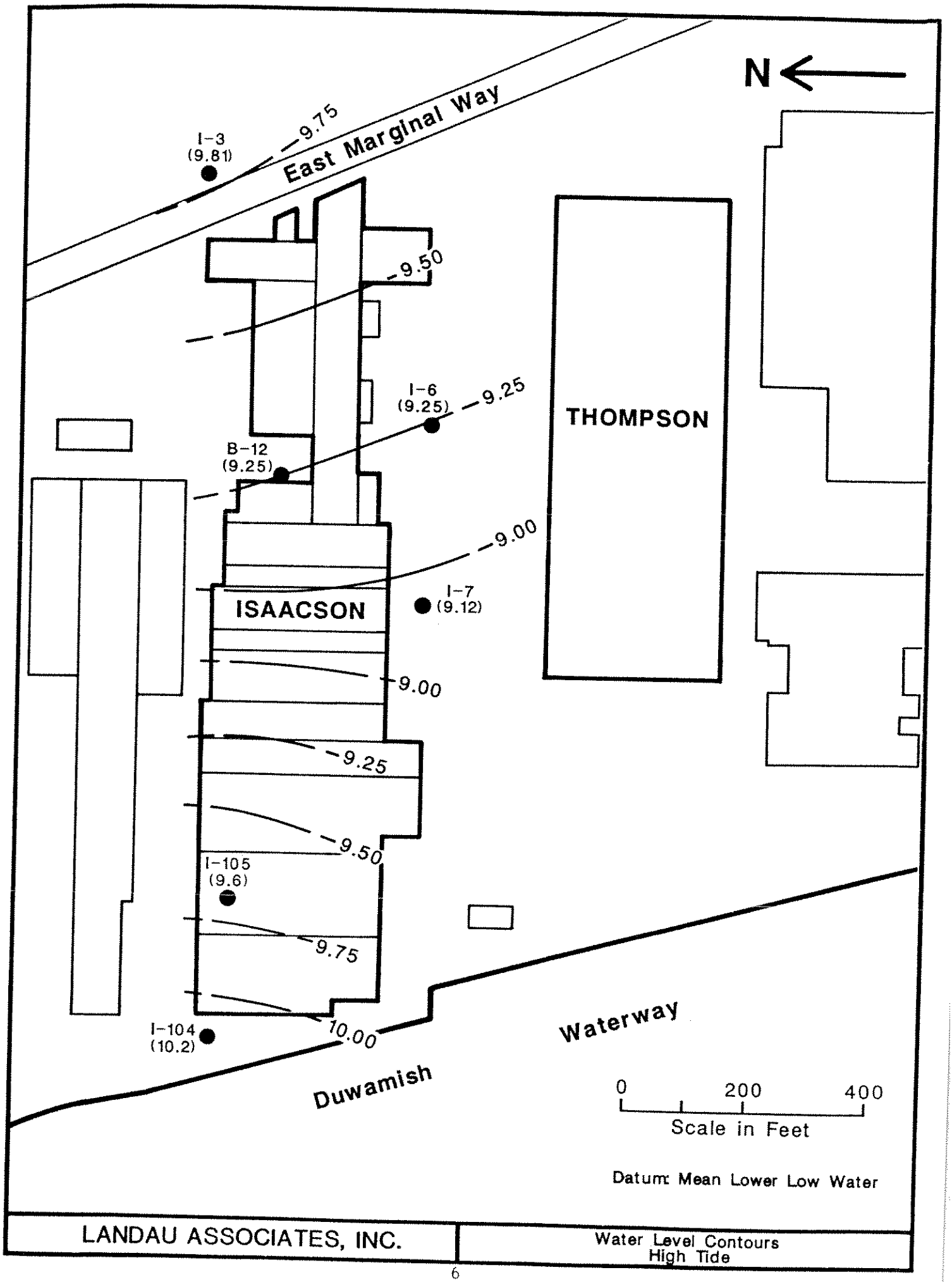

N
East Marginal Way
I-3
(9.81)
9.75
9.50
I-6
(9.25)
9.25
B-12
(9.25)
9.00
THOMPSON
ISAACSON
I-7
(9.12)
9.00
9.25
9.50
I-105
(9.6)
9.75
I-104
(10.2)
10.00
Waterway
Duwamish
0
200
400
Scale in Feet
Datum: Mean Lower Low Water
LANDAU ASSOCIATES, INC.
Water Level Contours
High Tide

TABLE 3
ARSENIC CONCENTRATIONS
IN GROUND WATER
ISAACSON PROPERTY [a]

| Well | 8/83 (b) | 10/83 (b) | 12/83 (b) | 6/85 | 12/85 | 7/86 | 1/87 | Average |
|---|---|---|---|---|---|---|---|---|
| I-1 | ----(c) | 0.27 | 0.31 | ---- | ---- | ---- | ---- | 0.29 |
| I-2 | ---- | 9.2 | 4.4 | ---- | ---- | ---- | ---- | 6.8 |
| I-3 | ---- | <0.005 (d) | 0.01 | <0.005 (0.015) (e) | <0.005 (0.012) | <0.005 (0.014) | <0.005 (0.027) | 0.006 (0.017) |
| I-4 | ---- | 0.041 | 0.042 | ---- | ---- | ---- | ---- | 0.042 |
| I-104 | ---- | ---- | ---- | ---- | 0.005 (0.018) | <0.005 (<0.005) | <0.005 (0.006) | 0.005 (0.01) |
| I-5 | ---- | 0.36 | 0.59 | ---- | ---- | ---- | ---- | 0.48 |
| I-105 | ---- | ---- | ---- | ---- | 1.2 (2.4) | 0.48 (1.5) | 4.3 (4.3) (f) | 1.99 (2.73) |
| I-6 | ---- | 0.014 | 0.034 | ---- | 0.005 (0.048) | 0.007 (0.087) | 0.006 (0.024) | 0.013 (0.053) |
| I-7 | ---- | 0.096 | 0.11 | 0.080 (0.11) | 0.025 (0.11) | 0.050 (0.15) | 0.045 (0.080) | 0.068 (0.11) |
| I-8 | ---- | ---- | ---- | ---- | 0.021 (0.21) | 0.019 (0.24) | 0.008 (0.050) | 0.016 (0.17) |
| B-7 | (0.028) | 0.053 | 0.020 | ---- | ---- | ---- | ---- | 0.037 (0.028) |
| B-12 | (0.26) | 0.36 | 0.34 | 0.31 (0.62) | 0.022 (1.2) | 0.51 (1.0) | 0.27 (0.64) | 0.302 (0.74) |
| B-20 | (0.30) | 0.056 | 0.14 | ---- | ---- | ---- | ---- | 0.098 (0.30) |

---

(a) Expressed in ppm (parts per million); all values are for dissolved arsenic unless otherwise denoted.
(b) From Wicks (1983).
(c) --- denotes analysis not performed.
(d) <Denotes "less than."
(e) X(Y): X = dissolved arsenic, and (Y) = total arsenic.
(f) Reanalysis of this sample indicated total arsenic values of 4.7 and 4.2 ppm. See Appendix B, Laucks #2700 and Brown & Caldwell #E87-03-147.