

HAGGITT CONSULTING

2004 Bark Monitoring Survey Report

Tolstoi Bay

JANUARY 12, 2004 SURVEY

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Introduction

This report is the second annual bark monitoring survey at Tolstoi Bay LTF/LSA. Haggitt Consulting conducted a pre-discharge survey at this site on January 1, 2001. This report encompasses the entire project area from the log transfer ramp to the log storage area. This site was active at the time of the survey, the Log Storage Area contained rafts and a barge was being loaded. The weather conditions for the survey were favorable, with a light SE wind and good visibility.

This survey included the previously established radial and parallel transect patterns. The bearings and sample point interval of the prior years' survey were repeated for consistency. The results of the two surveys are presented and compared in this report.

A summary of the approach and techniques used in the LTF survey are provided in the Methods Section of this report. The result of the survey is then presented together with estimates of the spatial extent and depth of bark on the seafloor. Finally, the results of the past and present surveys are compared and estimates of the area of continuous and discontinuous cover are presented.

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Methods

Area calculations were accomplished by drafting scaled transect diagrams from the sample point tables in Turbo Cad professional v6.

Radial Transects

The fixed hub reference point for the transects radiating from the log transfer ramp was initially located by reviewing maps and diagrams created by Haggitt Consulting for the January 2001 pre-discharge survey. The hub location was then "fixed" at the center of the ramp with DGPS coordinates.

The reference hub was located as close as possible to the center of the discharge site to facilitate future reconnaissance. Five transects were established, radiating from the reference hub at 30-degree intervals. Two separate magnetic compasses were compared to determine the bearings. Vessel based personal monitored the divers' progress and used radio/diver-telephone communications for course adjustments.

Parallel Transects

The three parallel transects reference point hubs were initially located by reviewing maps and diagrams created by Haggitt Consulting for the January 2001 pre-discharge survey. The DGPS coordinates were verified, and the bearing of 110 degrees was followed. Each transect ended at 90 feet MLLW.

Sample Points

Samples were taken at intervals of 15 linear feet along each radial and parallel transect. This interval distance was established with the use of a rolling tape measure, the accuracy is reported as +/- 3 inches at 1000 feet.

For the 2001 pre-discharge LSA survey, it was requested by Dave Sturdevant of DEC that the transect termination criteria of 60 feet MLLW be exceeded. The transects for the 2004 LSA survey were terminated by 90 feet MLLW.

At each sample point observations were noted on the abundance and type of marine organisms present, the native vegetation, and composition of the substrate. Data including the water depth, current direction, and estimated current velocity also were incorporated into the field notes. Each of the sample points also included relevant observations on operational debris and existing bark debris. Photographic documentation was used at representative sample locations to record algal life, animal life, substrate, and debris present. Sample location depth

notations are based on readings from a Cochran Consulting Nemesis IIA dive computer calibrated for saltwater and altitude.



Tolstoi Bay LTF Dive Survey

Surveyed on January 12, 2004

The survey was conducted at the request of Aloha Lumber Corporation. An underwater reconnaissance was requested to determine the representative condition of an area operating as a Log Transfer Facility (LTF). The survey dive was conducted on January 12, 2004. The site surveyed is located in the southwest portion of Tolstoi Bay on Prince of Wales Island.

This inspection documented findings according to the Alaska Department of Environmental Conservation (ADEC), Environmental Protection Agency (EPA) and NPDES requirements. The percentage of bark coverage was determined by using the protocol for operating a bark-monitoring program given in the EPA General Permit. The area calculation used in this report is outlined in the ADEC publication “**Required Method for Bark Monitoring Surveys under the LTF General Permits**”.

Findings

Continuous Coverage	Discontinuous Coverage	Total Survey Area
0.33 Acres / 1363 M ₂	0.95 Acres / 3924 M ₂	1.28 Acres / 5286 M ₂



Log Transfer Ramp

The reference point hub position, located at the center of the drive down ramp was recorded using a Raytheon DGPS.

The coordinates for this hub are

N 55° 37.496 by
W 132° 27. 447.

Weather conditions during the survey consisted of overcast skies with winds less than five knots. Diving commenced at 9 a.m. on January 12, 2004 during mid tide. The Hadley Lyman Anchorage tidal station (subordinate station #1493) was used to correct depths to MLLW. The station reported a tide level of 4.2 ft at 9 a.m. The current conditions remained negligible. Seawater temperature was recorded at 40 degrees F. The horizontal visibility was estimated to be 25 feet.

Five transects radiated out from the reference point on bearings labeled T¹ 290°, T² 320°, T³ 350°, T⁴ 020° and T⁵ 050°. A total of 57 sample locations were assessed.

Site conditions remained steady with winds less than five knots and overcast skies. Diving concluded at 11:30 a.m., on January 12, 2004 during high tide. The tidal station (subordinate station #1493) was used to correct depths to MLLW. The station reported a tide level of 5.5 ft at 11:00 a.m. The current conditions remained negligible. Seawater temperature was recorded at 40 degrees F. The horizontal visibility was estimated to be 25 feet.

Each transect terminated by 60 ft MLLW or beyond the area of significant bark accumulation. The grade for these transects varied from 4:1 to 50:1.

continuous

Observations

The ramp at Tolstoi Bay Log Transfer Facility was composed of cobble and aggregate and descended from the beach and gently curved to the west. The ramp was elevated from the natural seabed and had discontinuous coverage on its surface. At the terminus it abruptly descended to an area of 100% coverage that extended in a radial pattern. The bark debris reduced in depth and percent of coverage the farther from the point of discharge that the samples were drawn. The survey noted that within the debris field, there are natural deposits of wood and vegetation that have been imported by tidal current forces.

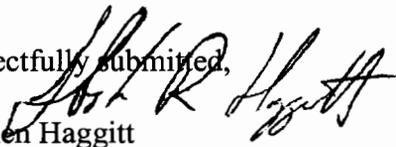
The small amount of *Zostera marina* that was reported in the 2001 pre-discharge survey; that was located about 15 feet east of the ramp below the MLLW line, was not observed during this survey. This area is interspersed with continuous and discontinuous bark debris.

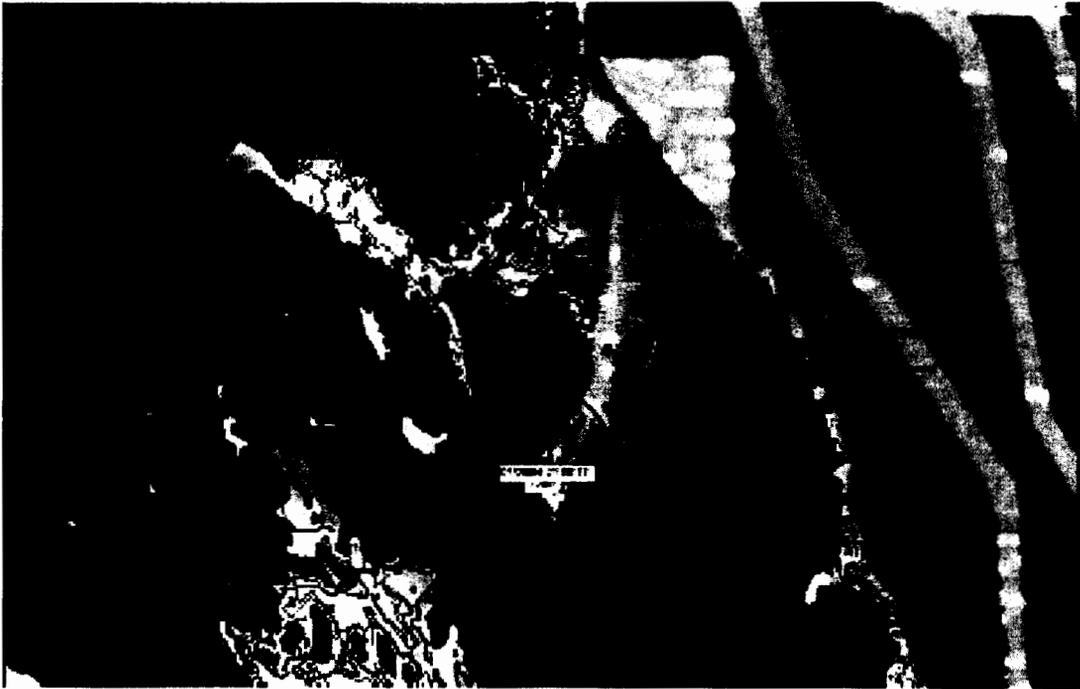
General observations included a higher percentage of natural debris, possibly imported from winter storms. The Sea cucumber *Parastichopus californicus* was noted in very high abundance. The marine life appears to be generally healthy, and is supporting a greater abundance of species commonly associated with a substrate that includes wood debris.

Bark deposits were consistent with former observations regarding the character, particle size, and general dispersal pattern reported in the 2003 survey. However, this years survey observations revealed an increased proportion of continuous cover to discontinuous cover. The bathymetry of the site was that of a gradual slope composed of a mix of gravel, sand, bark and silt. Although, the bark debris located directly in front of the input structure exhibited a jiggling effect that's commonly associated with bark coverage that is not mixed with sand or silt.

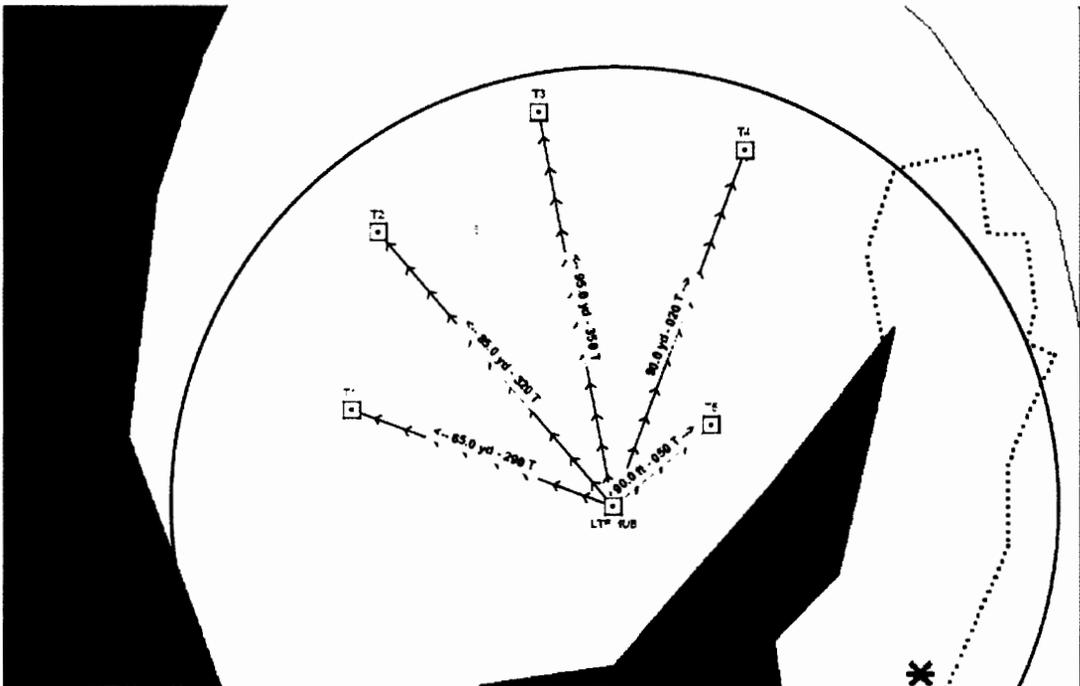
This determination is based on the calculations derived from the transect data collected for this report only. For further service regarding this report, please direct inquiries to (253) 209-9380 or e-mail at Haggitt1@juno.com.

Respectfully submitted,


Stephen Haggitt
Haggitt Consulting
February 10, 2004



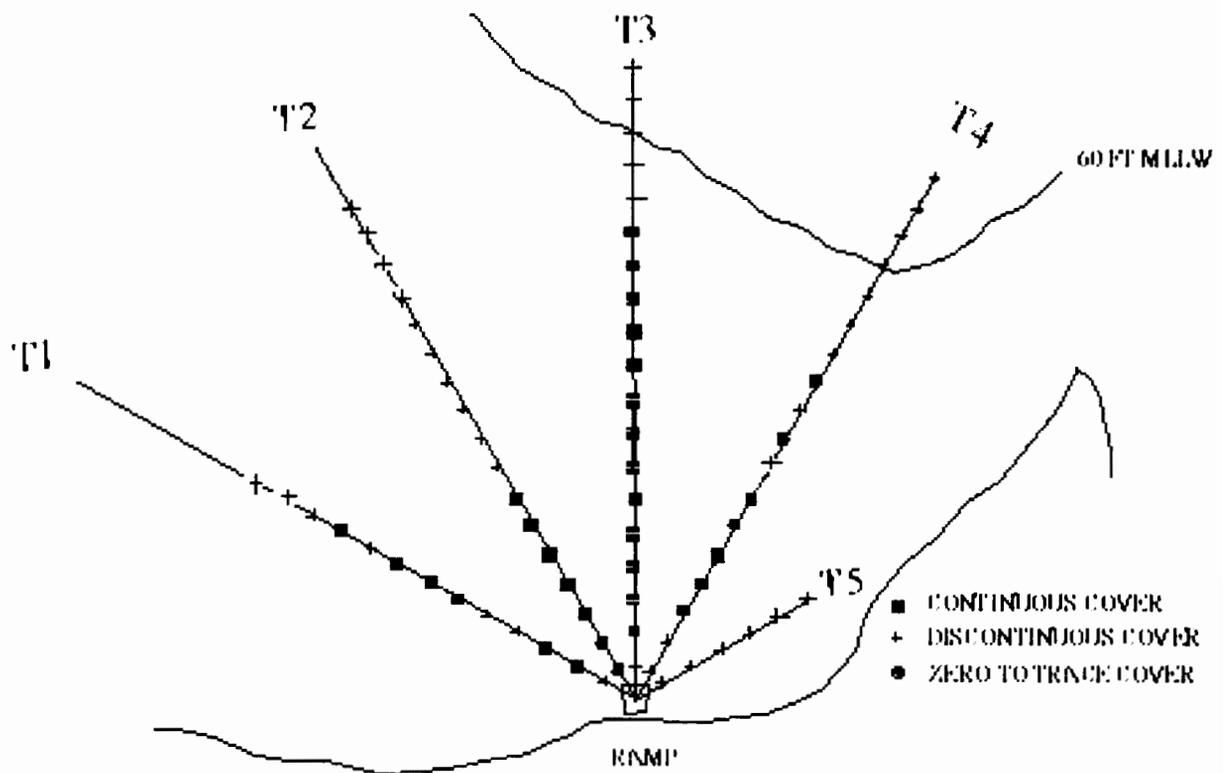
TOLSTOI BAY PRINCE OF WALES ISLAND



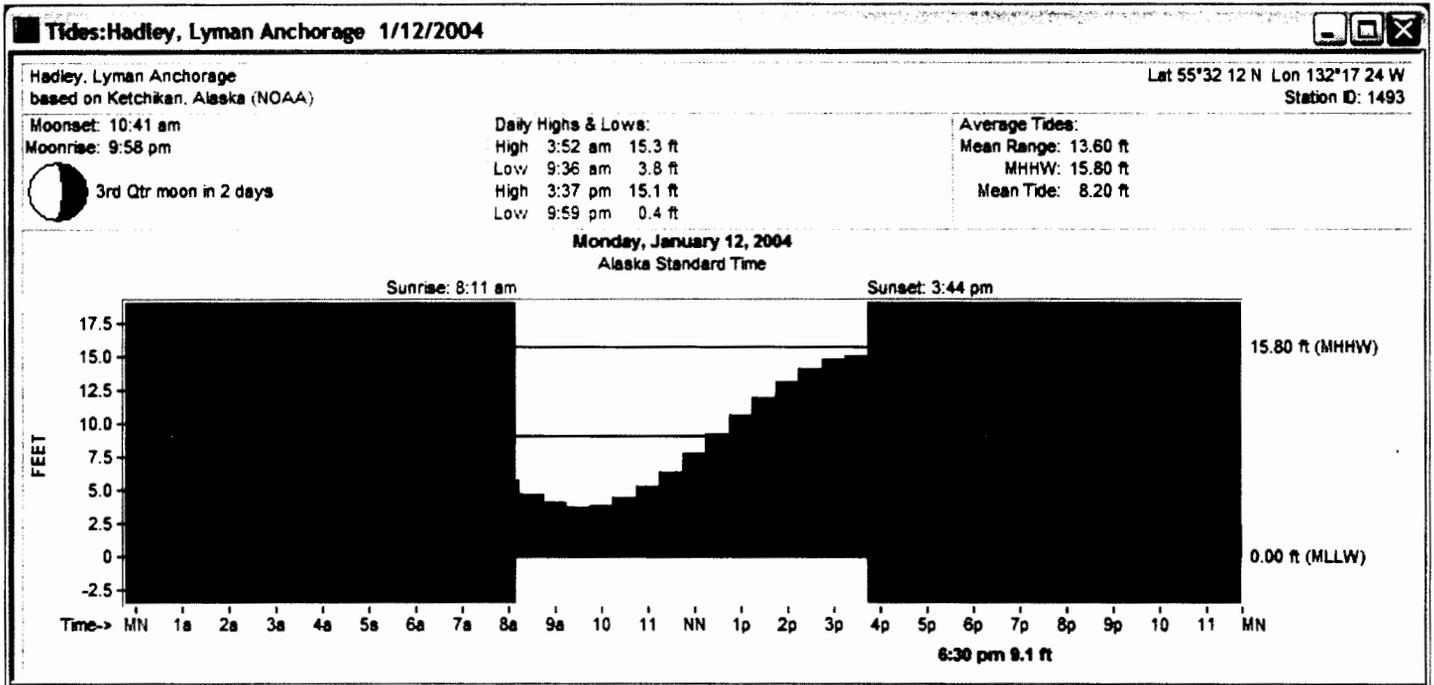
TOLSTOI LTF TOLSTOI BAY ALASKA

Transect Diagrams

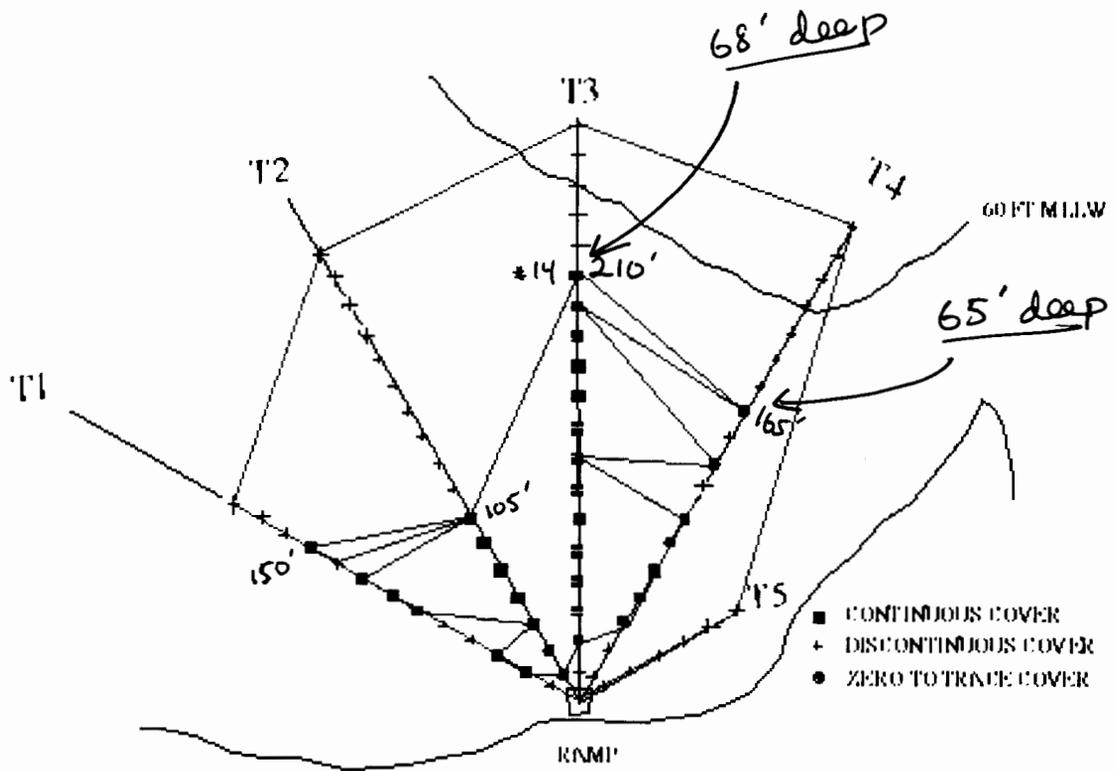
+



Tidal Chart



Calculation Sheet



Total Survey Area: 55,952 Sq. Ft.

Continuous Coverage: 14,384 Sq. Ft.

Discontinuous Coverage: 41,568 Sq. Ft.

Data Tables

Transect 1 290 Degrees

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	8	>1	40	S
2	9	2	100	S
3	10	1	100	S
4	11	>1	30	S
5	13	>1	20	S
6	14	3	100	S
7	15	3	100	S
8	15	3	100	S
9	15	>1	80	S
10	15	>1	100	S
11	16	>1	80	S
12	16	>1	30	S
13	16	>1	10	S
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

Transect 2 320 Degrees

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	8	2	100	S
2	13	3	100	S
3	15	4	100	S
4	15	2	100	S
5	16	4	100	S
6	17	5	100	S
7	17	2	100	S
8	18	>1	80	S
9	18	>1	70	S
10	19	>1	50	S
11	20	>1	50	S
12	20	>1	50	S
13	19	>1	40	S
14	19	>1	20	S
15	19	>1	40	S
16	18	>1	20	S
17	17	>1	10	S
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Key:
 Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

Transect 3 350 Degrees

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	10	2	20	S
2	15	2	100	S
3	18	5	100	S
4	23	3	100	S
5	25	4	100	S
6	27	5	100	S
7	28	2	100	S
8	32	4	100	S
9	34	3	100	S
10	36	2	100	S
11	38	3	100	S
12	41	2	100	S
13	46	1	100	S
14	48	2	100	S
15	52	1	80	S
16	55	1	60	S
17	58	1	40	S
18	63	>1	10	S
19	68	>1	10	S
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

Transect 4 020 Degrees

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	6	>1	10	S
2	8	1	20	S
3	12	5	100	S
4	17	1	100	S
5	18	>1	100	S
6	22	3	100	S
7	25	2	100	S
8	28	1	80	S
9	31	1	100	S
10	35	1	70	S
11	38	1	100	S
12	44	1	80	S
13	48	1	60	S
14	52	>1	40	S
15	56	>1	10	S
16	61	>1	10	S
17	64	>1	10	S
18	65	1	20	S
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

Transect 5 050 Degrees

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	6	TRACE	TRACE	S
2	8	>1	20	S
3	10	2	40	C
4	10	>1	40	C
5	8	>1	30	R
6	8	>1	20	R
7				
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

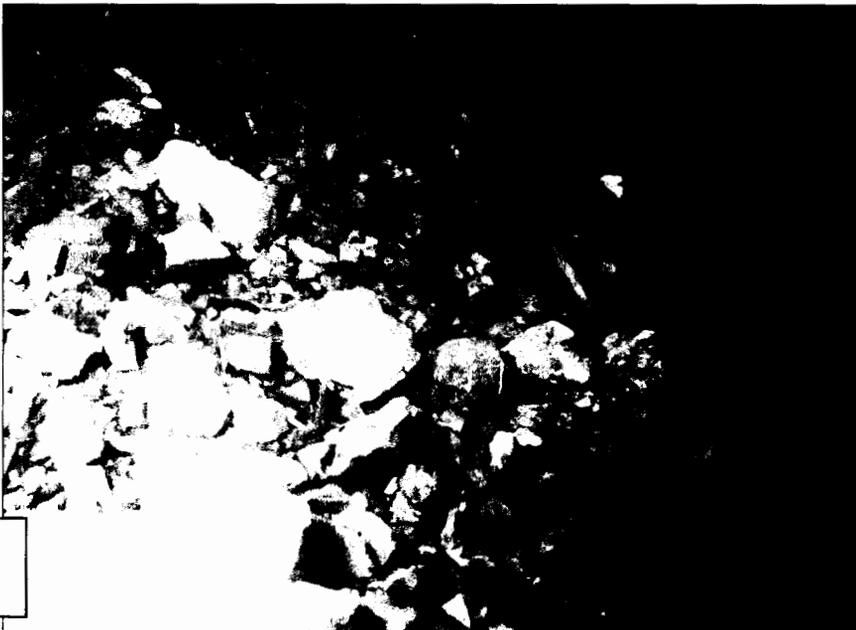
Abundance Tables

Scientific Name	Common Name	Abundance
Plants		
<i>Ulva / Monstroma spp.</i>	Sealettuce	L
<i>Lessoniopsis littoralis</i>		L
<i>Cystoseira osmundacea</i>		L
<i>Laminaria saccharina</i>	Suger kelp	L
<i>Macrocystis pyrifera</i>		L
<i>Zostara marina</i>	Eel grass	L
Invertebrates		
<i>Macoma nasuta</i>	Bent nosed clam	L
<i>Protohaca staminea</i>	Littleneck clam	C
<i>Parastichopus californicus</i>	Sea cucumber	A
<i>Beggiatoa spp.</i>	White sulfur bacteria	A
<i>Balamus spp.</i>	Barnical	C
<i>Pagurus spp.</i>	Hermit crab	L
<i>Orthasterias koehleri</i>	Mottled sea star	L
<i>Pycnopodia helianthoides</i>	Sunflower star	L
<i>Saxidomus giganteus</i>	Butter clam	A
<i>Mercenaria mercenaria</i>	Quahog	L
<i>Clinocardium nuttallii</i>	Heart cockle	L

Photographic Representation

4090

T1 S1



3090

T1 S4



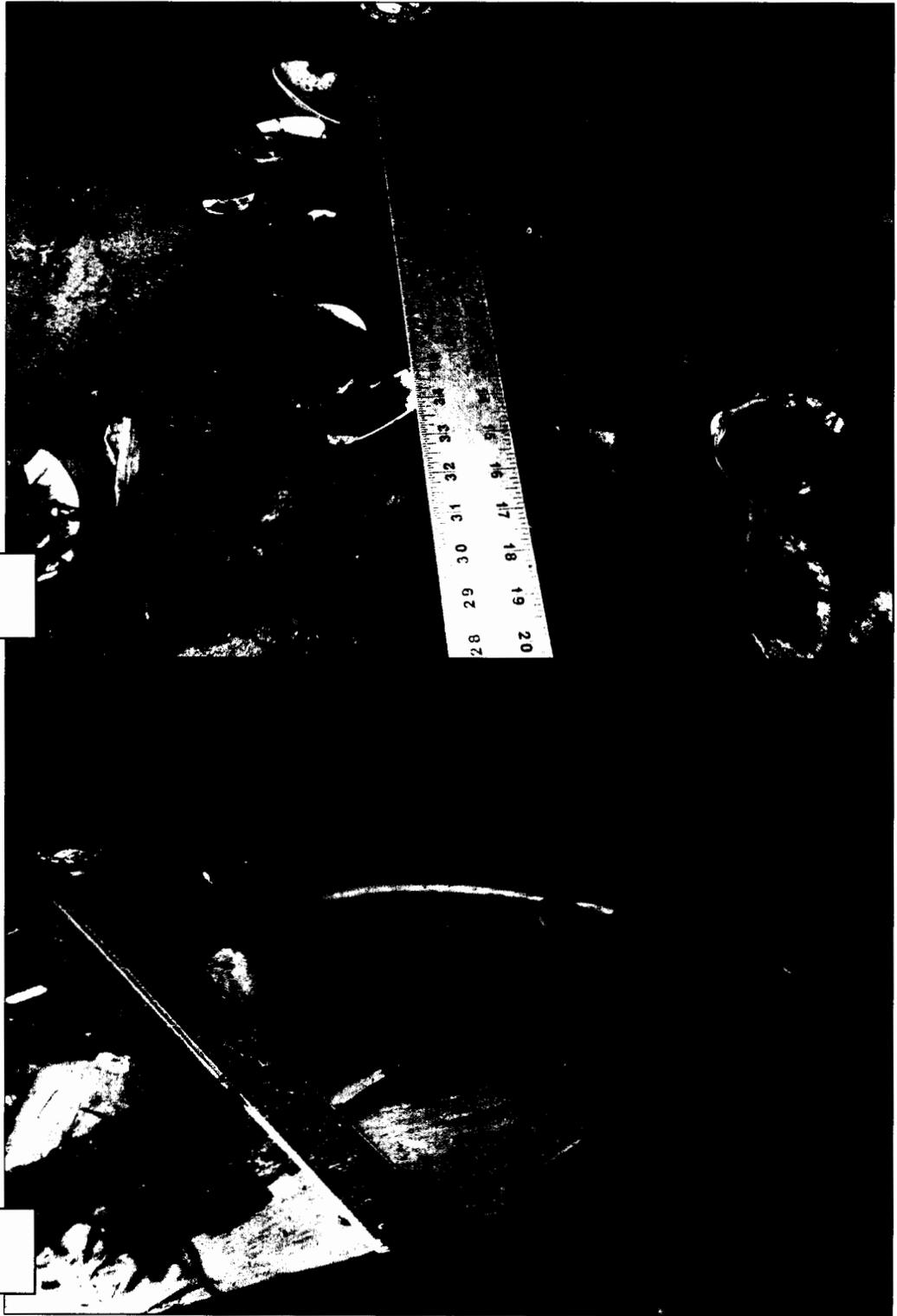


2090

T1 S5

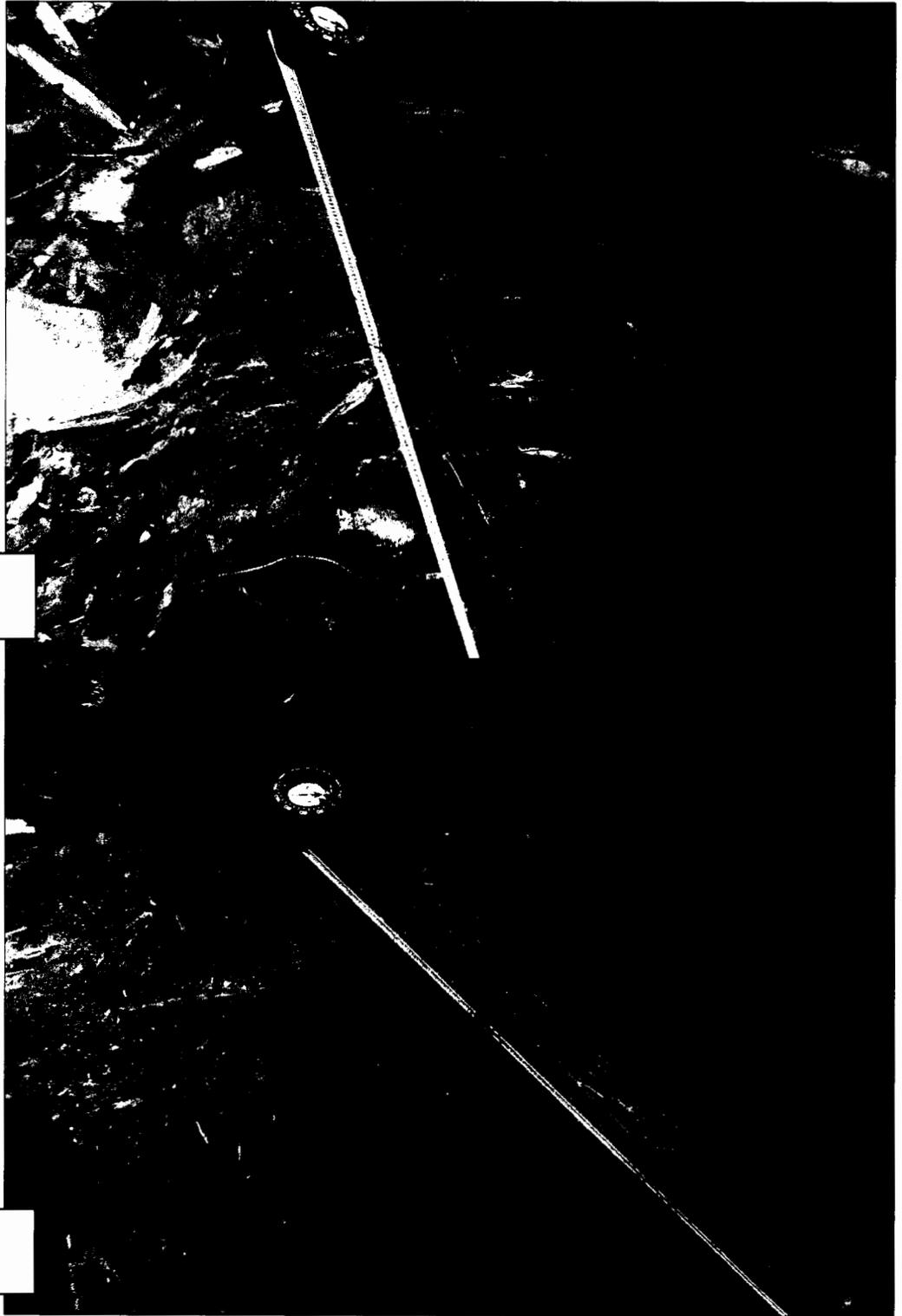
10090

T1 S6



T1 S7

T1 S8

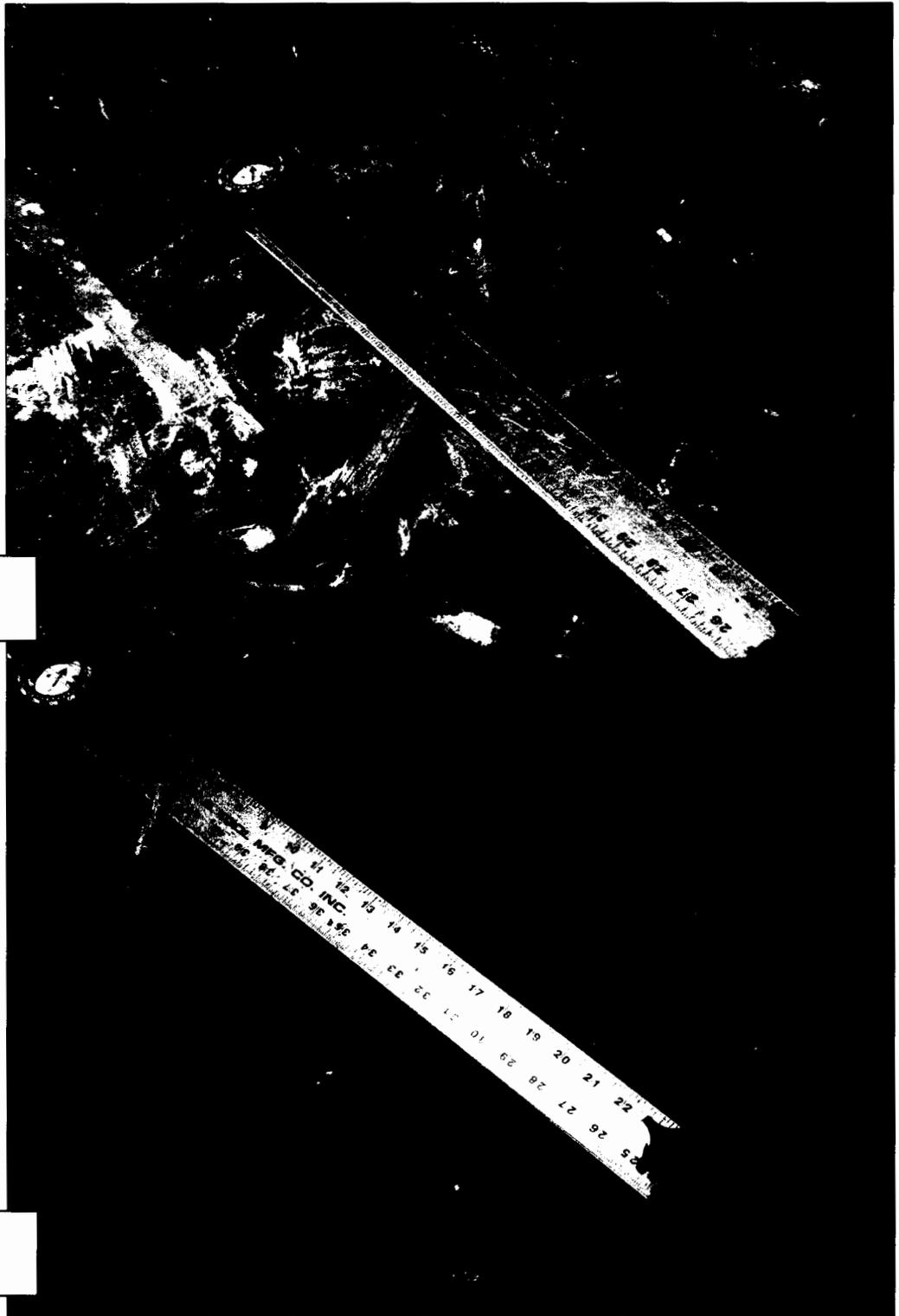


9090

T1 S9

10090

T1 S10



80%

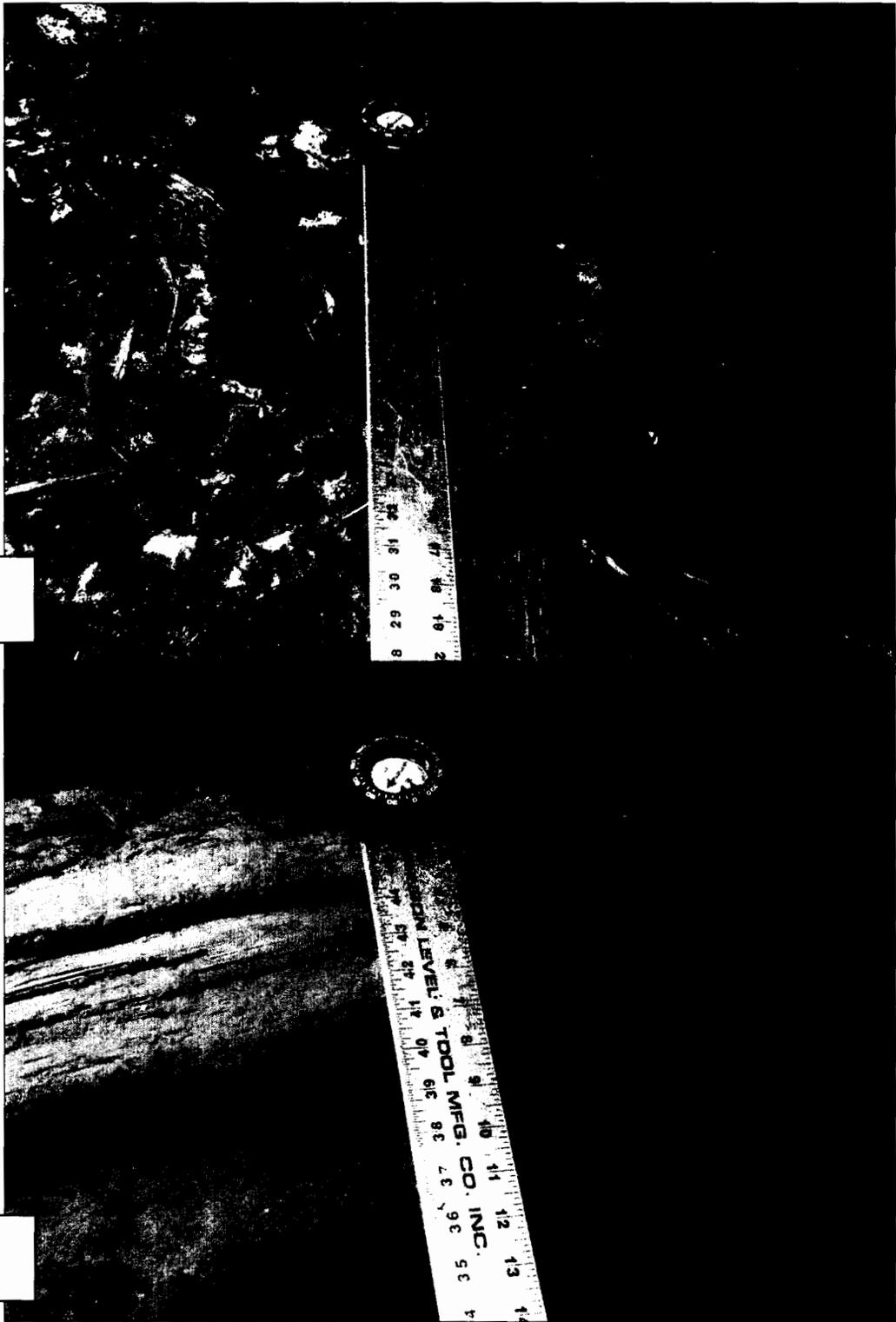
T1 S11

30%

T1 S12

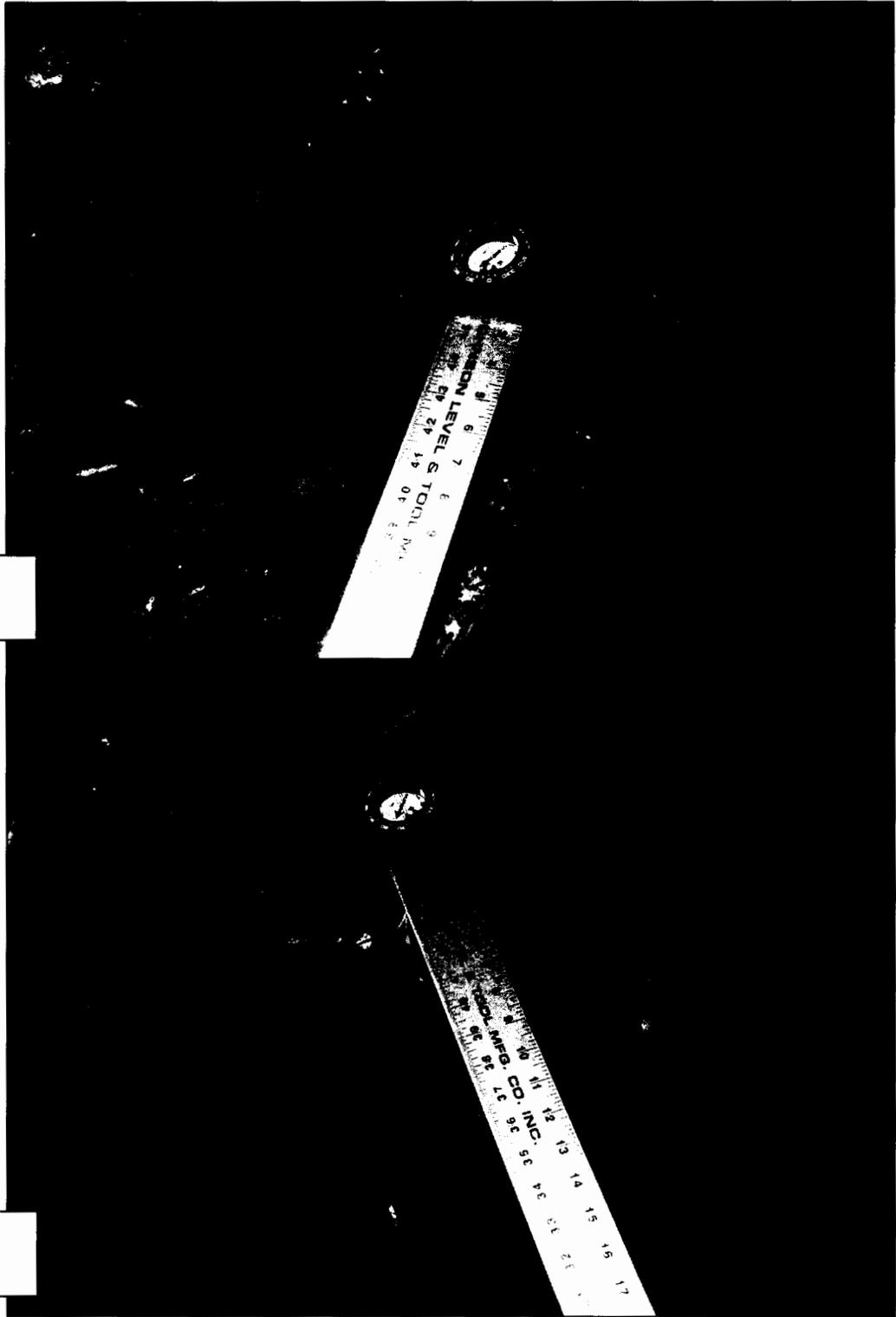
10070

T2 S1



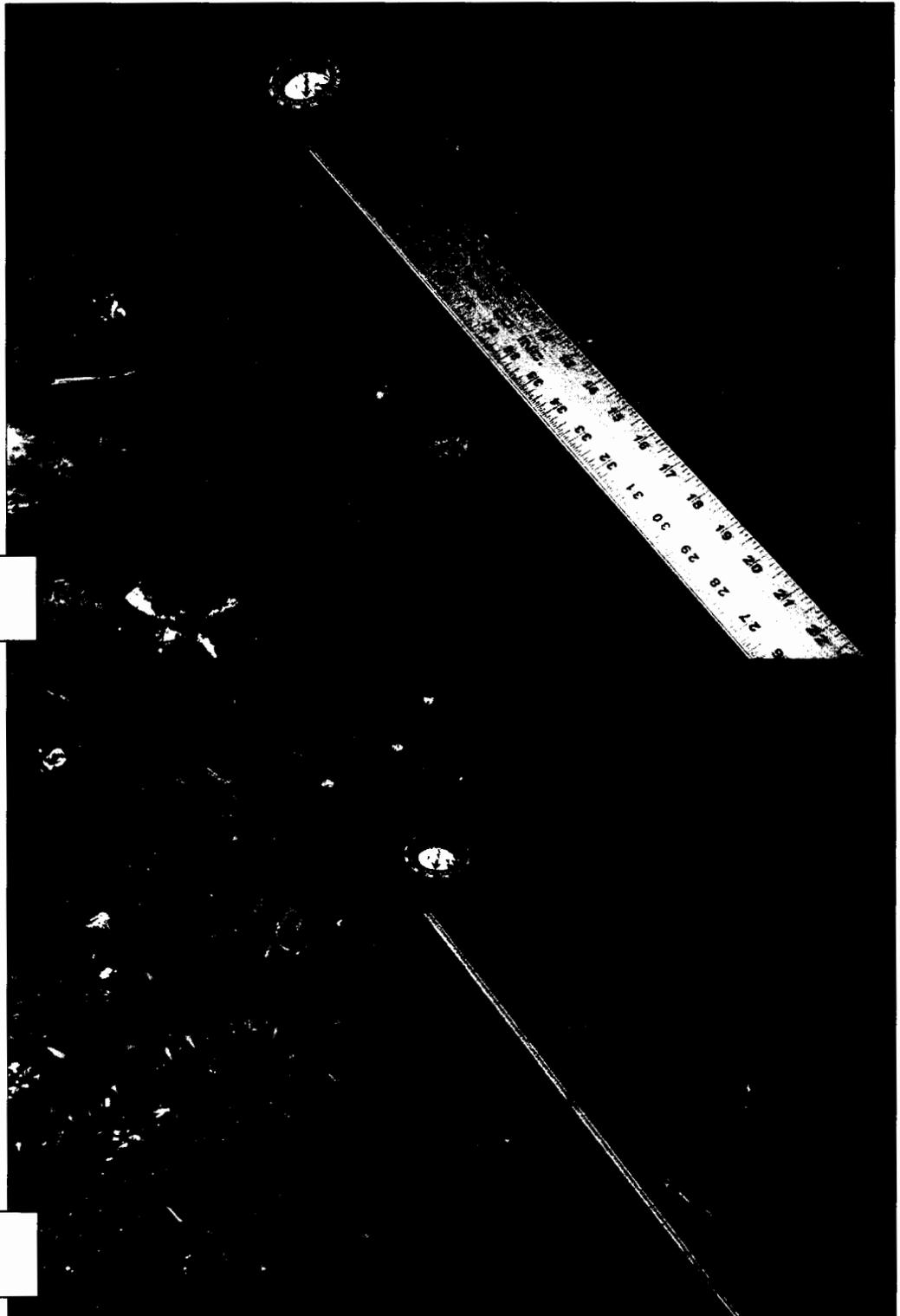
100

T2 S2



100
T2 S3

100
T2 S4

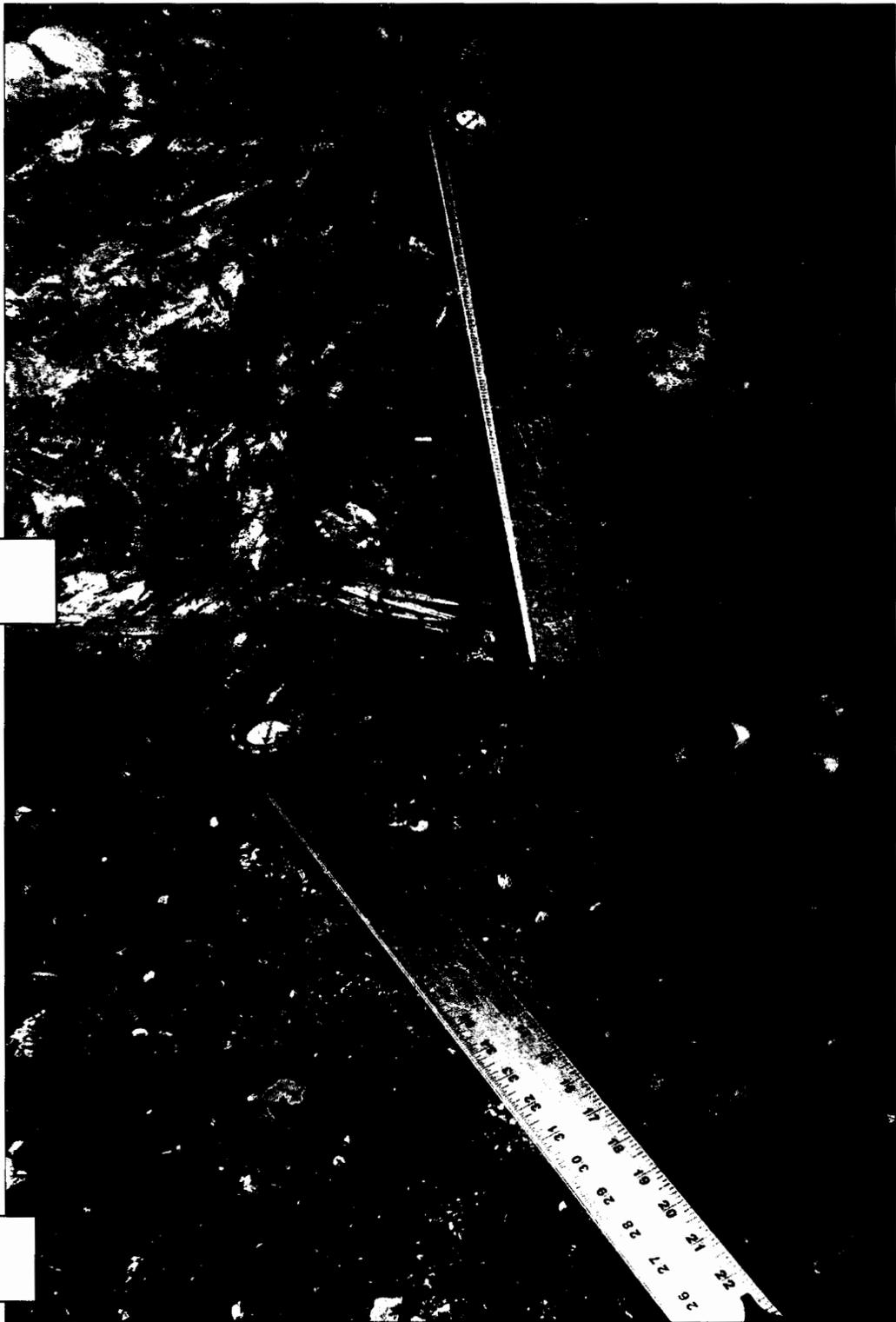


100

T2 S5

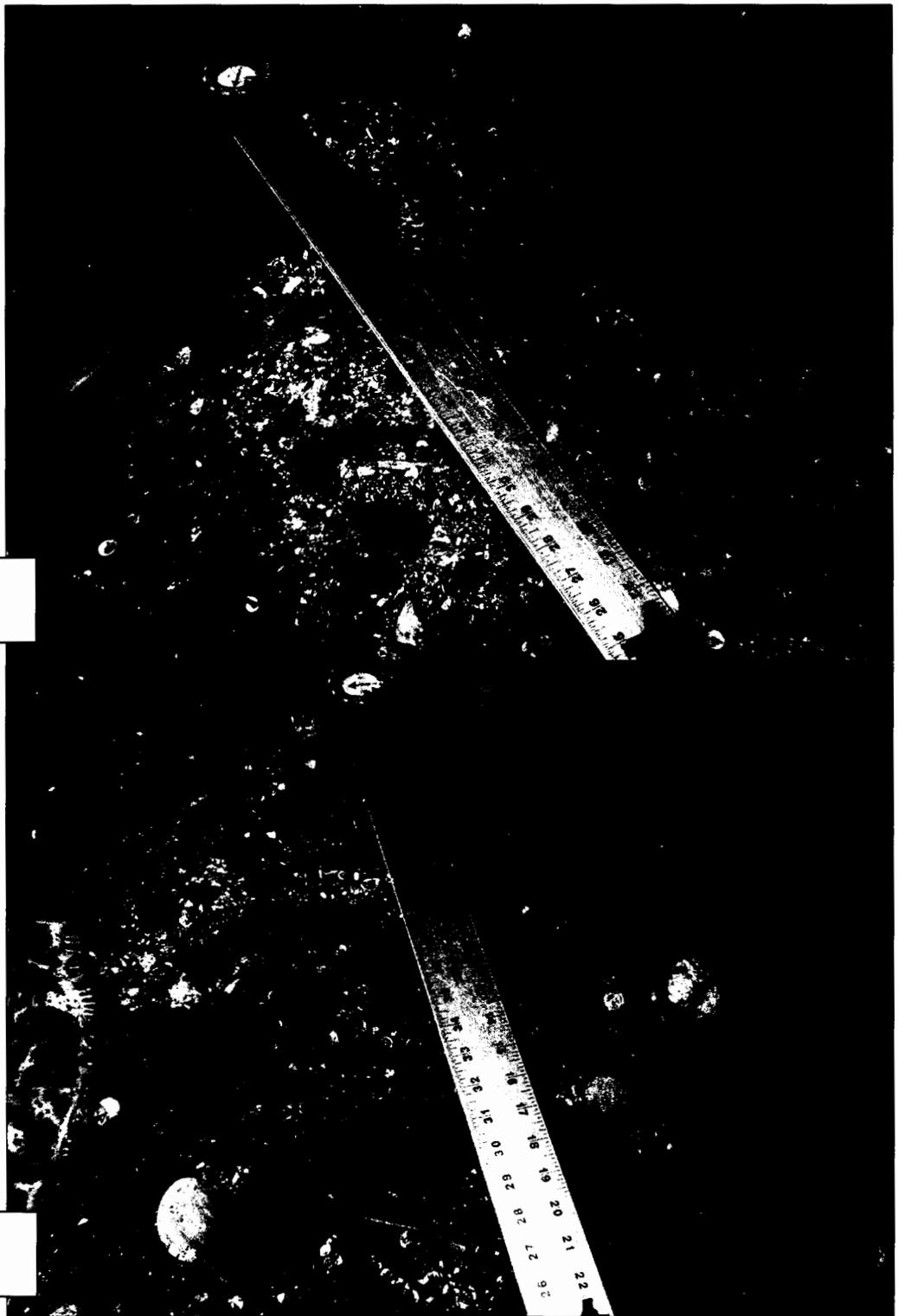
100

T2 S6



100
T2 S7

90
T2 S8

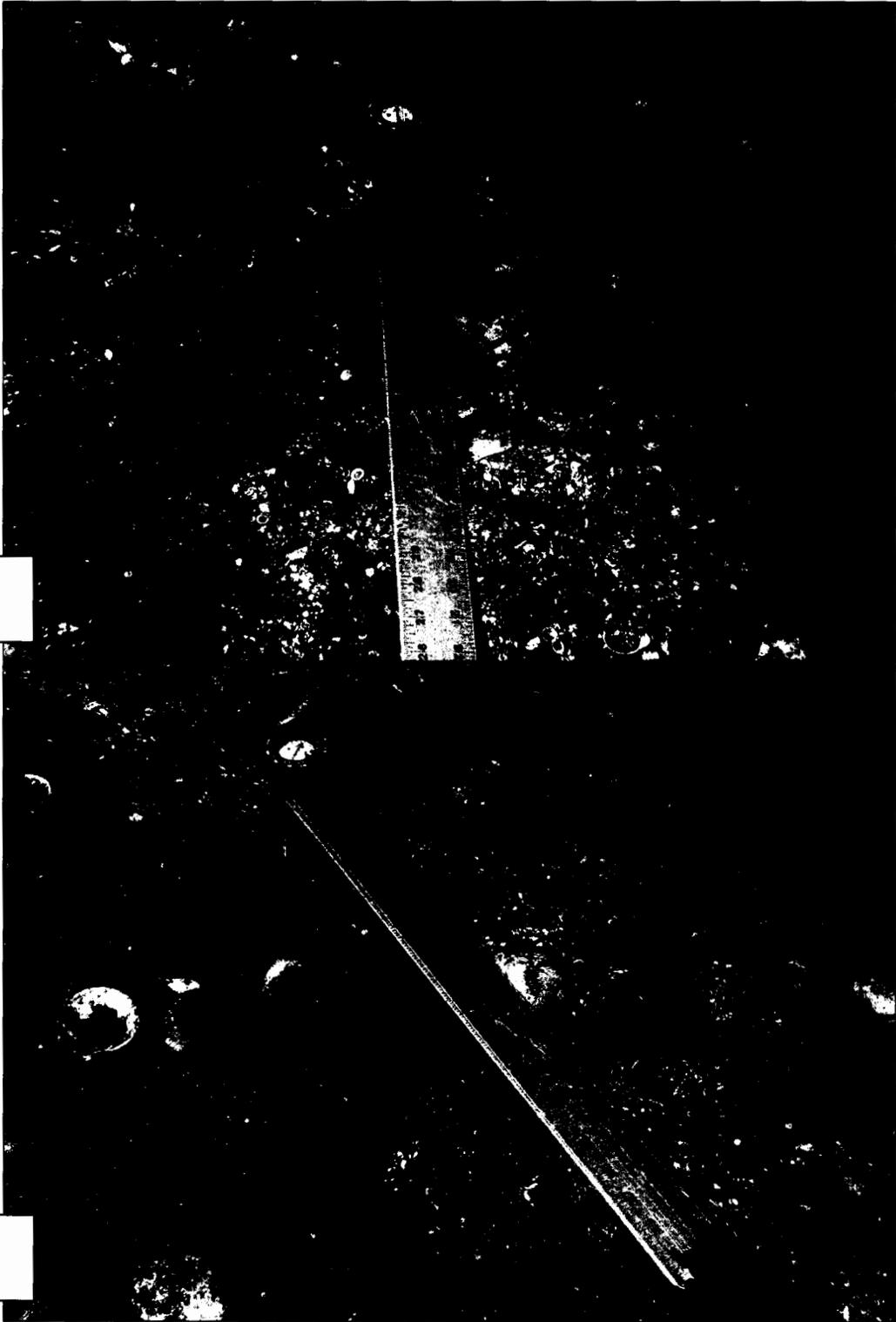


70

T2 S9

50

T2 S10

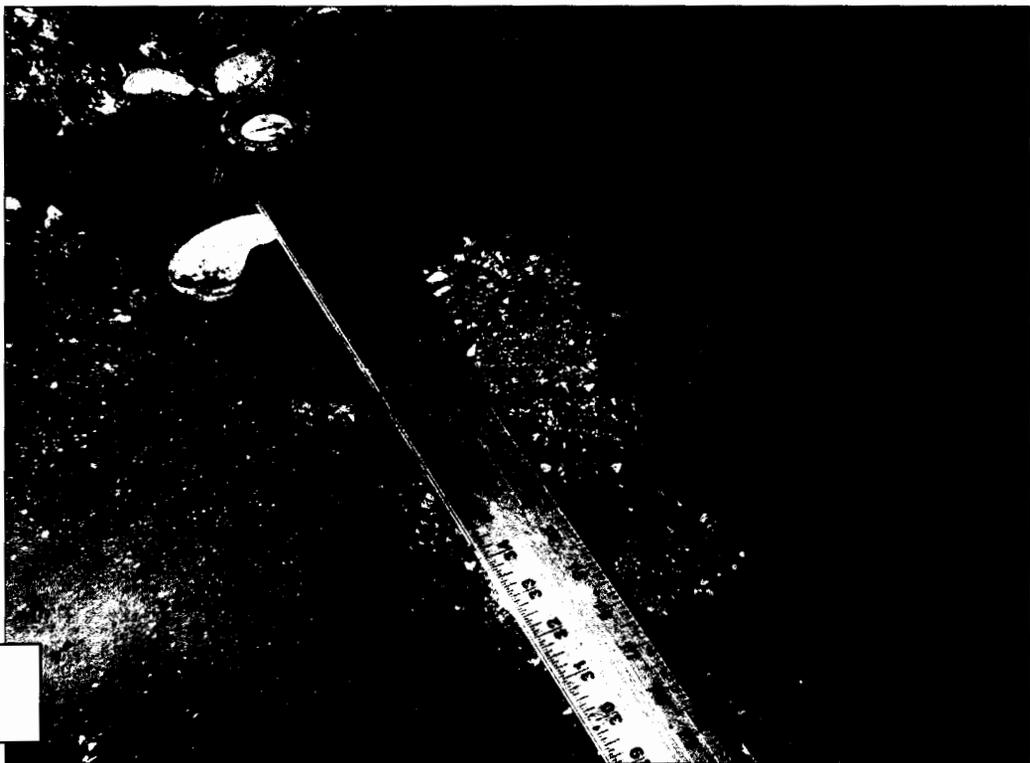


T2 S11

T2 S12

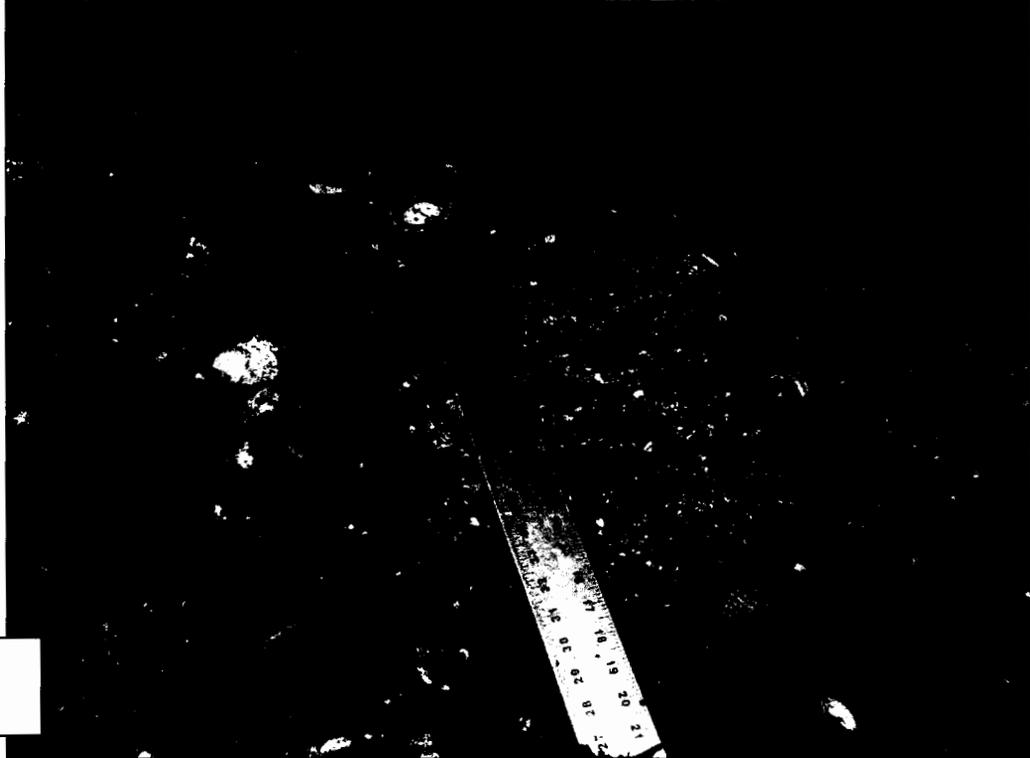
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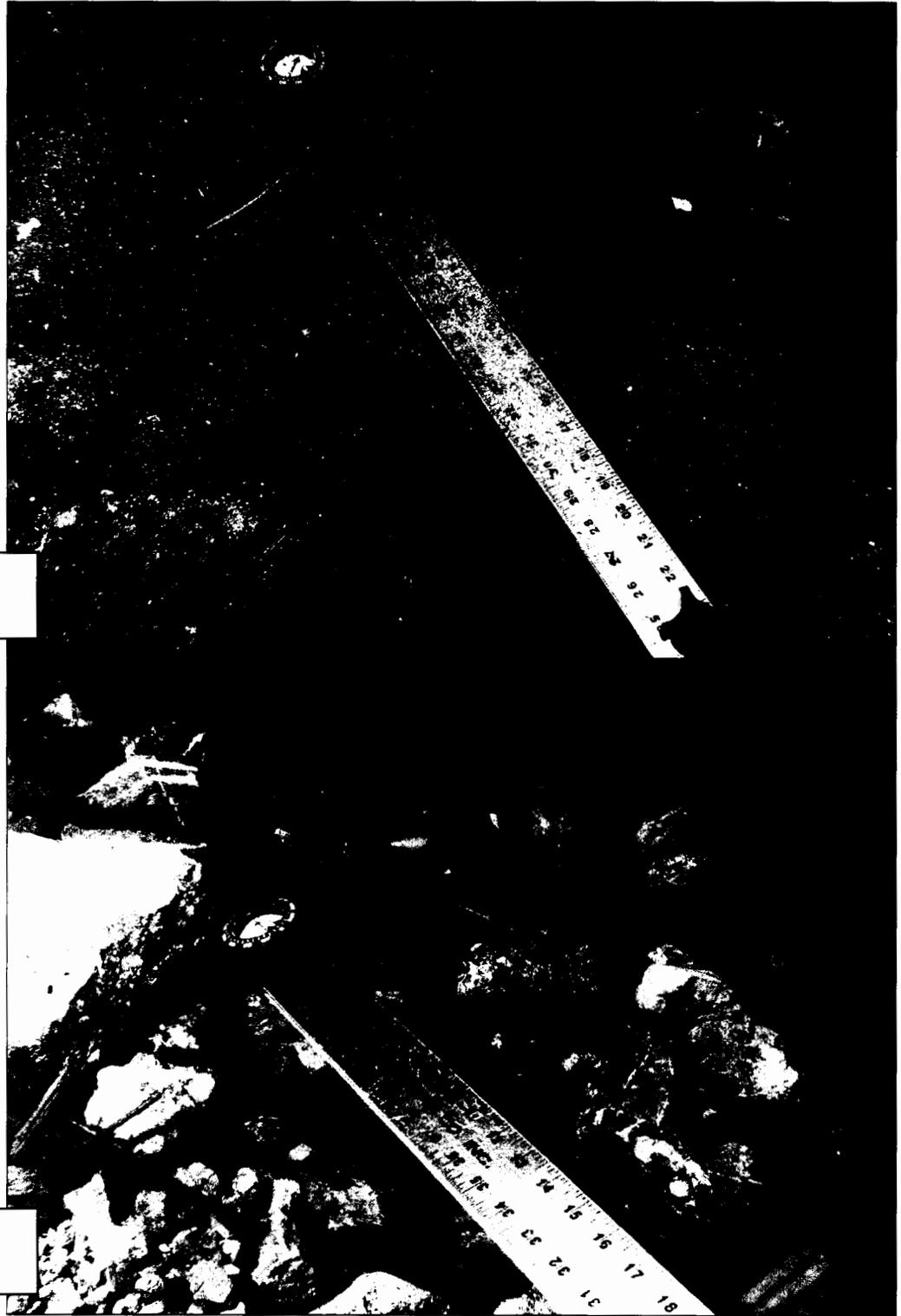
T2 S13



20

T2 S14



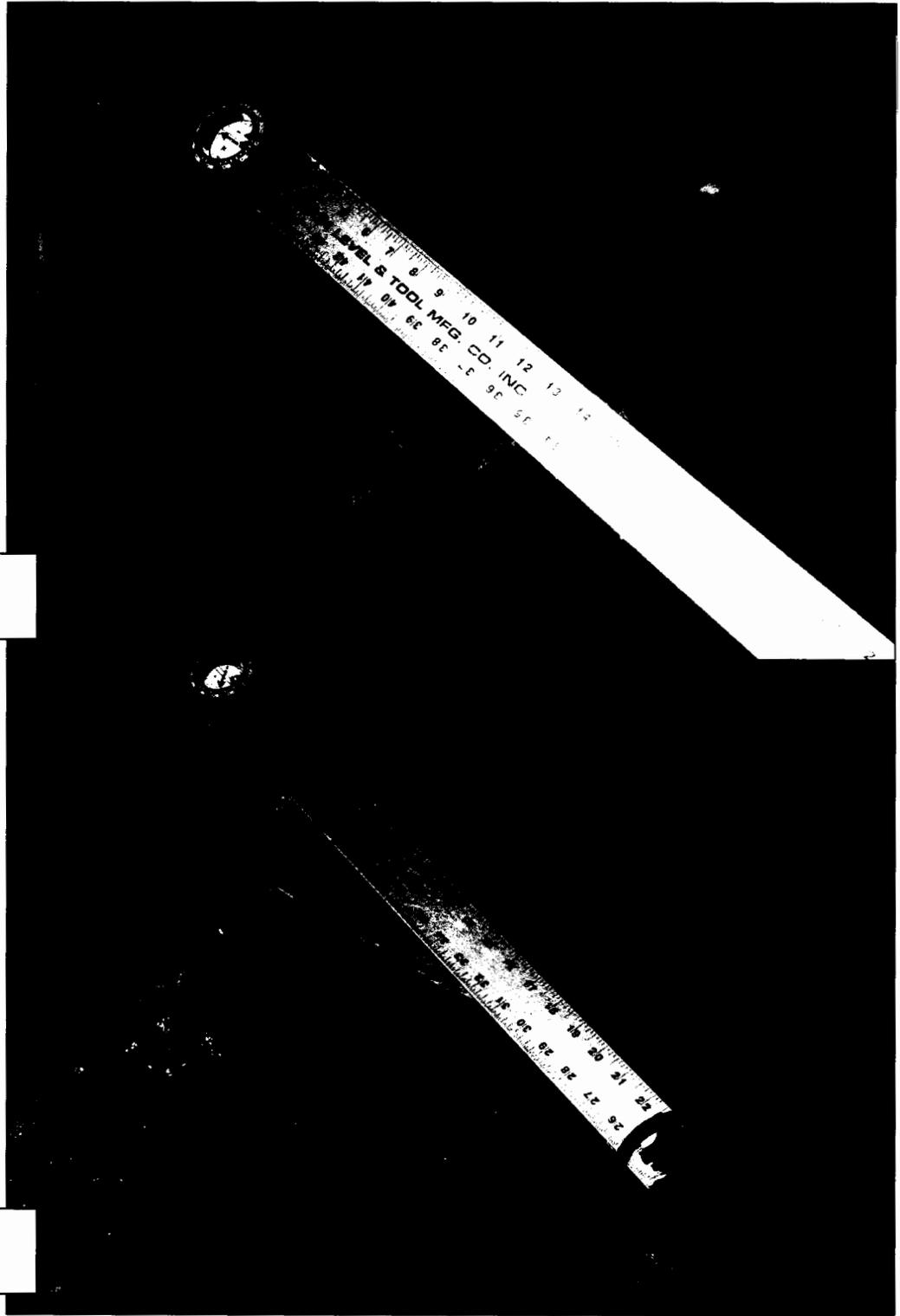


40

T2 S15

20%

T3 S1

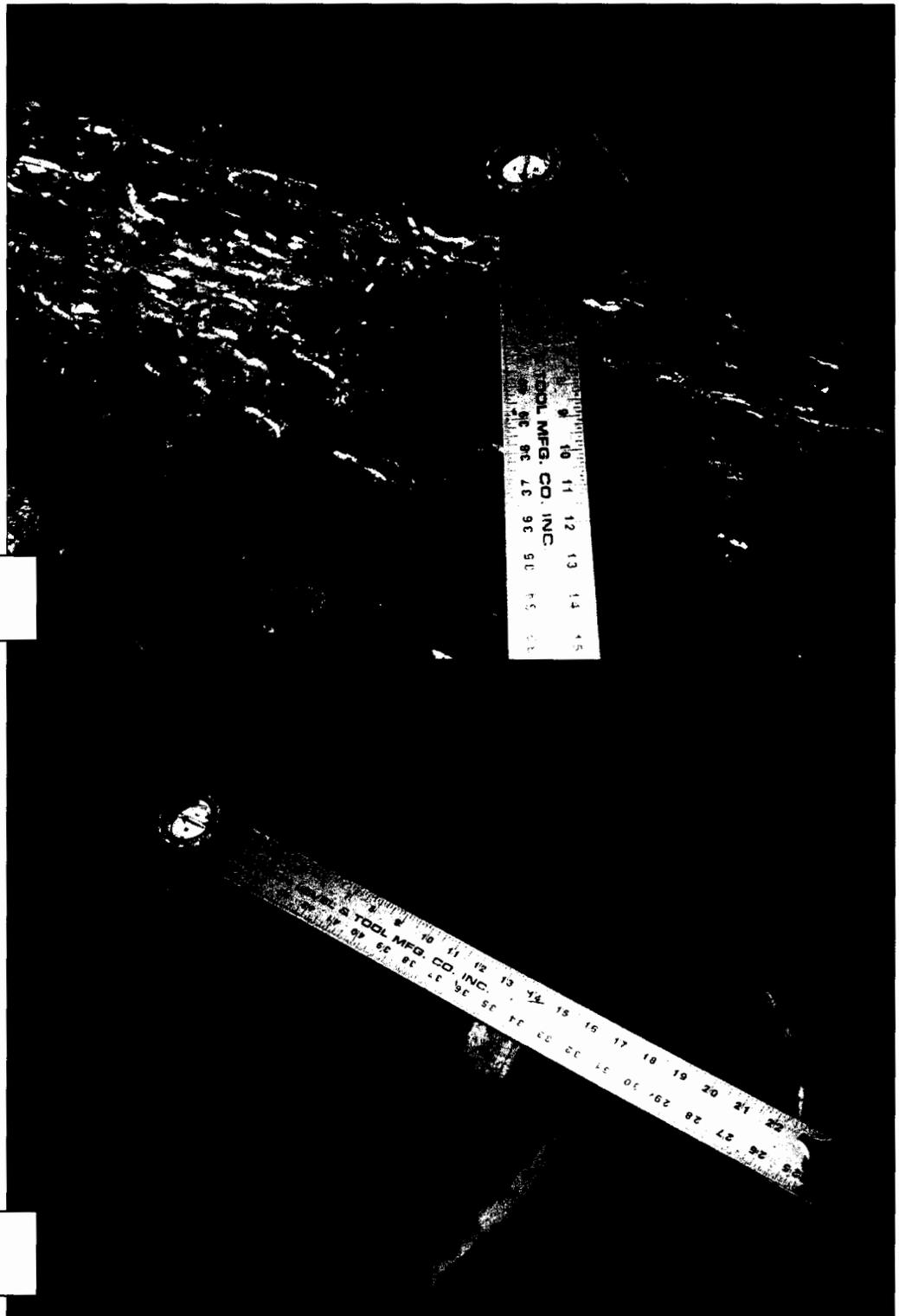


100

T3 S2

100

T3 S3

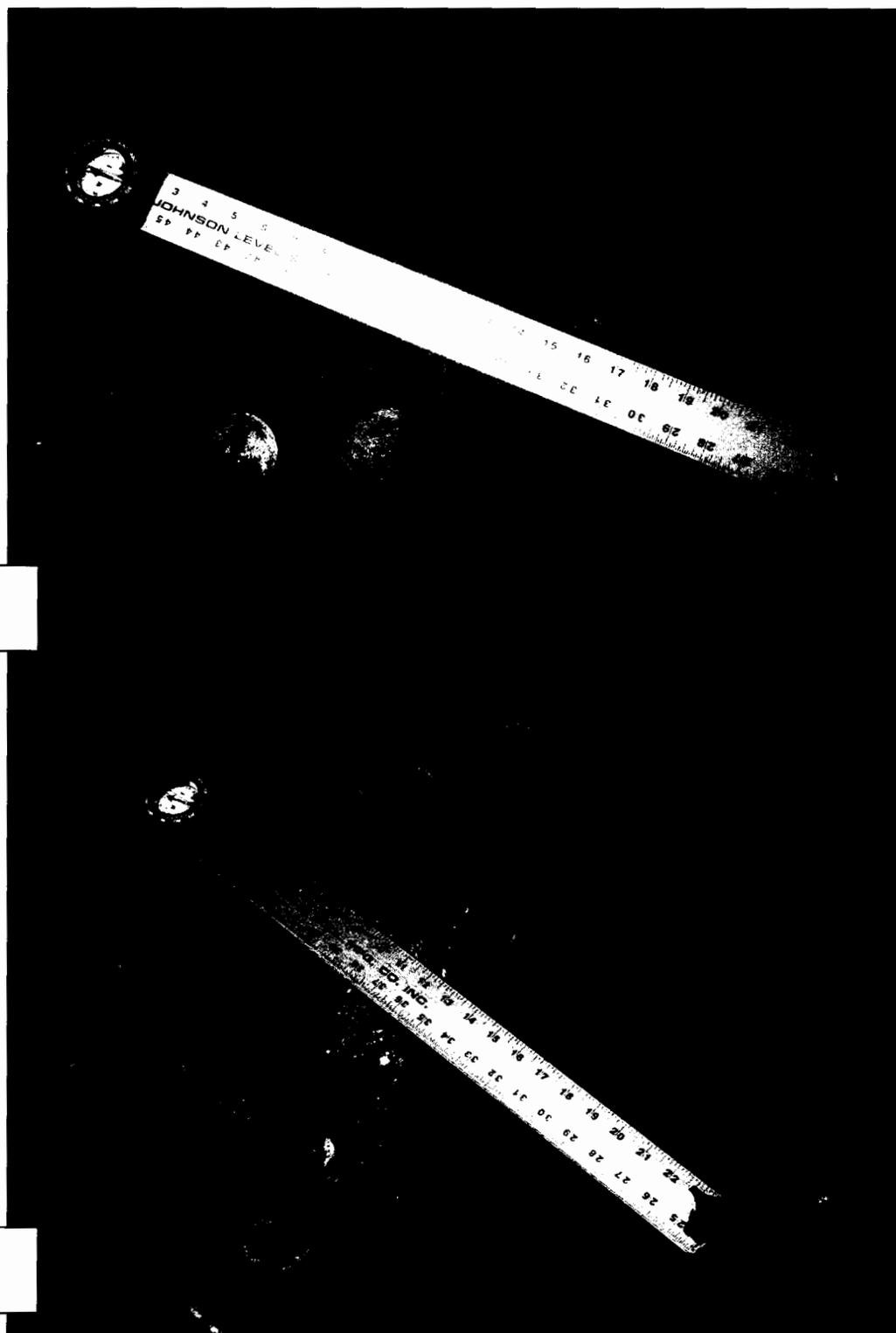


3"
100

T3 S4

4"
100

T3 S5



T3 S6

T3 S7

4"
100

T3 S8



3"
100

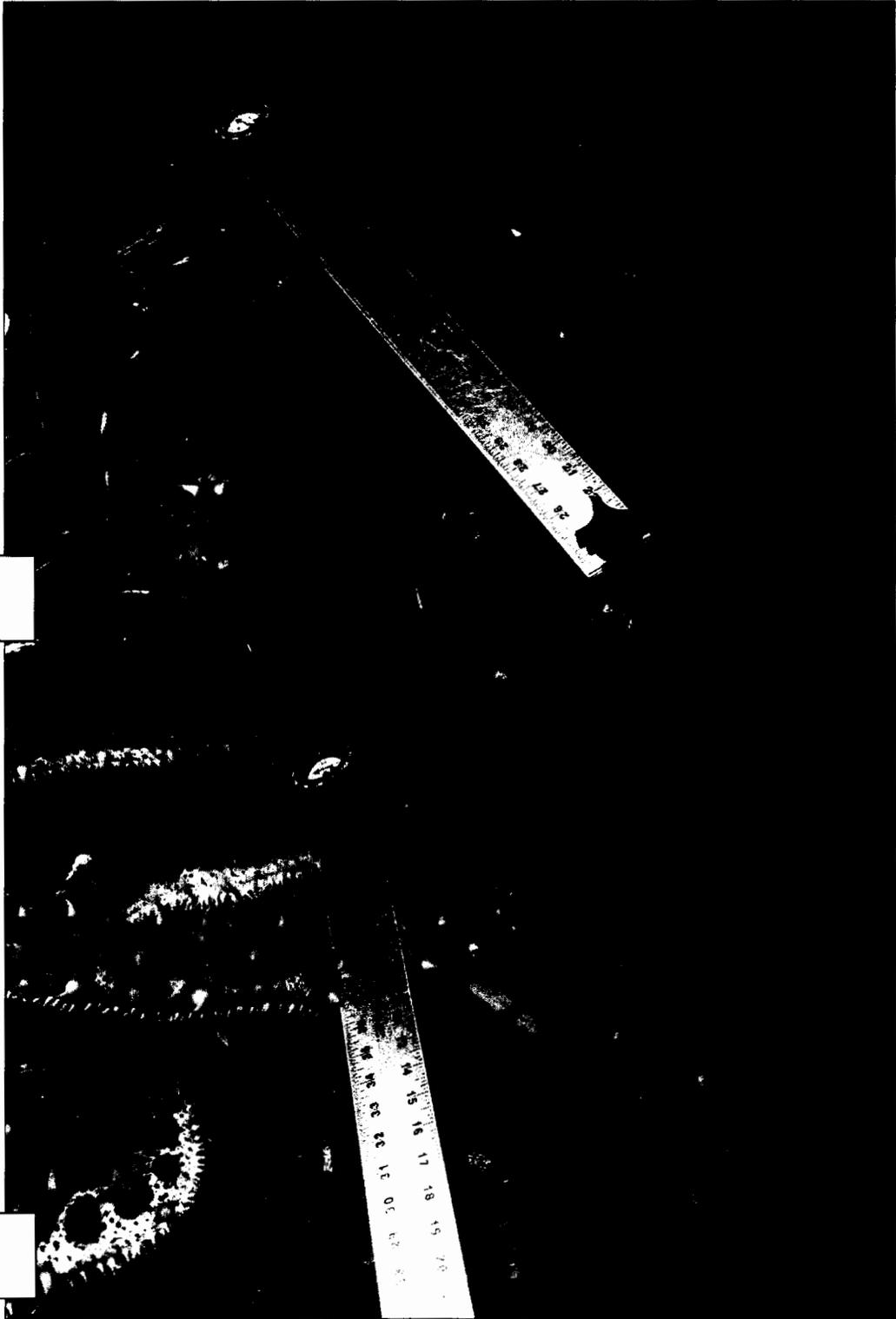
T3 S9

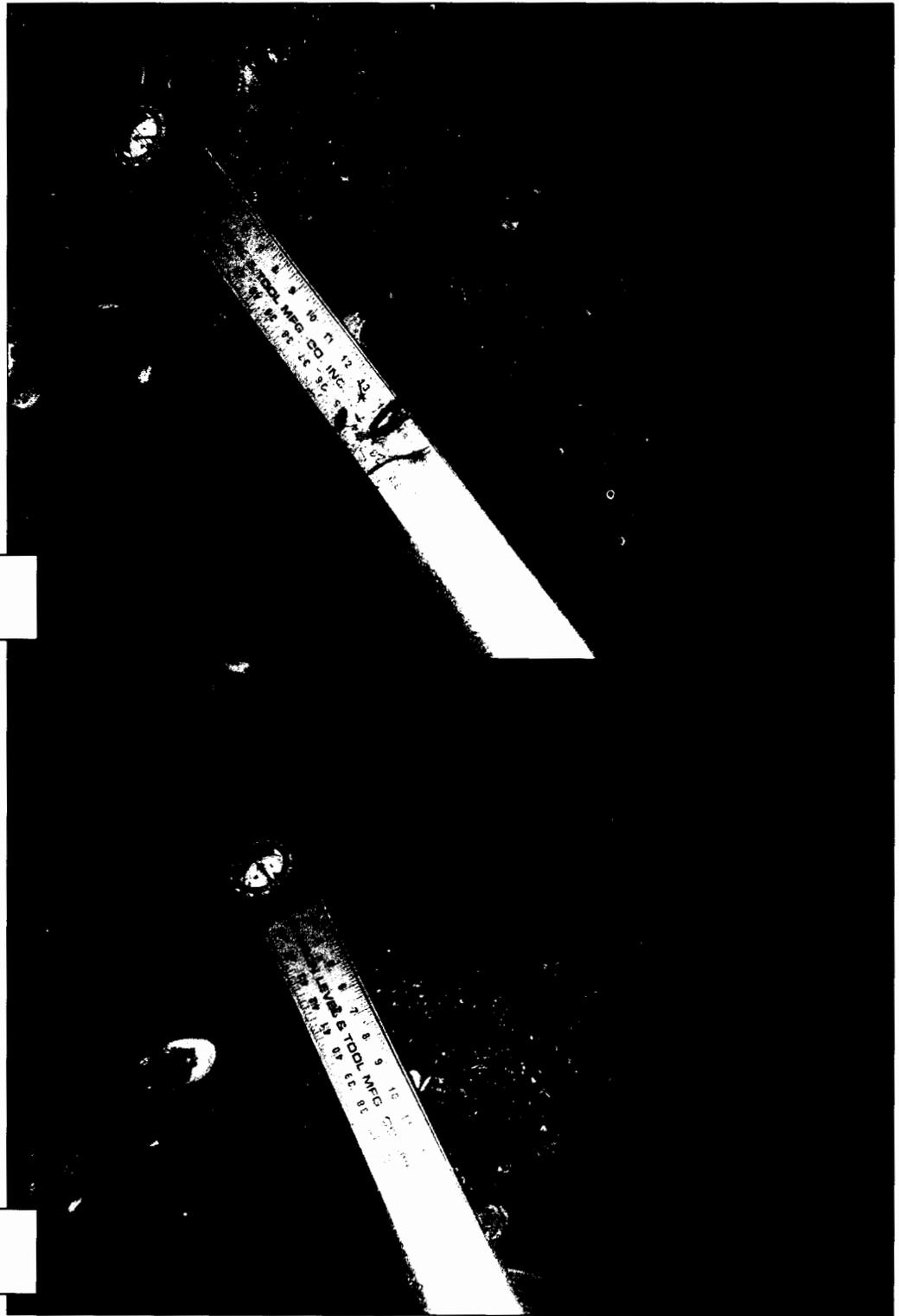
2"
100

T3 S10

3"
100

T3 S11



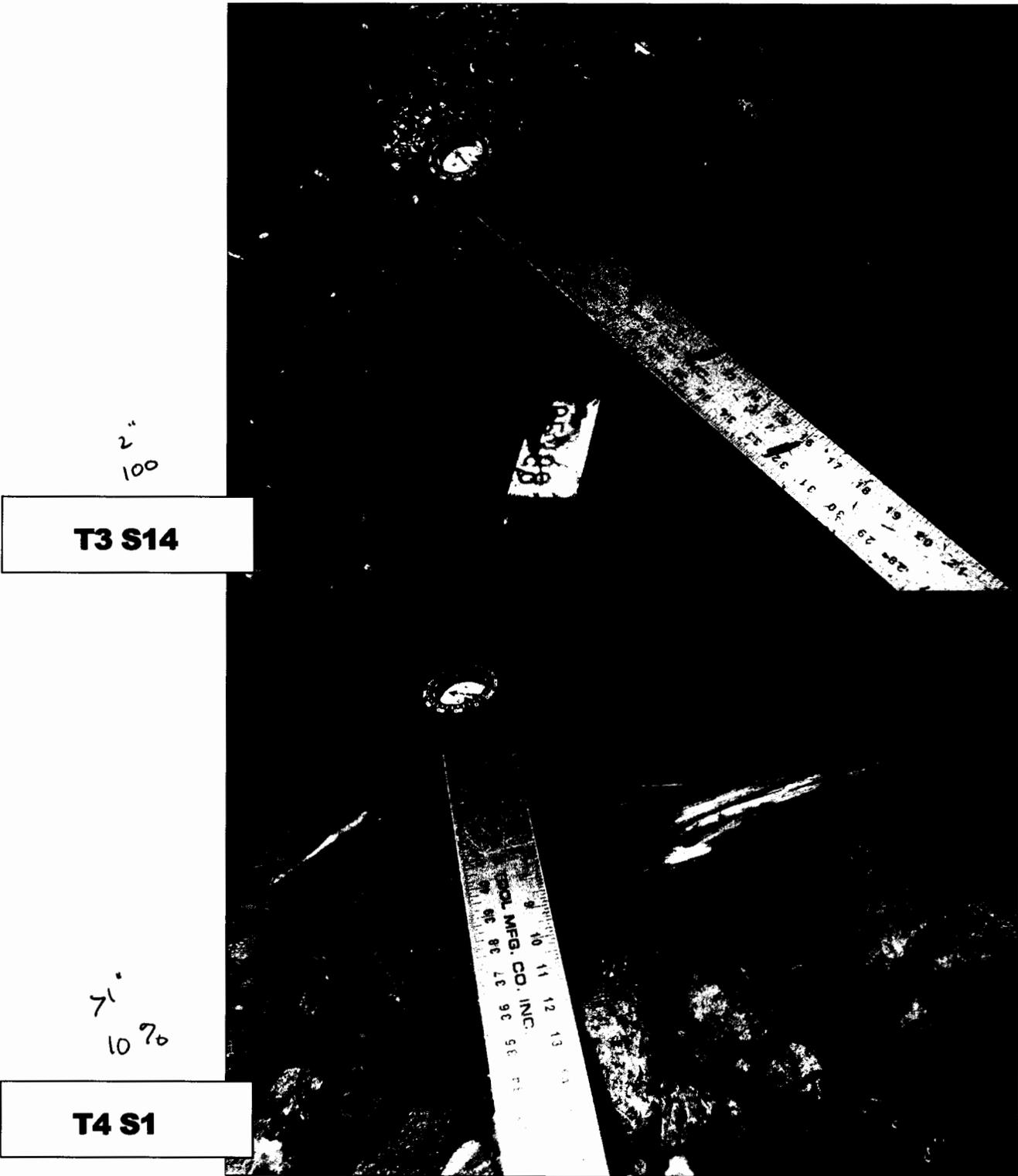


2"
100

T3 S12

1"
100

T3 S13

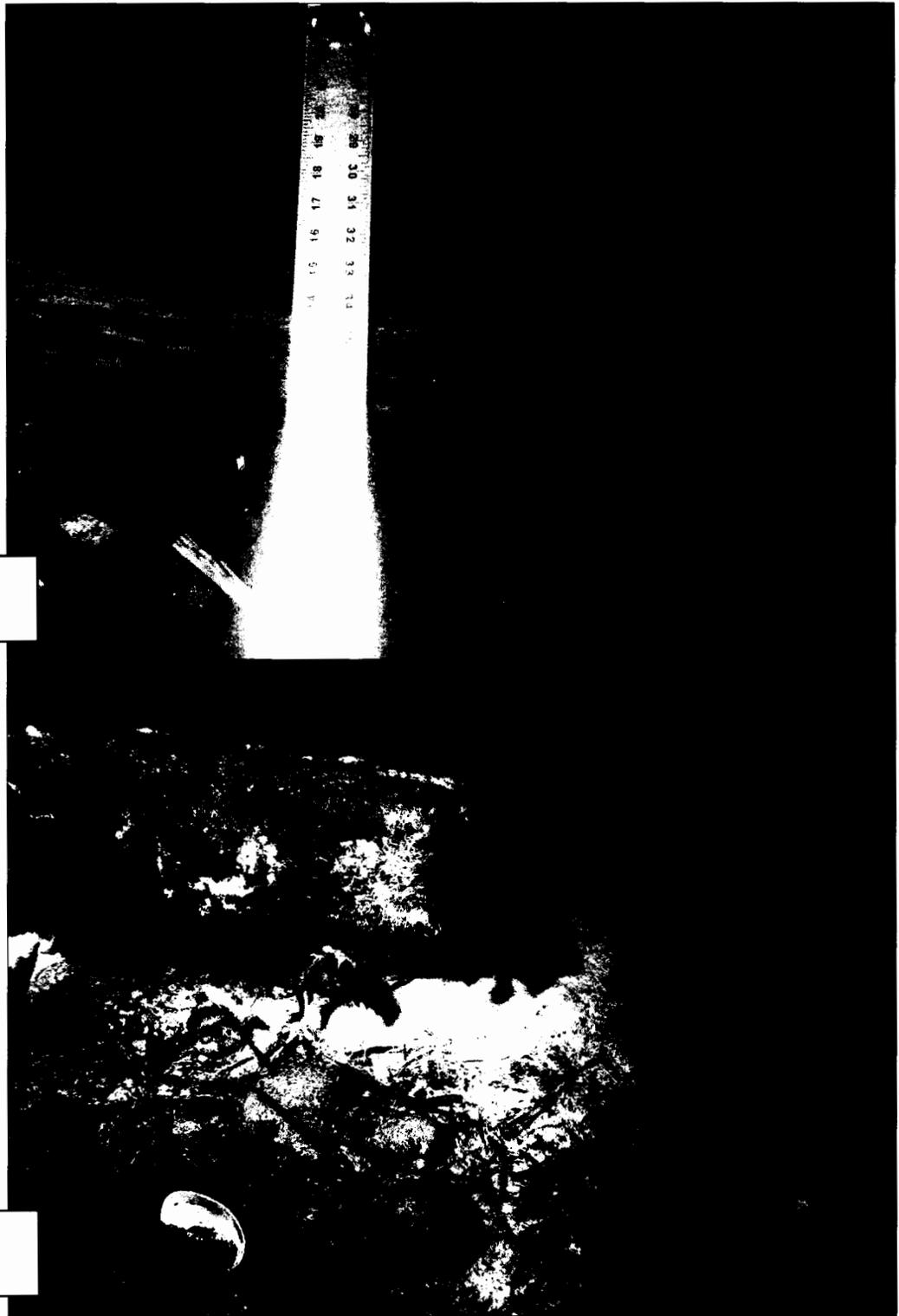


2
100

T3 S14

7
10 76

T4 S1



20

T4 S2

100

T4 S3



T4 S4

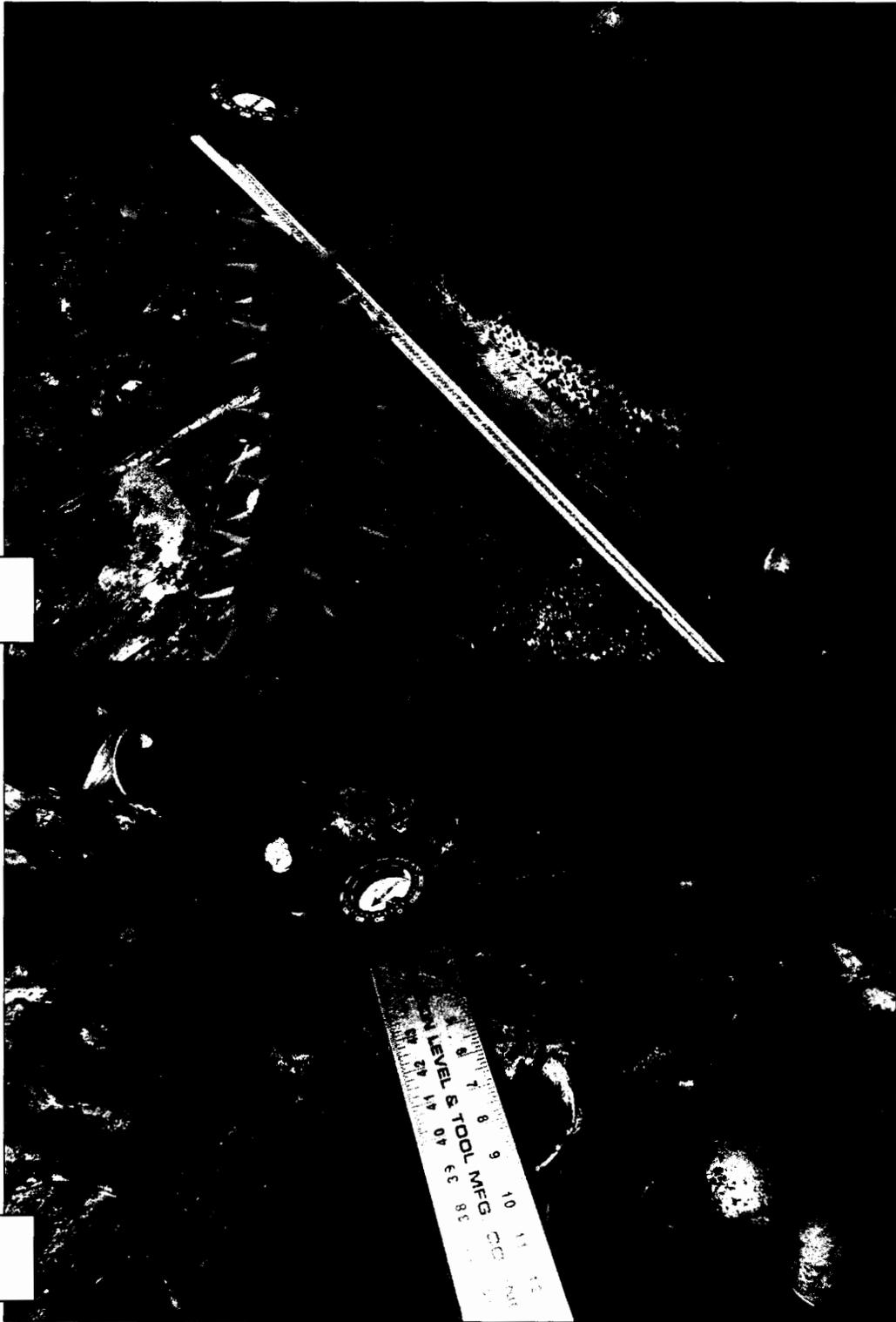
T4 S5

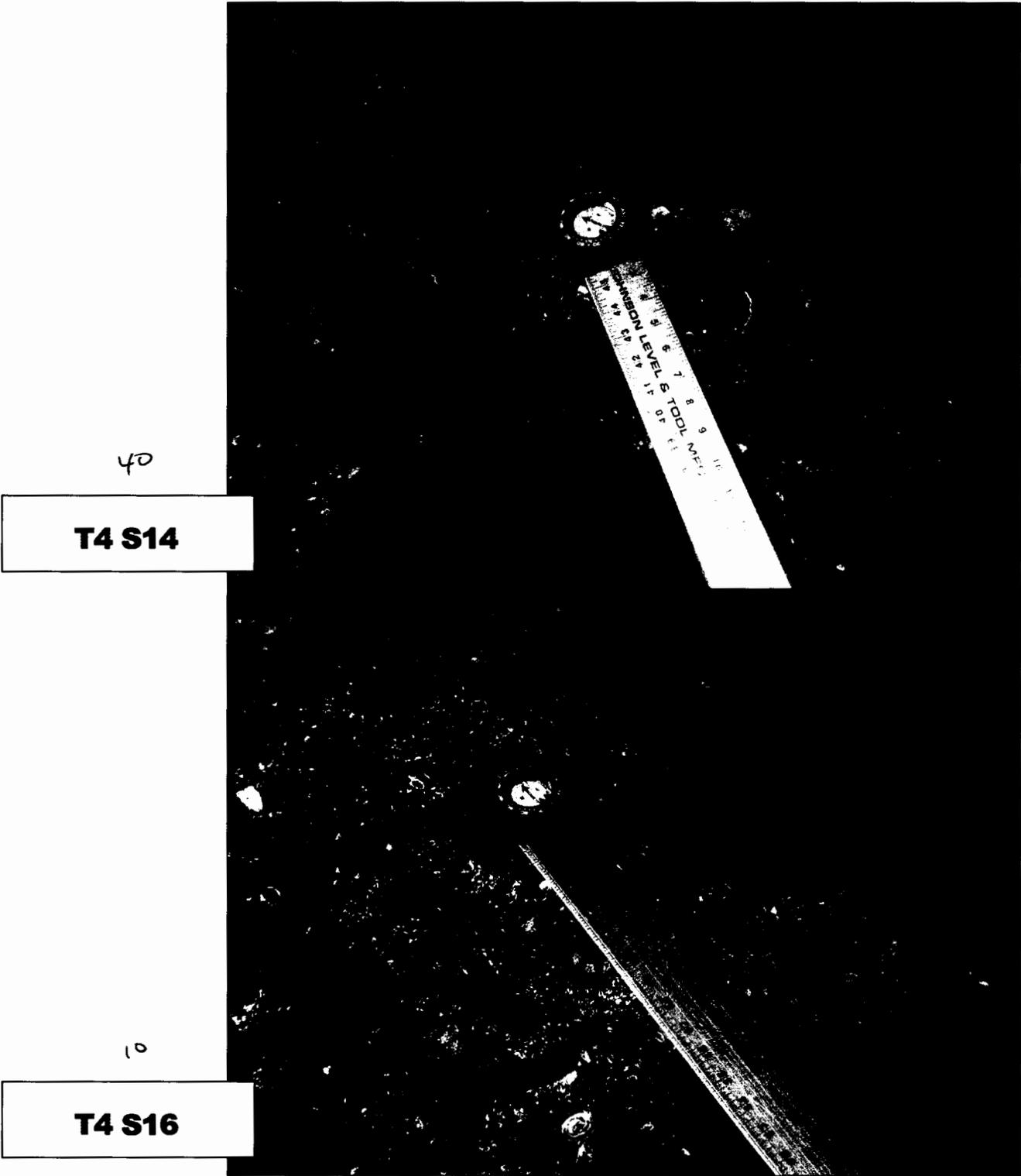
3"
100

T4 S6

2"
100

T4 S7





40

T4 S14

10

T4 S16

20

T4 S18



Trace
~~20~~

T5 S1

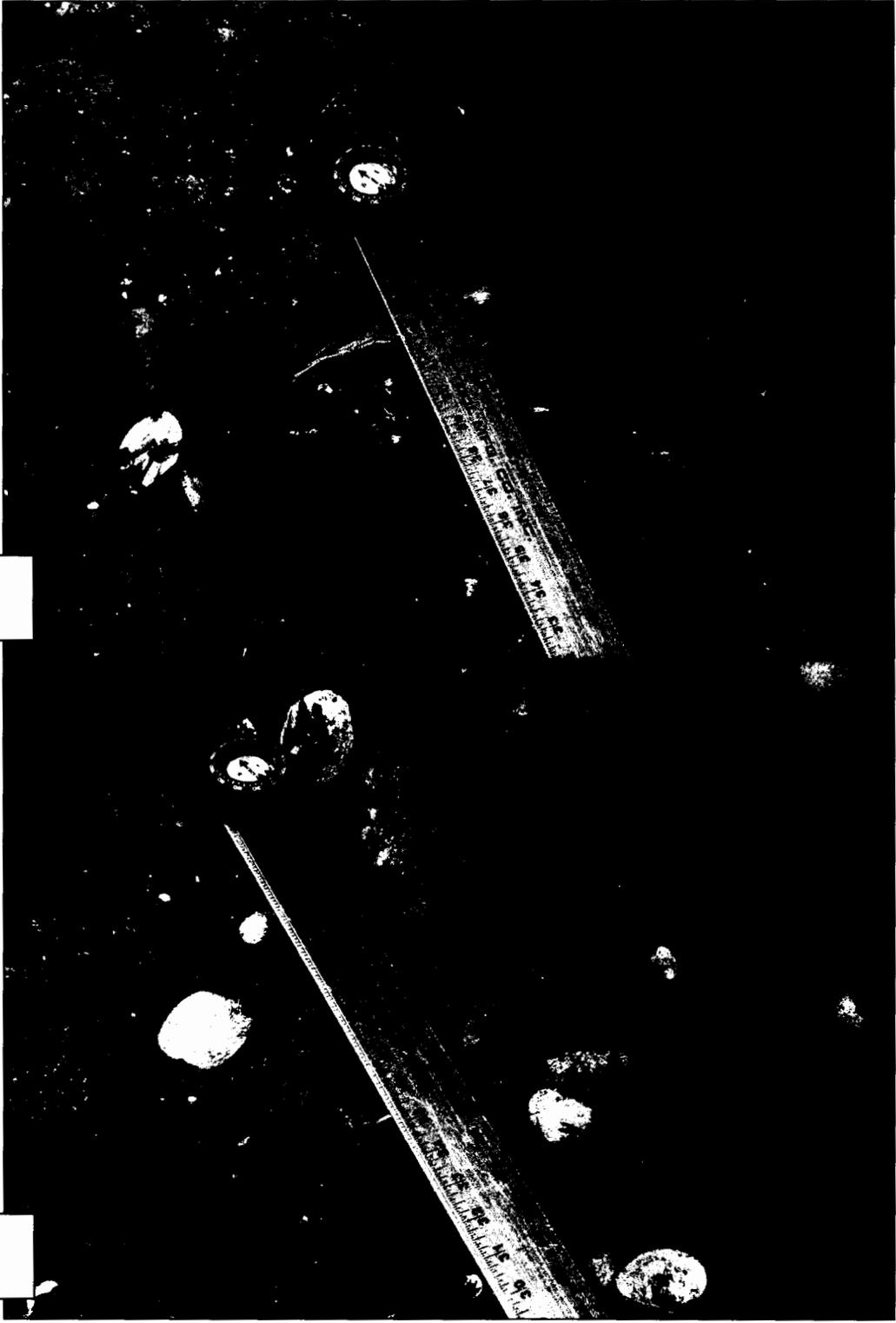


20

T5 S2

40

T5 S3



40

T5 S4

30

T5 S5



20

T5 S6

Tolstoi Bay LSA Dive Survey

Surveyed on January 12, 2004

The survey was conducted at the request of Aloha Lumber Corporation. An underwater reconnaissance was requested to determine the representative condition of an area operating as a Log Storage Area (LSA). The survey dive was conducted on January 12, 2004. The site surveyed is located in the southwest portion of Tolstoi Bay on Prince of Wales Island.

This inspection documented findings according to the Alaska Department of Environmental Conservation (ADEC), Environmental Protection Agency (EPA) and NPDES requirements. The percentage of bark coverage was determined by using the protocol for operating a bark-monitoring program given in the EPA General Permit. The area calculation used in this report is outlined in the ADEC publication “**Required Method for Bark Monitoring Surveys under the LTF General Permits**”.

Findings

Continuous Coverage	Discontinuous Coverage	Total Survey Area
0.0 Acres / 0.0 M ₂	0.0 Acres / 0.0 M ₂	4.87 Acres / 20,113 M ₂



Log Storage Area

Three linear transects, bearing 110° were established perpendicular to shore in a parallel arrangement. A total of 25 sample locations were assessed.

The DGPS coordinates for each parallel hub are as follows:

Transect 1: N 55° 37. 670 by W 132° 27. 350.

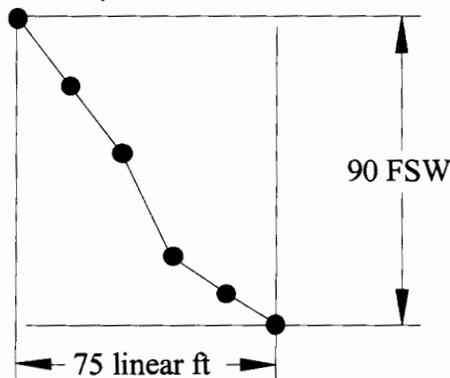
Transect 2: N 55° 37. 791 by W 132° 27. 170.

Transect 3: N 55° 37. 891 by W 132° 27. 090.

Weather conditions during the survey consisted of partly cloudy skies with winds less than five knots. Diving commenced at 11:30 a.m. during high tide. The tidal station (subordinate station #1493) was used to correct depths to MLLW. The station reported a tide level of 5 ft at 11:30 a.m. on January 12, 2004. The current conditions remained negligible. Seawater temperature was recorded at 40 degrees F. The horizontal visibility was estimated to be 30 feet.

Site conditions remained steady with winds less than five knots and overcast skies. Diving concluded at 3:30 p.m., on January 12, 2004 during MHHW. The tidal station (subordinate station #1493) was used for depth corrections, reporting a 15.1 ft tide level at 3:37 p.m. The tidal current velocity was estimated at 0.5 knots. The horizontal visibility remained constant and was estimated to be 30 feet.

Each transect terminated by 90 FSW, corrected to MLLW at subordinate station #1493. The grade for transects 1 and 2 averaged 1.5 feet horizontal to 1 foot vertical. The grade for transect 3 was 1 foot horizontal to 1.2 feet vertical, until transect termination.



Transect 3
Grade 1:1.2

Observations

The log storage raft was located offshore in deep water. This survey was conducted using the same reference point hub positions as the 2003 survey. Each transect terminated by 90fsw MLLW without reaching the storage raft.

The substrate adjacent to the log storage area consisted primarily of bedrock. The shoreline was populated by species of seaweeds, lichens, and animals commonly associated with a rocky substratum. At the base of the rock walls, the substrate changed to cobble and sand/aggregate mix that supported sea stars and sea cucumbers in lower abundances than were noted on the rock wall.

High densities of *Fucus gardneri* were observed at the shallow sample points, but abundance declined with depth. Subtidally, several species of *Laminaria* populated the wall in common abundance along with unidentified species of foliose red algae.

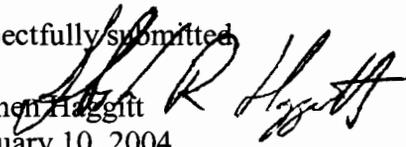
Abundance of *Parastichopus californicus* ranged from common to high, depending on substrate and food availability. Echinoderms observed along the slope in 40 to 90 FSW range included the sea star species *Evasterias troschelli*, *Crossaster papposus*, *Mediaster aequalis*, and *Pycnopodia helianthoides*. Mussels observed were identified as *Mytilus edulis* and were found in high abundance on the rock wall at the shallower sample points. Fish abundance remained low at all sample points.

The bathymetric conditions of rock walls harbored small amounts of debris, similar to that found in the prior survey. The debris comprised both natural wood and the type of wood debris commonly associated with log storage areas. The 2004 survey did not observe any increased bark deposits as compared to the survey performed in 2003. The algal and animal life appeared to be healthy and not adversely impacted by the nearby storage raft.

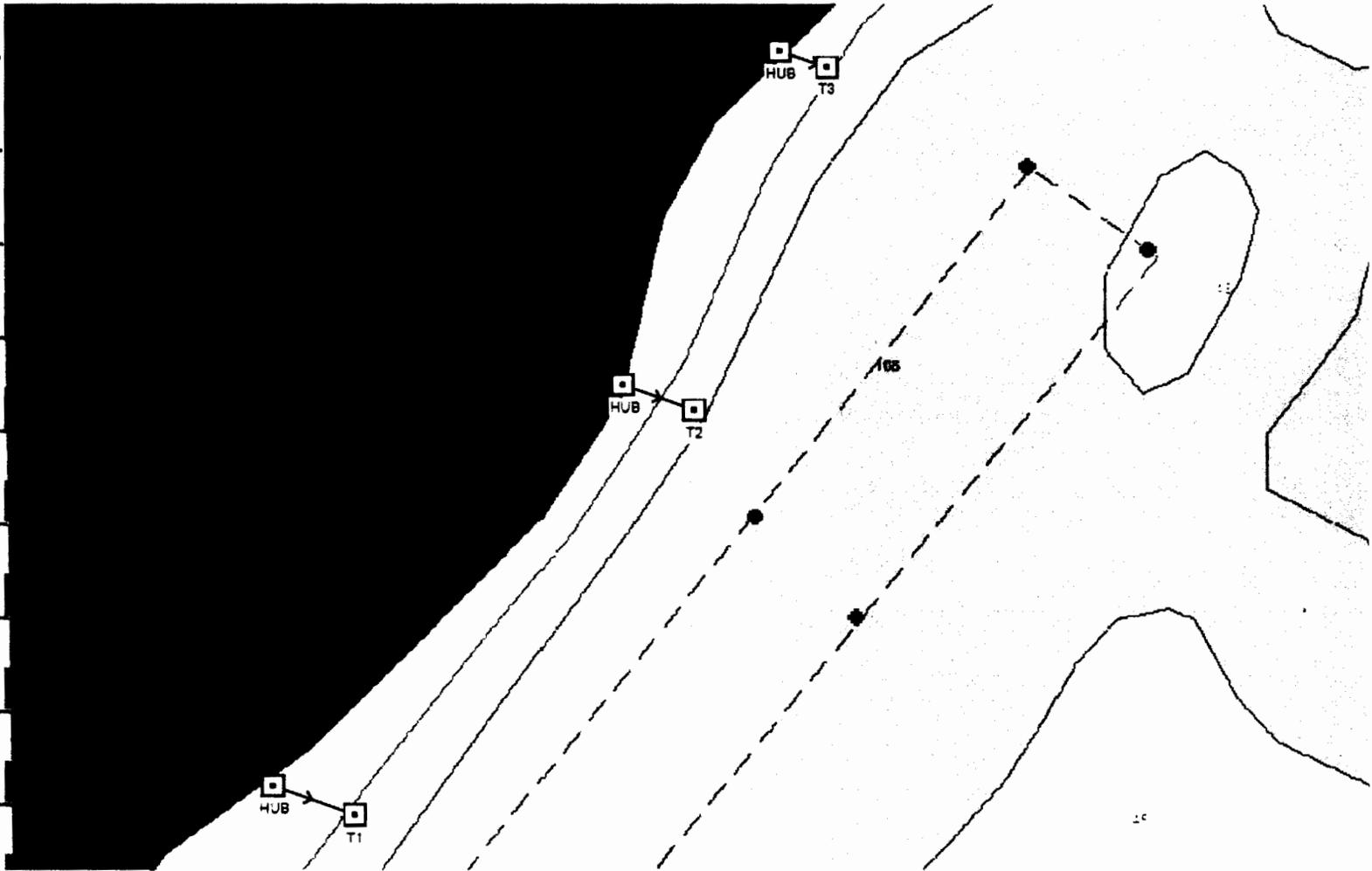
If you have need of further service regarding this report, please contact me directly at (253) 209 9380. E-mail correspondence can be forwarded to Haggitt1@juno.com. I appreciate the opportunity to provide you with this report.

Respectfully submitted,

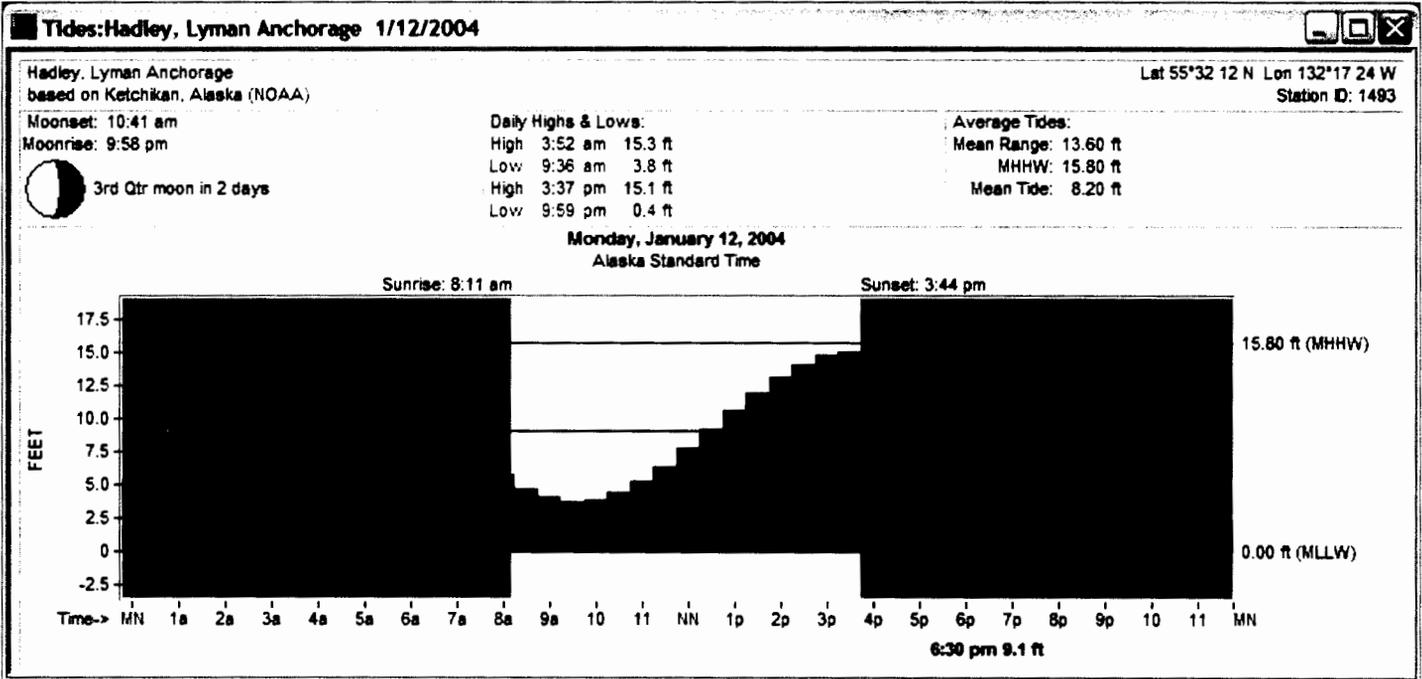
Stephen Haggitt
February 10, 2004



Transect Diagrams



Tidal Chart



Calculation Sheet



Total Survey Area: 211,994 Sq. Ft.

Continuous Coverage: 0.0 Sq. Ft.

Discontinuous Coverage: 0.0 Sq. Ft.

Data Tables

Transect 1 110 Degrees

Hub Coordinates: Latitude N 55° 37.670 Longitude W 132° 27.350

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	10	0	0	R
2	12	0	0	R
3	17	0	0	S, R
4	21	0	0	R
5	32	0	0	S, SH
6	40	0	0	S, G
7	54	0	TRACE	S, R, SL
8	64	0	TRACE	S, R, SH
9	73	0	0	S, C, SL
10	90	0	TRACE	
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
Bark Depth Recorded in Inches

Transect 2 110 Degrees

Hub Coordinates: Latitude N 55° 37.791 Longitude W 132° 27.170

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	9	0	TRACE	R
2	21	0	0	R
3	32	0	0	R
4	42	0	TRACE	R
5	52	0	TRACE	S, C
6	60	0	TRACE	S, C
7	71	0	TRACE	R, S, G
8	78	0	TRACE	R, S, G, SH
9	91	0	TRACE	R, S
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Key:

Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

Transect 3 110 Degrees

Hub Coordinates: Latitude N 55° 37.891 Longitude W 132° 27.090

Sample Point	Depth at MLLW	Bark Depth (Inches)	% of Cover	Substrate Type
1	7	0	TRACE	R
2	21	0	0	R, S
3	40	0	TRACE	R
4	72	0	0	S, C
5	80	0	0	S, SHALE
6	93	0	TRACE	S, SH, R
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Key:
 Substrate Type; S=Sand, M=Mud, SL=Silt, R=Rock, C=Cobble, G=Gravel
 Bark Depth Recorded in Inches

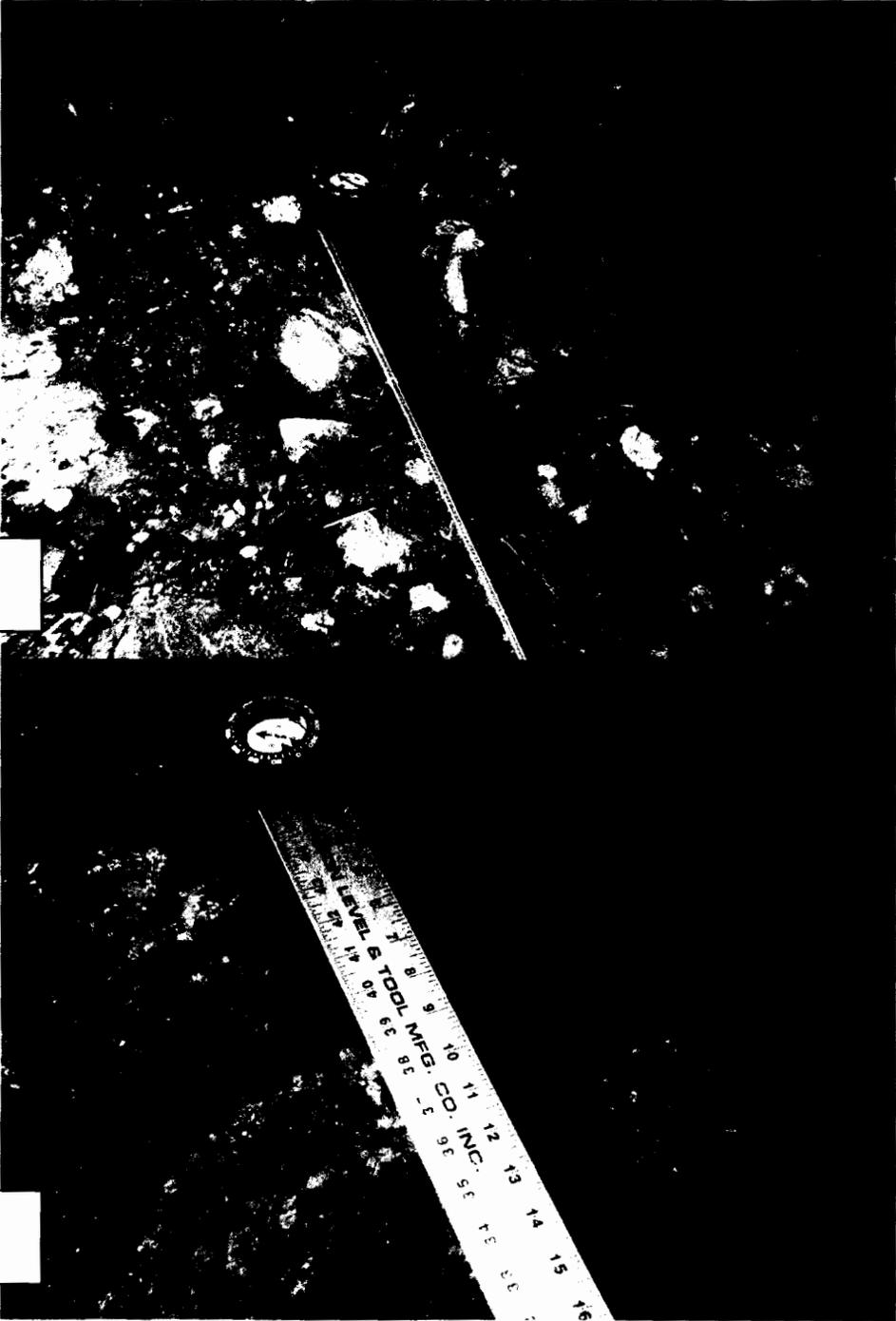
Abundance Tables

Scientific Name	Common Name	Abundance
Plants		
<i>Ulva / Monstroma spp.</i>	Sealettuce	L
<i>Lessoniopsis littoralis</i>		L
<i>Cystoseira osmundacea</i>		L
<i>Laminaria saccharina</i>	Suger kelp	L
<i>Macrocystis pyrifera</i>		L
<i>Fucus gardneri</i>	Rock weed	A
Invertebrates		
<i>Macoma nasuta</i>	Bent nosed clam	L
<i>Protothaca staminea</i>	Littleneck clam	C
<i>Parastichopus californicus</i>	Sea cucumber	C
<i>Balanus spp.</i>	Barnical	C
<i>Pagurus spp.</i>	Hermit crab	L
<i>Orthasterias koehleri</i>	Mottled sea star	L
<i>Pycnopodia helianthoides</i>	Sunflowerstar	L
<i>Saxidomus giganteus</i>	Butter clam	L
<i>Mercenaria mercenaria</i>	Quahog	L
<i>Clinocardium nuttalli</i>	Heart cockle	L

Photographic Representation

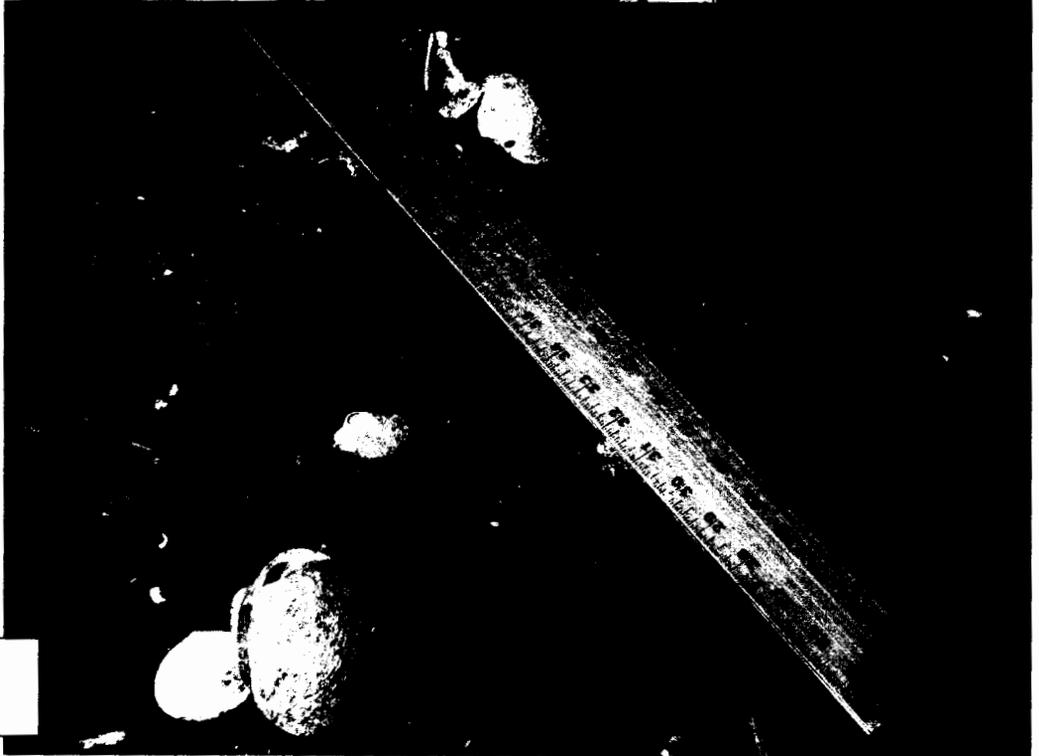
T1 S1

T1 S4





T1 S7



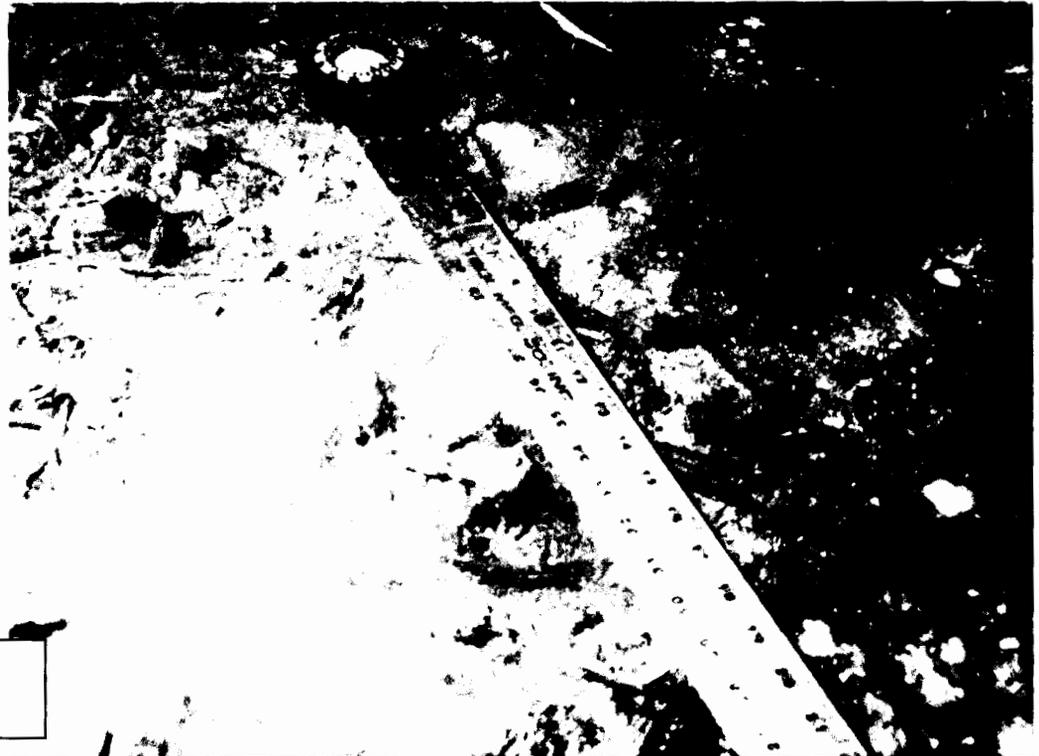
T1 S10



T2 S3



T2 S4



T2 S7



T2 S8



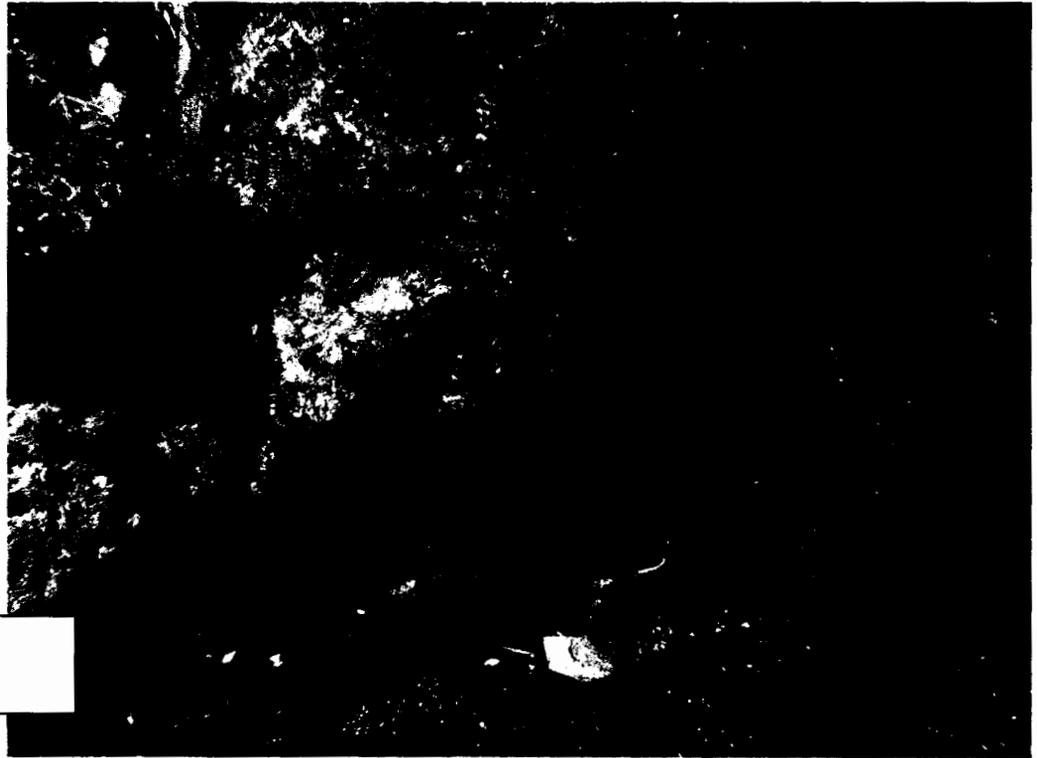
T2 S9

T3 S1



T3 S3

T3 S5



T3 S6

Survey Comparison

The LTF has increased the area of continuous coverage by .23 acres since the last survey (2003). The area of discontinuous coverage is essentially unchanged in spatial dimensions, but has increased in the previously reported percents of coverage. The type and character of the debris suggests this is a combination of debris accumulation from the input ramp and the storage area. The pattern of coverage extends towards the log storage area, but as is typical, the percent of coverage and debris depth is mitigated the greater the distance from the primary discharge source.

The shore parallel to the LSA has remained much as it appeared in the pre-discharge, and the 2003 bark monitoring survey. The debris at this location is characterized as insignificant. However, the 2004 survey did observe a slight increase in trace amounts of bark.