

AD-A168 528

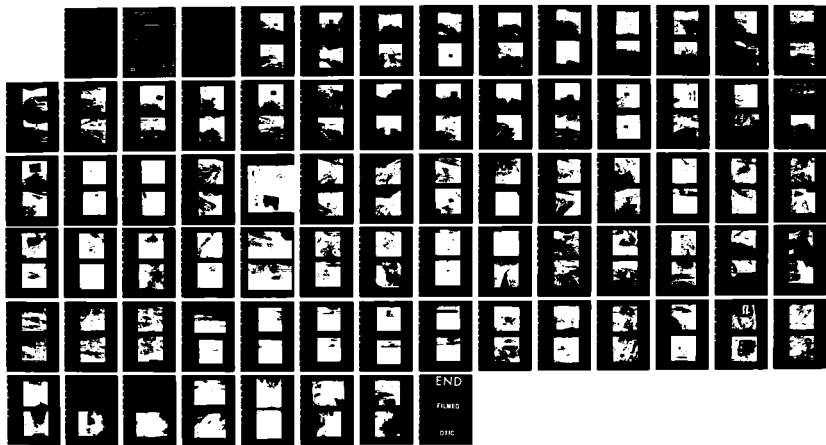
CLARENCE CANNON DAM AND MARK TWAIN LAKE FOUNDATION AND
EMBANKMENT COMPLET (U) ARMY ENGINEER DISTRICT ST LOUIS
NO DEC 84

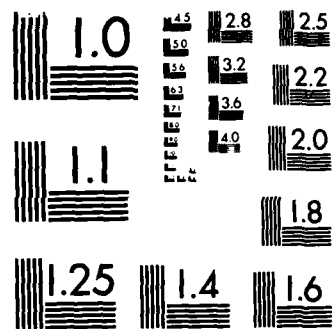
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NATIONAL BUREAU OF STANDARDS-1963-A

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CLARENCE CANNON DAM & MARK TWAIN LAKE

AD-A160 528

FOUNDATION AND EMBANKMENT COMPLETION REPORT

PART II MAIN DAM

PHASE II CONSTRUCTION AND RELATED CONTRACTS

VOLUME III — PHOTOGRAPHS PAGES 137 THRU 209

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DECEMBER 1984

SECTION 3

PAGES NOS.

DIVERSION CHANNEL

137 - 179

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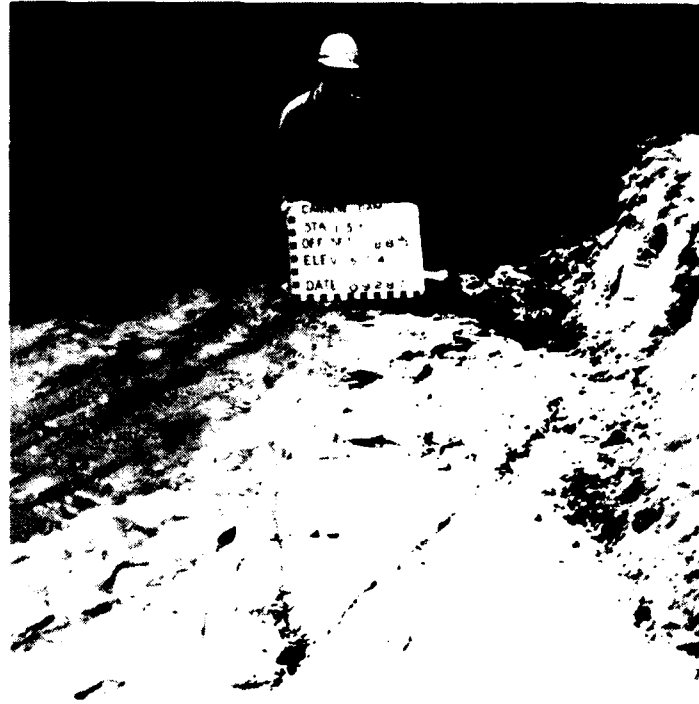
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Station 15+17, Offset 128 feet downstream, Elevation 504 feet.
Final shale foundation in Diversion Channel. 28 Sept. 79.



Station 15+17, Offset 88 feet downstream. Elevation 504 feet.
Final shale foundation in Diversion Channel. 28 Sept. 79.



Station 15+30, Offset 95 feet upstream, Elevation 504.7 feet.
Excavated joint ready for tuckpointing. 25 Sept. 79.



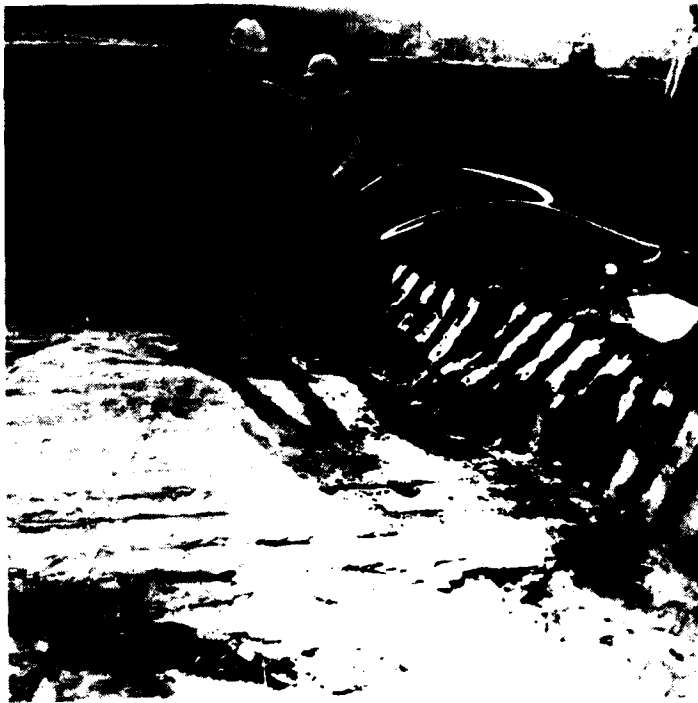
Station 15+67, Offset 95 feet downstream, Elevation 503.9 feet.
Final shale foundation in Diversion Channel. 27 Sept. 79.



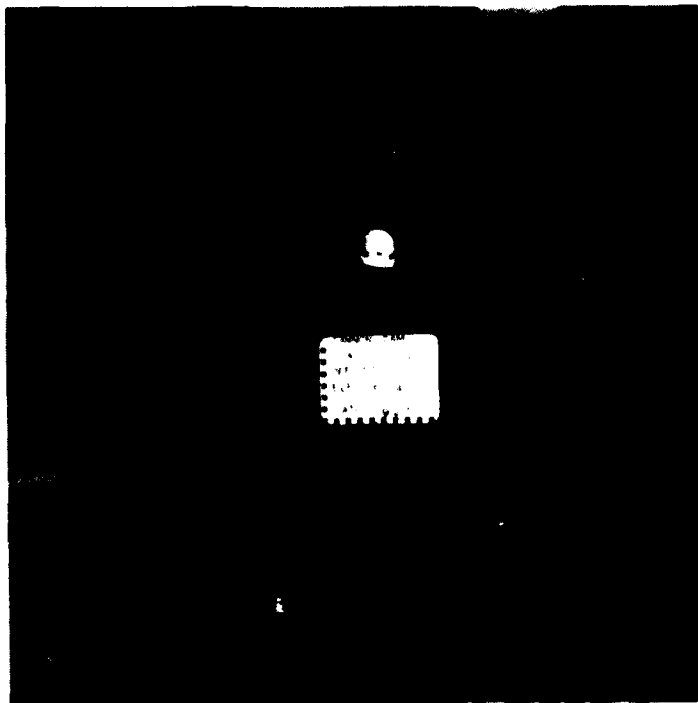
Station 15+67, Offset 65 feet downstream, Elevation 503.9 feet.
Final shale foundation in Diversion Channel. 27 Sept. 79.



Station 15+70, Offset 40 feet downstream, Elevation 503.5 feet.
Final shale foundation in Diversion Channel. 25 Sept. 79.



Station 15+78, Offset 1 foot downstream, Elevation 504.2 feet.
Final shale foundation in Diversion Channel. 25 Sept. 79.



Station 15+79, Offset 11 feet upstream, Elevation 504.5 feet.
Excavated joint ready for tuckpointing, final foundation, 25 Sept. 79.



Station 15+74, Offset 95 feet upstream, Elevation 504.3 feet.
Final shale foundation in Diversion Channel. 24 Sept. 1979.



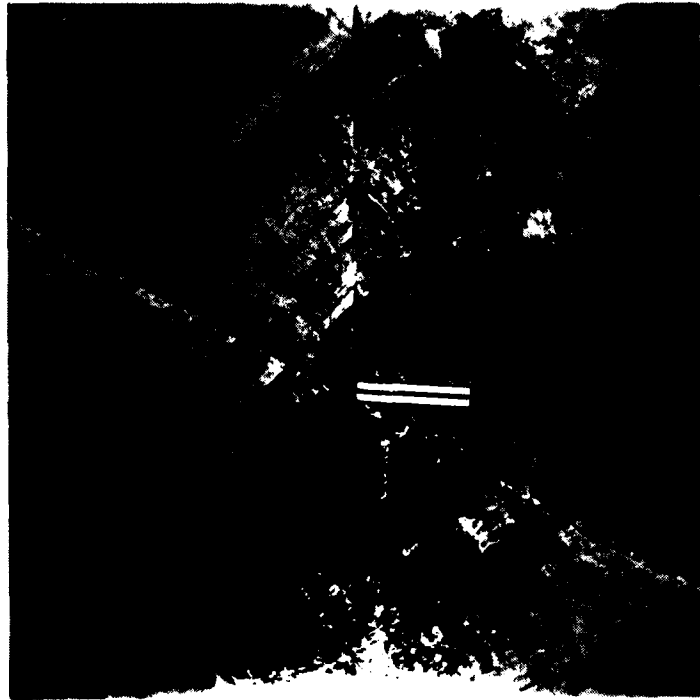
Station 16+12, Offset 160 feet downstream, Elevation 505.8 feet.
Final shale foundation in Diversion Channel. 19 Sept. 1979.



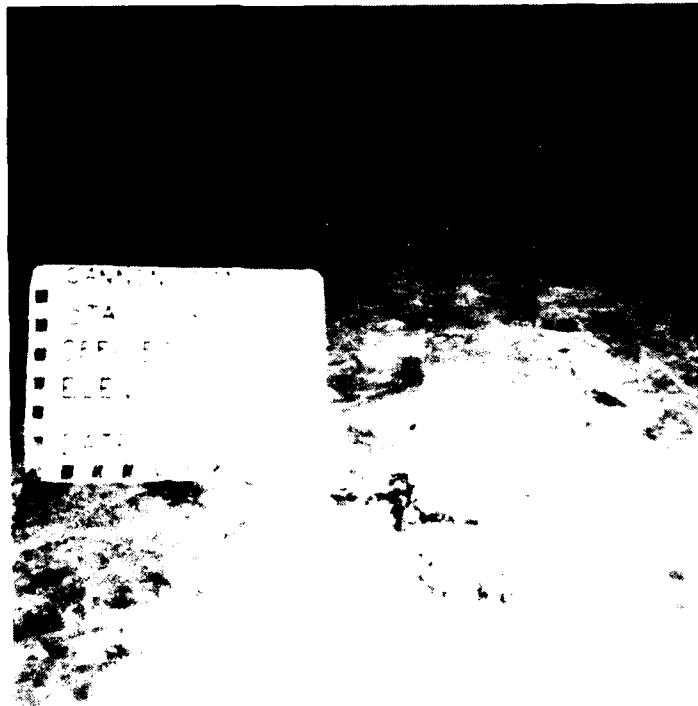
Station 16+15, Offset 50 feet downstream, Elevation 508.1 feet.
Final shale foundation in Diversion Channel. 19 Sept. 79.



Approximate station 16+00, strike-slip faulting with a 3 inch
offset in Hannibal Shale. Final foundation, 22 Sept. 79.



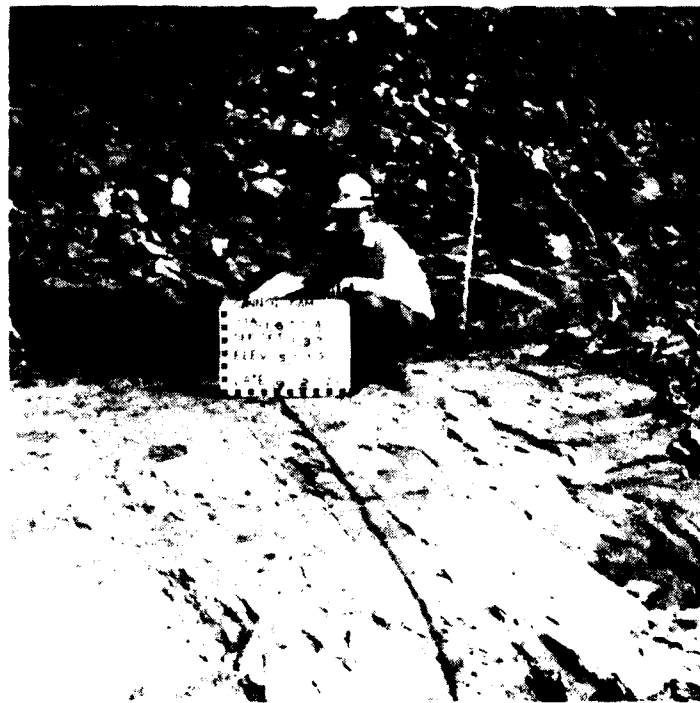
Approximate station 16+00, strike-slip faulting with a 3 inch offset in Hannibal Shale. Final foundation. 22 Sept. 79.



Station 16+14, Offset 67 feet upstream. Elevation 505.6 feet. Final shale foundation in Diversion Channel. Note 6 foot ruler lying on one of two parallel joints. 4 Sept. 79



Station 16+15, Offset 1 foot upstream, Elevation 505.7 feet.
Final shale foundation in Diversion Channel. 19 Sept. 79.



Station 16+04, Offset 137 feet upstream, Elevation 503.9 feet.
Final shale foundation in Diversion Channel. 24 Sept. 79.



Station 16+10, Offset 160 feet upstream, Elevation 503.1 feet.
Final shale foundation in Diversion Channel. 21 Sept. 79.



Station 16+56, Offset 160 feet downstream, Elevation 509.1 feet.
Final shale foundation in Diversion Channel. 17 Sept. 79.



Station 16+56, Offset 140 feet downstream, Elevation 506.7 feet.
Final shale foundation in Diversion Channel. 17 Sept. 79.



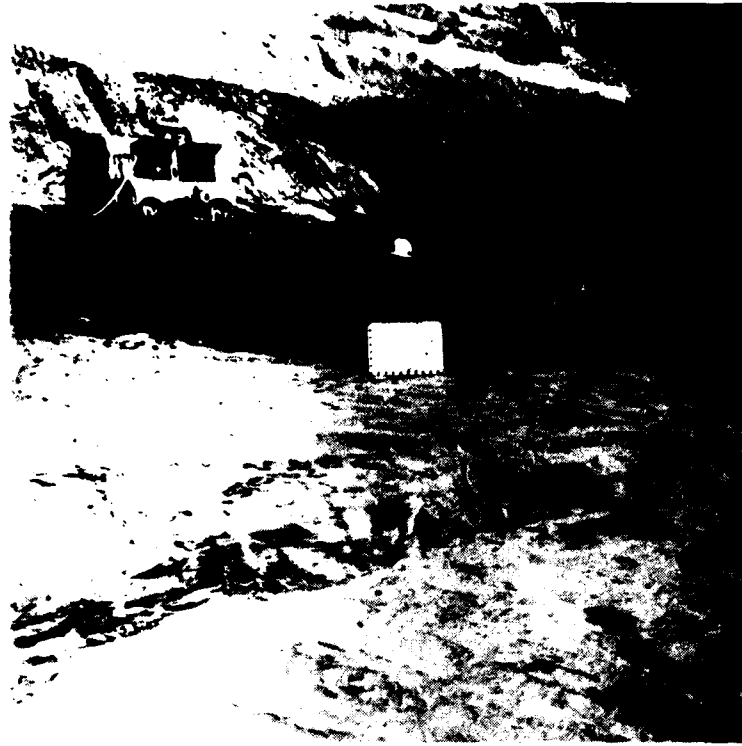
Station 16+56, Offset 115 feet downstream, Elevation 507.2 feet.
Final shale foundation in Diversion Channel. 19 Sept. 79.



Station 16+26, Offset 115 feet downstream, Elevation 505.5 feet.
Final shale foundation in Diversion Channel. Note joint. 17 Sept. 79.



Station 16+52, Offset 106 feet downstream, Elevation 503.2 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



Station 16+35, Offset 50 feet downstream, Elevation 504.9 feet.
Final shale foundation in Diversion Channel. 19 September 1979



Station 16+35, Offset 20 feet downstream, Elevation 504.5 feet.
Final shale foundation in Diversion Channel. 19 September 1979



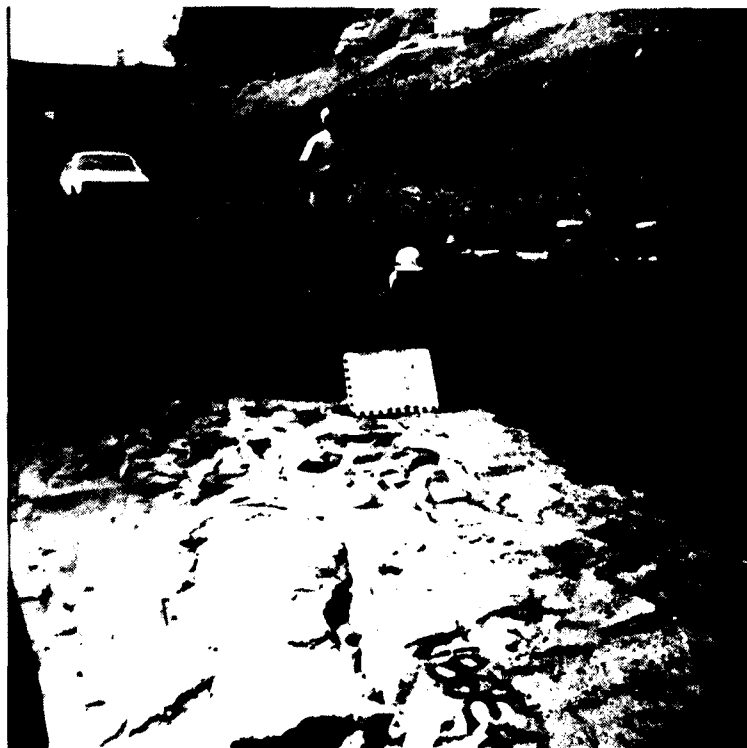
Station 16+37, Offset 37 feet upstream, Elevation 507.2 feet.
Final shale foundation in Diversion Channel, 20 Sept. 79.



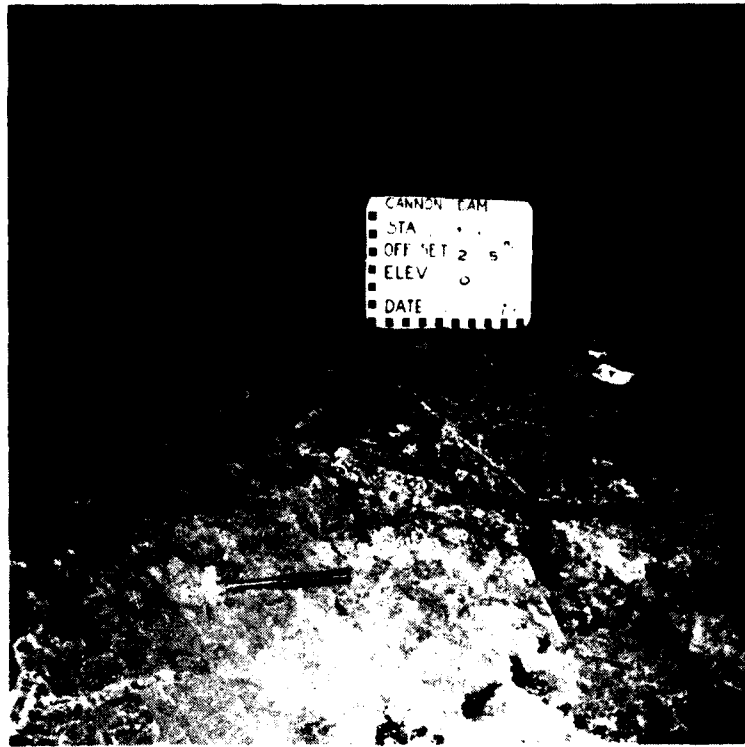
Station 16+55, Offset 71 feet upstream. Elevation 509.2 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



Station 16+29, Offset 76 feet upstream. Elevation 504.3 feet.
Final shale foundation in Diversion Channel. Note joint face
in background. 20 Sept. 79.



Station 16+49, Offset 125 feet upstream. Elevation 508.4 feet.
Final shale foundation in Diversion Channel. Note high angle
relief jointing. 20 Sept. 79.



Station 16+46, Offset 205 feet upstream. Elevation 508.5 feet.
Final shale foundation in Diversion Channel. 20 Sept. 79.



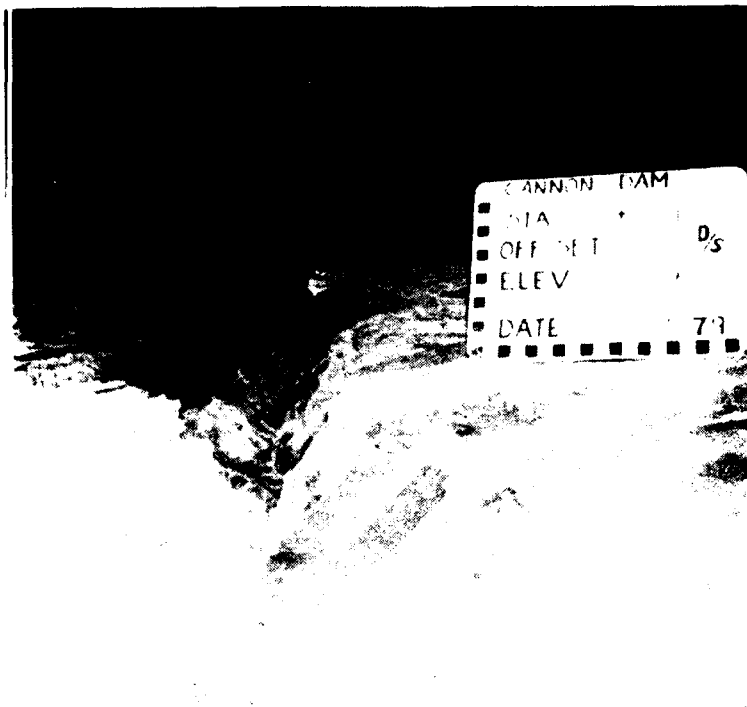
Station 16+70, Offset 106 feet downstream. Elevation 508.7 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



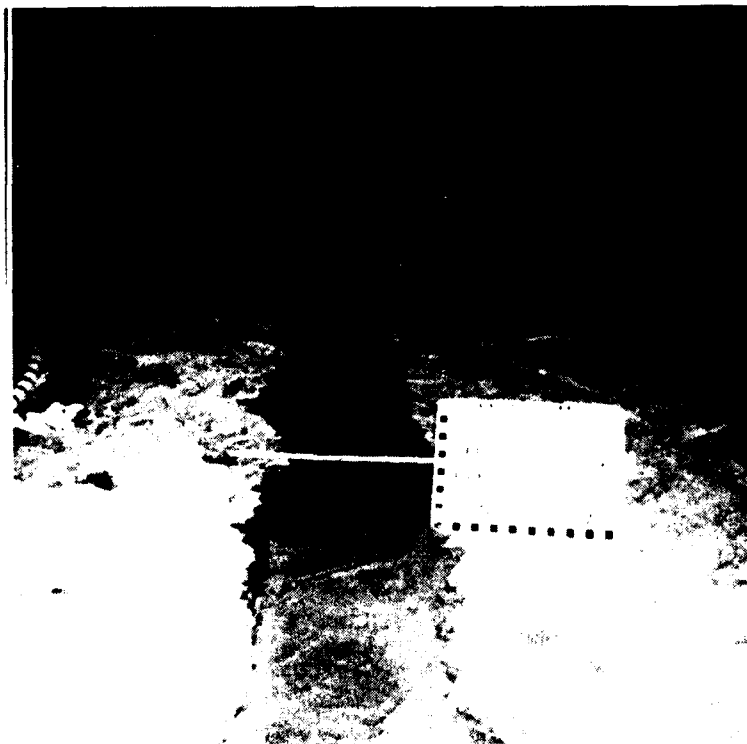
Station 16+70, Offset 100 feet downstream, Elevation 510.6 feet.
Final shale foundation in Diversion Channel. Note the various
joints. 15 Sept. 79.



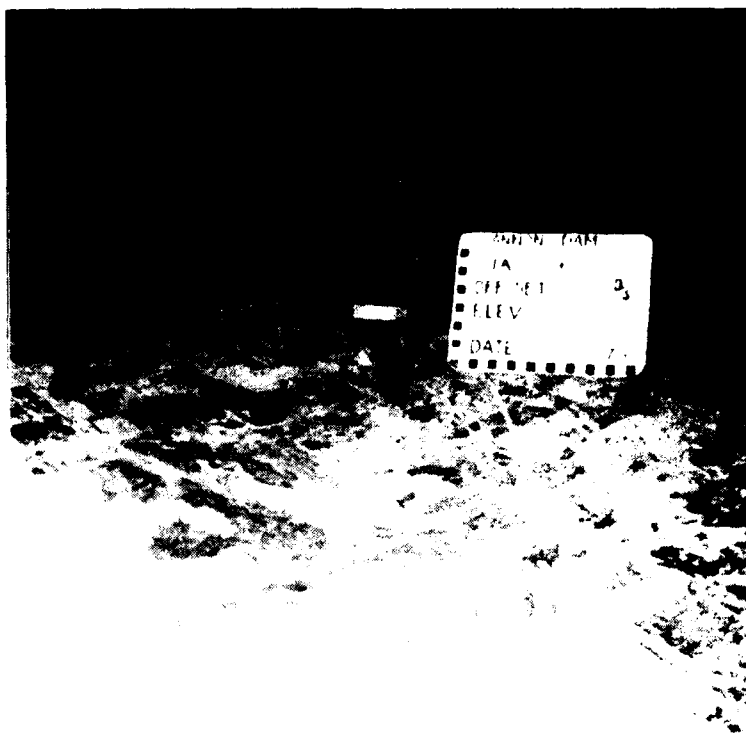
Station 16+60, Offset 80 feet downstream, Elevation 507.3 feet.
Final shale foundation in Diversion Channel. See joint. 15 Sept. 79



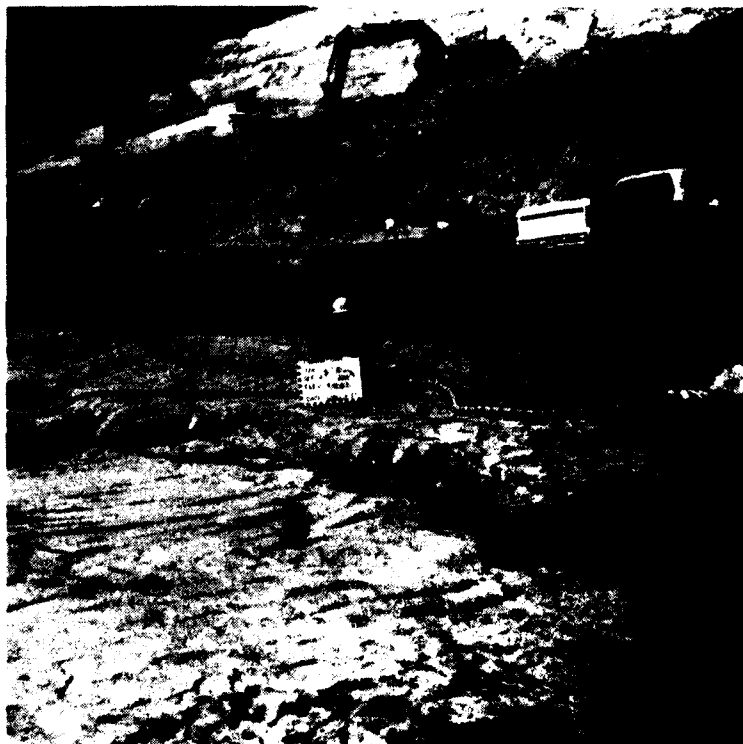
Station 16+61, Offset 57 feet downstream, Elevation 509.6 feet.
Highly weathered joint after dental excavation. Final shale
foundation in Diversion Channel. 15 Sept. 79.



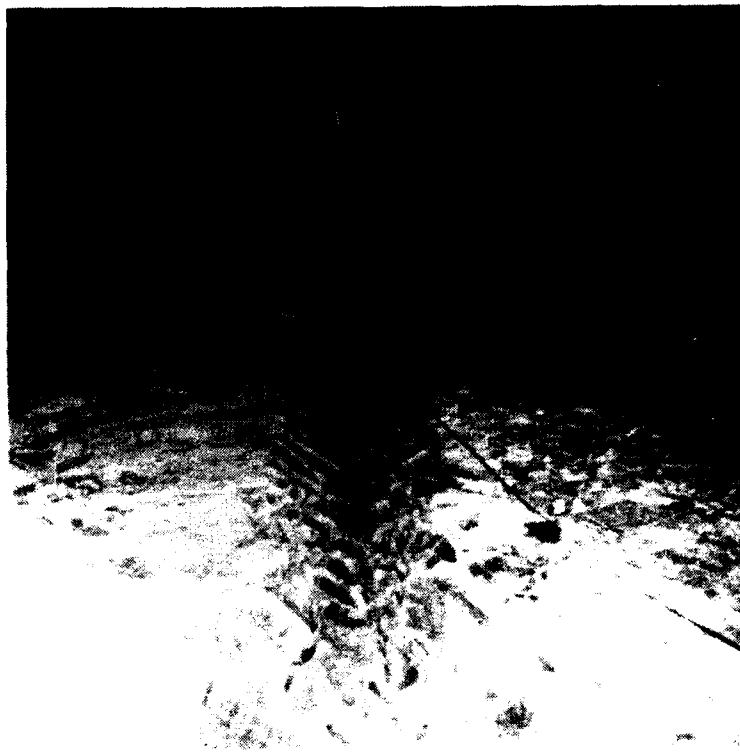
Station 16+78, Offset 35 feet downstream, Elevation 509.7 feet.
Highly weathered joint after dental excavation and tuckpointing.
Final shale foundation in Diversion Channel. 15 Sept. 79.



Station 16+77, Offset 26 feet downstream, Elevation 509.2 feet. Highly weathered area at intersection of several major joints before dental treatment. Shale foundation in Diversion Channel. 14 Sept. 79.



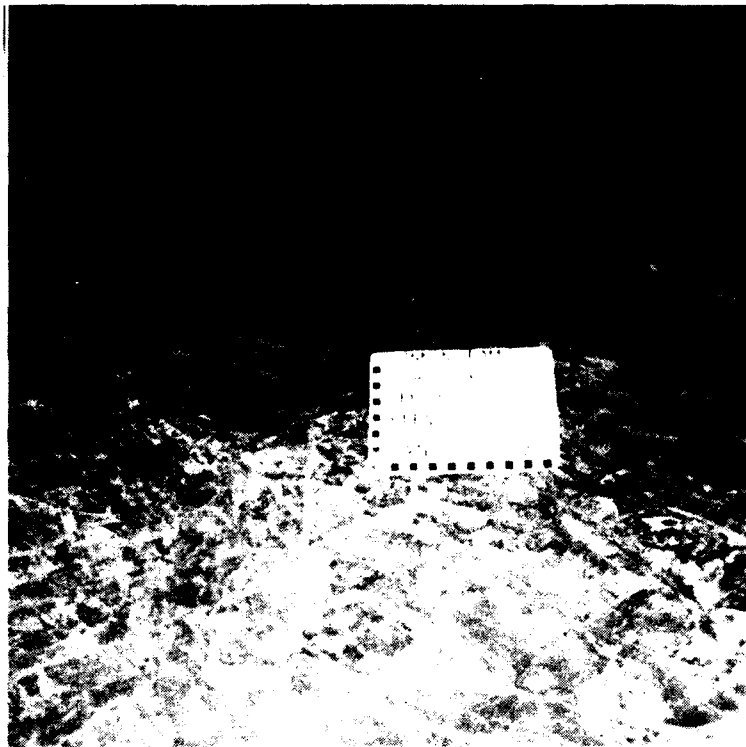
Station 16+67, Offset 20 feet downstream, Elevation 504.5 feet. Final shale foundation in Diversion Channel. 1 Sept. 79.



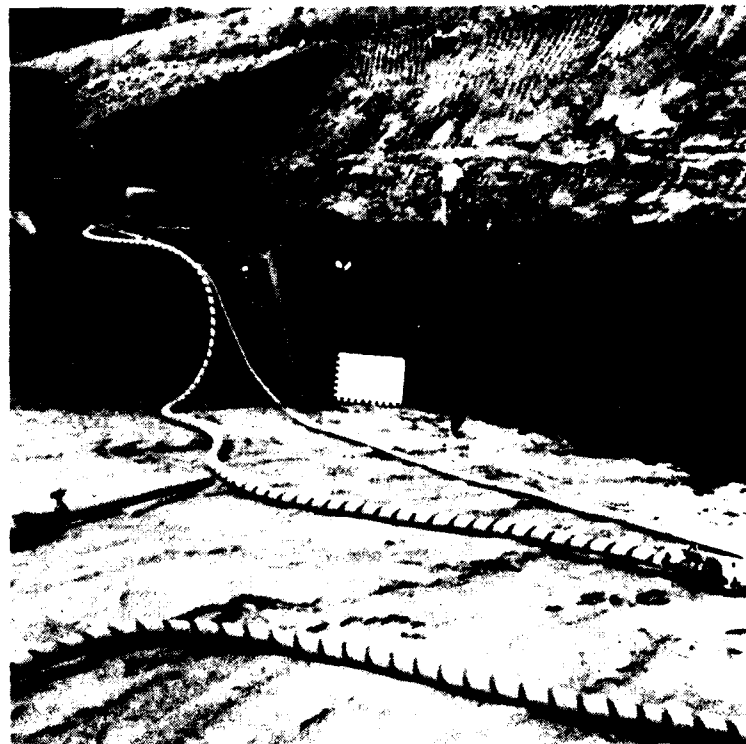
Station 16+77, Offset 26 feet upstream, Elevation 509.2 feet.
Joint after dental excavation. Shale foundation in Diversion
Channel. 14 September 1979



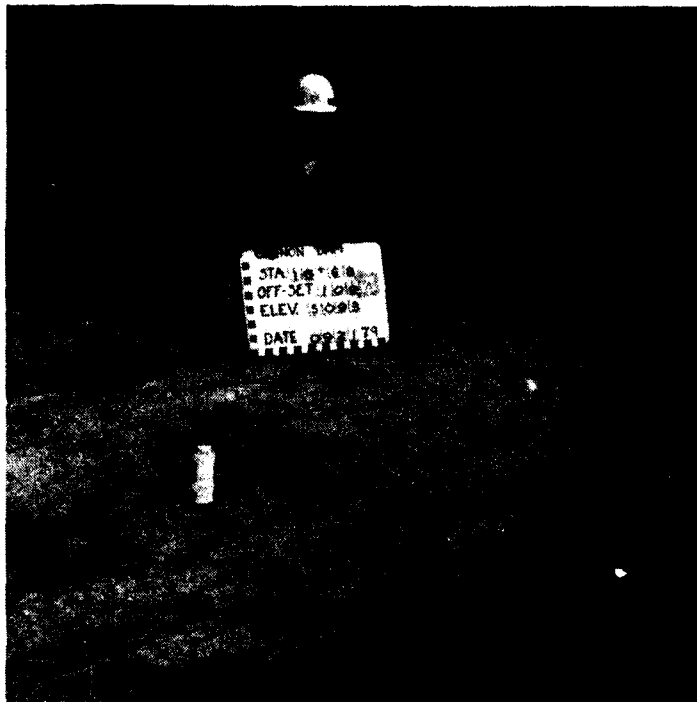
Station 16+70, Offset 45 feet upstream, Elevation 509 feet.
Final shale foundation in Diversion Channel. 14 September 1979



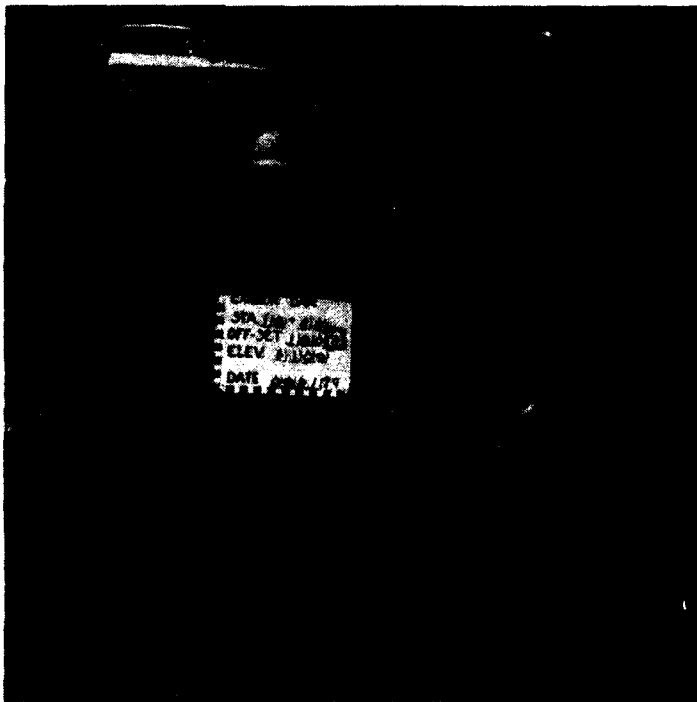
Station 16+78, Offset 47 feet upstream, Elevation 508.9 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



Station 16+70, Offset 71 feet upstream, Elevation 508.7 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



Station 16+68, Offset 109 feet upstream, Elevation 509.3 feet.
Final shale foundation in Diversion Channel. 21 Sept. 79.



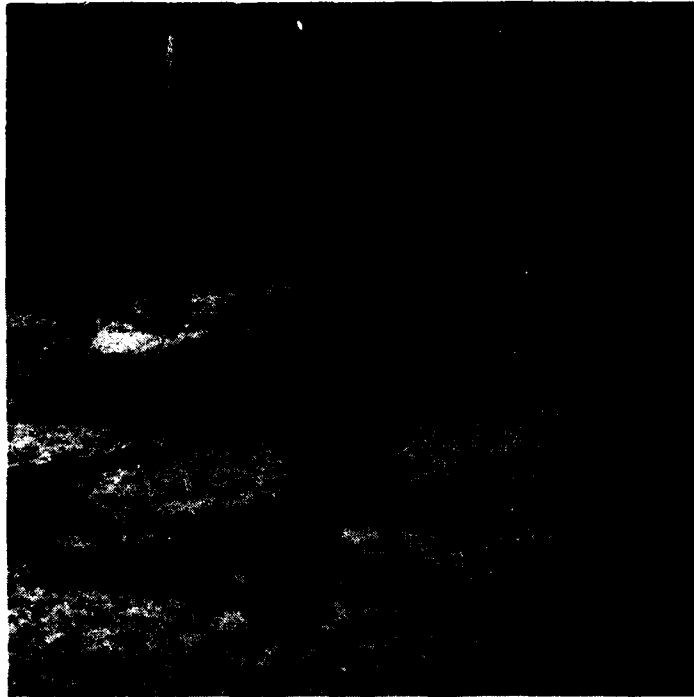
Station 16+68, Offset 160 feet upstream, Elevation 510.9 feet.
Final shale foundation in Diversion Channel. 21 Sept. 79.



Station 16+76, Offset 130 feet upstream, Elevation 509.1 feet.
Hand compacting fill in joint. Final shale foundation in Diversion
Channel. 16 Sept. 79.



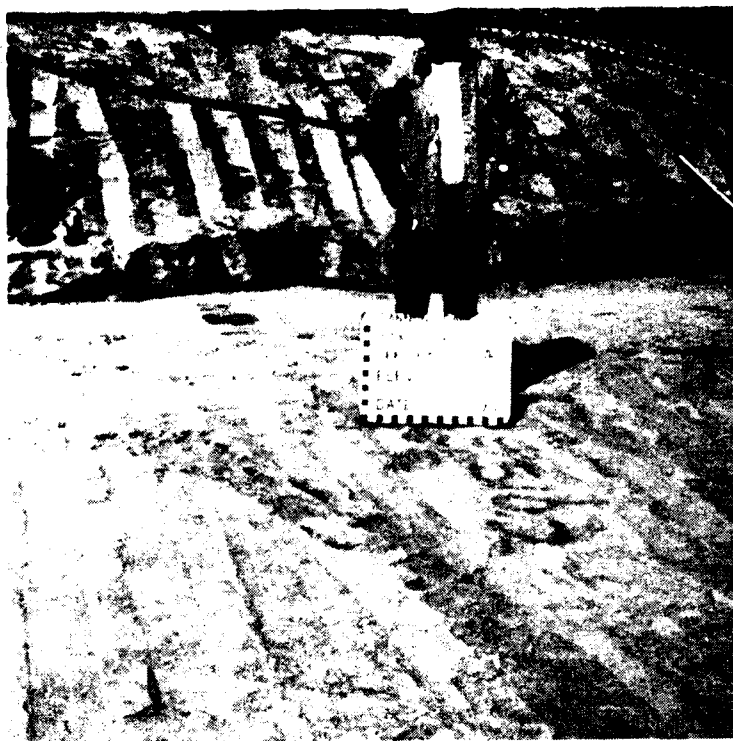
Sept. 79. Backfilling joint in final foundation of shale in
Diversion Channel.



Tuckpointing along open bedding plane in Hannibal Shale foundation in Diversion Channel. Sept. 79.



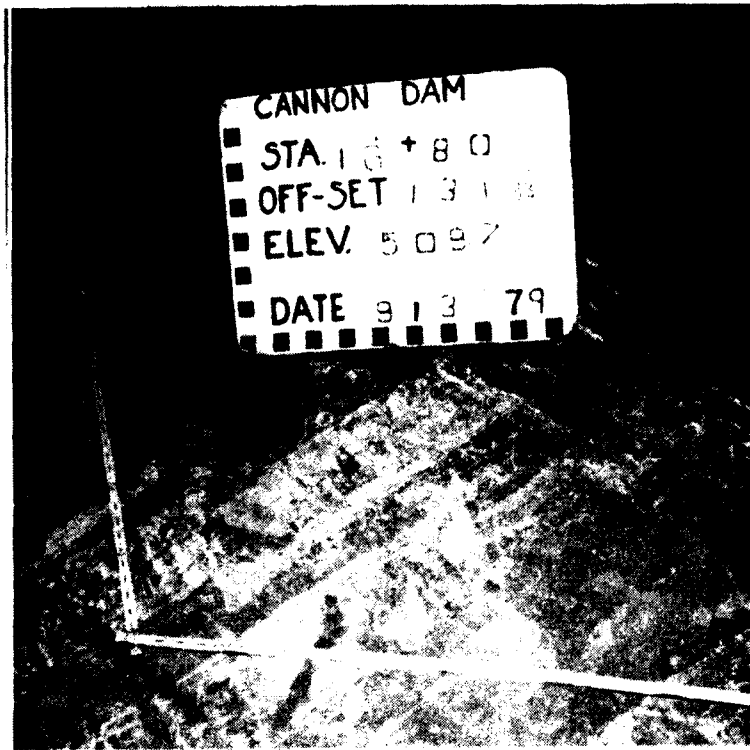
Station 16+85, Offset 100 feet downstream, Elevation 511.0 feet. Final shale foundation in Diversion Channel. 15 Sept. 79.



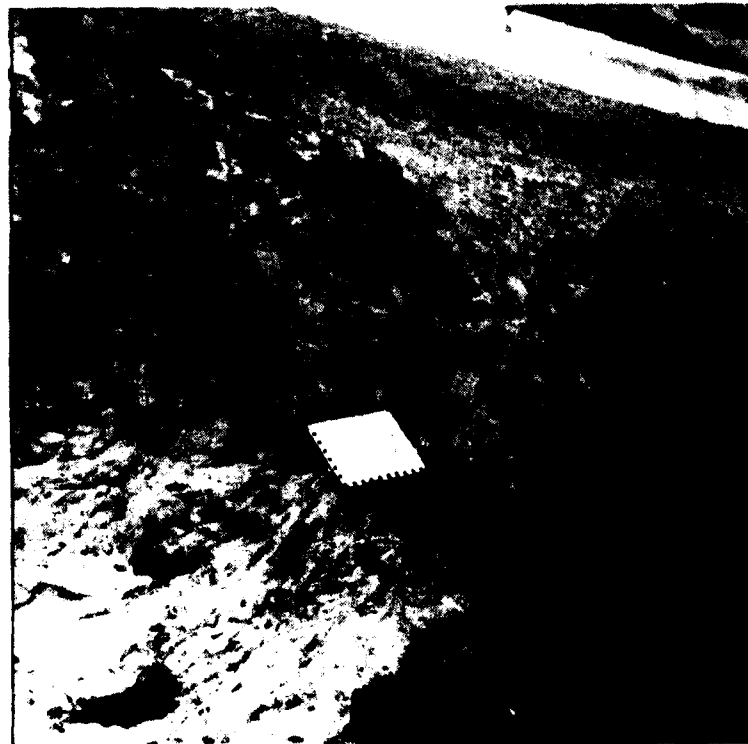
Station 16+86, Offset 80 feet downstream. Elevation 510.2 feet.
Final shale foundation in Diversion Channel. 15 Sept. 79.



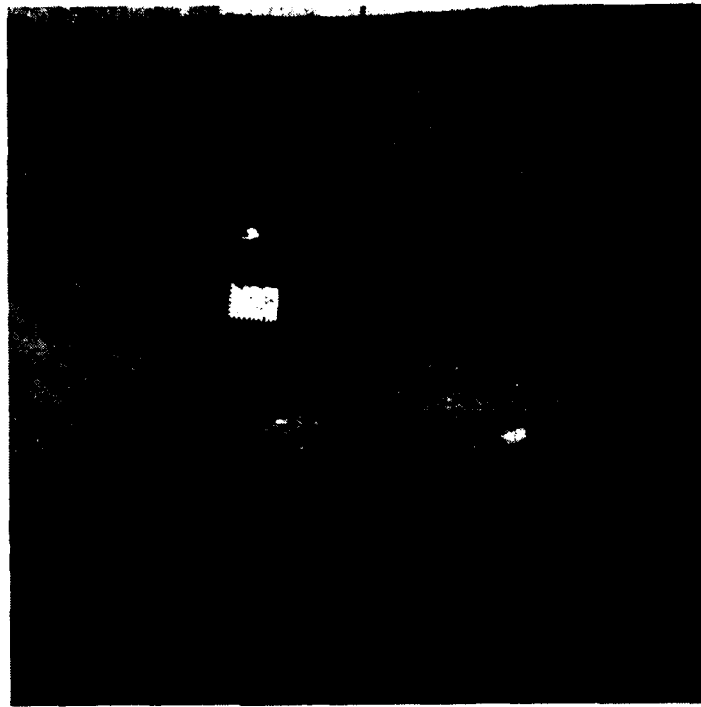
Station 16+92, Offset 34 feet upstream. Elevation 509.5 feet.
Final shale foundation in Diversion Channel. 14 Sept. 79.



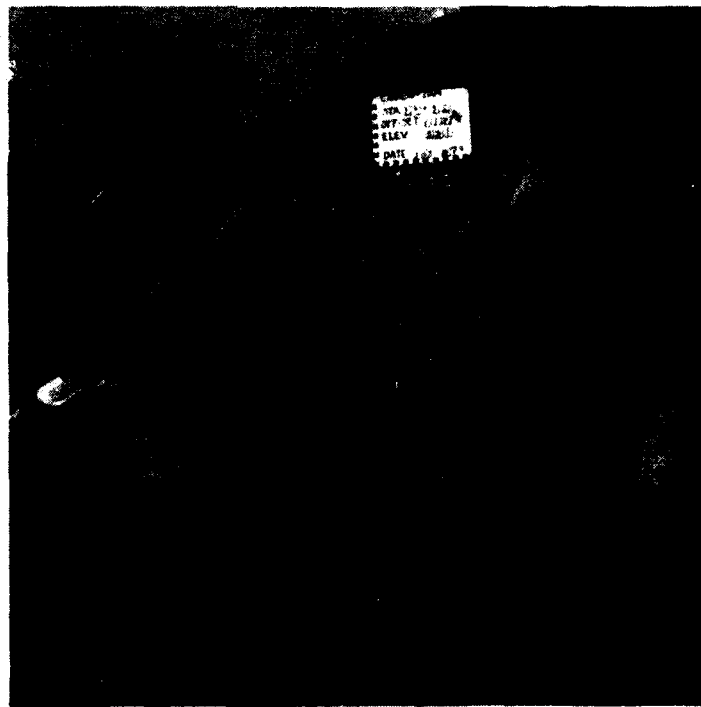
Station 16+80, Offset 131 feet upstream, Elevation 509 feet.
Final shale foundation in Diversion Channel. 13 Sept. 79.



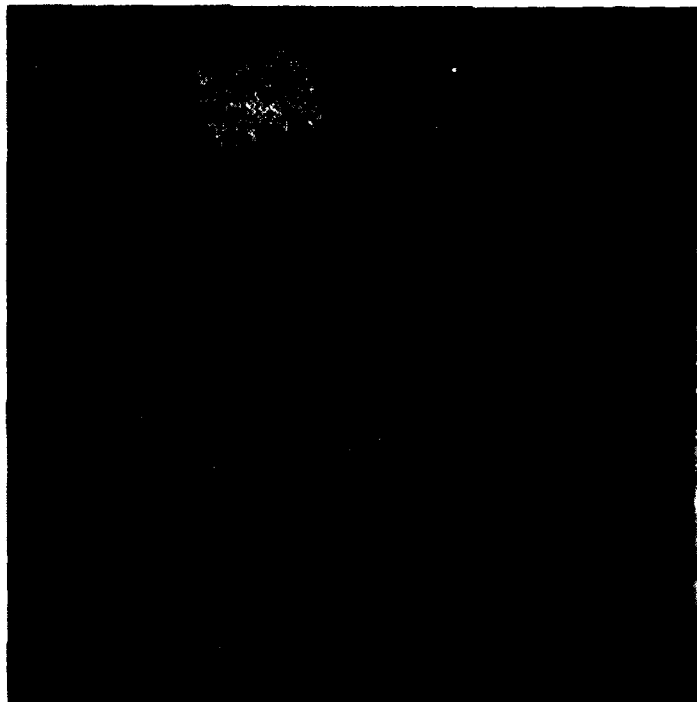
Station 17+43, Offset 124 feet downstream, Elevation 528 feet.
Final shale foundation in Diversion Channel. 16 Oct. 79.



Station 17+32, Offset 117 feet downstream, Elevation 521 feet.
Final shale foundation in Diversion Channel. 8 October 1979



Station 17+32, Offset 117 feet downstream, Elevation 521 feet.
Note tuckpointed areas. Final shale foundation in Diversion
Channel. 8 October 1979



Station 17+27, Offset 100 feet downstream. Elevation 521 feet.
Note parallel jointing. Final shale foundation in Diversion
Channel. 8 Oct. 79.



Station 17+22, Offset 34 feet downstream. Elevation 521 feet.
Concrete backfill where several weathered joints intersected.
Final shale foundation in Diversion Channel. 2 Oct. 79.



Station 17+40, Offset 34 feet upstream, Elevation 532 feet.
Final shale foundation at base of left abutment. 16 Oct. 79



Station 17+22, Offset 65 feet upstream, Elevation 532 feet.
Final shale foundation at base of Left Abutment. 2 Oct. 79.

CANNON DAM
STA 17+22
OFFSET 65 0%
ELEV
DAT 279



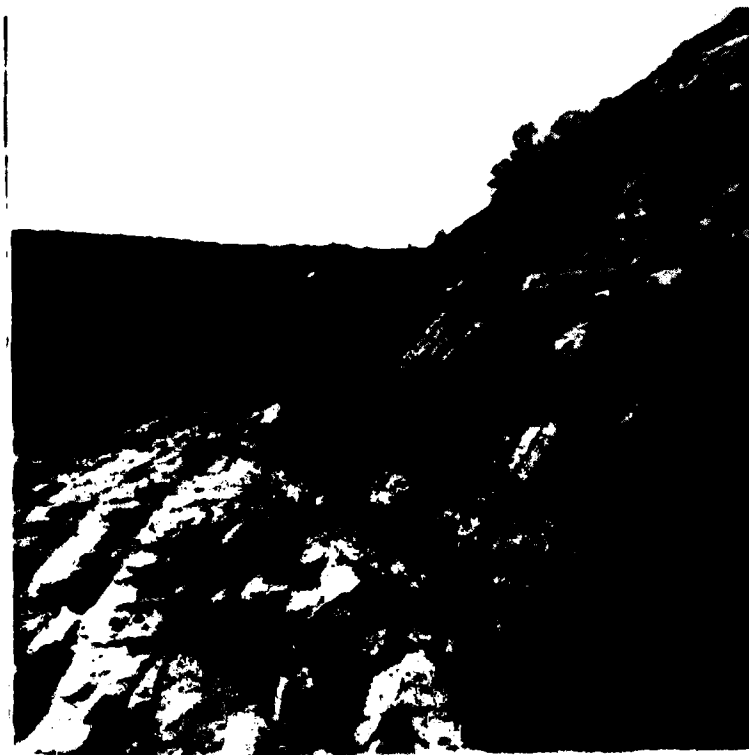
Station 17+56. Offset 118 feet downstream. Elevation 532 feet. Final shale foundation in Diversion Channel. 16 Oct. 79.



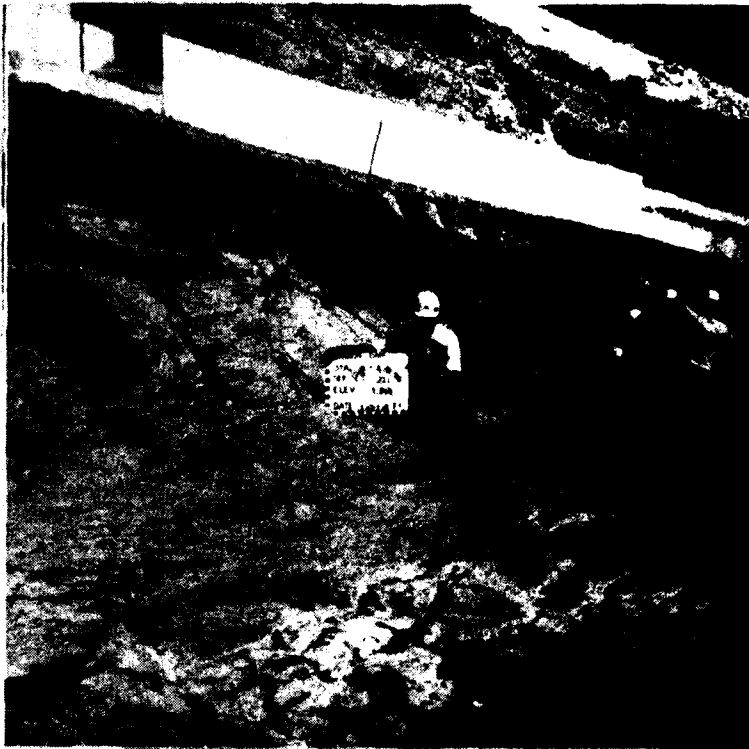
Station 17+54. Offset 94 feet downstream. Elevation 532 feet. Final shale foundation in Diversion Channel. 16 Oct. 79.



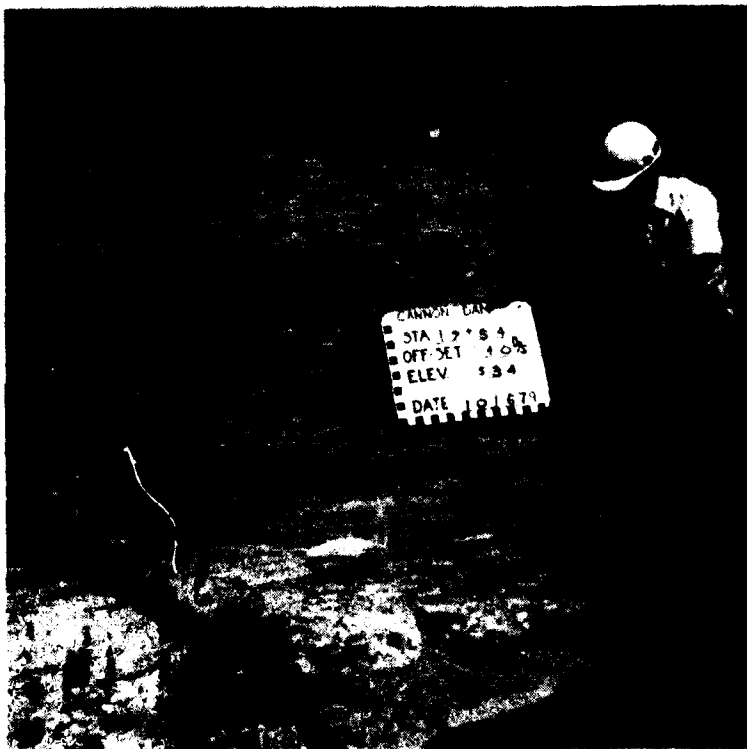
Station 17+52. Offset 84 feet downstream, Elevation 534 feet. Final shale foundation in Diversion Channel. Note relief jointing. 16 Oct. 79



Station 17+52. Offset 84 feet downstream, Elevation 534 feet. Final shale foundation in Diversion Channel. View Upstream. 16 Oct. 79.



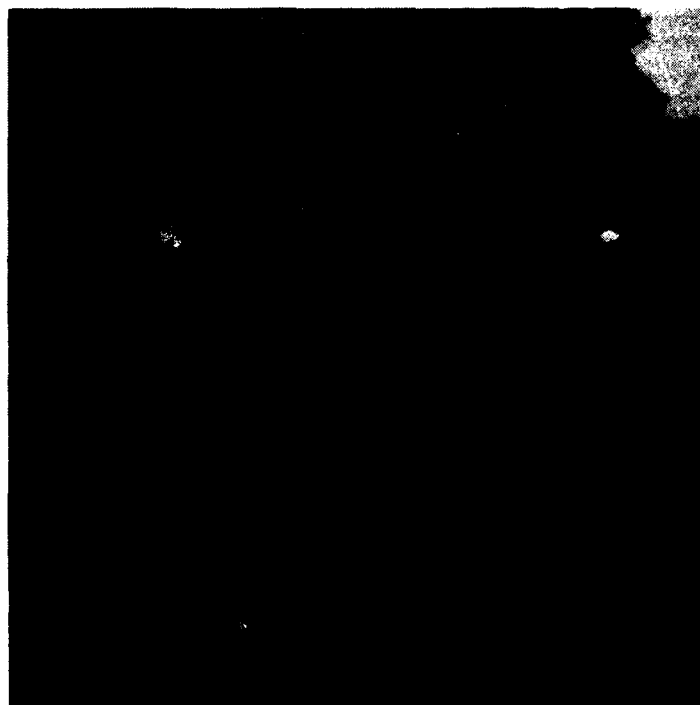
Station 17+49, Offset 71 feet downstream. Elevation 534 feet. Final shale foundation in Diversion Channel. View downstream. 16 Oct. 79.



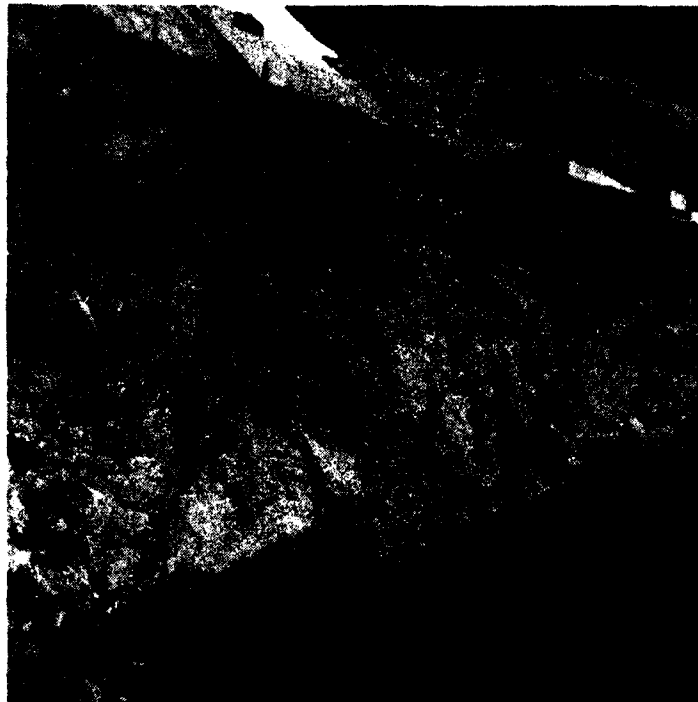
Station 17+54, Offset 40 feet downstream. Elevation 534 feet. Final shale foundation in Diversion Channel. 16 Oct. 79.



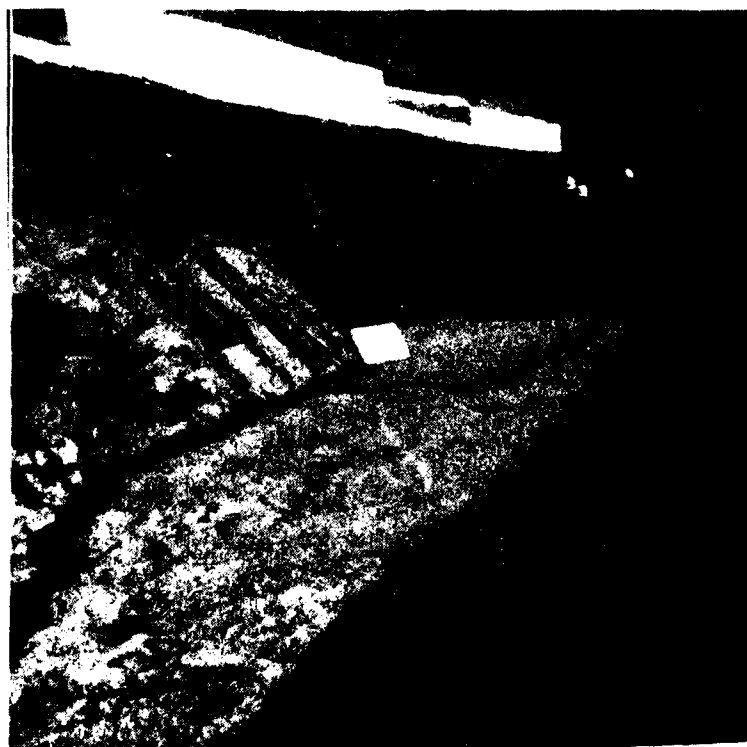
Station 17+51, Offset 17 feet downstream. Elevation 529 feet. Final foundation of shale in Diversion Channel. 16 Oct. 79.



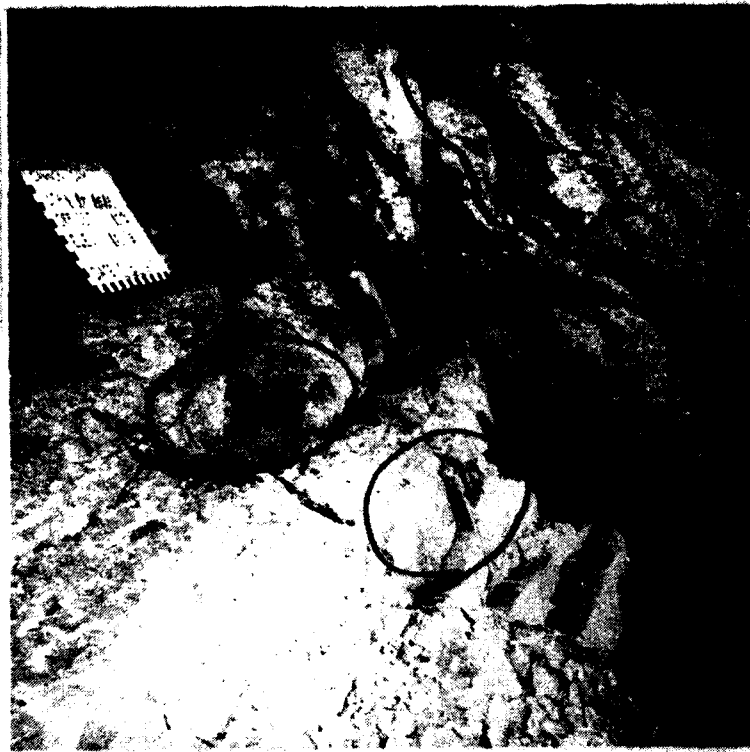
Downstream pseudocore area in Diversion Channel. Looking downstream at final foundation of slush grouted benches in Hannibal Shale.



Station 17+22, Offset 65 feet upstream, Elevation 516 feet. Final shale foundation of pseudocore in Diversion Channel. 2 Oct. 79.



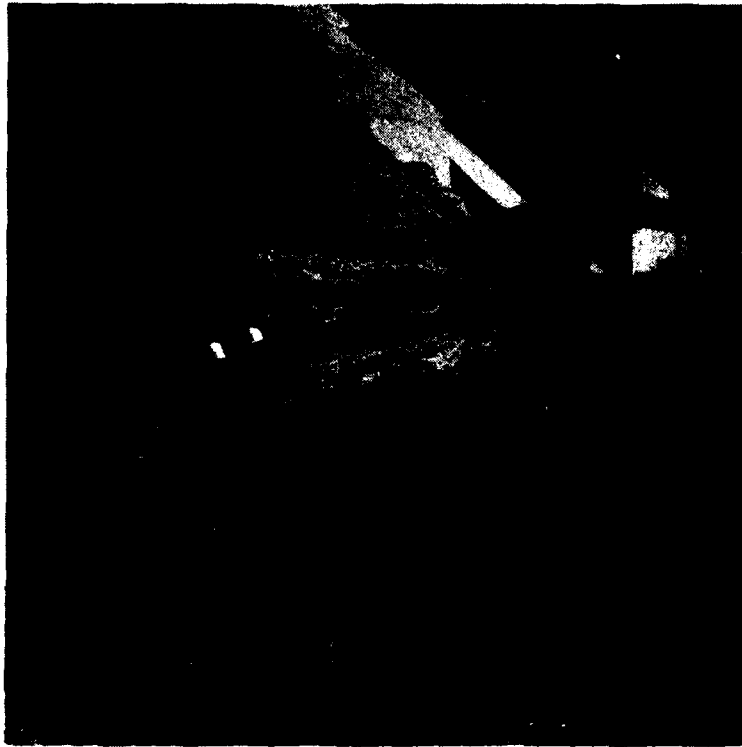
Station 17+69, Offset 73 feet downstream, Elevation 540 feet. Final shale foundation of pseudocore in Diversion Channel. 24 Oct. 79.



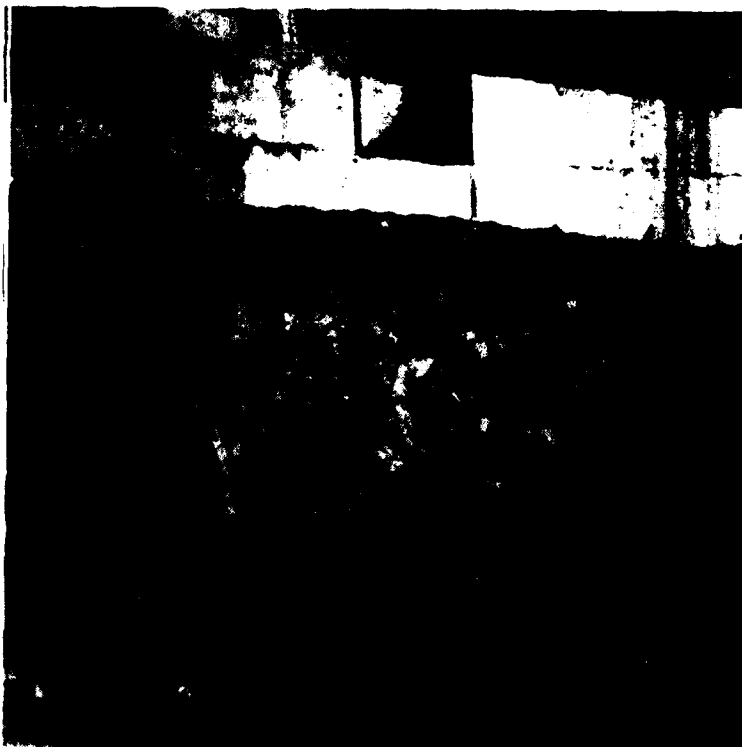
Station 17+63, Offset 7 feet downstream, Elevation 533 feet. Foundation preparation of shale in Diversion Channel. Circled areas show iron staining along joint faces. 16 Oct. 79.



Station 17+61, Offset 24 feet upstream, Elevation 534 feet. Final shale foundation in Diversion Channel. Note iron staining along joint faces in circled areas. 16 Oct. 79.



Final shale foundation in Diversion Channel of upstream pseudocore area. Note closely spaced relief jointing. Oct. 79.



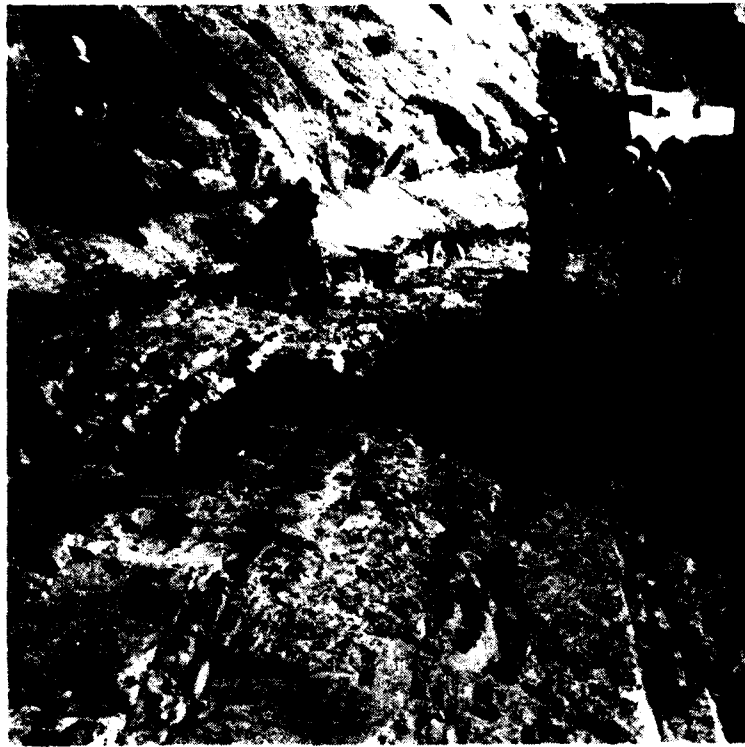
Final shale foundation in Diversion Channel of downstream pseudocore area. Note slush grouting and tuckpointing performed in area. 26 Oct. 79.



Final shale foundation in Diversion Channel of downstream pseudocore area. Slush grouting and tuckpointing performed in area. 26 Oct. 79.



Foundation preparation being performed on Hannibal Shale in upstream pseudocore area of Diversion Channel. 25 Oct. 79.



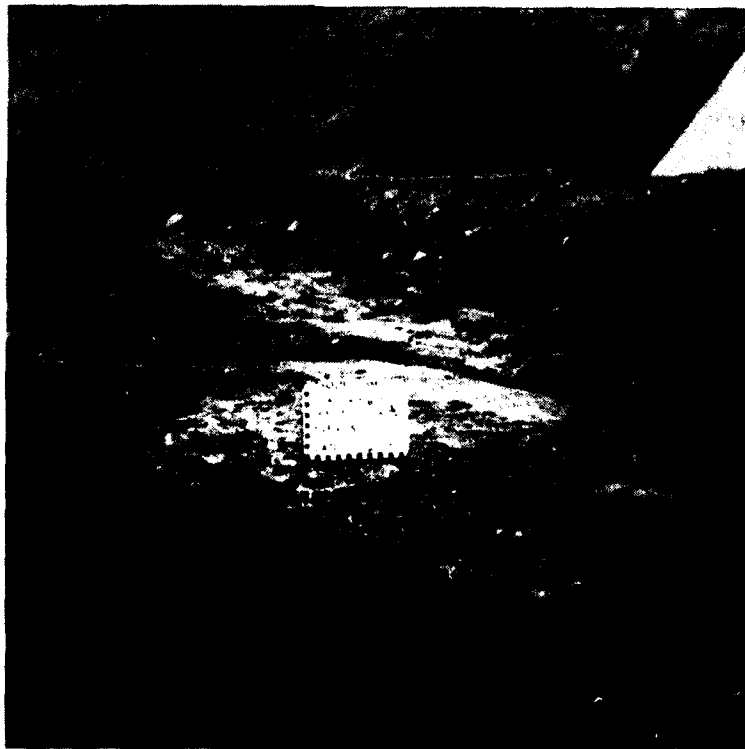
Final shale foundation of Diversion Channel in upstream pseudocore area near contact with Chouteau Limestone. Note protective concrete over shale at contact.



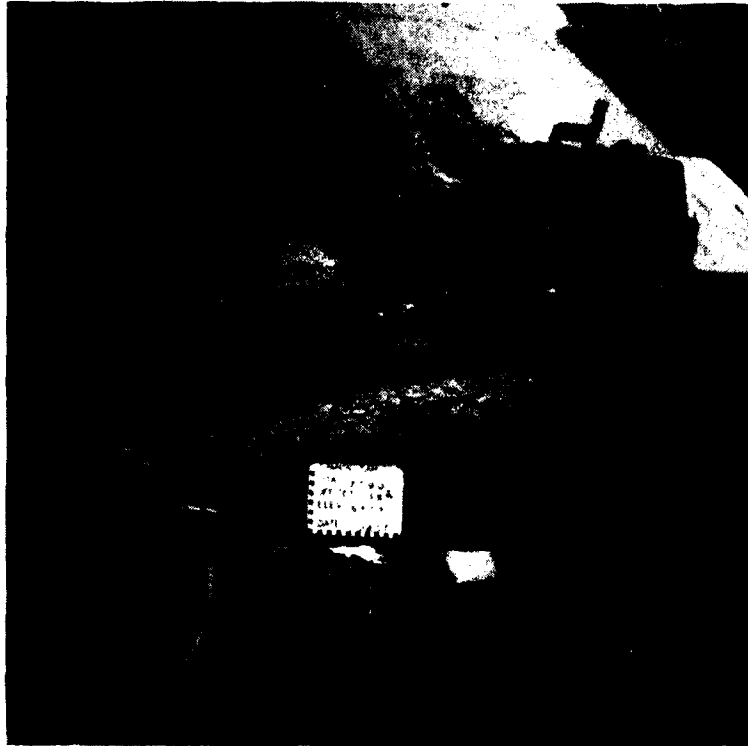
Final shale foundation of Diversion Channel in downstream pseudocore area. View downstream of cleaning shale surface for inspection using compressed air.



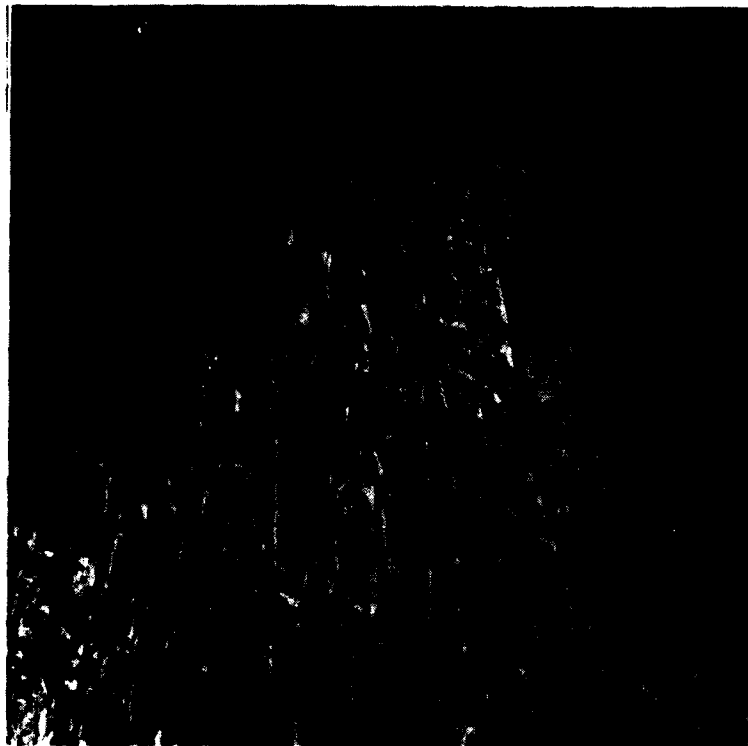
Final shale foundation of Diversion Channel in downstream pseudocore area. Note tuckpointing of shale adjacent to battered concrete fillet.



Final shale foundation of Diversion Channel in downstream pseudocore area at Station 17+85, Offset 15 feet downstream, Elevation 545 feet. 27 Oct. 79.



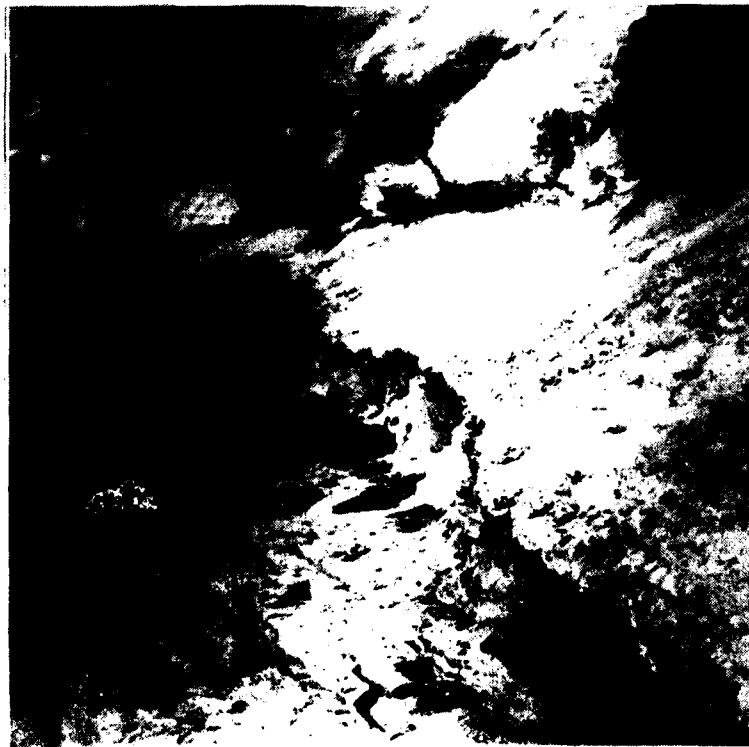
Station 17+90, Offset 55 feet upstream. Elevation 545.9 feet. Final shale foundation displaying closely spaced relief joints. 27 Oct. 79.



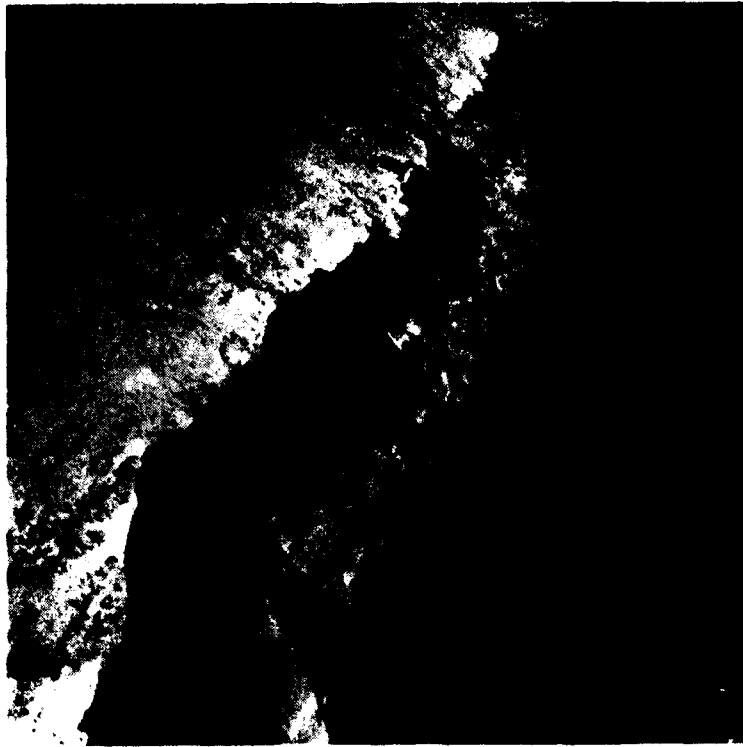
Final shale foundation of Diversion Channel in upstream pseudocore area. Note closely spaced relief jointing. 27 Oct. 79.



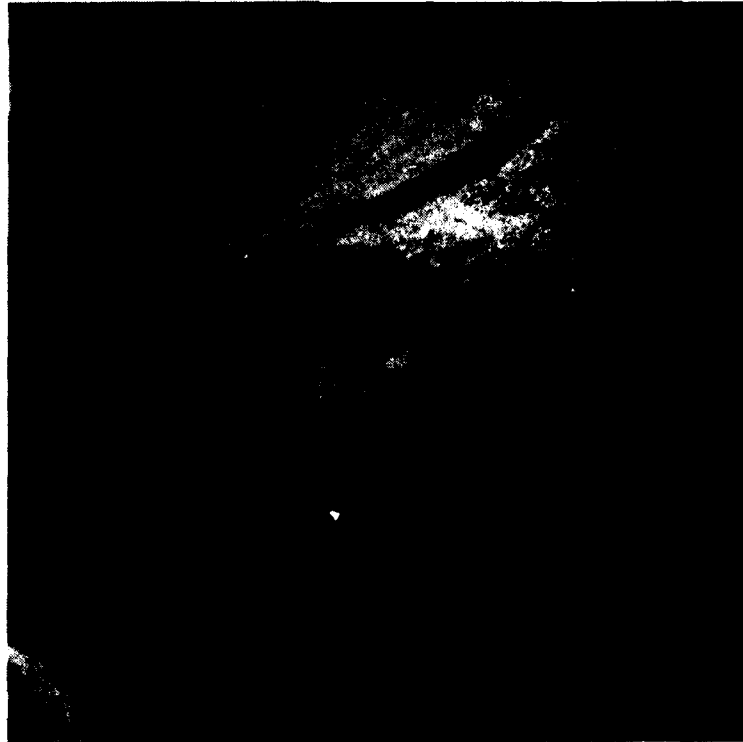
Final shale foundation of Diversion Channel in upstream pseudocore area. Tuckpointing performed along front and upstream edge of concrete cutoff wall.



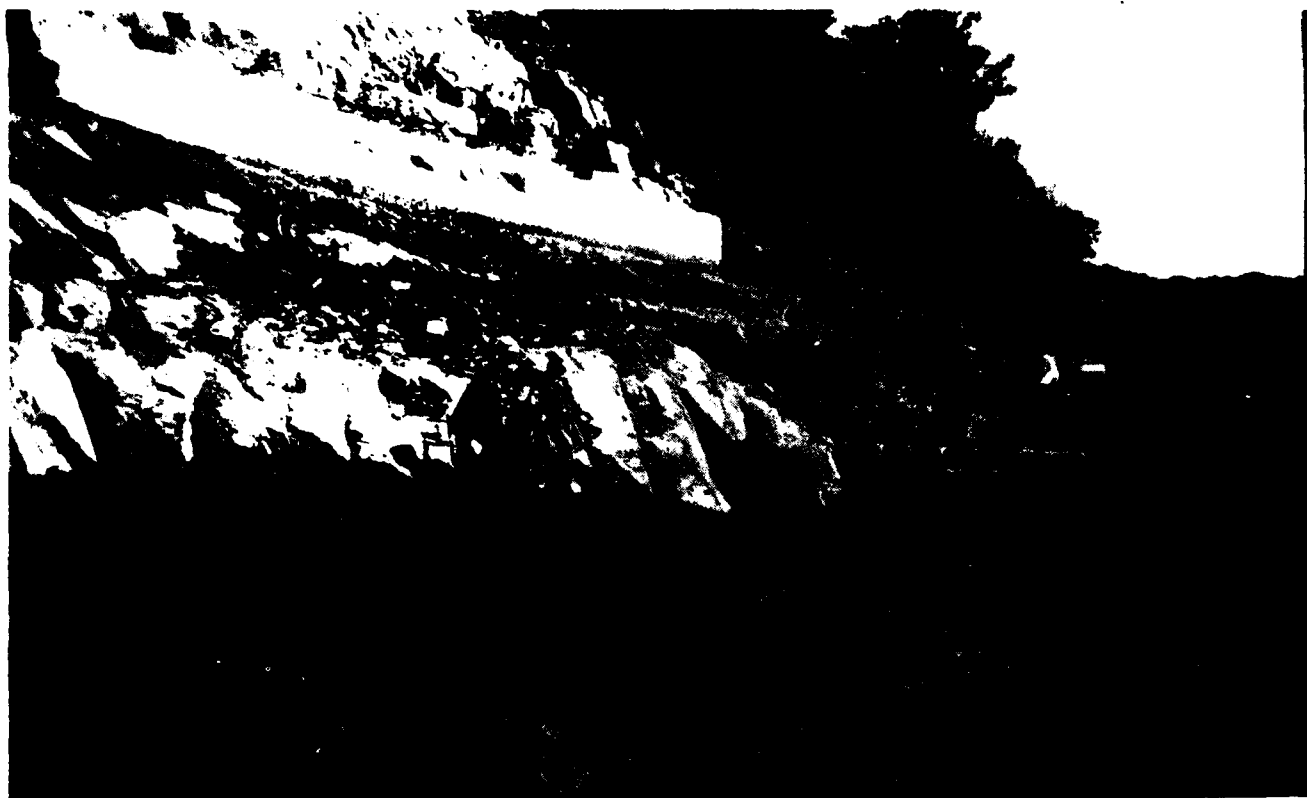
Performing Hannibal Shale foundation preparation in Diversion Channel on upstream pseudocore area near contact with Chouteau Limestone. Note protective concrete over shale at contact.



Final shale foundation of Diversion Channel in upstream pseudocore area near Chouteau Limestone contact. Note tuckpointing along protective concrete at shale/limestone contact.



Final shale foundation of Diversion Channel in upstream pseudocore area near Chouteau Limestone contact. Tuckpointing needs to be performed along protective concrete at shale/limestone contact. Slanted line represents upstream limits of pseudocore.



Compaction of embankment material against prepared surface of Hannibal Shale in Diversion Channel. Looking downstream along left abutment.



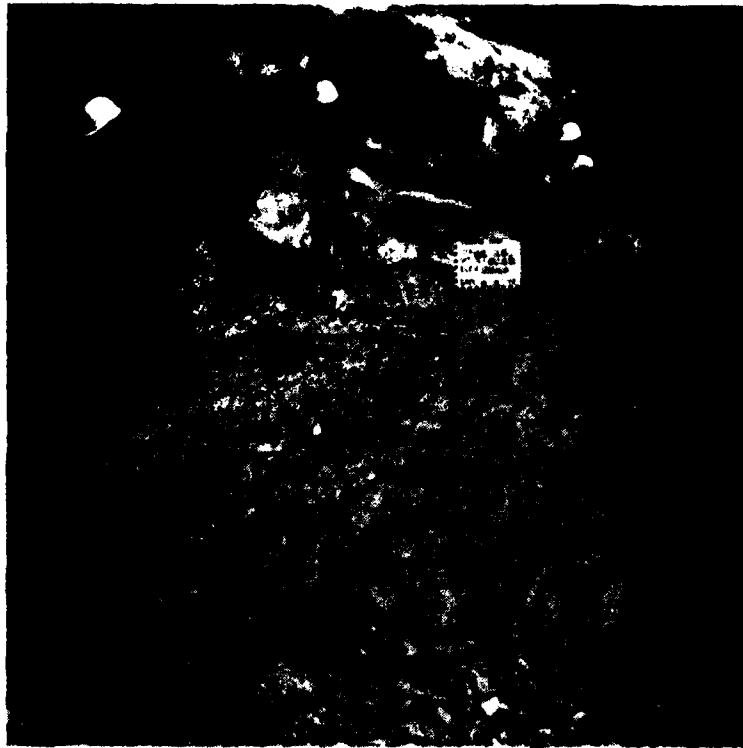
General view of Hannibal Shale in Diversion Channel. Note labor crew preparing shale surface using compressed air.



Station 17+75, Offset 425 feet upstream, Elevation 546 feet. 30 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N75E, Dip 75S to vertical, average spacing 0.25 feet.



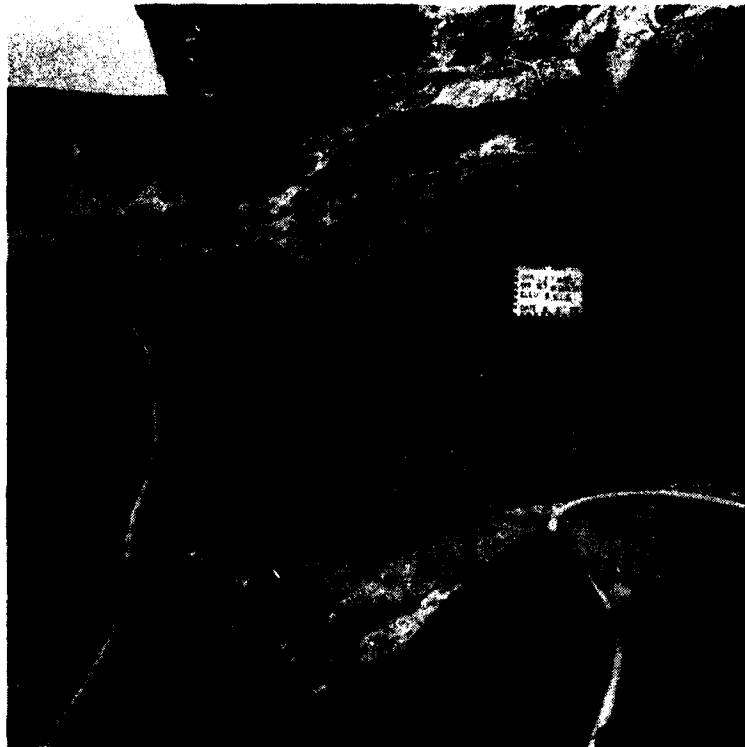
Station 17+78, Offset 409 feet upstream, Elevation 546 feet. 6 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N75E, Dip 75S to vertical, average spacing 0.25 feet.



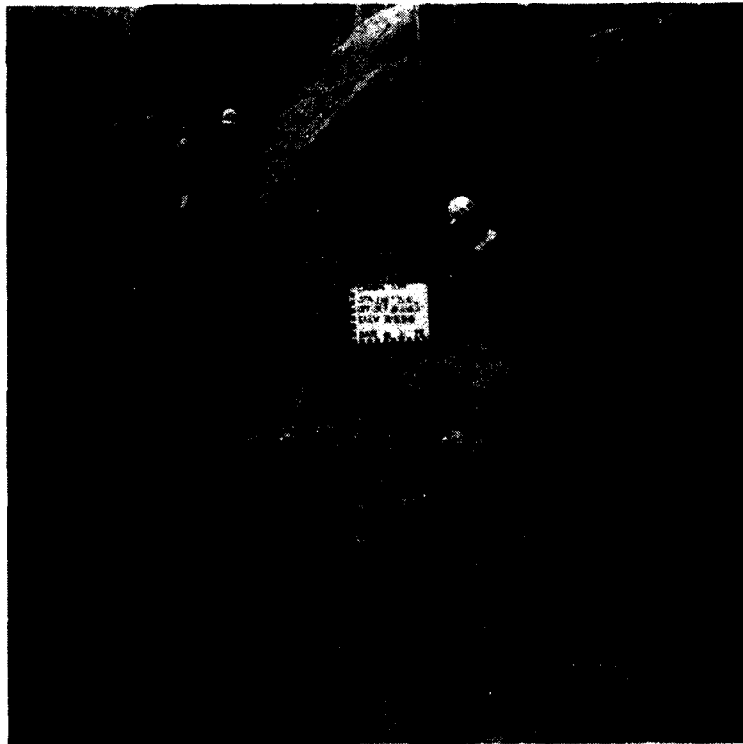
Station 17+75, Offset 375 feet upstream, Elevation 546 feet. Left abutment shale preparation for fillet placement, final foundation. Joint set: Strike N83E, Dip 80S, average spacing 0.2'. 30 August 1978



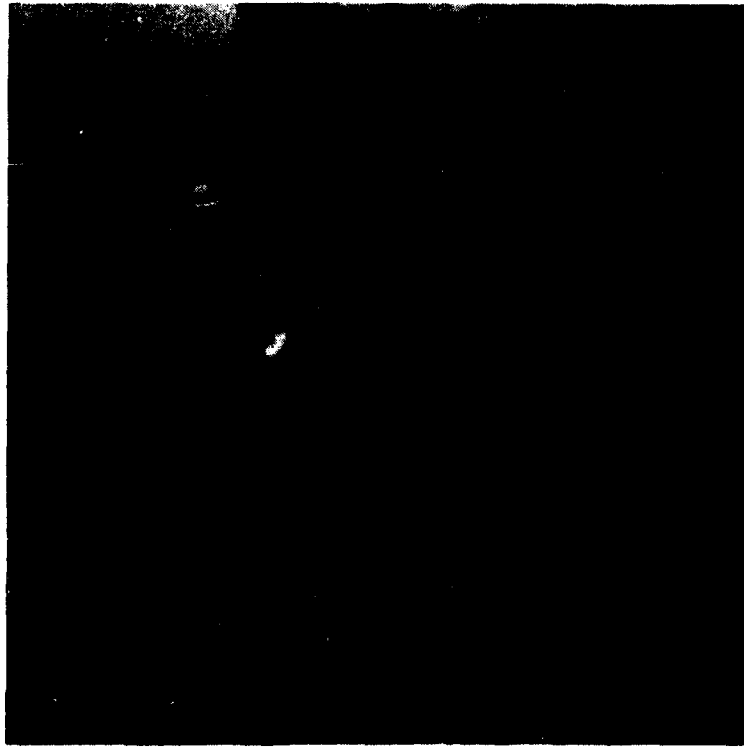
Station 17+75, Offset 325 feet upstream. Elevation 546 feet. 24 Aug. 7
Left abutment shale preparation for fillet placement, final foundation. Highly weathered shale at juncture of major and minor joints.



Station 17+90, Offset 300 feet upstream, Elevation 551 feet. 5 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.



Station 18+36, Offset 200 feet upstream, Elevation 551 feet. 1 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.



Station 18+06, Offset 150 feet upstream, Elevation 551 feet. 1 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N74E, Dip vertical, average spacing 0.1 feet.



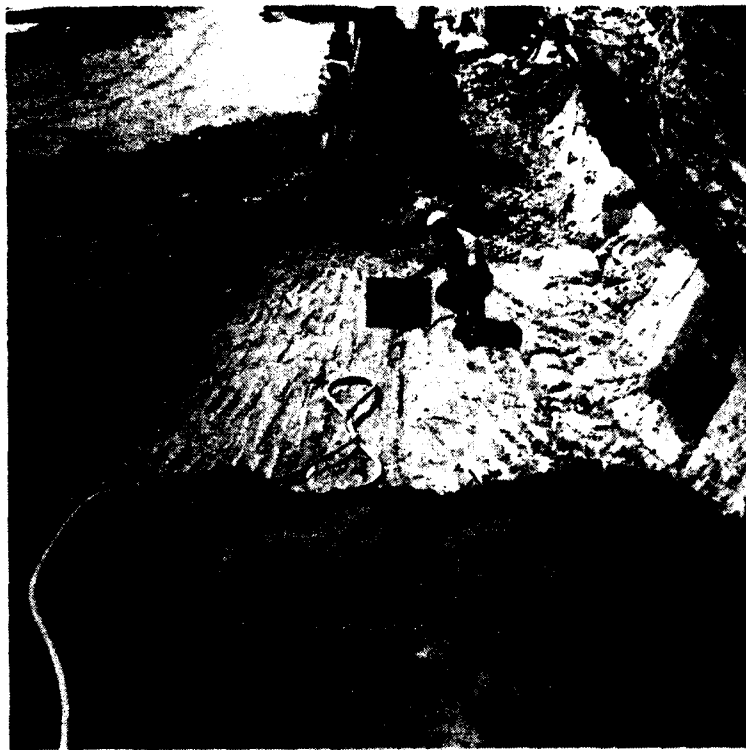
Final foundation preparation for fillet placement. Left abutment upstream
pseudocore area, concrete fillets at Chouteau limestone-Hannibal shale contact.
Summer 1980.



Station 18+11, Offset 13 feet downstream, Elevation 547 feet. 23 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.



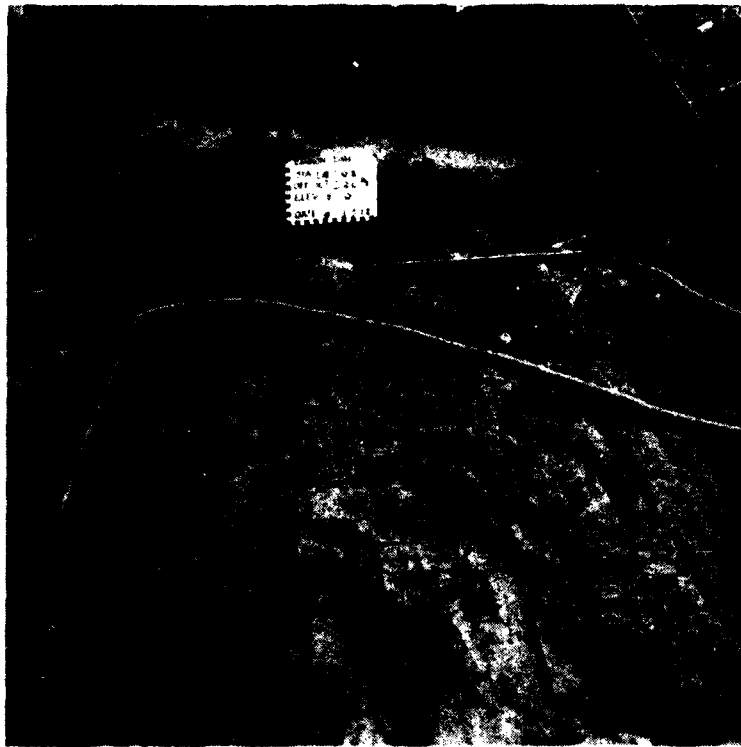
Station 18+05, Offset 25 feet downstream, Elevation 548 feet. 22 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N76E, Dip vertical, average spacing 0.3 feet.



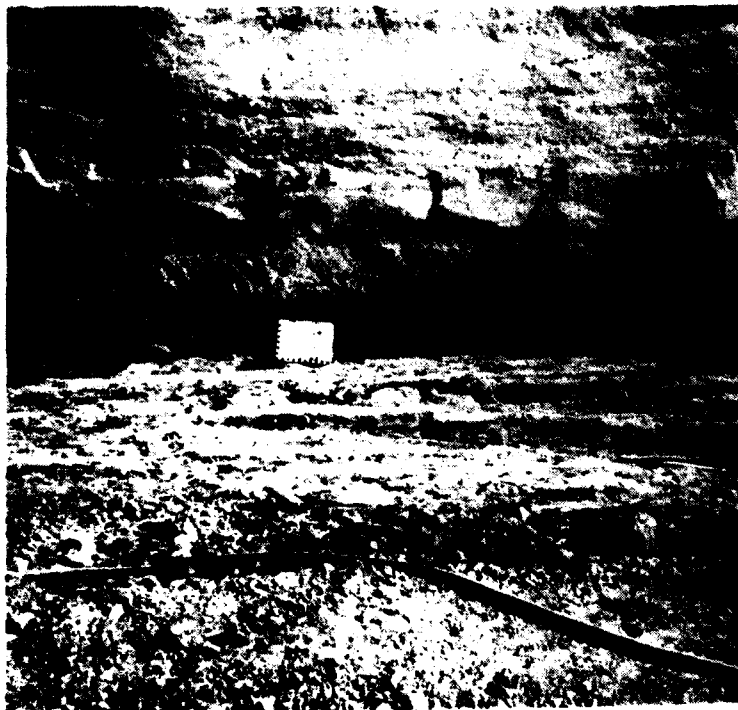
Station 18+05, Offset 35 feet downstream, Elevation 549 feet. 21 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Note high angle relief jointing on floor and directly below contact at right
of photograph. Joint set: Strike N76E, Dip vertical, average spacing 0.5 feet.



Station 18+05, Offset 55 feet downstream, Elevation 549 feet. 21 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Note high angle relief jointing on floor and directly below contact.
Joint set: Strike N76E, Dip vertical, average spacing 0.5 feet.



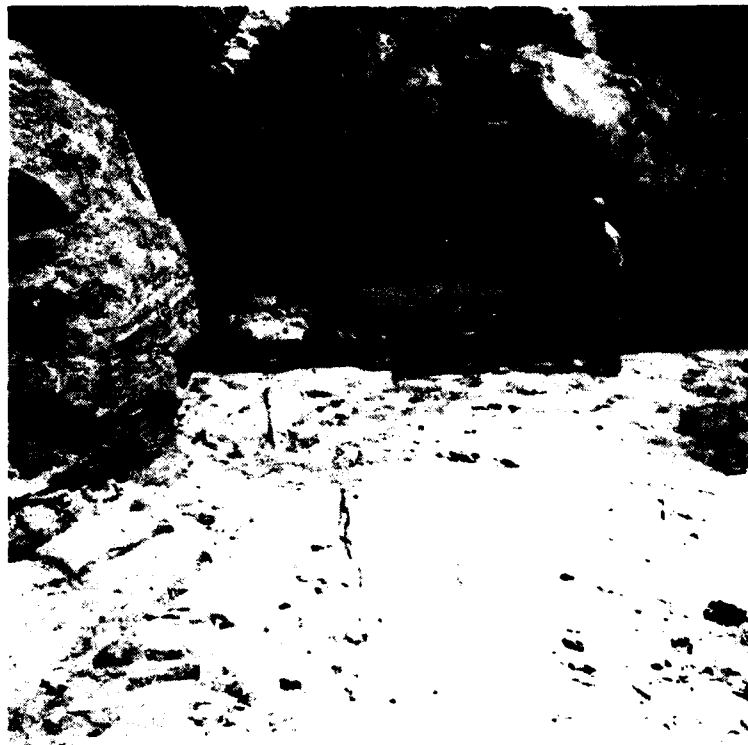
Station 18+05, Offset 120 downstream, Elevation 550 feet. 15 Aug 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N65E, Dip vertical, average spacing 0.1 feet to 0.6 feet.



Station 18+05, Offset 170 feet downstream, Elevation 550 feet. 28 July 78.
Left abutment shale preparation for fillet placement, final foundation.



Station 17+84, Offset 270 feet downstream, Elevation 550 feet. 27 July 78.
Left abutment shale preparation for fillet placement, final foundation.



Station 17+90, Offset 320 feet downstream, Elevation 550 feet. 27 July 78.
Left abutment shale preparation for fillet placement, final foundation.



Station 17+71, Offset 344 feet downstream, Elevation 549 feet. 27 July 78.
Left abutment shale preparation for fillet placement, final foundation.
Joint set: Strike N76E, Dip vertical, average spacing 0.2 feet to 0.5 feet.



Station 17+92, Offset 220 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



Station 17+84, Offset 270 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



Station 17+90, Offset 320 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



Station 17+90, Offset 330 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



Station 17+71, Offset 350 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



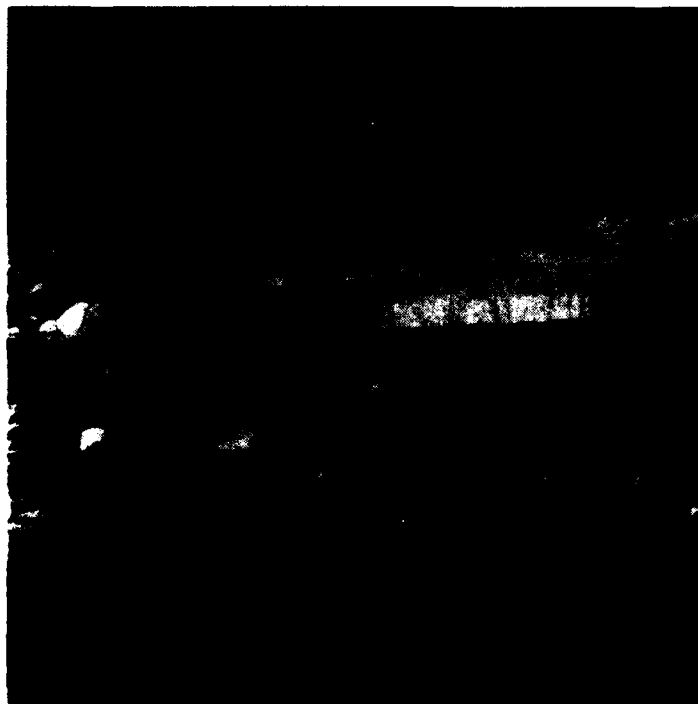
Station 17+71, Offset 370 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



Station 17+77, Offset 395 feet downstream, Elevation 549 feet. 28 July 78.
Left abutment downstream embankment, 1 on 1 slope prior to fillet placement.
Maroon line at top of photograph is approximate final grade of fill.



General overview of excavated left abutment and completed concrete fillets. Black line denotes approximate downstream limits of pseudocore preparation. September 1980



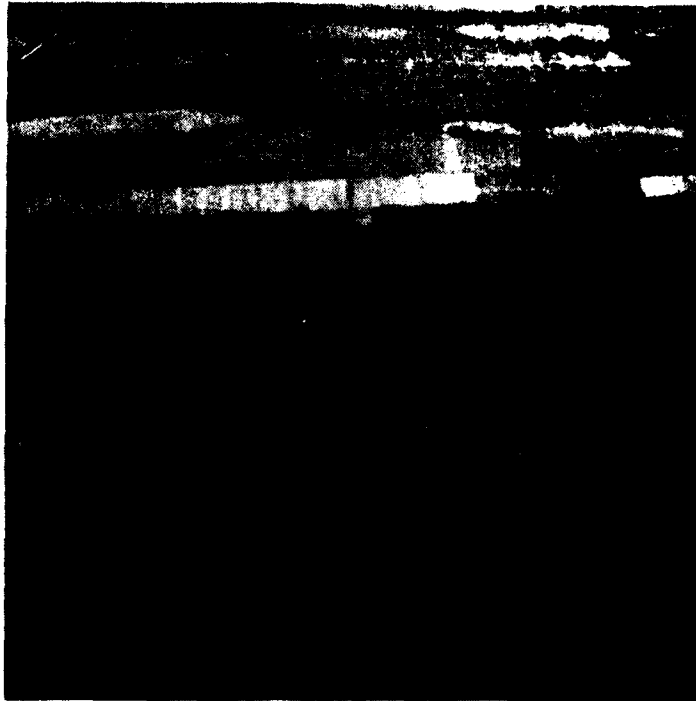
Left abutment upstream basal concrete fillets. August 1979



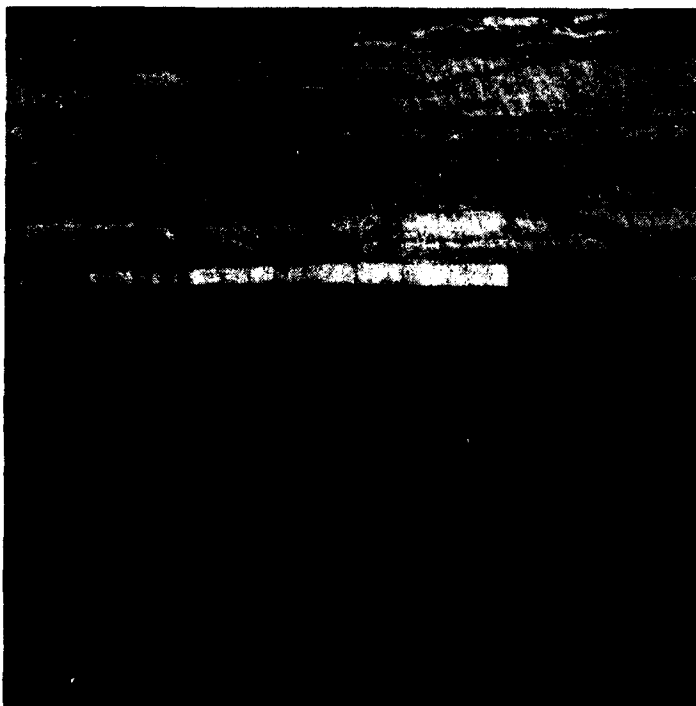
Left abutment upstream concrete fillets. Large fillet in foreground is at Hannibal Shale and Chouteau Limestone contact. Aug 79.



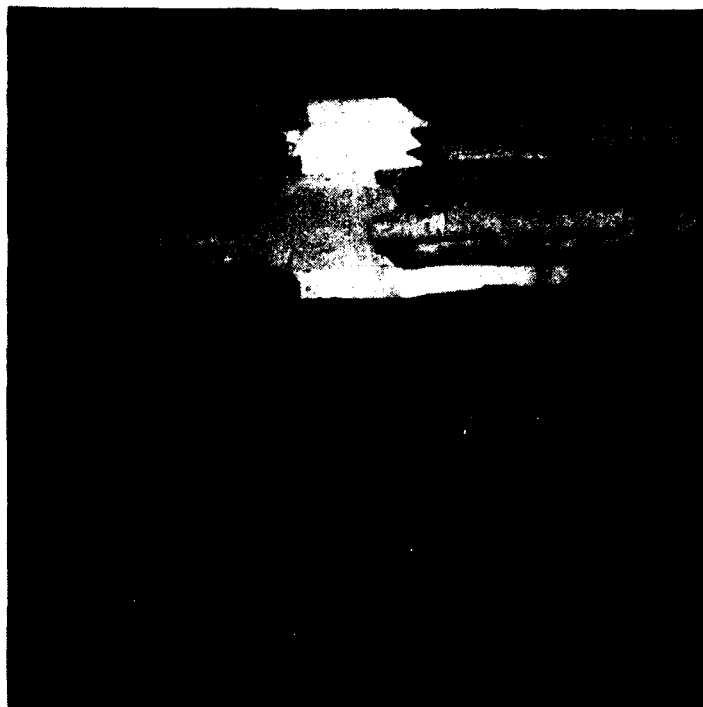
Left abutment upstream concrete fillets. Aug 79.



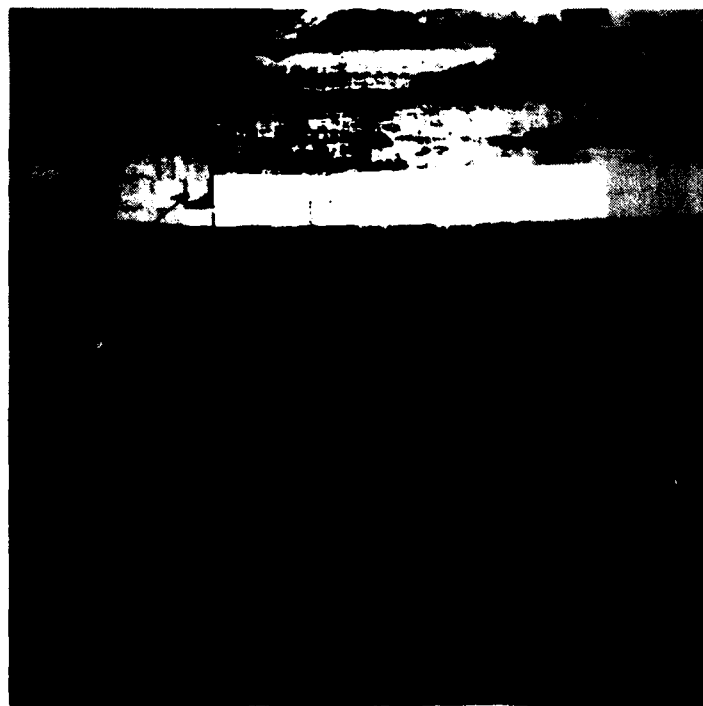
Left abutment upstream concrete fillets. Aug 79.



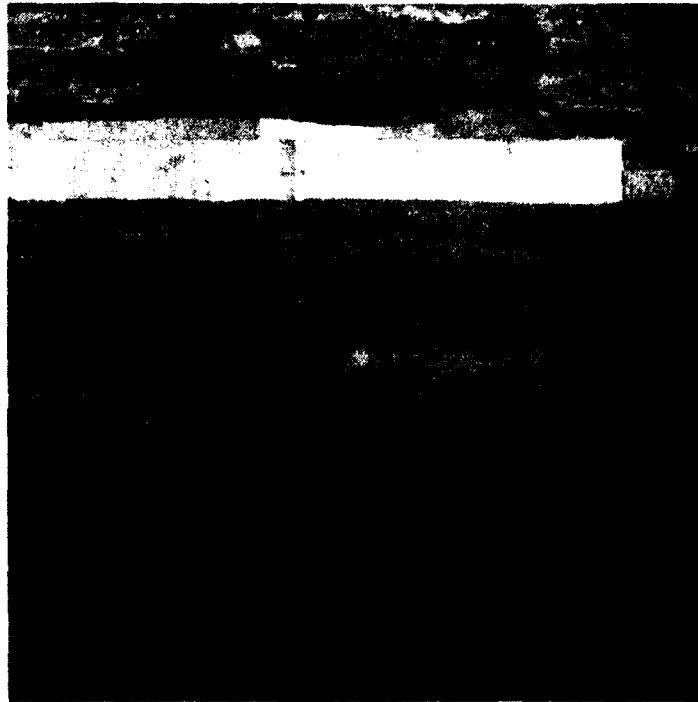
Left abutment upstream concrete fillets. Aug 79.



Left abutment concrete Cutoff Wall. Aug 79



Left abutment downstream concrete fillets.
Yellow line denotes downstream limits of pseudocore preparation. Aug 79.



Left abutment downstream basal concrete fillets.
Line is approximate final grade of fill. Aug 79.



Left abutment downstream concrete fillets.
Cutoff Wall is visable on left edge of photograph. Aug 79.



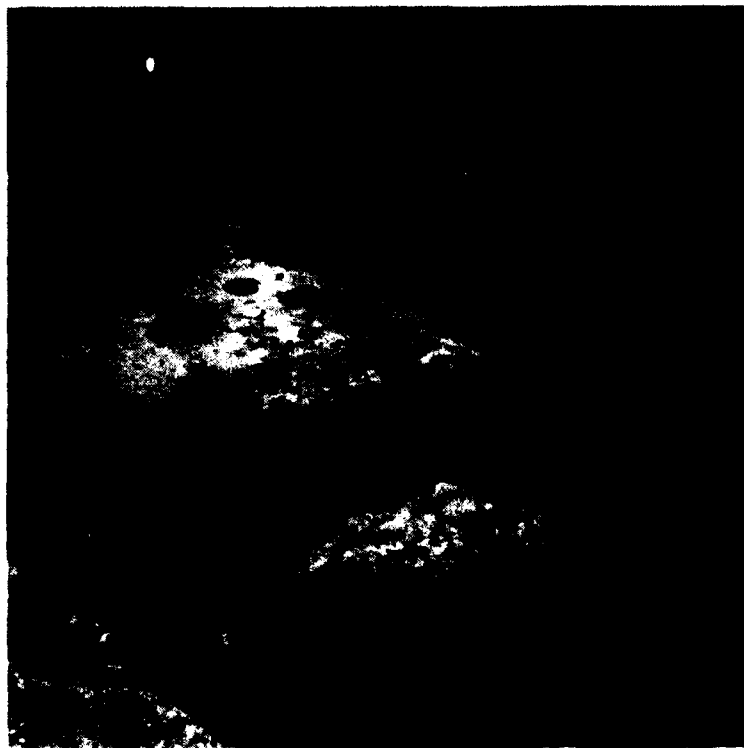
Left abutment cutoff wall, initial presplit of floor. 7 April 1978.



Left abutment cutoff wall excavation, view to the south. June 1978.



Left abutment cutoff wall excavation, view to the east. 28 Sept. 1978.



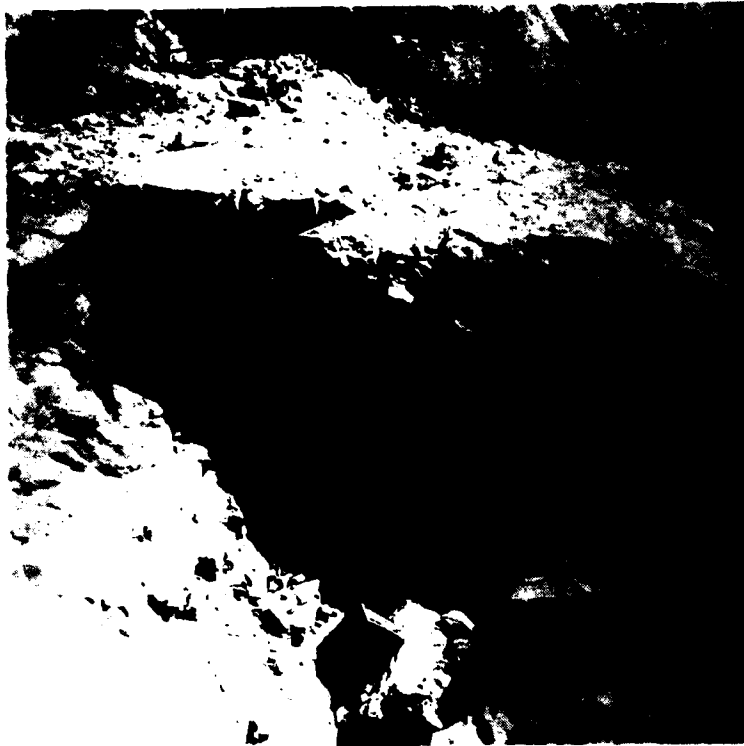
Left abutment cutoff wall, note degree of fracturing. April 1978.



Left abutment cutoff wall excavation, production shot from elevation 590-600 feet. View to the north. 11 April 1978.



Left abutment cutoff wall excavation. production shot from elevation 590-600 feet. Note degree of fracturing. 12 April 1978.



Left abutment cutoff wall excavation, production shot from elevation 590-500 feet. Note degree of fracturing. 12 April 1978.



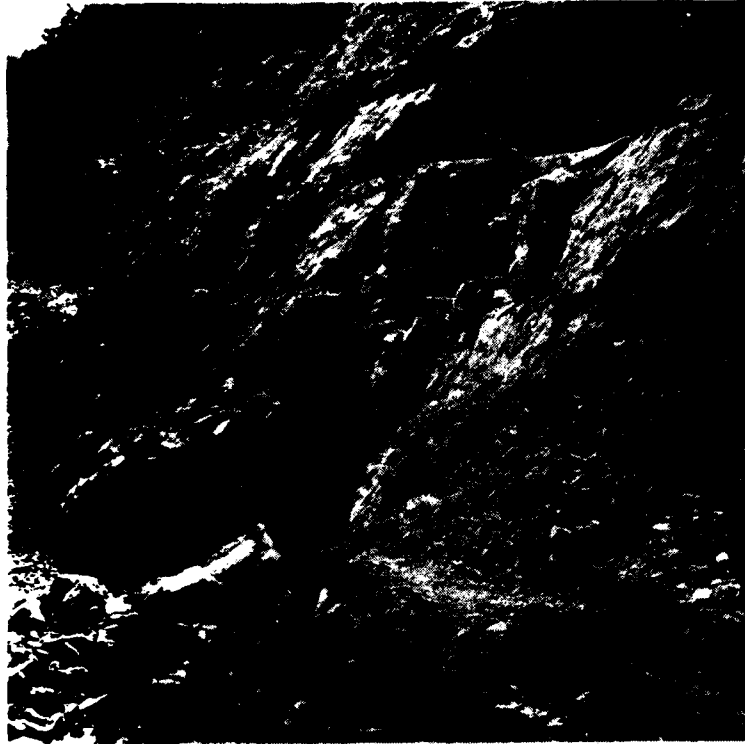
Left abutment cutoff wall excavation, loading of production blast from elevation 590-600 feet. 22 April 1978.



Left abutment cutoff wall excavation, cleanout of cavity#1 on upstream face. June 1978.



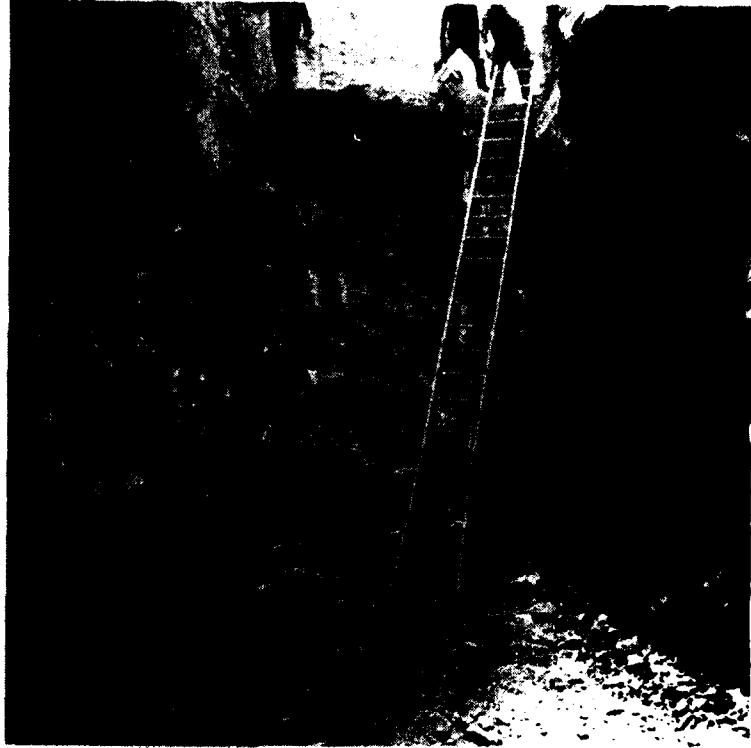
Left abutment cutoff wall excavation, presplit blast from elevation 570-590 feet. Note degree of fracturing. July 1978.



Left abutment cutoff wall excavation, production shot between Station 18+24 to 18+38 at elevation 570-590 feet. June 1978.



Left abutment cutoff wall excavation, production shot between Station 18+24 to 18+38 at elevation 570-590 feet. June 1978.



Left abutment cutoff wall excavation, results of production shot adjacent to cavity#1. 21 June 1978.



Left abutment cutoff wall excavation, results of production shot. 21 June 1978.



Left abutment cutoff wall excavation, cleanout of downstream Cavity#1.



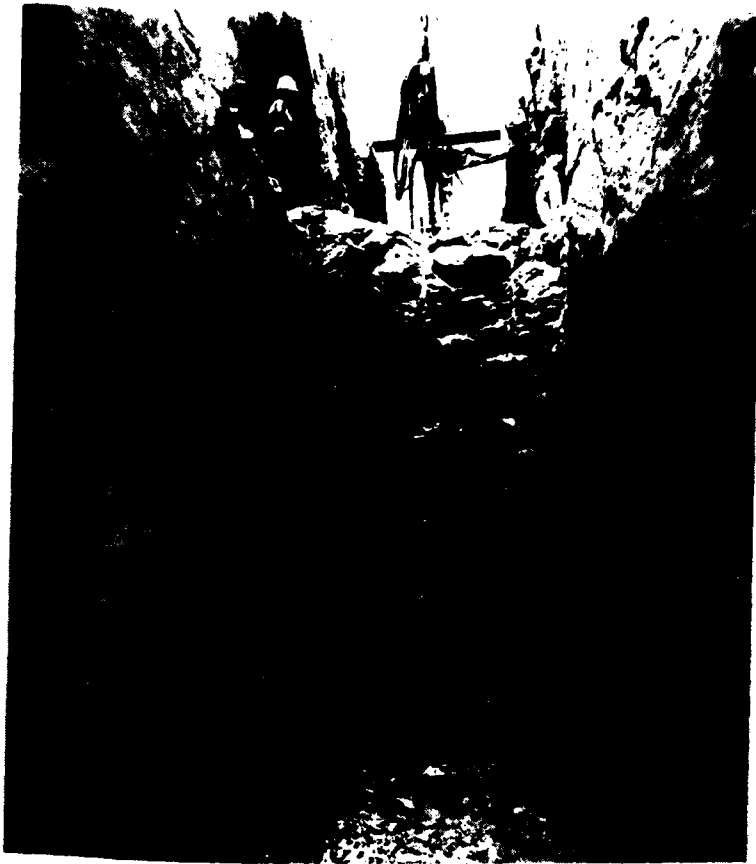
Left abutment cutoff wall excavation, cleanout of downstream cavity#2.



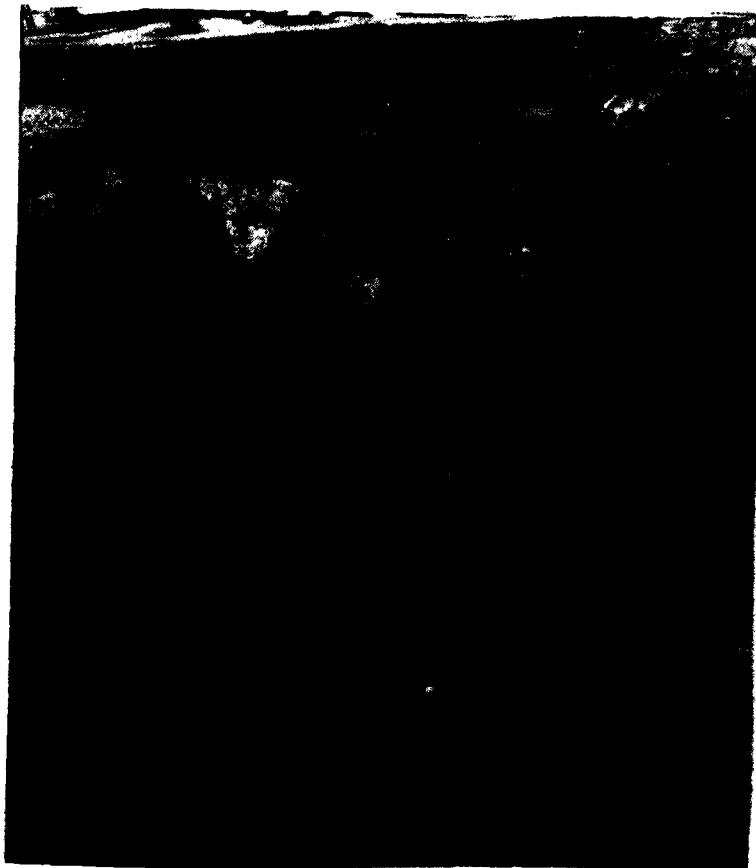
Left abutment cutoff wall excavation from elevation 553-570 feet.



Left abutment cutoff wall excavation from elevation 553-570 feet.



Left abutment cutoff wall excavation, looking north, elevation 553-570 feet



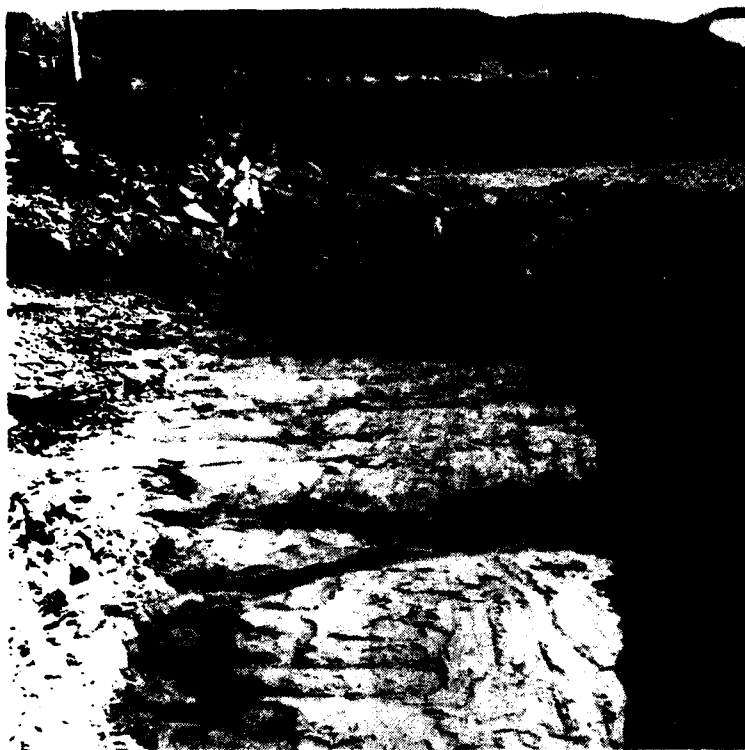
Left abutment cutoff wall excavation from elevation 553-570 feet, looking south.



Left abutment cutoff wall excavation from elevation 553-570 feet, looking north.



Left abutment cutoff wall excavation, production shot from elevation 553-570 feet. 22 July 1978.



Left abutment cutoff wall final foundation, Hannibal Shale,
Station 18+00, Elevation 547.2 feet. 22 August 1978



Left abutment cutoff wall final foundation, Hannibal Shale.
Station 18+19, Elevation 547.2 feet. 22 August 1978

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