VALLEY FALLS DAM

VERNON, CONNECTICUT

#14612

(860)742-9019
588 Stonehouse Rd.
Coventry, CT 06238

INSPECTION REPORT

PREPARED FOR:

TOWN OF VERNON

OCTOBER 1997

KARL F. ACIMOVIC, P.E. & L.S.
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October 27, 1997

Mr. Bruce Dinnie, Director
Vernon Parks and Recreation
120 South Street
Vernon, Connecticut 06066

Re: Engineering Inspection
Valley Falls Pond Dam / DEP #14612
Vernon

Dear Mr. Dinnie:

Enclosed is an inspection report of your dam, detailing its condition and making recommendations for improvements. It is in generally poor to fair overall condition, requiring some essential modifications and improvements. Three copies are provided, one with color photos and two with color copies. Should you require additional copies, please let me know.

As you will note in the inspection comments, the most severe and immediate problems include stumps from trees which grew on or near the embankments, the poor structural condition of the downstream earth embankment, seepage from the downstream toe of the earth embankment, the poor condition of the secondary spillway and the inadequate spillway capacity for a design storm of 100-year recurrence interval. All of these problems appear to have been present for some time, as evidenced by the condition of the spillway concrete and the size of the stumps on the embankments. In checking with the Dam Safety Section of the Inland Water Resources Unit of the Department of Environmental Protection, there were no apparent inspections done by them in prior years. One note in their file, however, indicates that they visited the site in November of last year and found the dam to be in fair to poor condition, an assessment with which I concur.

Although the dam does not appear to be in immediate danger of failure, a significant storm could wash over the top of the embankment and erode the crest and slopes, leading to the transport of sediment and embankment soil materials to downstream locations, blocking the road crossing and overtopping the road, and possibly lead to a loss of a significant recreational area. Because of these potential problems, I would recommend improvements be designed for a storm return frequency of 100 years.

It is also noteworthy that this is a historical area, with the old trout hatchery just upstream of the pond and dam recently named to the National Register of Historical Places. This would make preservation of the surrounding area - particularly the pond and dam - especially important. Recommended improvements should, therefore, take these historical aspects into consideration.

Recommendations have been shown on the attached sketch and include the following items. Although alternatives were considered, the recommendations shown are essential to any repairs and modifications. Alternatives should, therefore, take into consideration the historical and aesthetic appearance of the site and its features.

(1) **Remove Additional Trees** - At the left and right abutment areas, there are some trees close to the walls and embankments. The recommended separating distance from tree growth to any portion of the dam, toe or other embankment areas ranges from 20 to 30 feet. Because of extensive root growth of the trees in this area, I would recommend at least 25 feet.

(2) **Increase Existing Spillway Capacity** - Preliminary hydrologic and hydraulic calculations indicate that the existing spillway capacity is inadequate. In addition, the embankment has come close to being overtopped several times in the recent past. It appears that the capacity must be increased to at least three times the existing in order to pass a 100-year storm flow. Prior to any final design, I would recommend a detailed analysis to establish more precise numbers. Because of its construction, I would recommend retaining the downstream stone wall of the existing secondary spillway, removing and rebuilding the existing concrete walls and slab, and increasing the spillway capacity with new concrete construction. Alternates here could include the use of form liners to give a stone masonry appearance or using actual stone facing after concrete has been installed. Along with new concrete training walls (i.e., walls along the side of the spillway channel), I would also recommend the installation of a new upstream cutoff wall. This would serve to cut off direct flow below the spillway that could seep out of the downstream face. [Note that a photo provided by you indicates seepage through the existing downstream stone wall of the secondary spillway during a period of higher flow.] Spillway reconstruction would also include some downstream channel modifications, namely widening and placement of riprap in the new channel section.

(3) **New Intake / Outlet Structure** - Because of the location, condition and relative inaccessibility of the existing low level outlet, it is recommended that a new outlet structure be installed to the right of the newly proposed spillway section as shown on the attached sketch. This structure could take many configurations, but I would recommend an accessible upstream location attached directly to the spillway training wall. This structure would be simpler in design, with an upstream trash rack and weir board slots at the intake and a sluice gate with a stem that could be operated from the top of the structure. Along with the construction of both this outlet and the spillway, new safety railing or fencing would also be required.

(4) **Embankment Reconstruction and Toe Drain Installation** - Because of the steep slopes and poor embankment conditions, the stumps and brush should be removed. Placement of impervious material on the upstream slope, along with riprap protection, is highly recommended. This slope should be a minimum of 2H:1V. On the downstream

side, I would recommend placement of more pervious gravel material to achieve a 3H:1V slope. This slope grade would make maintenance much easier. In addition, a new toe drain must be installed to prevent both seepage through the toe area and unsaturated conditions along the slope. Inherent in this recommendation would be retaining the existing stone wall along the downstream crest to preserve the historical appearance of the site.

(5) **Remove and Reconstruct the Existing Primary Spillway** - Because of poor flow conditions, unknown foundation conditions, open masonry construction and possible voids behind the walls, I would recommend removing and then reconstructing this spillway section. It could be incorporated into the newer spillway construction, but may be historically significant in its present location. Facing, as previously mentioned, could be actual stone or form liners to give a stone appearance. Because the existing slope drain from the beach area now discharges below water level at the upstream end of this spillway, I would recommend relocating it as shown on the sketch in order to more easily monitor and maintain it.

Access to various portions of the site as well as proximity to disposal areas and material source areas will add some expense to the normal construction costs anticipated for this dam. Water level would have to be significantly lowered for the duration of the construction, but might be combined with other pond and beach area improvements. A preliminary construction cost estimate for the work noted above would be in the range of $300,000., not including pond or beach area improvements. Engineering design costs, including wetland delineation, one to two days of test borings, soil sampling and DEP permitting are estimated at $30,000.

The word preliminary should be stressed here, since further study will be required to size and design specific elements of the required modifications. In addition, no contingencies have been included at this stage (a minimum of 15% to 20% is usually recommended at this stage for unforeseen circumstances when working on old dams). Prices are based on recent contract unit costs for similar work; actual cost to you could be reduced by performing some of the work with your own forces and making use of some of the existing materials from removals - namely stone.

Should you be interested in meeting to discuss this report or its recommendations or if you have any questions or concerns about any of the findings, please contact me at your convenience.

Sincerely yours,

Karl F. Acimovic

Karl F. Acimovic, P.E. & L.S.

enclosures

INSPECTION REPORT

DEP / INLAND WATER RESOURCES DIVISION

INSPECTION CHECK LIST

DAM NAME & NUMBER: Valley Falls Dam / #14612

INSPECTION DATES: July 17, 1997 (Diving Inspection)
September 30, 1997; October 17, 1997

IMPOUNDMENT AREA: Valley Falls Pond

POOL LEVEL: 2 inches above primary spillway
10 inches below secondary spillway
Flow ≈ 0.5 cfs (10-17-97)

WEATHER CONDITIONS: Clear, Sunny

INSPECTOR(S): Karl Acimovic

ACTION TAKEN:

DAM / EMBANKMENTS The dam consists of a combination earth embankment and stone wall on the downstream side (see photos and sketch). The downstream slope is covered by unmaintained grass and brush. The top of the dam and the upstream slope consist of a grass cover, and a hiking path (headed toward the old railroad track area) crosses the top center line of the dam.

GENERAL CONDITION: Fair - Based upon the condition of the downstream slope, which is steep, has inconsistent grades, shows signs of seepage, and is covered with stumps, old roots and brush.

VEGETATIVE COVER: The grass growth on top of the dam is in generally good condition and maintained by cutting on a regular basis. Downstream embankment vegetation, however, is largely uncontrolled; there is brush cover and some grass which is not cut or maintained on a regular basis. Although there is evidence that trees and brush have been cut in the recent past, there are signs that the embankment was not maintained prior to that. Many stumps and roots are still visible in both the embankment and crest area, with some stumps

as large as 22 inches in diameter. Some additional trees, because of size, root growth and proximity to the dam, still need to be cut along the toe area. In addition, there are many trees on top of the left abutment directly adjacent to the spillway walls which also need to be cut.

EROSION / BURROWS: There is erosion evident in several areas, although none appear to have resulted in any significant earth movement or sliding. These include the downstream slope, near saturated toe areas; on the upstream slope along the water's edge, where the ground is steep and almost vertical in grade; and along two low areas in the upstream embankment (one near the center and one about 30 feet east of the spillway) where pedestrian traffic for fishing access has created barren soil areas. Although no large animal burrows were noted, there is a visible sign of mole activity along the crest just north of the path crossing the dam. This often results in poor grass growth and leads to erosion when located along sloped areas.

SETTLEMENT / ALIGNMENT / MOVEMENT:

There are no apparent signs of movement or alignment problems. The downstream stone masonry wall shows no signs of alignment deviation or movement.

Settlement was noted at a stump hole directly adjacent to the north side of the manhole cover for the outlet structure next to the spillway. This hole is about 3 feet in diameter and varies in depth up to about a foot deep. In addition, there is a low area of about 10 feet by 6 feet on the center of the upstream embankment, which may have resulted from a rotting stump - since roots are still evident. There are, however, no signs of cracks or openings in the earth as a result of the settlement.

SEEPAGE / FOUNDATION DRAINAGE:

Even at a relatively low water level in the pond, there is evidence of seepage along the downstream toe of the embankment. One is about 40 feet by 20 feet near the center line of the toe and the other is about 5 feet by 10 feet approximately 45 feet left (or west) of the primary spillway area. At present water level, the seepage is relatively slow and appears to be coming out of the lower embankment.

RIPRAP: No riprap was used on the embankment.

STONE MASONRY: Stone masonry (both wet and dry) was used for walls on the downstream embankment crest, the secondary spillway on the left side of the dam and at the old headrace channel (or primary spillway) on the right side of the dam. The walls on the embankment crest appear in generally fair to good condition where exposed surfaces are visible; their foundation conditions, however, are unknown.

CONCRETE CONDITION:

There is concrete at the secondary spillway, but none on the main embankment of the dam.

CRACKS: Not applicable.

OTHER:

SPILLWAY / TRAINING WALLS / APRON

Primary Spillway - This is what appears to be an old narrow headrace channel on the right (or east) side of the dam, about 3 feet wide and 3½ feet in height. It consists of large embankment stones at its upstream entrance and then changes to dry stone wall masonry just below the foot bridge. The reason it is called the primary spillway is that it is about a foot lower than the spillway at the left end of the dam and carries all normal low flow emanating from the watershed.

Secondary Spillway - This spillway consists of a deteriorated concrete slab with concrete training walls located at the west end of the dam; it is about 15 feet wide and 2½ feet in height. Its downstream support rests on a wet and dry stone masonry wall which has a vertical drop ranging from 8 to about 11½ feet. This spillway carries all flows exceeding the capacity of the primary low flow channel / spillway.

GENERAL CONDITION: Primary - Fair, based upon the condition of the stone training walls.

Secondary - Poor, based upon the condition of the concrete base slab.

SETTLEMENT / ALIGNMENT / MOVEMENT:

Primary - None apparent.

Secondary - None apparent.

STONE MASONRY:

Primary - Fair, as previously mentioned; stone walls show some visible voids between stones on the exterior face. This is often an indication of deeper voids behind the wall.

Secondary - The vertical downstream spillway wall is in fair condition. There is a void at the base of the wall at the left end directly beneath the left spillway training wall - apparently pushed out by tree roots which are visible in the hole. Grout between stones has also deteriorated and is missing in many locations.

CONCRETE CONDITION:

Primary - Not applicable; there is no concrete used here.

Secondary - The concrete is in poor condition. There are spalled areas along the training walls, and the top of the base slab has completely deteriorated. The top of the slab is gone, probably eroded by flow; aggregate has unraveled and rebar is showing in many locations. Grass is also growing in the top surface of the former slab.

CRACKS:

There is no cracking visible in the secondary spillway, since the top surface of the concrete has completely deteriorated.

SCOURING / UNDERMINING:

Primary - No scouring or undermining is apparent at this location.

Secondary - The top surface of the spillway slab is completely gone, scoured by past flow.

OTHER:

Primary - There are signs of minor erosion on top of the wall embankments on both sides of the channel.

DOWNSTREAM CHANNEL

The channel downstream of both the primary and secondary spillways consists of natural exposed rock and boulders. The secondary spillway channel also has riprap.

SCOURING: There is no sign of washout, scouring or undermining in either downstream spillway channel. There is one hole about 18 inches deep about 5 feet out from the face of the secondary spillway, but it does not represent a problem at this time. Stones have been displaced; there is, however, no immediate hazard since the base is founded on larger rock.

DEBRIS: Some wood debris is evident just at the bottom of the secondary spillway, but does not represent an impediment to flow at this time. I would recommend that such items be removed on a regular basis during routine maintenance.

RIPRAP: The small amount of riprap in the discharge channel at the base of the secondary spillway is in good condition. I would, however, recommend that the hole noted above be filled in during routine maintenance.

EMERGENCY SPILLWAY

Although there are two spillways, neither can actually be called an emergency spillway, since the primary is capable of handling only normal low flows. There is no formal emergency spillway on either abutment area.

CONCRETE CONDITION: N/A

STONE MASONRY: N/A

VEGETATIVE COVER: N/A

RIPRAP: N/A

OTHER: N/A

INTAKE STRUCTURE(S)

The intake structure for the low level outlet consists of a 24-inch pipe in the pond approximately 18.5 feet upstream of the end of the secondary spillway. The pipe invert is about 11 feet below the level of the primary spillway. Although the diver was unable to determine its makeup during the diving inspection (due to turbidity problems, i.e., poor visibility), the downstream end of the exposed pipe emanating from the outlet structure is clay tile pipe. The diver was able to determine its size and the makeup of the wall around the pipe which consists of a built up stone wall that rises about 3 to 4 feet above the top of the pipe.

GENERAL CONDITION: Poor - The pipe is relatively inaccessible and has not been maintained, probably due to its submerged location.

CONCRETE CONDITION:

Not applicable.

SETTLEMENT / ALIGNMENT / MOVEMENT:

None observable due to high turbidity conditions. By feeling his way around the structure, the diver found no apparent sign of collapse, settlement, or other movement of either the pipe or its surrounding headwall.

STONE MASONRY: Fair - The headwall as described above appears to be a coarse rubble stone wall. The diving inspection indicated some open void areas between stones. Further inspection was difficult due to high turbidity during summer conditions.

CRACKS: Not applicable.

OTHER: There was sediment at the base of the pipe, probably due to the lack of flow through the structure.

OUTLET STRUCTURE

The outlet structure is located directly adjacent to the right (east) side of the secondary spillway. It is a concrete structure containing a high weir type structure with a low level gate that has an offset control stem. Manhole steps are in poor condition. The diver, however, was able to gain sufficient access to make a determina-

tion of the concrete and valve condition. Because of its construction, access to the upstream portion of the structure was not possible.

GENERAL CONDITION: Fair to poor, based upon the condition of the control valve and the construction design.

CONCRETE CONDITION:

The concrete appears to be in fair condition, with no significant structural problems apparent. As noted above, however, manhole steps set in the concrete walls are in poor condition with missing rungs.

SETTLEMENT / ALIGNMENT / MOVEMENT:

None apparent.

SCOURING / UNDERMINING:

Not applicable.

STONE MASONRY: Not applicable.

OTHER: The valve is rusted and in an apparently inoperable condition. A decision was made not to operate the valve during this inspection, due to the possibility that it would not close after opening and thus drain the pond.

MISCELLANEOUS FEATURES

ACCESS - ROADS, BRIDGES, ETC.:

There are two foot bridges across the spillways - an 8-foot wide bridge over the primary spillway and a 5-foot wide bridge over the secondary spillway. Both appear to be in good condition with solid bearing on abutment walls. Wood appears to be firm with no obvious signs of deterioration.

SAFETY - FENCING, RAILING, ETC.:

Existing fencing located at the secondary spillway is in poor condition, with missing rail and deteriorating wood. In addition, there are additional areas that should have safety fencing along the spillway and downstream stone wall.

DOWNSTREAM HAZARD REASSESSMENT:

No change in hazard assessment at this time. There is a downstream road crossing with utility lines; the recommended design storm is a 100-year return frequency.

OTHER:

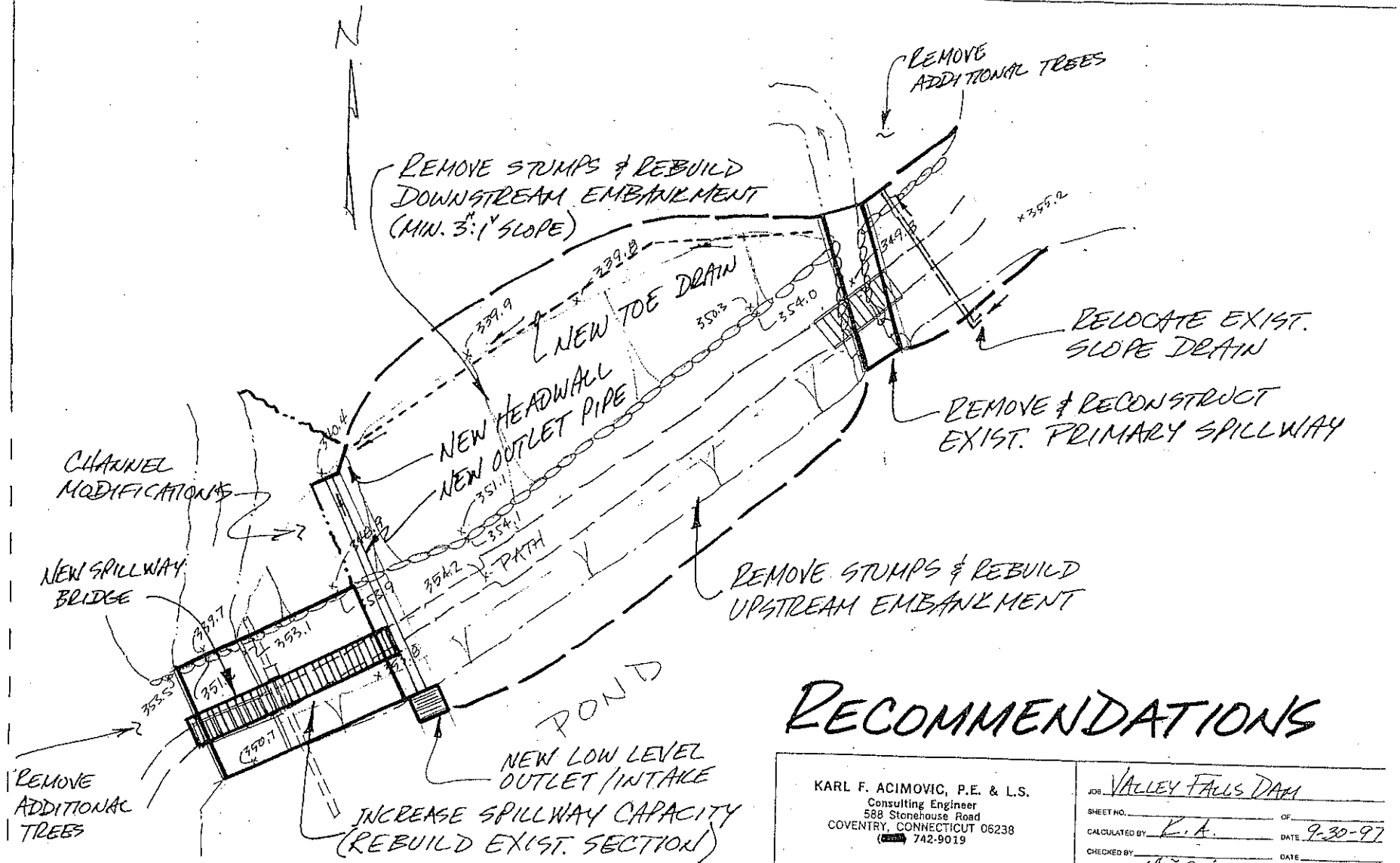
The diving inspection done in August was made somewhat difficult because of poor visibility. It did, however, yield some of the information noted above and the condition along the upstream side of the dam. The diver noted that there were no signs of obvious sinkholes or direct piping through the upstream area. He did note that there was a shallow but steep drop-off at the water's edge and the area consisted of sand and gravel to a point about ten feet out into the water. After that, he described the area as a bottomless muck with weeds ranging from 2 to 3 feet in height. He also found a small diameter PVC pipe below water level which discharged into the primary spillway channel and is apparently used to drain the embankment area surrounding the beach.

RECOMMENDATIONS

[See attached letter.]

SITE PLAN

(Existing & Recommendations)



RECOMMENDATIONS

KARL F. ACIMOVIC, P.E. & L.S.
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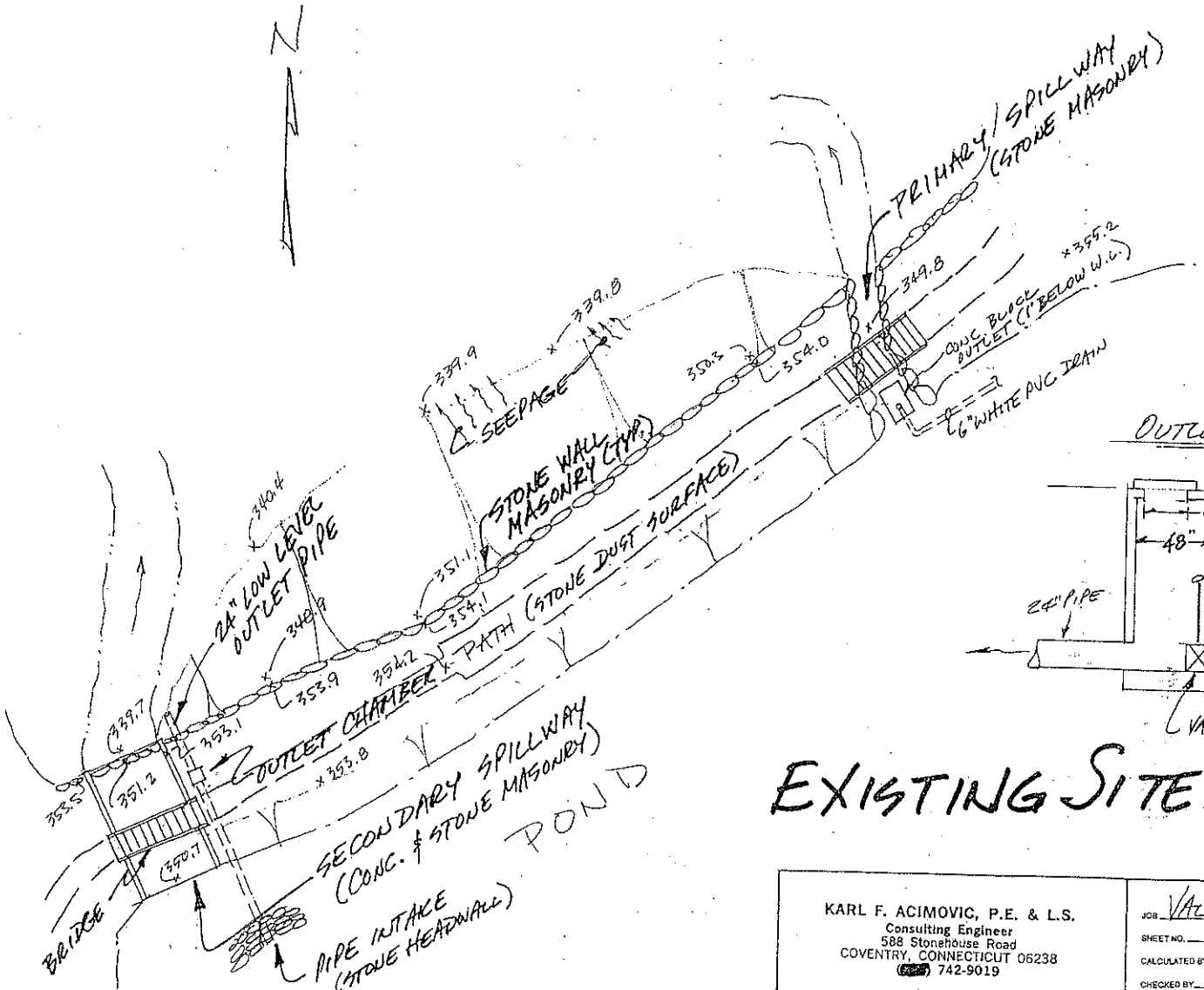
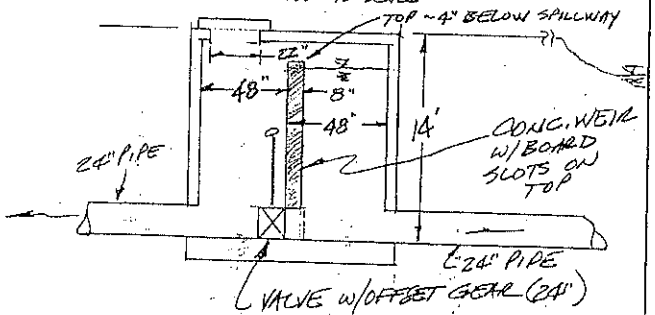
JOB VALLEY FALLS DAM
SHEET NO. _____ OF _____
CALCULATED BY K. A. DATE 9-30-97
CHECKED BY _____ DATE _____
SCALE 1" = 20'



OUTLET CHAMBER

NOT TO SCALE



EXISTING SITE PLAN

KARL F. ACIMOVIC, P.E. & L.S.
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PHOTOGRAPHS

(Taken 9-30-1997)

PHOTOGRAPHS

VALLEY FALLS DAM

Vernon, Connecticut

[Unless otherwise noted, "left" and "right" will refer to the side of the dam as one looks in a downstream direction. Photos were taken September 30, 1997.]

[1097B-4] Overview of the downstream embankment taken from the left side of the dam. Note the stone wall on the downstream crest and brush growing on the embankment and at the toe areas.

[1097B-5] The crest of the dam looking toward the right abutment area, taken from the left side adjacent to the secondary spillway. The bridge in the background crosses the primary spillway.

[1097B-6] The upstream side of the embankment. This view was taken from the center left side looking toward the beach area. Note the drop-off at the water line and tree stumps in various locations.

[1097B-7] Another view of the upstream side looking toward the left end of the dam. Note the vegetative and small brush growth along the water line.

[1097B-8] The left downstream embankment seen from the approximate center of the dam. Once again, note the small brush growth and the presence of a large stump in the right foreground.

[1097B-9] A view of the toe area in the same vicinity as the prior photo, the left downstream embankment. The secondary spillway discharge channel is in the background. The tree to the right is closer than the recommended distance to the toe of the dam.

[1097B-10] Another view of the left upstream slope showing one of the worn areas where minor erosion has taken place - probably from pedestrian access for fishing.

[1097B-11] A view of the upstream end of the secondary spillway. Note the vegetative growth on the embankments, along walls and in the spillway channel. In addition, tree growth on the left side of the spillway is too close. The bridge and hiking path are seen on the right side of the photo.

[1097B-12] A view of the bridge crossing the secondary spillway. In the right center of the photo is the wooden manhole cover for the outlet structure. Fencing is located along the edge of the spillway. Once again note the proximity of trees on the left abutment.

[1097B-13] The upstream end of the spillway channel looking toward the right side of the dam. The top surface of the slab has deteriorated completely and rebar is clearly visible. Note also the poor condition of the training wall on the right side of the slab.

[1097B-14] The downstream spillway crest consists of stone masonry. Note the concrete training walls on both sides and the vegetation growing in the channel.

[1097B-15] Another view of the spillway channel showing vegetation growing in the deteriorated concrete slab.

[1097B-16] The downstream stone masonry wall of the secondary spillway; view taken from the left side.

[1097B-17] A view of the downstream channel area taken through the branches of the trees close to the left abutment area. Note the debris in the channel at the base of the wall.

[1097B-18] The secondary spillway channel as seen from the downstream side.

[1097B-19] The downstream vertical stone masonry wall of the secondary spillway. Note the void at the base of the wall just below the left training wall and the bedrock foundation beneath the wall.

[1097B-20] A close-up of the downstream end of the low level outlet pipe. This is a clay tile pipe end; note the cracked and broken condition.

[1097B-21] A view of the secondary spillway area as seen from the right side of the downstream discharge channel. Note tree growth along left abutment.

[1097B-22] The center of the downstream embankment as seen from the toe of the dam. Stumps, poor grass growth, brush and open soil areas are clearly visible.

[1097B-23] Although obscured by vegetation, this view of the center downstream toe is the location of seepage passing through the base of the dam.

[1097B-24] Looking toward the right downstream embankment from the center toe area.

[1097B-25] The stone wall at the right downstream crest of the dam.

[1097C-1] Looking across the primary spillway bridge toward the left end of the dam. The access path for maintenance and hiking runs along the center line of the dam's crest.

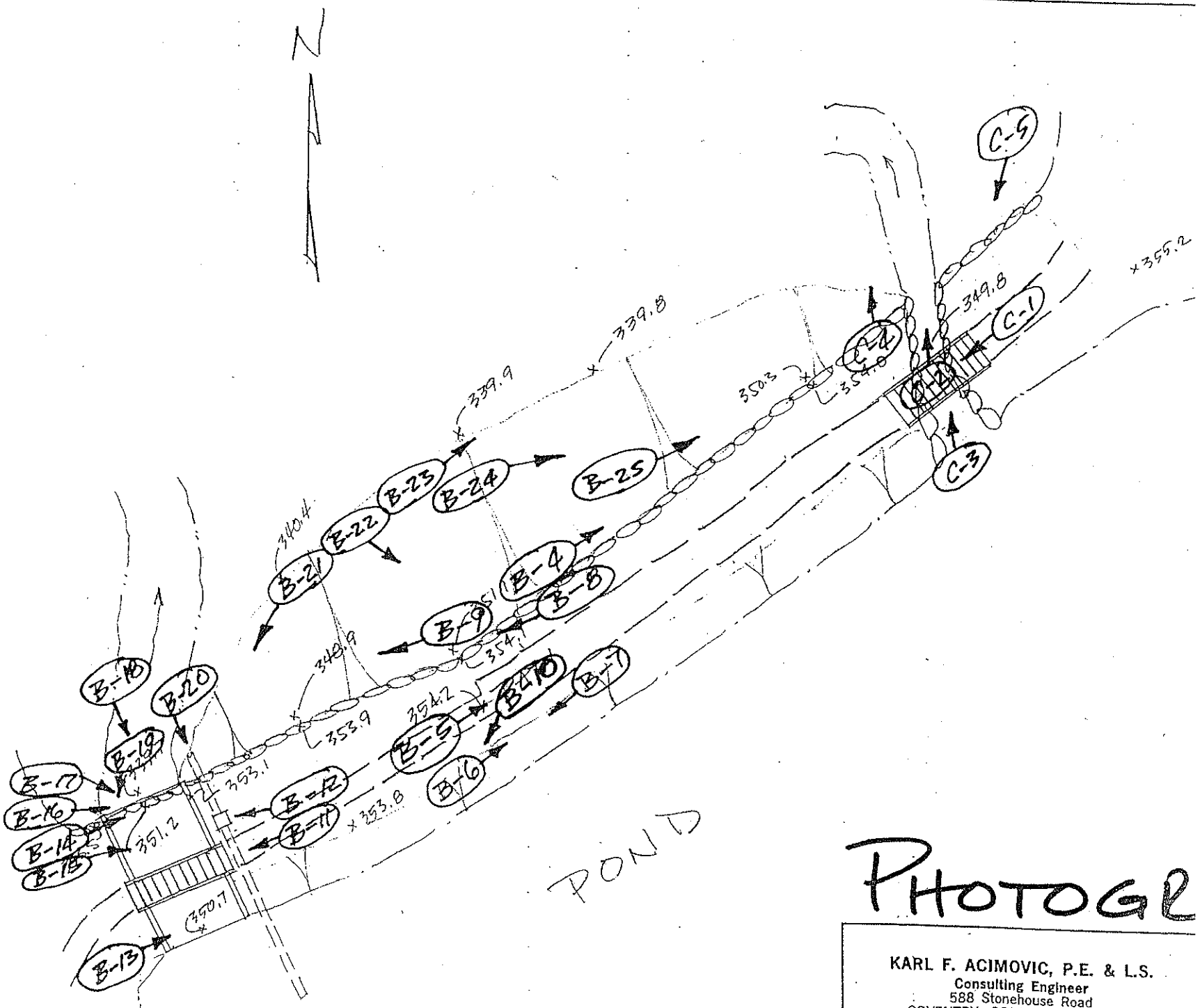
[1097C-2] The downstream end of the primary spillway discharge channel.

[1097C-3] A view of the same channel as seen beneath the bridge crossing. Note the difference in side channel slopes along the right side.

[1097C-4] The downstream end of the primary spillway discharge channel. The end of the walls seen in the photos above is to the right of this photo. Note the exposed rock outcrops and the trees growing along the downstream embankment area.

[1097C-5] Another view of the downstream end of the primary spillway discharge channel as seen from the right abutment area. The trees in the foreground are too close to the downstream embankment wall.

[1097C-6] An overview of the upstream side of the dam as seen from the beach on the right side. The bridge at the right of the photo crosses the primary spillway channel.



PHOTOGR

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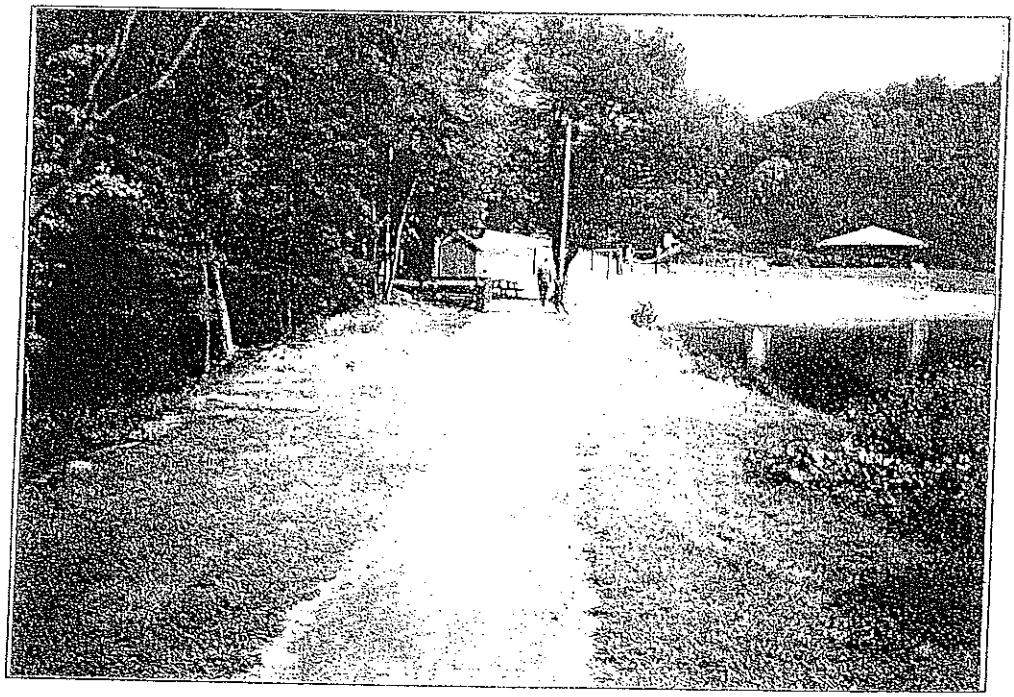
1097B-4 9-30-97



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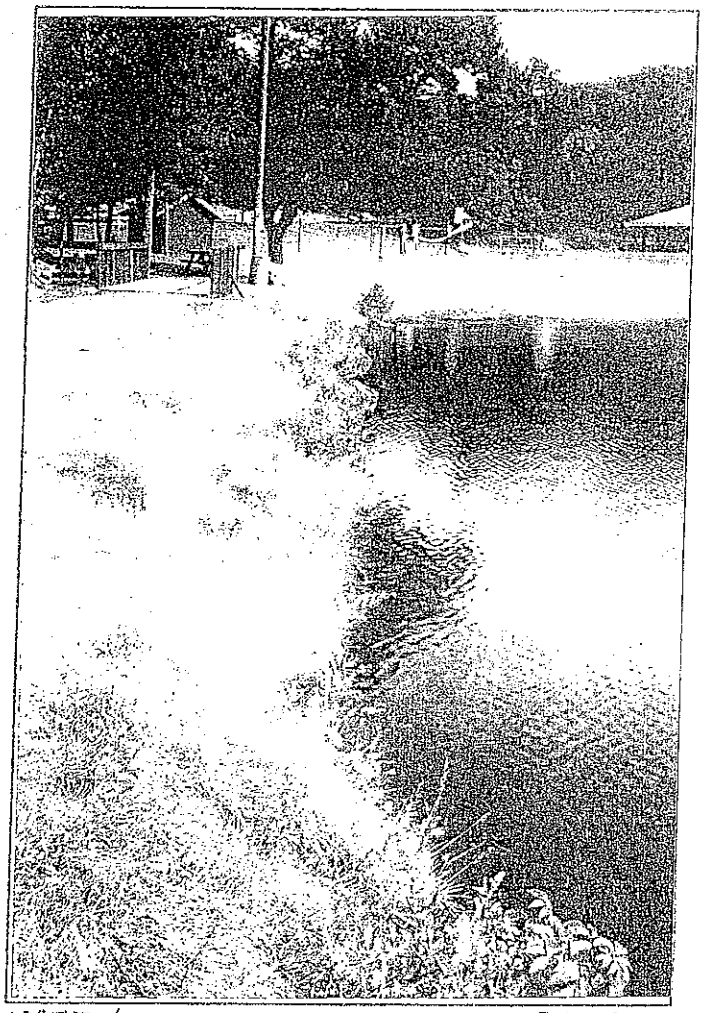

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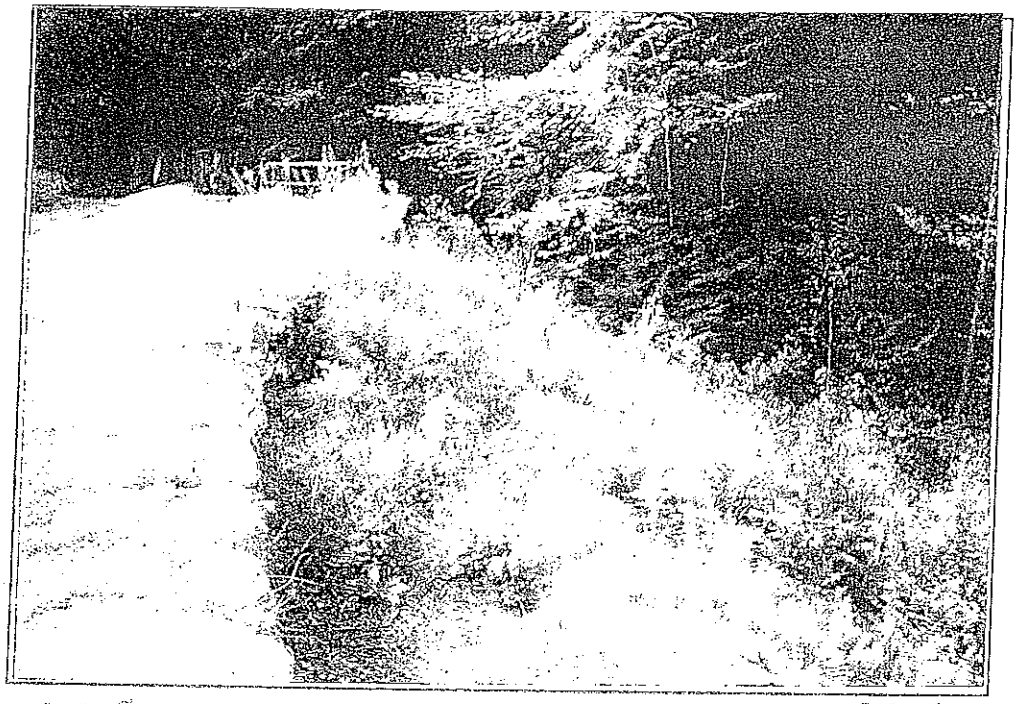

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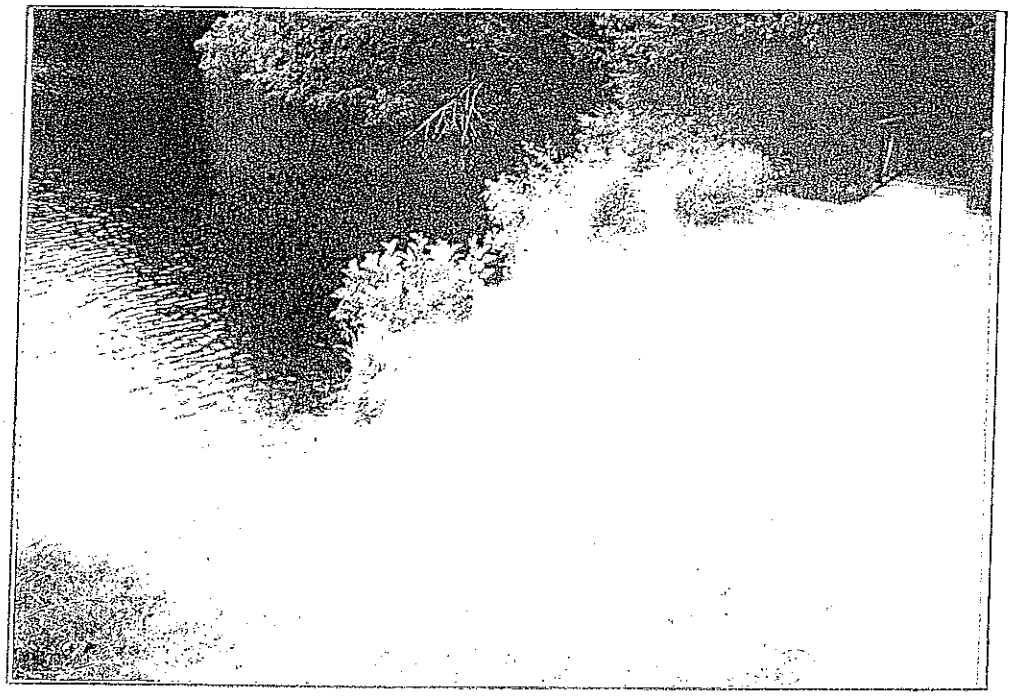

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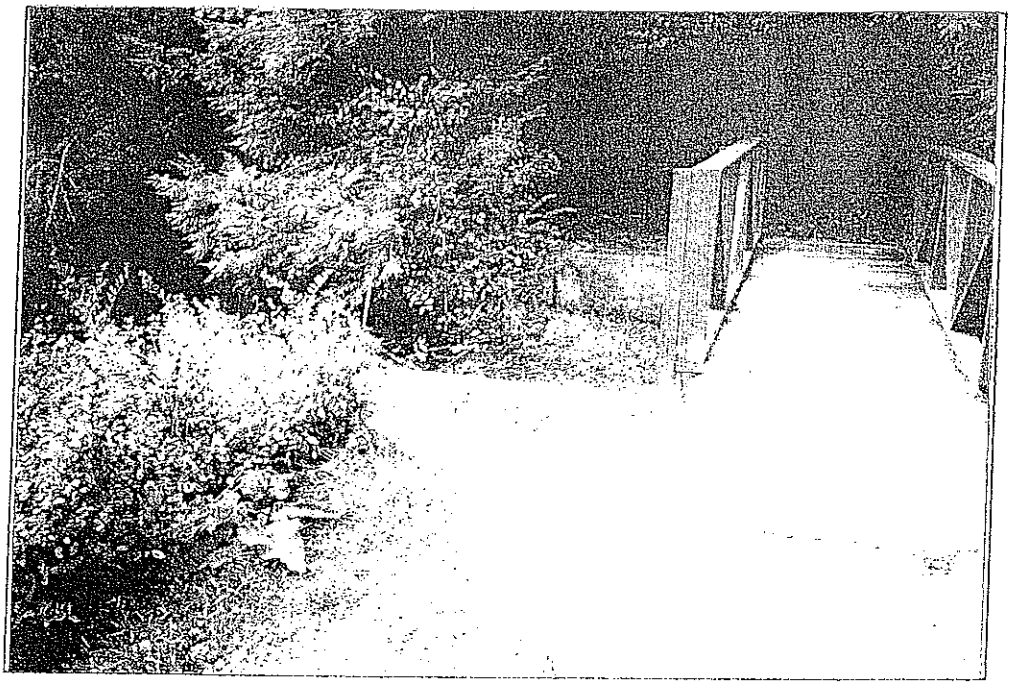

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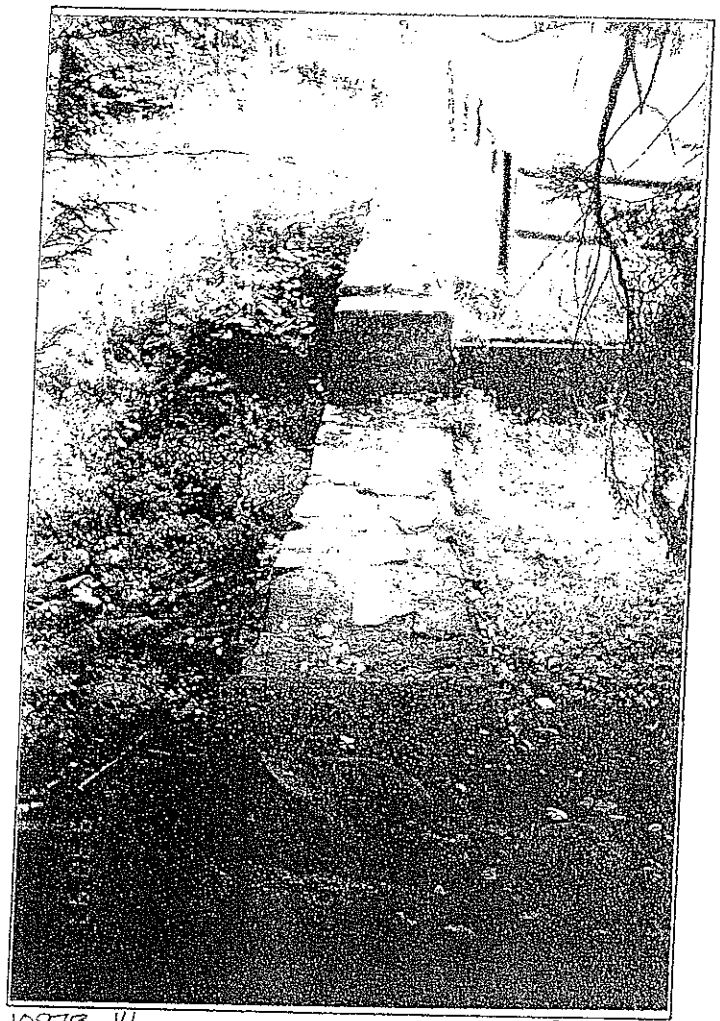

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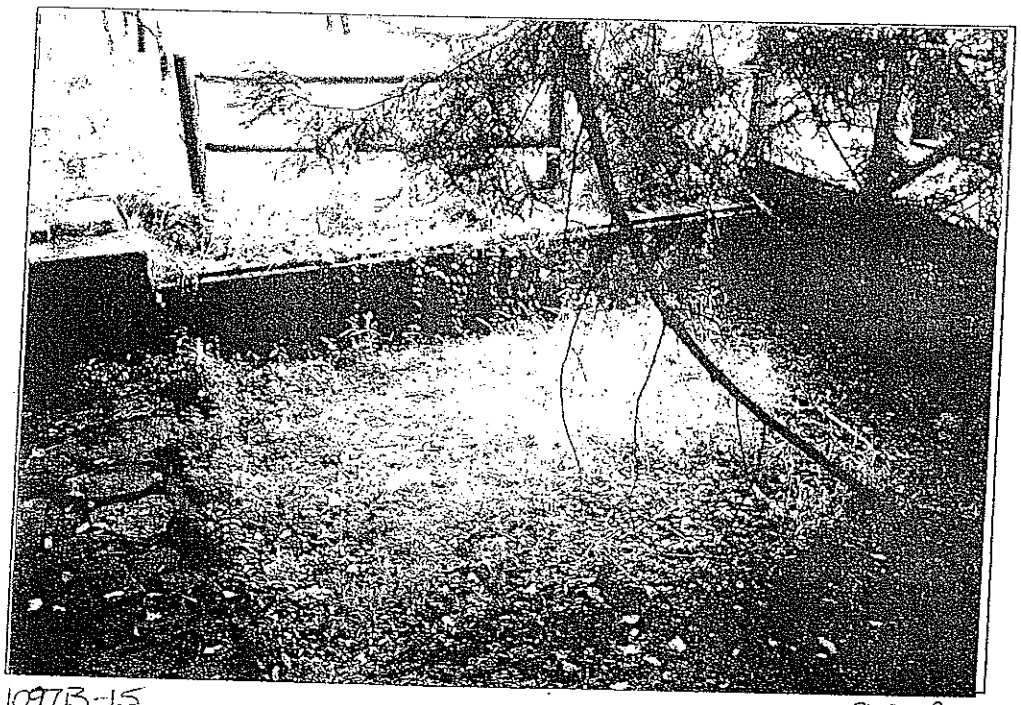

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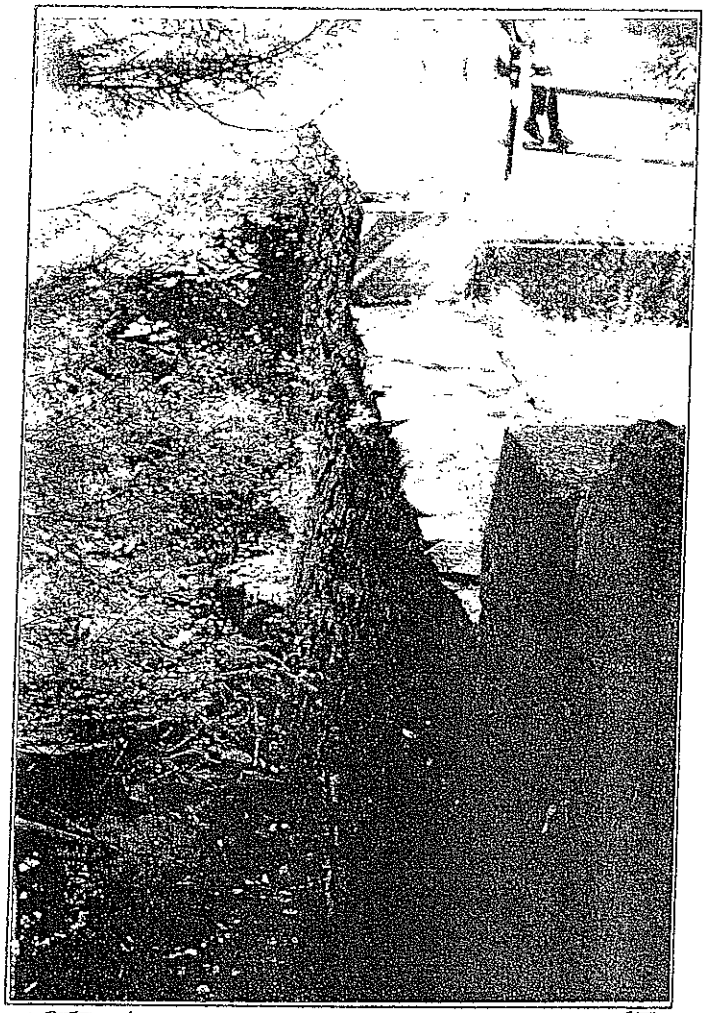

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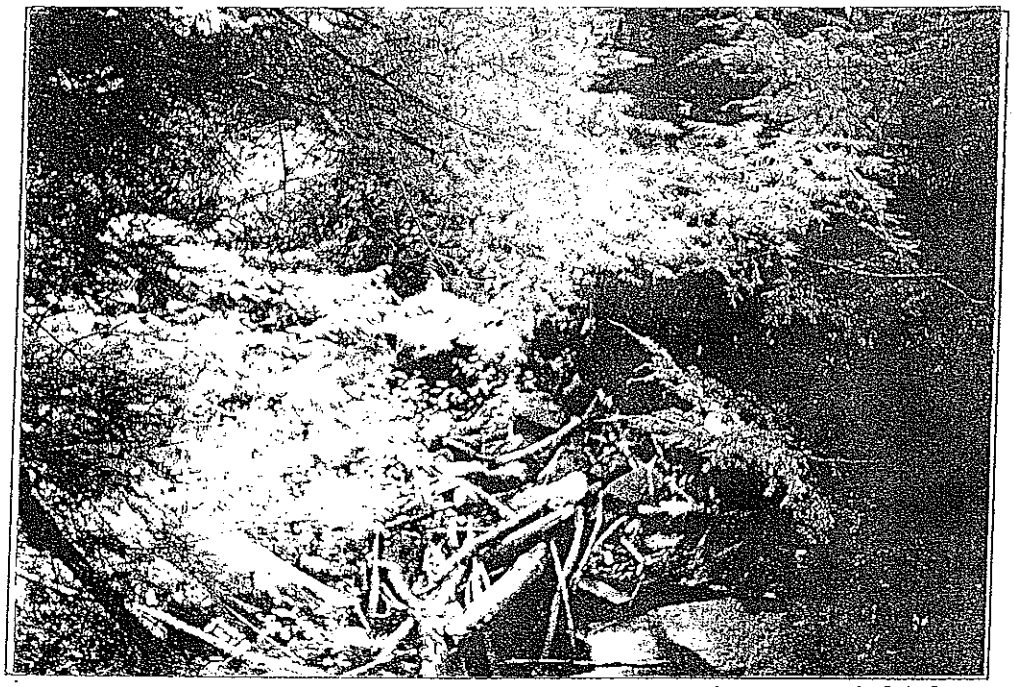
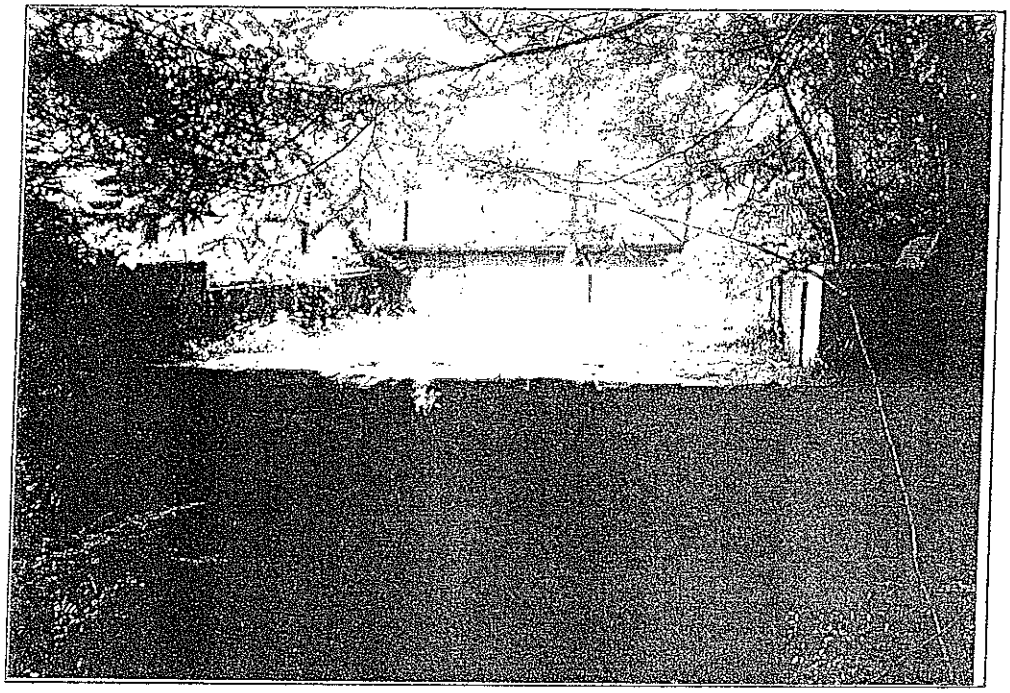


10978-17 9-30-97



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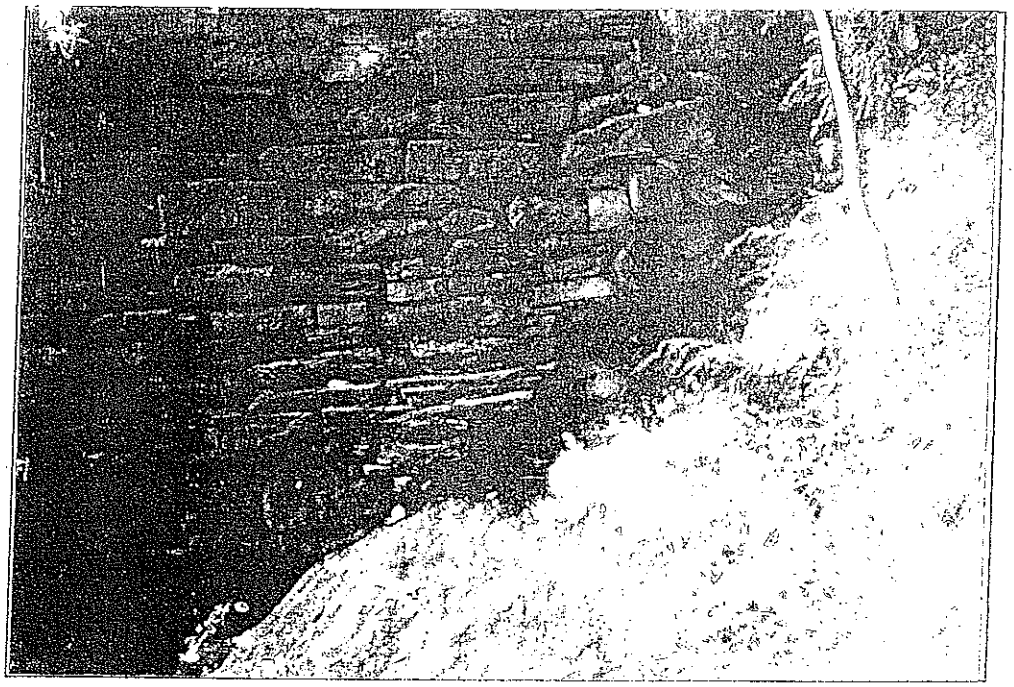

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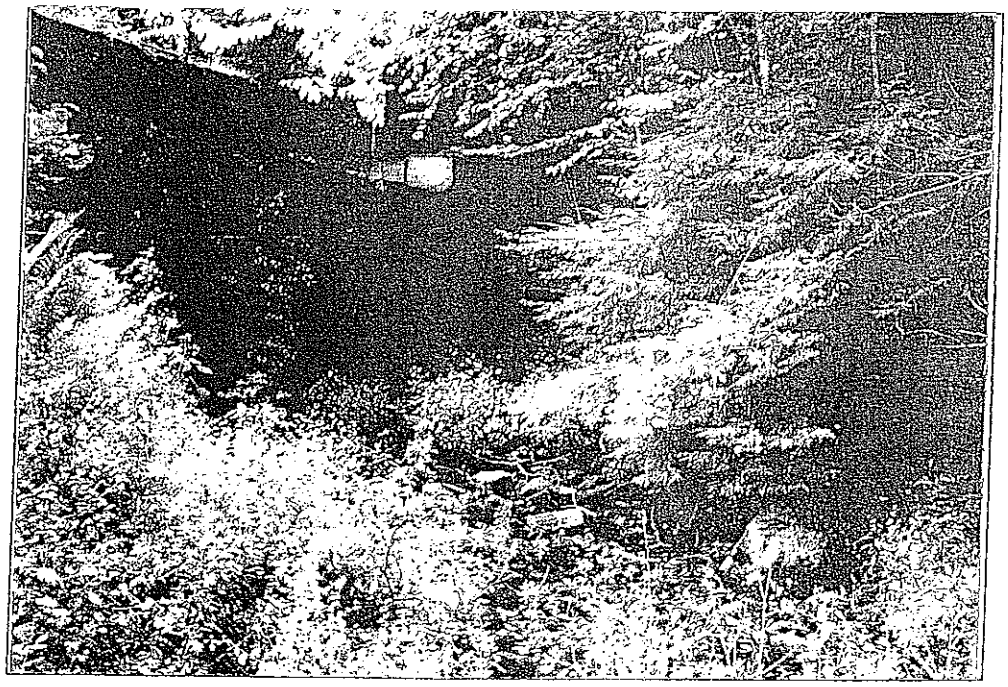
1097B-20 9-30-97



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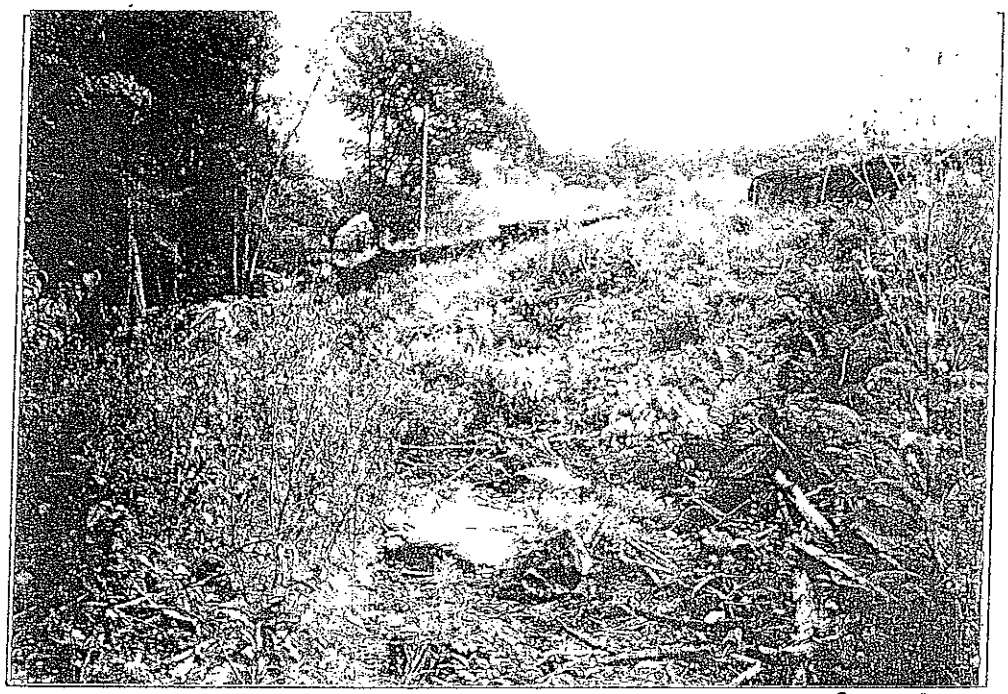

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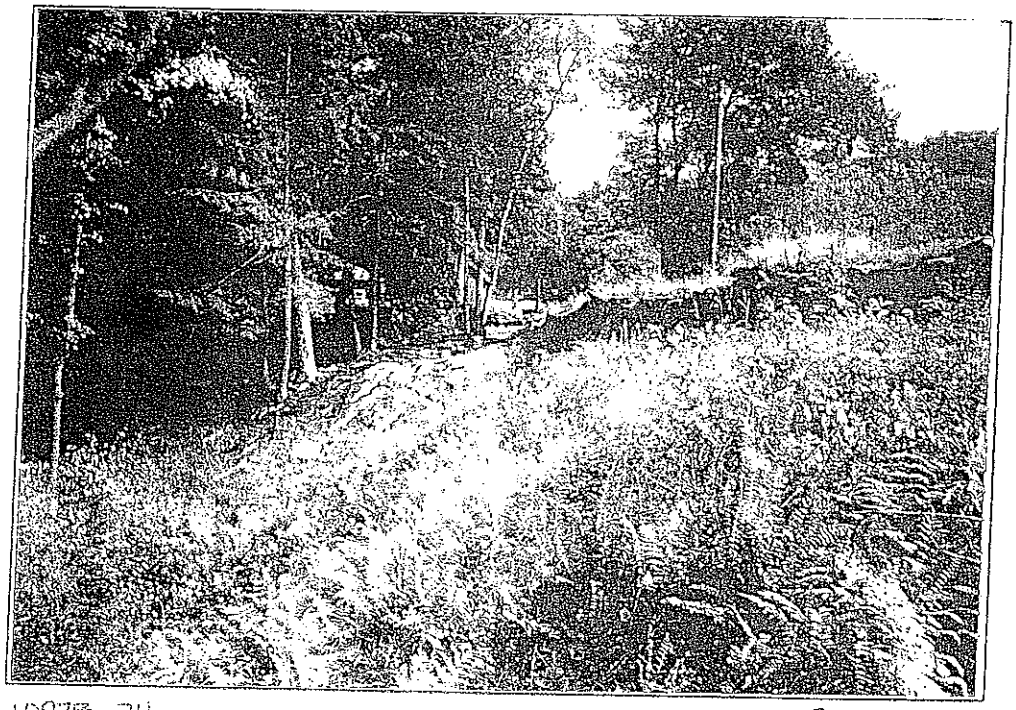
1097B-23 9-30-97



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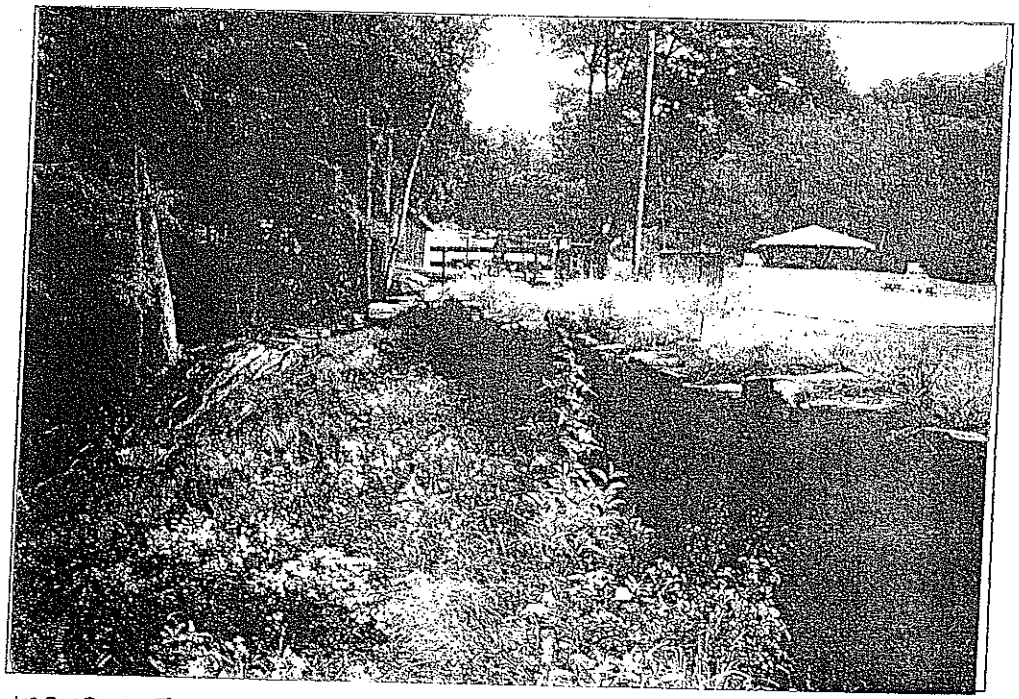

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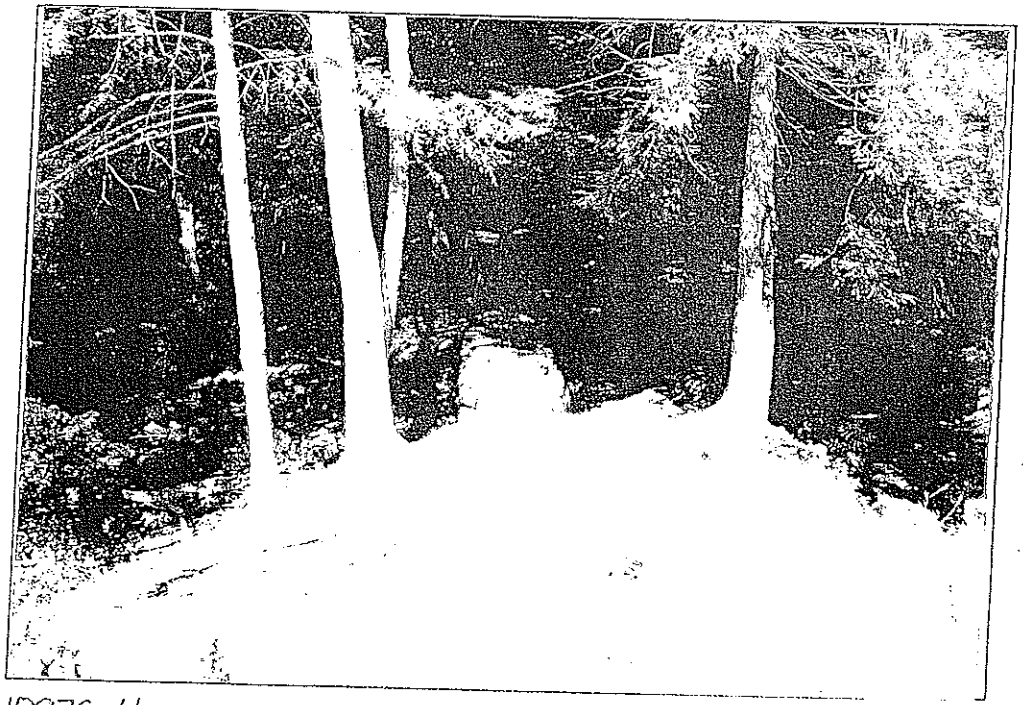
1097C-1 9-30-97

1097C-2 9-30-97

1097C-3 9-30-97



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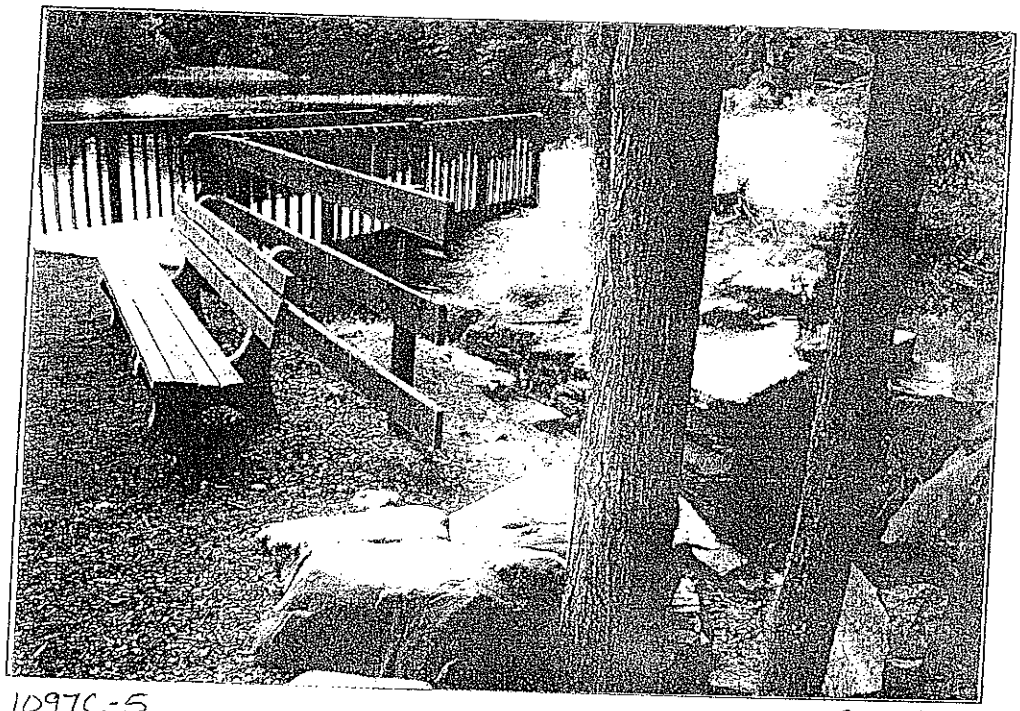

1097C-5

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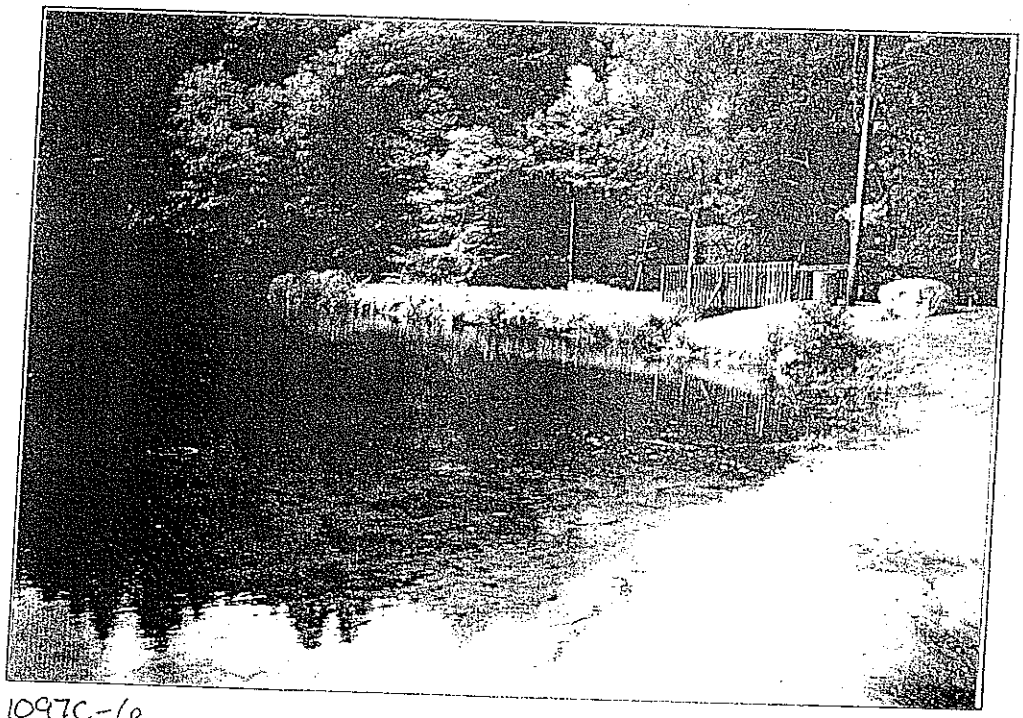

1097C-6

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