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Site Visit to Pacific Northwest National Laboratory, October 20, 1997.

On October 20, 1997, I flew to Pasco, Washington, at the request of Attorney Robin Michael, U. S. Department of Justice, Environment and Natural Resources Division, General Litigation Division, to make a site visit at the Pacific Northwest Laboratory (PNL) in order to report whether the Army Corps of Engineers was storing Kennewick Man's remains in a manner consistent with maintaining their scientific integrity.

I was met at the Tri Cities Airport by the Army Corps Staff Archaeologist Ray Tracey and Attorney James Baker, who drove me to the Hanford Site in Richland, Washington, where the Battelle Memorial Institute operates the Pacific Northwest National Laboratory in this Department of Energy complex.

We were met at Sigma III, one of buildings on the site, by Brian E. Opitz, Technical Group Manager, Environmental Characterization and Risk Assessment Group, PNL, signed in with the receptionist, given badges, and escorted to the Sigma V building where the Kennewick remains are stored. At Sigma V, we were then joined by Laurie Hale, a staff member of the PNL's Hanford Cultural Resources Laboratory, who escorted us into the archives room where the Kennewick remains are stored, and answered questions about the storage, room usage, and building along with Brian Opitz.

In terms of the visit I shall report 1) on the overall building, room conditions, etc., 2) on storage and the condition of the Kennewick remains, 3) provide my opinions of the suitability of housing/storage, and 4) finally make recommendations for improvements.

General Building

Sigma V, in which the PNL is housed, is a two story brick building, built around 1983 or 1984 (see photographs). It is a leased facility managed by the Sigma Corporation, which maintain it for Battelle. The building contains various research laboratories and offices. For example, there is a chemistry lab with fumehood on the first floor, as well at least one other laboratory equipped with fumehoods on the first floor. All information was provided by Brian Opitz, who provided most of the information after calling the appropriate office at Sigma or Battelle while we were in the Archives room.

1. Security and Access:

Access to this building is by proximity badge---some sort of card key access that can track by computer who is entering the building. Once in the building, corridor access on both floors appears free to anyone who has entered the building (visitors escorted). However, access to individual rooms appears also to be proximity card controlled, and computer recorded. After hours, the building is monitored by the PNL computerized program and checked by a PNL security guard. There appear no other forms of security systems, e.g. motion detectors, infrared eyes, etc. In case of an intrusion, a Battelle security guard would respond first. If an intrusion was found, the Richland police would be notified---the nearest police station being approximately 5 miles away---, and the building manager who in turn would notify the research manager. Initial response time was estimated at less than 5 minutes. Notification of the research manager would probably occur in less than half an hour.

2. Environmental Controls and Systems

The building has an HVAC system and has 26 zones set with thermostats. There are no schedule changes in the system, the heat set to come on if temperature falls below 65 degrees F., cooling in temperature rises above 78 degrees F. Fans run continuously and air filters are changed routinely three times a year, unless a filter airdrop indicates that an additional change is necessary. The filters will trap any pollutant greater than 25 microns in size. The supplied air is heated by a natural gas furnace, and the cooling system charged with freon. Two separate units provide supplied air to the building. Chemistry and other laboratories have

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a negative air pressure. Their fumehoods draw in the negative flow from the hallway. There are no humidification/dehumidification systems installed.

3. Fire Detection/Suppression System

The building has a wet sprinkler system—ceiling sprinkler heads noted in archives room—and there are fire hydrants located at the southeast and northwest corners of the building property. There is a direct wire to the city of Richland Fire Department. The nearest fire station is approximately 2.5 miles away and the response time estimated at less than 5 minutes. In case of fire, it was estimated that notification of fire to the research manager would be less than half an hour. (I did not notice any smoke detectors or verify which type so will actually will need to do this.) There are no fire walls present in the building.

Storage Room where the Kennewick remains are stored (Archives Room)

This room is a windowless, interior room on the second floor of Sigma V. Access to it is limited to 4 or 5 full-time, Cultural Resources Lab Project staff who have proximity cards uniquely coded for this room. Laurie Hale, a full-time staff member who is associated with the Washington University Program, took us into the room, and provided the information about room use reported below. It is serviced by the normal building HVAC, security and fire systems, etc. At the time of my visit, the environmental readings were taken and proved to be 75.5 degrees F., 32.5% R.H., and light levels (with all lights on) between 500 and 750 lux. UV content of the light approximated 20 microwatts per lumen.

The archives room is equipped with computer, file cabinets study tables, map case, and a 4 bank set of moveable Spacesaver shelves (1 fixed end unit, full moveable units and one half-width, moveable end unit. The Spacesaver shelving has its own key lock system. All units are furnished with open metal shelves. There is no gasketing between the units, i.e. the banks are not sealed when the units are closed.

Lighting in the room is recessed fluorescent, with prismatic, acrylic lighting panels. The walls are painted. The floor is carpeted overall except in the area of the Spacesaver storage shelves, where a raised linoleum floor was created to accommodate tracks for the rolling unit. Sprinkler heads are ceiling mounted as well as ventilation ducts. There is a thermostat near the door, that reportedly is never touched by the PNL staff working in the room. Neither environmental nor pest monitoring is done.

The room seems to serve a multifunction purpose. As well as housing files, there are field supplies (clean and reportedly not taken out for a long time) leaning against a wall next to the fixed compactor unit, and other field supplies in the fixed end unit proper. The room is used for storing Cultural Resources collections, processing and rehousing new and old collections. The collections are stored in the SpaceSaver unit. Boxes are also stacked neatly on the floor in front of the Spacesaver unit.

Collections stored in the room have been there awhile. They consist primarily of prehistoric bones, stones, historic cans, glass bottles and possibly soil samples. Occasionally something new is brought in. The pieces are checked over by another staff member, then put directly into the collections on the Spacesaver shelving. Charcoal samples are also brought into the room to dry. Other archaeological material, .e.g. stone flakes and bone fragments along with associated soil, were laid in trays on the open shelving unit to dry.

There is an ongoing project to rehouse collections more archivally in the room. Specimens are being rehoused in polyethylene ziplock bags, the bags being numbered, acid-free labels being put in the plastic bags with the specimens along with the original field ones, fragile specimens being padded, and the acidic cardboard boxes being replaced with acid-free boxes. A comprehensive inventory list is put on top of the specimens in each box. While work tables in the room were free when we came in, it is reported that incoming and/or older collections undergoing recuration, could be left out in the open on the tables while they were being worked on.

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The room is cleaned and trash emptied regularly by a custodian who Laurie Hale is in charge of letting in and supervising while in the room. Food and drink are allowed in the room, and the door may be left open when occupied.

The archival material, e.g. site forms, project files, aerial photographs, etc., are consulted in the room by staff and visitors alike. Visitors, approximately one per month, are escorted.

Locked Spacesaver shelving where Kennewick remains housed

The box containing Kennewick Man's remains are housed on the top shelf of the second rolling unit—middle aisle. Below it, on the adjoining unit and along the outer two aisles are housed storage boxes containing the older and newer field collections, as well as some specimens laid out to dry. Supplies for rehousing, e.g. plastic bags, archival boxes are housed on the end rolling unit, and field supplies in the fixed wall unit. While PNL staff do not access the Kennewick box, they do access collections on both sides of unit where it is stored. Hence the unit is rolled open routinely by staff working on the collection.

Storage of the Remains

The remains are stored in the butt-ended, screwed together(?) 3/4 inch plywood evidence box in which they were deposited at the PNL. The box is painted white and has a completely separate plywood lid taped on with two strips of gray duct tape. At one stage the lid would have been screwed down as attested by screw holes. Air gaps between the walls of the box are visible. The outer dimensions of the box are 23 3/4 in. long by 12 in. wide by 13 in. high. Board thickness is 3/4 inch, so interior dimensions would be 22 3/4 in. by 10 3/4 in. by 11 3/4 in.

All bones are stored in the box. Ray Tracey reported that he had unpacked the bones in September 1996 in the presence of Julie Longnecker, a member of the cultural resources staff of the Umatilla Nation, and Harvey Pete Reese, (sp.?) a Colville cultural resource staff member (both archaeologists and not tribal members). At that time they 1) labelled ziploc bag with numbers, e.g. "#1", and 2) made a quick written inventory of the contents of each bag—number of specimens and tentative ID when they could. The written list was thought to be with Julie Longnecker.

This inventory work coincided with the second visit by representatives from the five tribes, and was the only time that the remains were taken out of the box. In repacking the remains, long bones were placed at the bottom, skull bones on top, then bags with smaller fragments on top. At this time cedar twigs were burnt (presumably over the bones) and other ones left on top of the remains. Twigs were present when we opened the box, as well as ashes from the smoking.

Three bags appear to have been added after the September 1996 packing. There is a brown lunch bag with skeletal remains found at the site added by ... a tribal member, on 9/17/96. Another labeled partially open ziploc bag with two pieces of bone was placed in the box while still wet by Ray Tracey on 9/4/97. Yet a third ziploc sandwich-style baggie with one vertebra, this unnumbered bag was added at some uncertain time. According to Ray Tracy the additional specimens came from the same 20 x 40 foot plot along that the earlier Kennewick man remains came from, and are not duplicative of other bones in the box.

There was reported to be some padding in the box. When the box was opened, it appeared that the skeletal remains were incompletely covered with bubblepack and ethafoam. From what I could see there was no padding between the layered bags. Padding at the bottom was not visible or discussed.

Condition of the Remains

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Light, loosely packed ziploc bags containing one or more fragments of bone were removed briefly from the top of the box to check the condition of the bone and try to examine underlying bag. Only the topmost layers were removed since it appeared that physical damage could occur in the process of putting removed bags back in the box, and since an immediate safe alternative to housing was not at hand.

Although some of the ziploc bags were sealed, others were only partially sealed. They open bags may have been left so intentionally to allow slow drying of the bone. Some of the bone appeared to be in very good shape, showing little or no drying or storage damage. This applied mainly to dense, compact bone. Other fragments, mainly those with spongy, cancellous parts or thinner pieces of bone, appeared friable, with bits of bone flaking in the bags along with burial soils, and cracking. One loose molar tooth too showed cracking, and an as yet attached piece of enamel just above the root. Smaller pieces of bone, e.g. parts of ribs(?) and phalanges evidenced drying cracks—when these occurred was impossible to tell. A supposed thin cranial section, that had been cracked approx. 7/8 of its length during burial, appears to have broken the last 1/8 since it was cleaned and stored. Dirt was visible along the original crack, the last 1/8 showing new clean bone. In addition to having parts of the skull and teeth consolidated with a water-soluble polymer, it appears that a plaster reconstruction may been in progress, since there appear to residues of plaster left of some of the supposed skull fragments. (Ray Tracey commented that Dr. Chatters had been done reconstruction with plaster and made a latex mold).

I examined the bags we took out for evidence of mold. Further examination will be necessary. Aside from dark staining on a number of fragments, there were only two fragments that I saw with black surface deposits that could potentially be mated hyphae. Given current storage dryness however, further mold growth should be stymied at present.

Opinion of Housing

1. General Building

General building security and HVAC controls appeared sufficient. That there are labs in the building that depend on negative air pressure and fume hood operation to prevent spread of fumes in case of accident is worrisome. The absence of fire walls may also be worrisome, although I did not see plans of the entire building with locations of all laboratories and cannot predict spread of fumes/fire in case of fire or explosion.

Air filtration in the archives room, with door being left open when the room is occupied is of concern, as is the lack of humidity control and monitoring.

2. Archives Room

While access to the archives room is limited and controlled by both staff and computer program, this storeroom appears unsuitable for the storage of the evidence box. Of overwhelming concern is the location of the box on the compactor shelving unit that not only gets opened to allow access to other collections to the staff, but also vibrates with the airhandling system. A rattle was heard on the fixed wall unit where two heavy iron rods were stored. The rattle was attributed to them moving into each other by Atry. Baker. On the middle unit where the box was stored, vibrations from the air handling unit appeared much less, but nonetheless could be felt some on the raised linoleum floor and slightly on the shelf on which the box was stored. Of overwhelming concern also is the fact that the humidity in the room was measured with a fan driven psychrometer as 32.5% R.H., a humidity that is considered dry enough to induce cracking of the bone, and further cracking if the humidity were to rise and fall again. Upon calling a local weather station, Brian Opitz reported that the annual average humidity for the area was 53.5% R.H.

Scientific integrity of the skeletal remains in addition are compromised by the fact that 1) food and drink are consumed in the room, the residues of which could invite pest infestation, 2) the introduction of new materials into the room that are not inspected and isolated from the collections before they come into the

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room, and that could introduce contamination by organic and inorganic materials, and 3) the leaving of specimens to be dried on open shelving near an unsealed box with some unsealed ziploc bags inside.

3. The Evidence Box

Storage of the remains in the plywood evidence box in which Kennewick man was deposited at the PNL is totally unacceptable for several reasons. First, the box is too small for the skeletal remains. Remains are stacked on top of each other, and may indeed already have suffered from uneven weight and pressure. Second, the materials from which the box is made are not archival and have been shown to be acidic and capable of offgassing deleterious acids for at least five years (Hatchfield and Carpenter 1985?—needs completion). Third, the box is not sealed, a fact which on one hand would enable the escape of deleterious gasses, but on the other hand will allow foreign substances, including pests, mold, and other contaminants in, as well as the ambient humidity to fluctuate. This in addition of unsealed storage in unsealed bags could well be compromising the scientific integrity of the remains.

4. Lack of documentation

Although access to the box has been documented and controlled, the inventory of what is in each bag and the condition of each fragment has not been documented fully. The inventory taken last year may no longer be valid, (number of pieces, identification of the pieces, etc.) and a complete inventory, with safely stored and duplicated inventory lists is necessary.

Need for Immediate Intervention to preserve scientific integrity

There is an immediate need to ameliorate the storage conditions of the Kennewick remains, but plans should be thought out carefully in order not to further affect the preservation and integrity of the remains. Both Attorneys Robin Michael and James Baker asked for such recommendations.

1. Overall aims would be to unstack, pad, support as necessary, and store the remains in sealed containers. The containers which would be lighter, but perhaps larger than the current box should be chemically inert, at least for the short term and be stored on shelving units that are not routinely opened for other purposes or that vibrate due flow of air in the air-handling system. These boxes should then be housed in a closed, locked sealed and gasketed outer storage unit. Attorney Baker mentioned that he might be able to move a fireproof file cabinet to the Archives Room. This supposed 300 pound unit would probably be able to provide adequate protection for the short term to the remains, if placed on the corridor/door side of the room and if it were again locked and made inaccessible to people leaning on it, putting things on stop, etc.

Before starting to unpack the remains, a clean, table padded with ethafoam should be set up in a non-drafty part of the room, and the environment inside the box and the room be checked to make sure that they have similar temperatures and humidity (see C. Leckie's affidavit). Rubbermaid boxes, with sealing, snap-on, lids (the domestic polyethylene type of clear or tinted bottom and coordinating lids (I think they are tinted green this year with green lid) could be lined in advance with ethafoam, or cotton muslin over polyester batting over ethafoam (again see C. Leckie affidavit). The muslin should be of the prewashed, unbleached, 100% cotton, light-weight and tightly woven variety to avoid catching of friable or jagged bone in the weave. If the bones are susceptible to rolling with the slightest movement, sufficient layers of ethafoam cutout to the exact form of the individual pieces should be added. To protect the sides of the bones from the abrasive edges of the cutouts, the sides of the cutouts should be heat-sealed with a liner of Volara 2A polyethylene foam.

In unpacking the pieces, a complete inventory of all pieces should be made, even if the exact identification of each fragment is not made at this time. If possible photography of each piece individually or as a group should be made and a photographic record of each image taken. Hot photolights should not be left of the

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specimens. The specimens should be minimally handled with sterile, non-powdered plastic gloves. If sterility is of great concern, unpacking should be done in a glove box, or clean room.

2. If this were to prove difficult to accomplish at present without further assistance, I would advocate placing the ziploc bags as they are in ethafoam-lined sealed Rubbermaid boxes, and the boxes carefully be set into the fireproof file drawers. I would recommend that the remains be unstacked, padded, supported as necessary and stored in sealed containers. The containers should be lined in advance with ethafoam or other archival padding, or light, pre-washed cotton muslin over polyester batting and ethafoam. The containers should be large enough to store the remains without stacking them or having individual fragments of bone come in contact with each other. Furthermore, containers should be chemically inert and stored in a sealed, gasketed, inert cabinet fitted with shelves or drawers are is not routinely opened or subject to possible disturbance or jarring by other means. Further protection against disturbance of the remains by movement of the containers in the drawers should be accomplished by placement of rolls or wads of ethafoam around the boxes. Before starting to unpack the bagged remains, a clean table padded with ethafoam should be set up in a non-drafty part of the room, and the environment inside the box and room should be checked to make sure that the room temperature and relative humidity are similar to the conditions in the remains box. This should provide the stable, buffered environment necessary to prevent deleterious movement and changes of the bone in response to changes in temperature and humidity. At all times sterile, non-powdered plastic gloves should be worn, and the specimens handled minimally. Furthermore every bag should be inventoried and labeled with accession, catalogue, field and/or lot number, and the number of pieces in each bag indicated on each bag.

Long term rehousing and storage conditions.

Long term care and preservation goals of the fragments should include many of the points raised by C. Leckie in her affidavit. Sooner than later, in the next month or so, I would highly recommend that proper archival housing be done in order to more fully preserve the scientific integrity of the skeletal material. At that time I would recommend full conservation and curatorial assessments be made, since the material has already begun to crack, break and flake. The extent of invisible damage is as yet unknown. At that time too it might also be good to remove fully the bits of plaster left from the reconstruction of the skull, check if any of the latex molding materials are left in the skull, and remove them if so after talking to researchers about the pros and cons of removal of latex mold oils vs. use of solvents. A team made up of a bioarchaeologist, registrar and conservator might be the most effective.

As part of this planning process I would like to suggest that the Army Corps move the Kennewick remains to more suitable housing, such as a museum equipped with environmental systems capable of maintaining conditions optimal for preservation.

Madelene W. Fang
10/22/97

by Bna - Uplc
10/20/97

Sigma ~~IV~~ Building

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HVAC - 26 Zones w/ Thermostats
 No schedule changes 65° Heat 78° Cool
 Fans Continuous
 Filters 25 microns or smaller can pass through
 Humidity No set balance
 Filter changed - 3 Times/yr unless filter air deep indicate
^{additional} a change is necessary

Fire sprinklers are a wet system

Fume Hoods - separate ventilation system for Lab. Hoods
Negative Flow from hallways into Labs

Supplied air - natural gas Furnace
A/C system Freon

2 separate units provide supplied air to the Build

No Fire wells present in Building

Building is a Leased facility managed by
Sigma Corporation. They maintain the facility
for Battelle

Nearest Fire station ≈ 2.5 miles Response time < 5 min
 Nearest Police station ≈ 5 miles Response time < 5 min
 Nearest Hydrants SE + NW corners of Building property.

photos taken
10/20/97
by Madeleine Fung

Hanford Cultural Resources Laboratory
Pacific Northwest Laboratory

Photo Log

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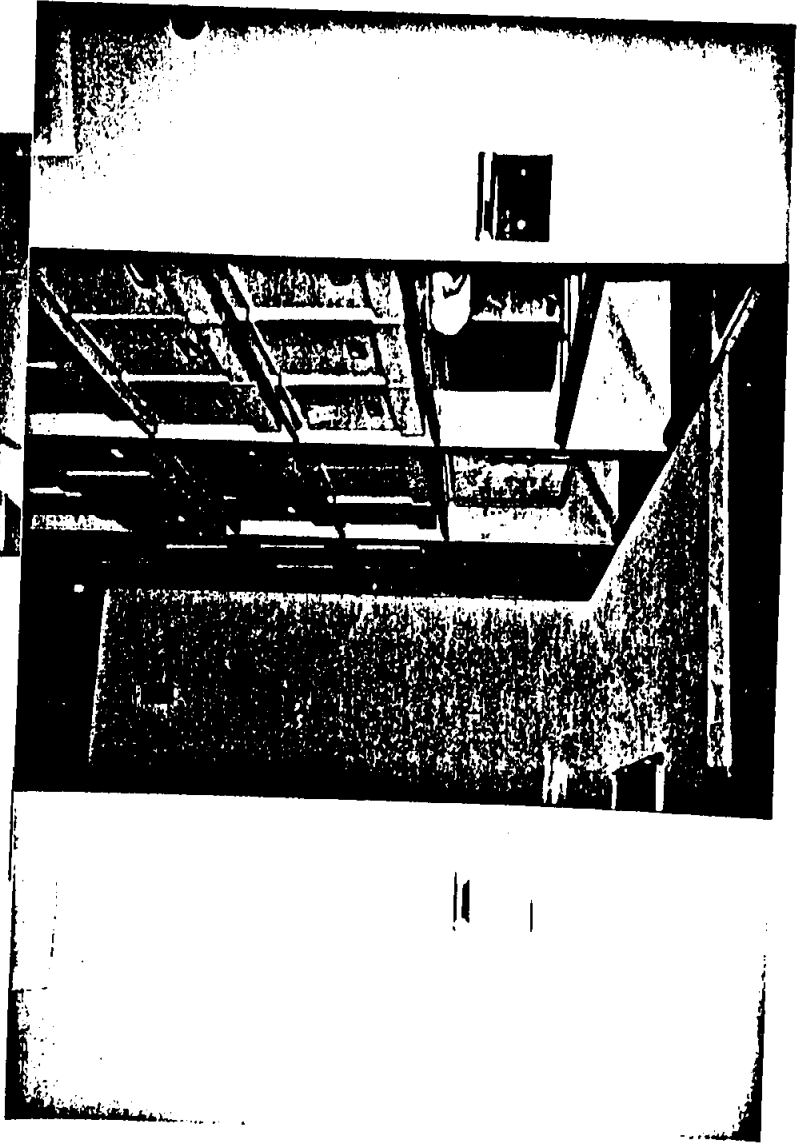
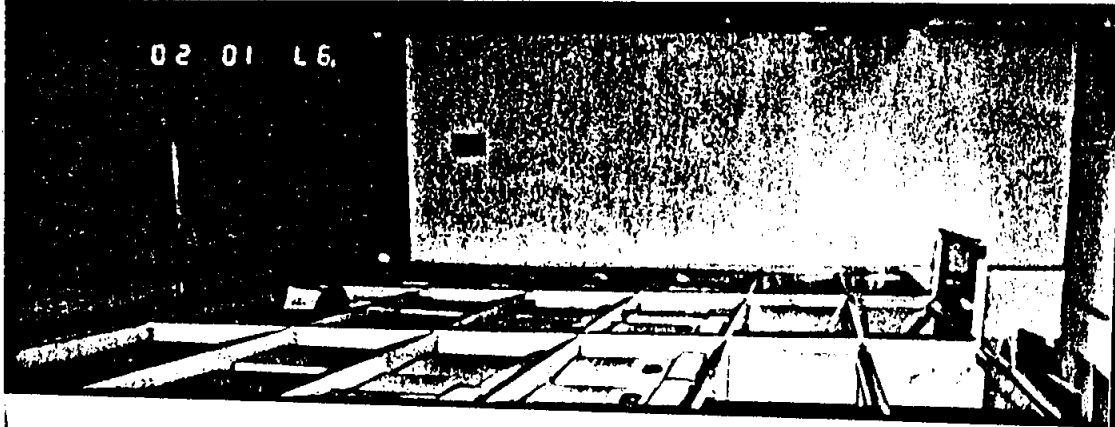
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Exposure #	HCRC Project #	Subject (include site, isolate # if appropriate)	Direction of view	Date	Photographer
1		Open Compacter Unit w/ Wooden Box on top center left			
2		" " " " " "			right side
3		Inside Compacter - View of Evidence Box - Box at Duct Tap			Painted Plywood
4		Evidence Box w/ scale (6" ruler) on table			
5		Evid. Box (open) Panoramic View			
6		2 extra bags - Closeup	View from Above		
7		Unsealed Sandwich Bag - Closeup - View from Above			
8	#5	(Shows some plaster) (Pt. Malay) Bone piece w/ possible mold (blackspot) - Closeup			
9		Left Mandible w/ loose tooth. Black staining on bone.			- Closeup
10		Closeup of Illium w/ crack through (st?)	upper left crack see		
11		Overall Compacter Units			
12		Looking into Room at Compacter Unit			
13		" " " "			
14		Looking ^{back} at Thermostat entrance to room.			
15		Archive Room on left - View down hall.			
16		rest of Building			
17		entrance +			
18		overall			

COMMENTS

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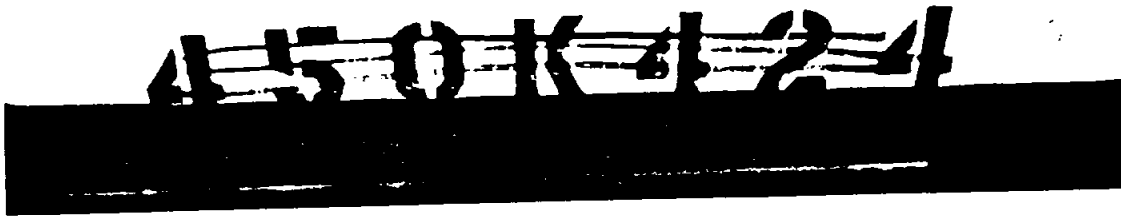
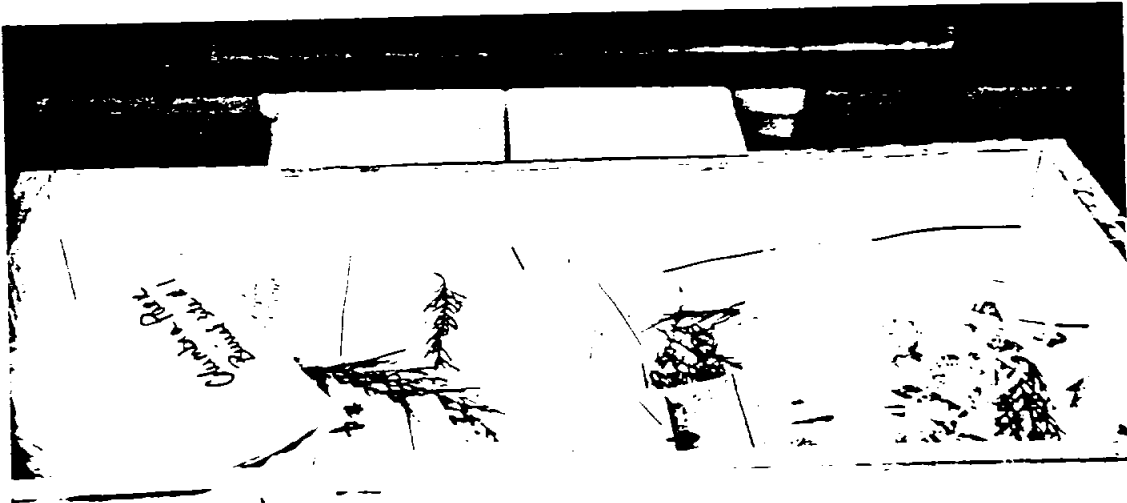
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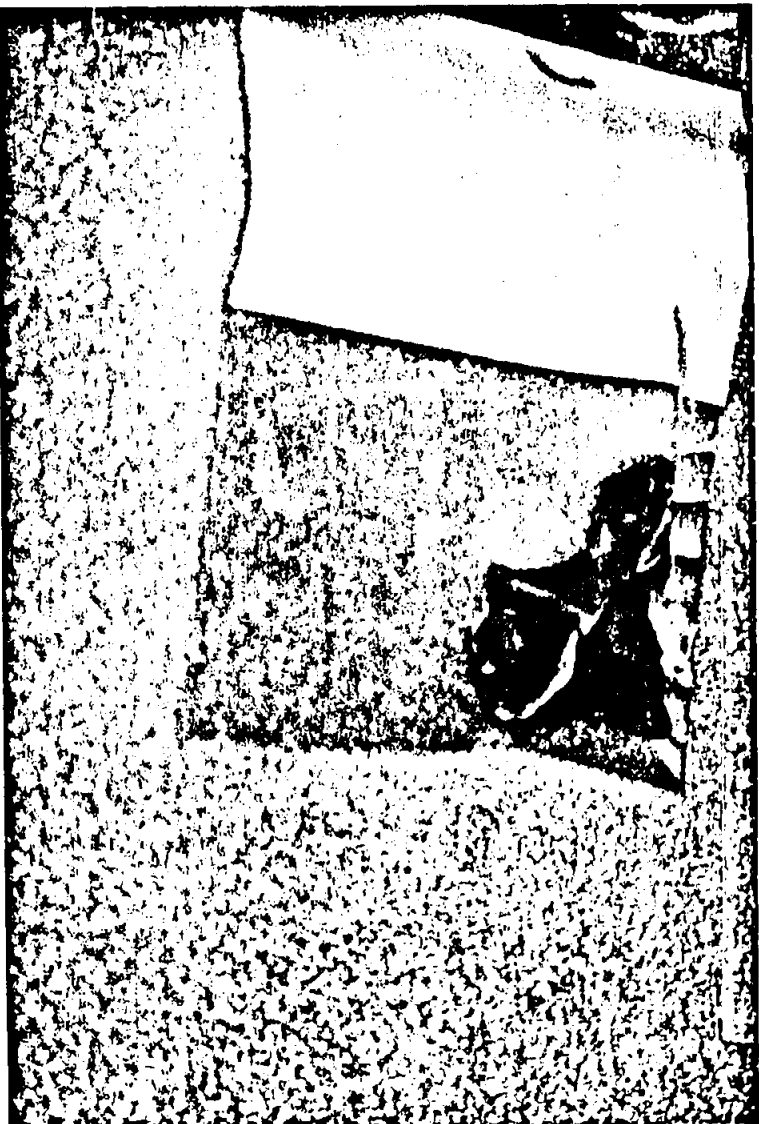
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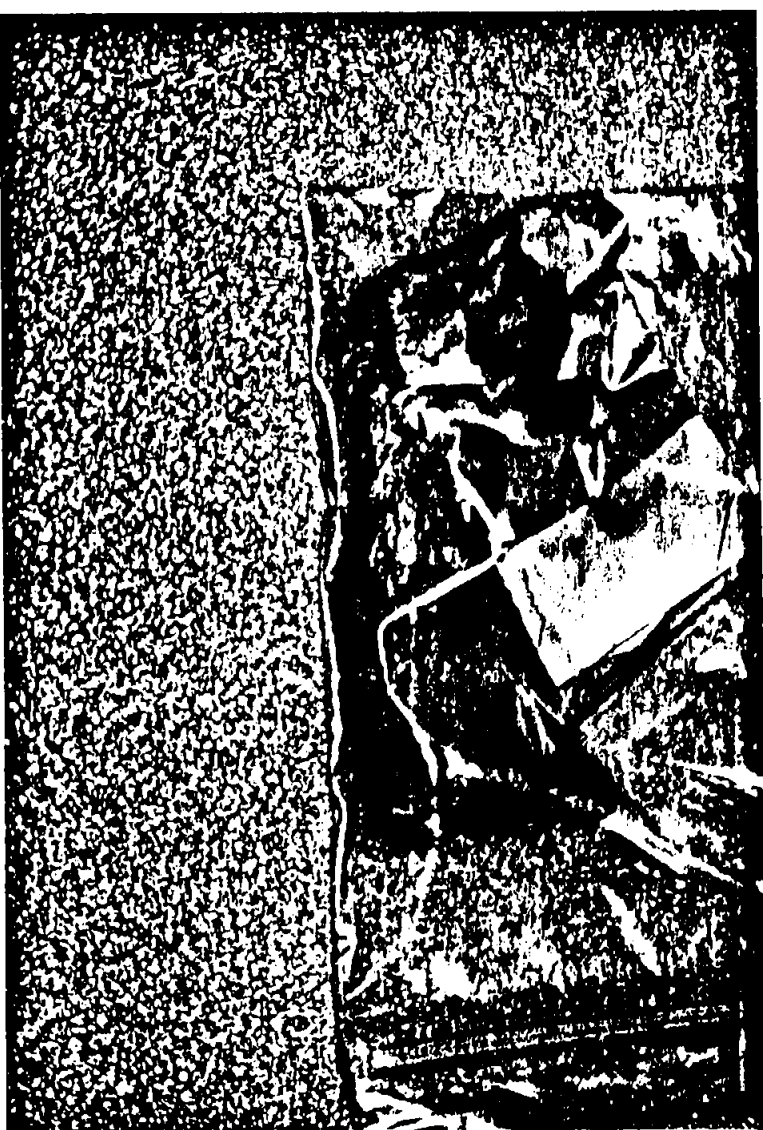
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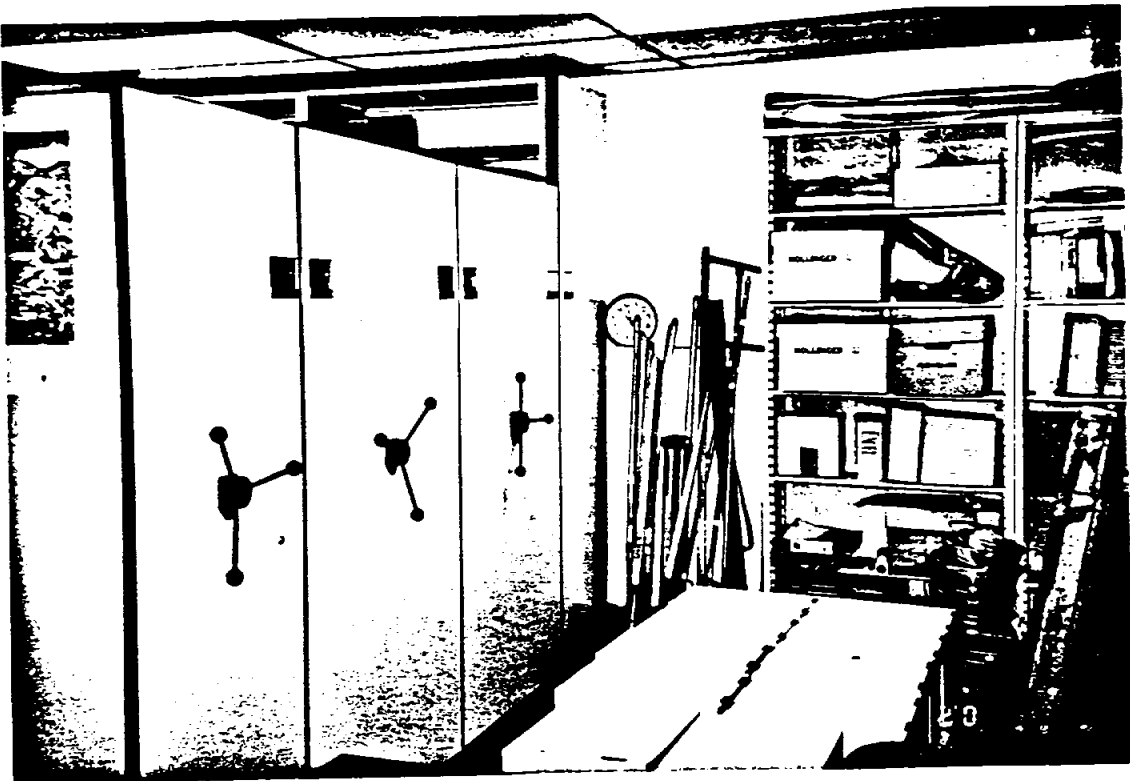
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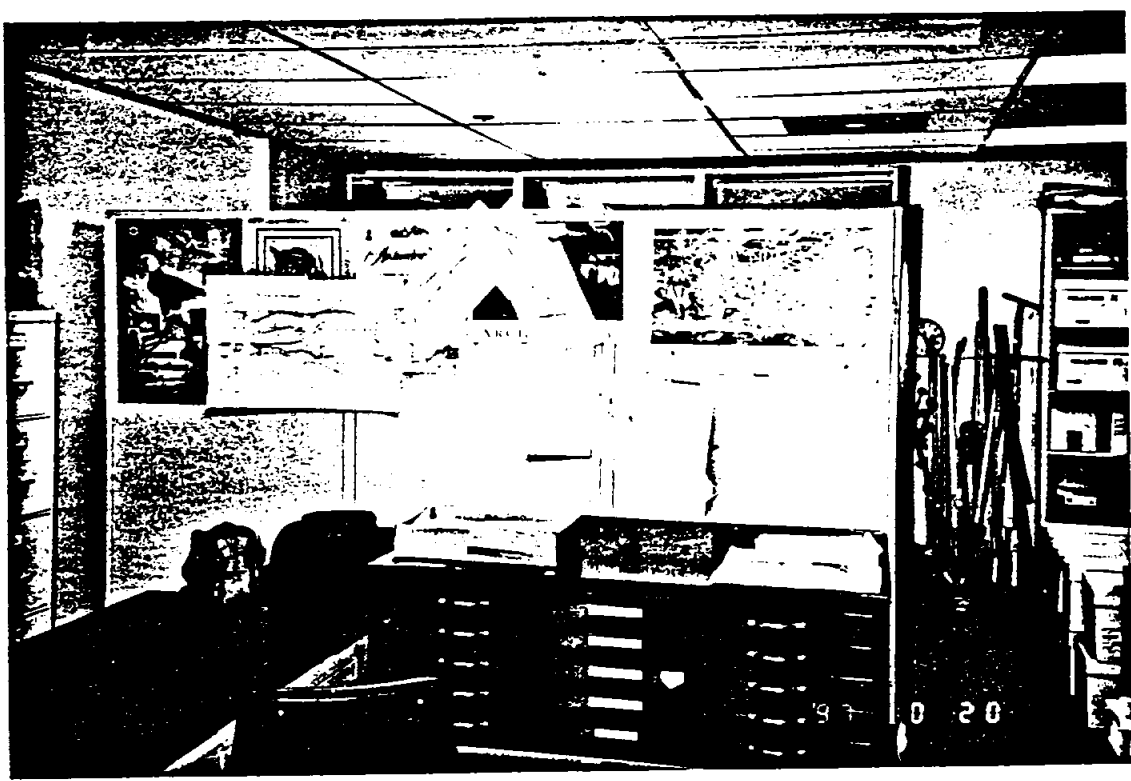
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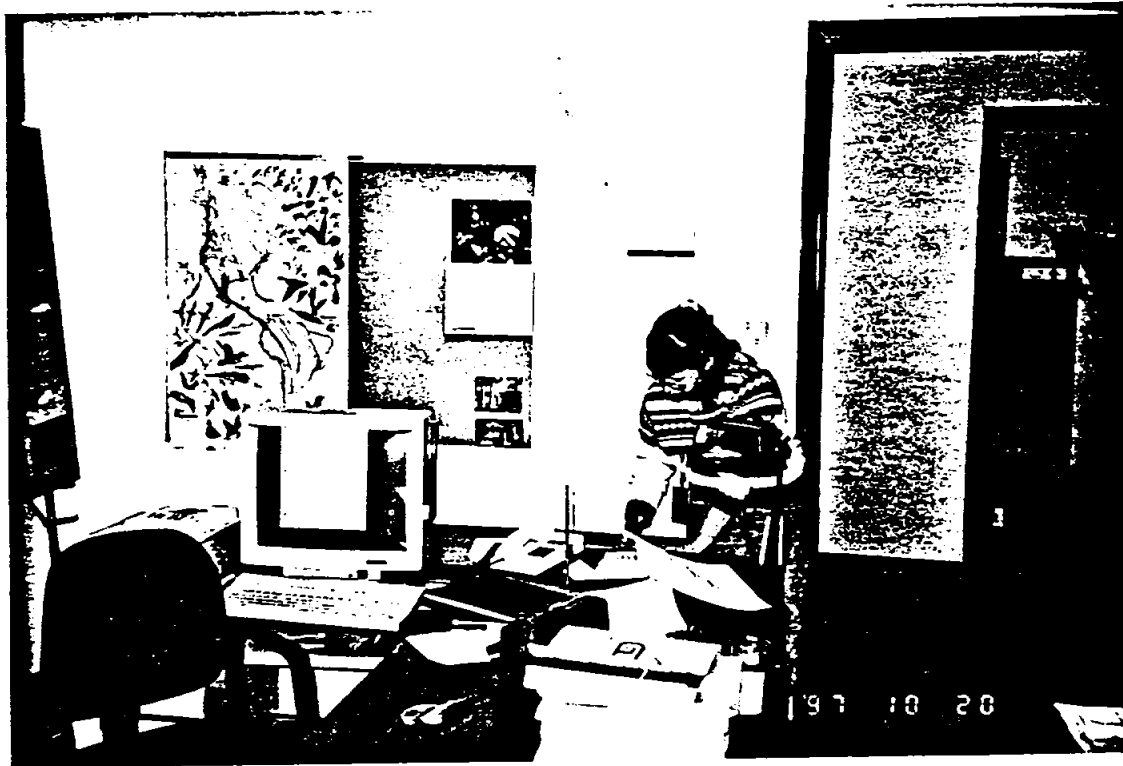
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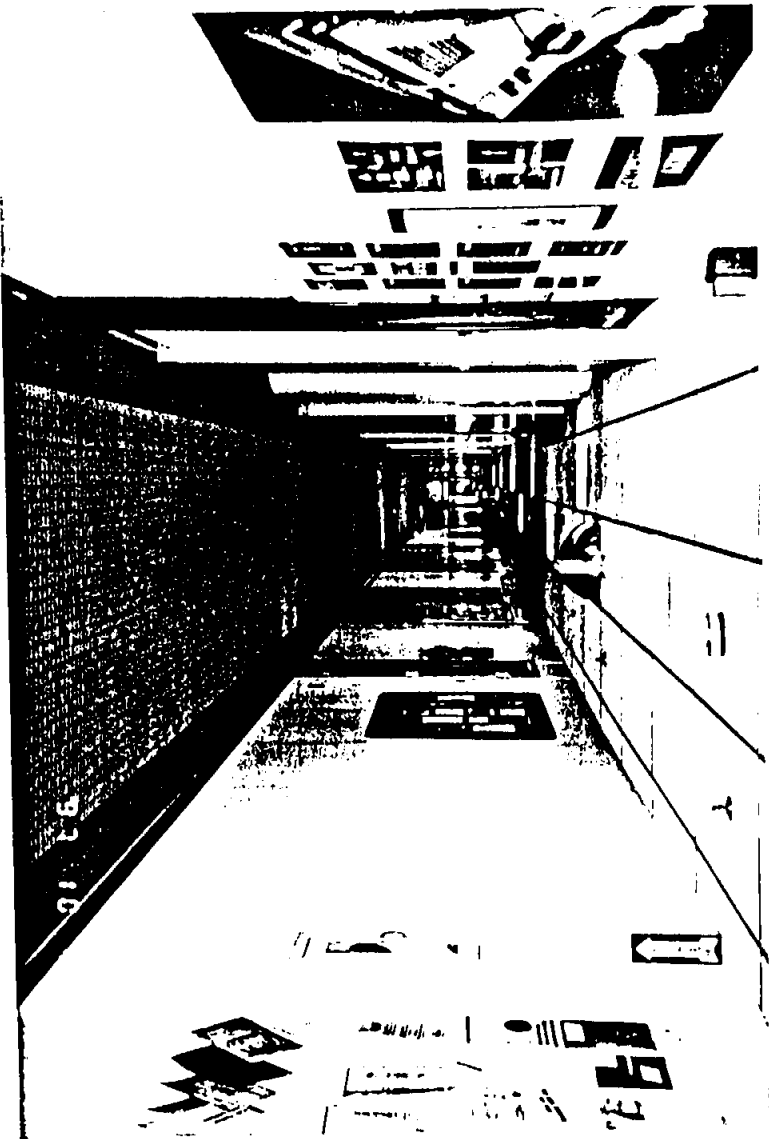
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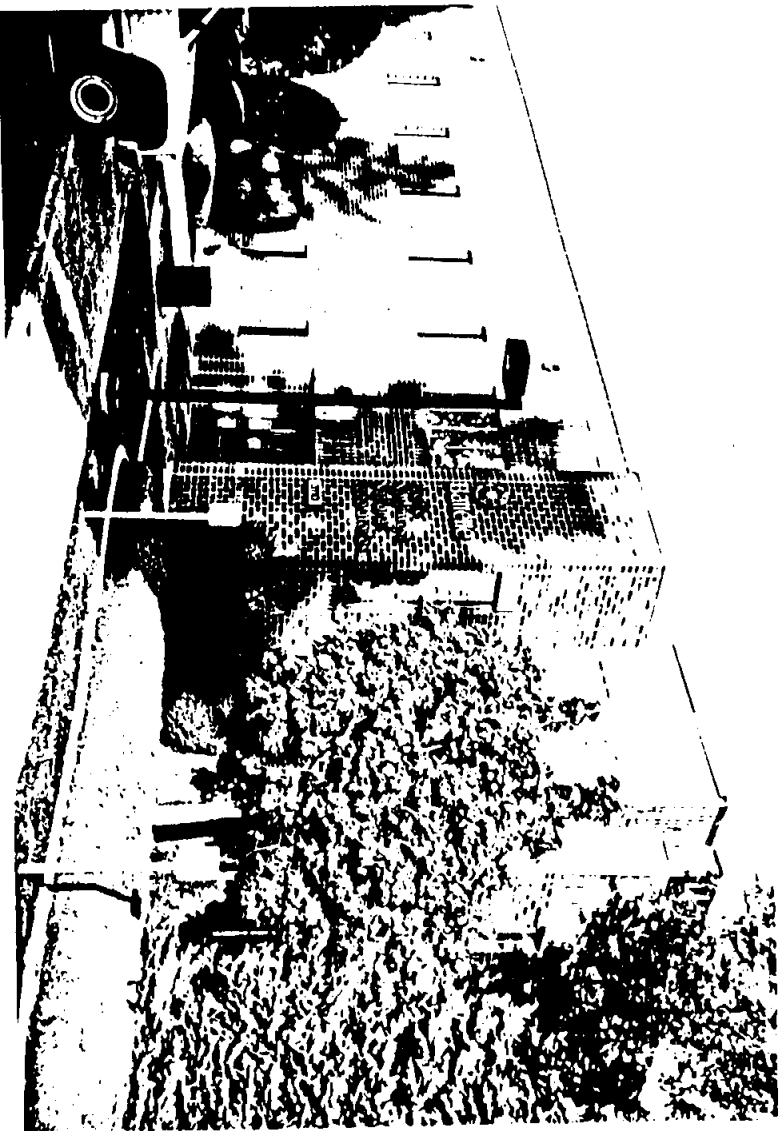


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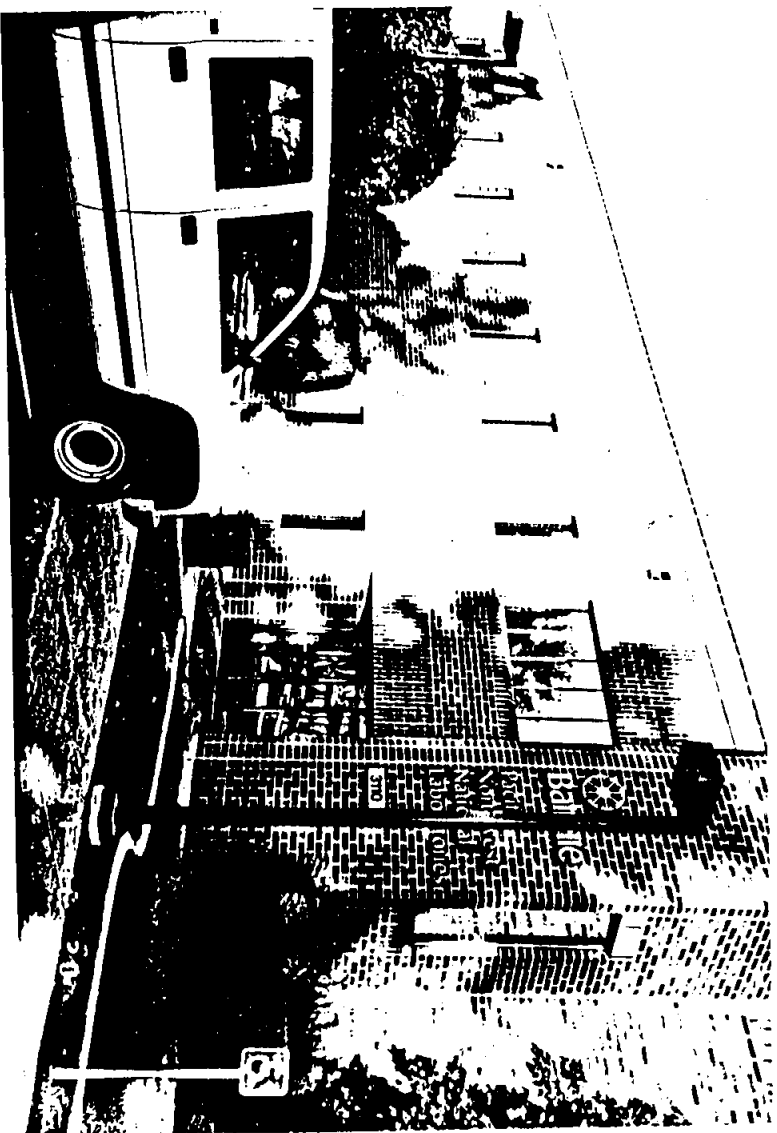
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