



Brownstone Quarry

Marina

Portland, Connecticut

November 1990

**EASTERN CONNECTICUT
ENVIRONMENTAL
REVIEW TEAM
REPORT**

**EASTERN CONNECTICUT
RESOURCE CONSERVATION AND DEVELOPMENT AREA, INC.**

Brownstone Quarry Marina

Portland, Connecticut

Review Date: September 25, 1990

Report Date: November 1990



Eastern Connecticut Environmental Review Team

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ENVIRONMENTAL REVIEW TEAM REPORT
ON THE

**BROWNSTONE QUARRY MARINA
PORTLAND, CONNECTICUT**

This report is an outgrowth of a request from Portland Planning Director to the Middlesex County Soil and Water Conservation District (SWCD). The S&WCD referred this request to the Eastern Connecticut Resource Conservation and Development (RC&D) Area Executive Council for their consideration and approval. The request was approved and the measure reviewed by the Eastern Connecticut Environmental Review Team (ERT).

The ERT met and field checked the site on Tuesday, September 25, 1990. Team members participating on this review included:

Nick Bellantoni	State Archaeologist CT Museum of Natural History
Jim Gibbons	Land Use Specialist UConn Cooperative Extension System
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Joyce Scheyer	District Conservationist USDA - Soil Conservation Service
Elaine Sych	ERT Coordinator Eastern Connecticut RC&D Area, Inc.
Bill Warzecha	Geologist DEP - Natural Resources Center
Allan Williams	Governor's Designee Connecticut River Assembly

Prior to the review day, each Team member received a summary of the proposed project, a list of the town's concerns, a location map, a topographic map, a soils map and the various consultant reports that were made available. During the field review the Team members were given plans and additional information. The Team met with, and were accompanied by the Planning Director and his staff, the Town Sanitarian, representatives from the Planning and Zoning Commission and the Inland Wetlands Commission, the developers and their engineers and consultants. Following the review, reports from each Team member were submitted to the ERT Coordinator for compilation and editing into this final report.

This report represents the Team's findings. It is not meant to compete with private consultants by providing site designs or detailed solutions to development problems. The Team does not recommend what final action should be taken on a proposed project -- all final decisions rest with the Town and landowner. This report identifies the existing resource base and evaluates its significance to the proposed development, and also suggests considerations that should be of concern to the developer and the Town. The results of this Team action are oriented toward the development of better environmental quality and the long-term economics of land use.

The Eastern Connecticut RC&D Executive Council hopes you will find this report of value and assistance in making your decisions on this proposed marina.

If you require additional information, please contact:

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1. LOCATION, ZONING AND LAND USE

The site, about 37 acres in size, is located at the western limits of Portland near its border with the Connecticut River. Approximately 65% of the site comprises the former Upper Portland Brownstone Quarry, which began in the mid 1600's. According historical information, it was most active during the late 1800's. The quarrying operation ended in the mid 1930's after it was flooded by the Connecticut River. Remnants of the quarry operation that include vertical walls, drill holes, stone structures and brownstone tailings are visible in proximity to the quarry basin. If the proposed development is approved, every effort should be made to preserve any artifacts that relate to the past quarrying operation which are salvaged or uncovered during the construction period.

The distance of the quarry basin from the Connecticut River ranges from about 250 feet at the southern end of the property to 1250 feet at the northern end.

The site is bounded on the west by Brownstone Avenue, on the south by Silver Street, on the east by residential and commercial properties, and on the north by wooded land and Middlesex Avenue. It is understood that a residential development known as Riverport Landing Housing, which is located to the north, was recently approved by the town.

The property is currently zoned industrial. In order to develop it for a marina and other related buildings (restaurant, marina store, clubhouse, bath houses), a special permit will be required.

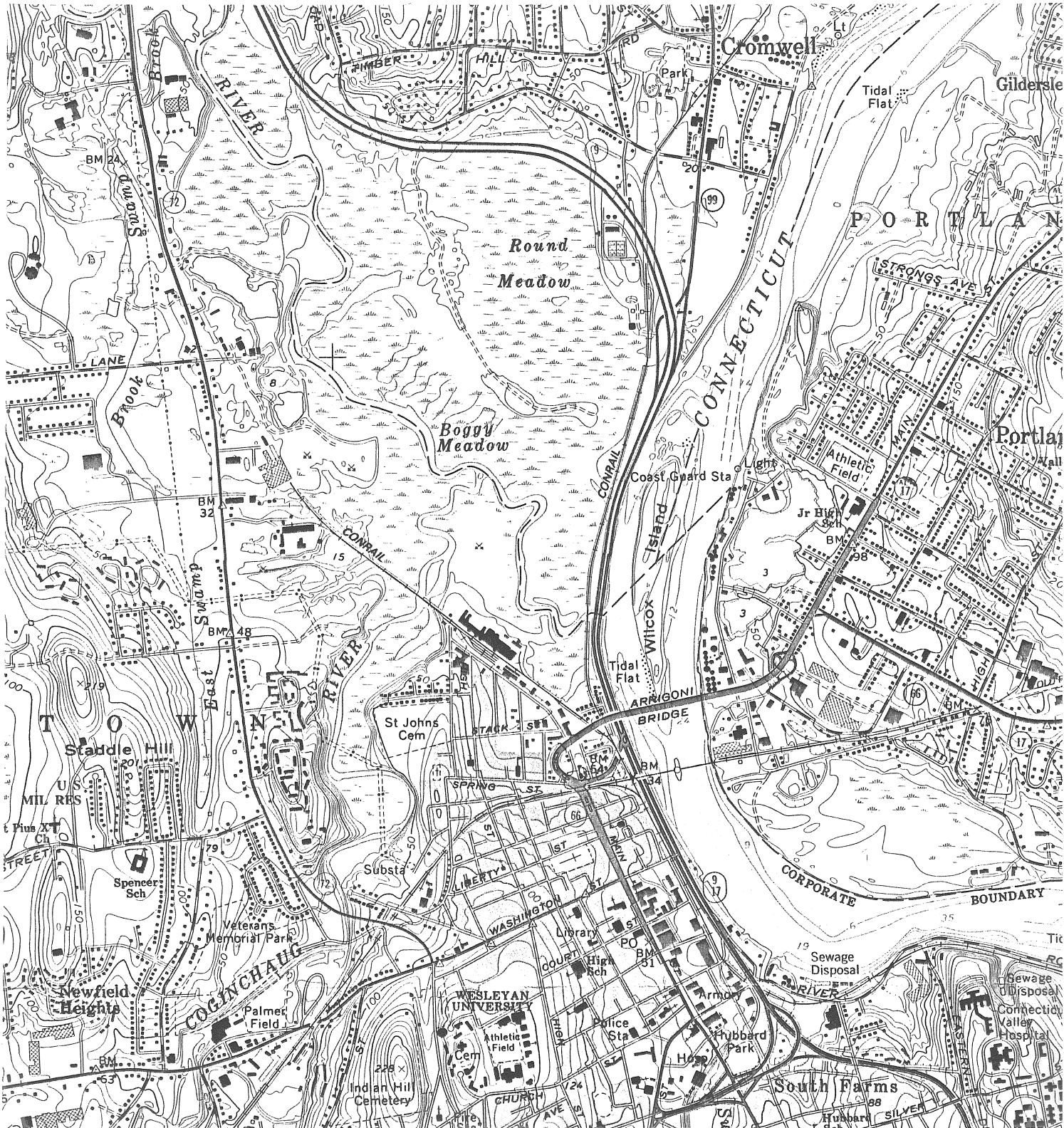
Historically speaking, the site and vicinity have been used for industrial and residential purposes. Existing surrounding land use include largely residential, industrial and commercial establishments. Between the upper quarry basin and Connecticut River, land uses include industrial buildings and fuel depots. Team members were informed on the

review day that the quarry is used for unauthorized dumping of automobiles, appliances, waste materials as well as fishing and swimming.



LOCATION MAP

Scale 1" = 2000'



2. PROJECT DESCRIPTION

The proposed development consists of marina development on a ± 37 acre wooded parcel that includes a ± 24 acre surface water body that filled the former quarry basin. It will include 915 boat slips and other ancillary buildings such as a restaurant, clubhouse, and marina retail space, as well tennis courts and parking lots. Additionally, the applicant proposes to provide a scenic overlook and historic marker for the public in the southern parts. From this vantage point, visitors will be afforded scenic views of the proposed marina and the quarry basin. An access canal, which will hydraulically connect the quarry basin to the Connecticut River will be excavated at the northern parts of the quarry. It is estimated that 78,000 - 80,000 cubic yards of soil, fill and rock material will be removed for the excavation. The canal will be roughly 60 feet wide, 8-10 feet deep and 650 feet long. The entire development will be served by municipal water and sewer. Access to the marina development will be accomplished via Silver Street, Brownstone Avenue and a new road called Turn of the River Road which links up with the Riverport Landing Housing development to the north and Middlesex Avenue.

3. TOPOGRAPHY

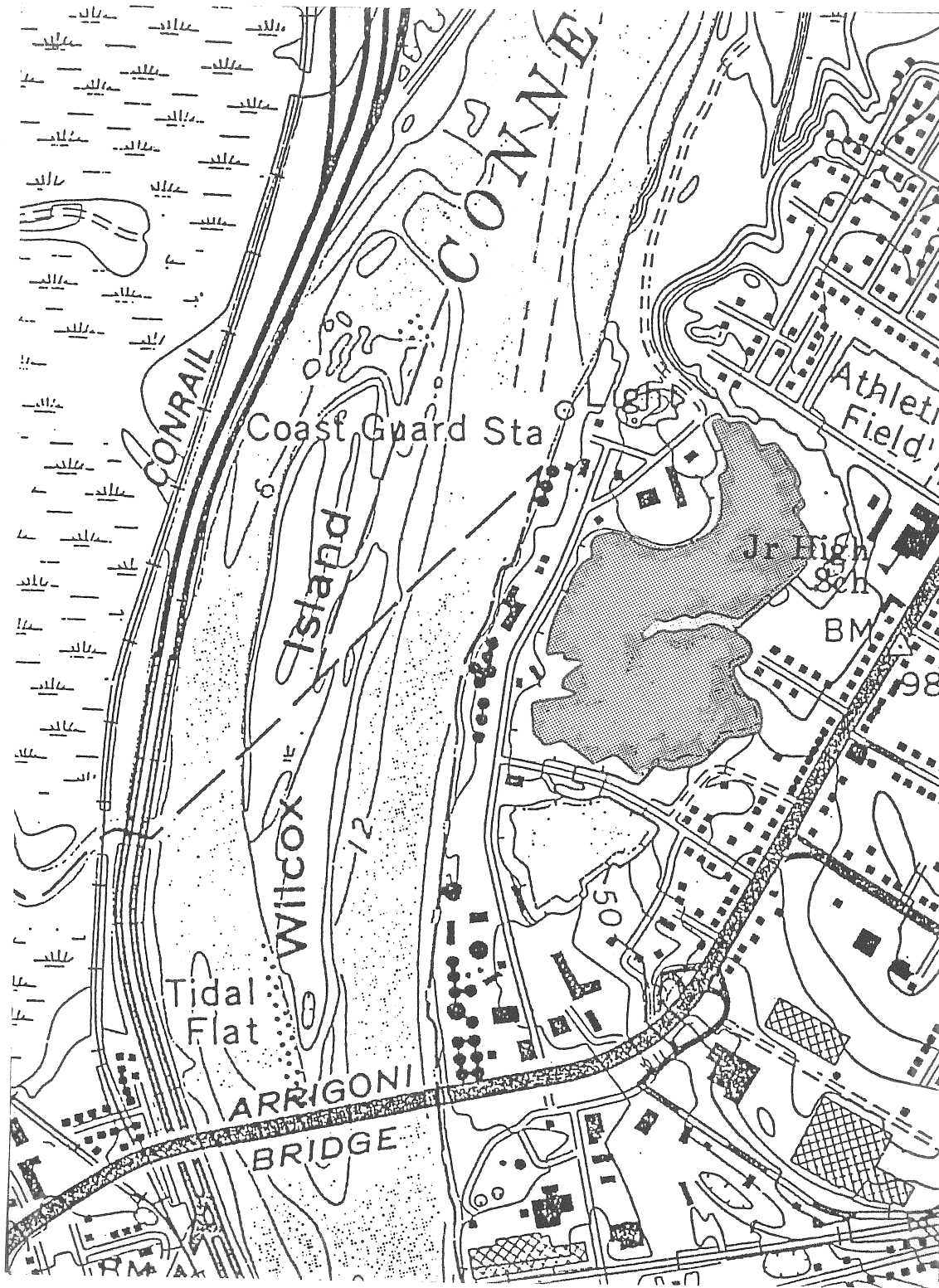
Except for northern parts (the area of the proposed canal), the site comprises the former quarry basin. The surface elevation of the quarry basin is 3 feet above mean sea level, slightly higher than the surface of the Connecticut River. For the most part, the perimeter of the quarry basin consists of nearly vertical walls of brownstone rock. Rock benches occur in the northeast corner of the site. The northern parts consist of a small knoll that has been disturbed, in places, by the past quarrying activity. This filling activity included placement of rock tailings on the ground surface. Small areas of moderate and steep slopes occur in the northern parts. Based on the attached topographic map, the maximum elevation on the site, about 70 feet above mean sea level, occurs on top of the small knoll in the northern parts.

In order to construct the proposed canal at the northern parts, a substantial cut through soil, fill, and rock material will need to occur. This work will probably require blasting. Because of the moderate to steep slopes in this area and because of its proximity to the river, there is potential concern involving the construction of the canal with regard to sedimentation and erosion control. Proper sedimentation and erosion control measures will help lessen potential adverse impacts to local water resources. (Also see **HYDROLOGY** section)

Due to the high vertical cliffs that surround most of the former quarry basin, consideration should be given to erecting fencing for public safety reasons, particularly if walking/hiking trails are constructed for public access in these area.

TOPOGRAPHIC MAP

Scale 1" = 1000'



4. GEOLOGY

The entire site lies within the Middletown topographic quadrangle. A bedrock geologic map (QR-8, by E.P. Lehmann, 1955) for the quadrangle has been published by the Connecticut Geological and Natural History Survey. Only preliminary surficial geologic information exists for the quadrangle at the present time. For this reason, the Team's geologist referenced the Soil Survey of Middlesex County, Connecticut and the unpublished Surficial Material Map of Connecticut by Janet Stone, et. al. 1985, and the soils report prepared by the applicant's soil scientist for the surficial geology portion of this report.

QR-8 identifies the bedrock formation underlying the entire site as Portland Arkose. In general, it consists of grayish red to reddish brown and pale brown (hence the name "Portland Brownstone"), coarse-to fine-grained arkose (a feldspar-rich sandstone) with interbedded arkose conglomerate (arkose containing pebbles and cobbles of different rock types), red and gray shale, mudstone and grayish green, less feldspathic sandstone. It is widely exposed around the perimeter of the former quarry.

The Portland Arkose is a sedimentary rock. Sedimentary rocks are composed of bits and pieces of older rocks that were eroded from an area, transported to and re-deposited in another area and then cemented together. The entire process occurred over long period of time.

5. GEOLOGIC HISTORY

A brief geologic history of Connecticut's Central Valley which encompasses the marina site includes the following:

Tensional forces responsible for the separation of Pangea (the term for the ancient landmass that included all of the continents) into the North American, European and African continents, produced major faults along the eastern margin of North America that resulted in a "rift valley". At this time, approximately 200 million years ago during the Late Triassic Period, the Connecticut Central Valley originated as a north/south trending rift valley. The Connecticut rift valley slipped down along a series of boundary faults. Considerable escarpments were produced during the period of faulting. Rivers flowed into the rift valley from the adjacent highlands, spreading sediments that resulted in the formation of conglomerate, sandstone and siltstone.

The Portland Arkose which underlies the site formed from the final period of sedimentary deposition that occurred in the Central Valley and is estimated to be approximately 4,000 feet thick. It was preceded by a sequence of sedimentary and volcanic deposits that were also laid down within the rift valley. From oldest to youngest, these deposits included the Talcott Basalt, the Shuttle Meadow Formation (a sedimentary unit), the Holyoke Basalt, the East Berlin Formation (a sedimentary unit), and the Hampden Basalt. The entire sequence of sedimentary and volcanic deposition probably occurred in a span of approximately 20 million years, beginning in the Late Triassic Period and ending in the Early Jurassic Period. The "layer cake" of sedimentary and igneous rock is estimated to be approximately 11,000 feet thick and, in places, has been intruded by dikes and sills of basaltic magma. Sedimentary rock formations and lava flows in the rift valley were tilted from 10 to 30 degrees generally toward the east and then eroded. In the area of the site, the

layering of the sedimentary rock is nearly level which is probably due to past structural activity in the Connecticut Valley.

Erosion of the relatively soft sedimentary rocks resulted in a relatively flat surface in the valley. The basalts and diabase are much more resistant to weathering and erosion and have consequently been left as high ridges and peaks within the rift valley examples are Higby Mountain and Lamentation Mountain west of Portland. Smaller, rounded hills of sedimentary rock have been formed principally by glaciation.

Because of its relative susceptibility to erosion, there is concern that the Portland Arkose will not make an aggregate suitable for quality construction products. The rock may have some value for fill material particularly in places where durable material is not necessary. If large blocks of the rock are used for fill material, especially below the water table, it may be susceptible to freezing and thawing action, subsequently resulting in the breakdown of the rock blocks. As such, buildings or roads placed over this type of fill material may be subject to subsidence or displacement.

Because the volume of material planned for excavation is fairly large, consideration should be given in advance to where the quarried rock will be deposited and plans for its use. Although it may have been a good building stone, Portland Arkose may be poor quality in terms of construction aggregate.

Also, see attached excerpt on the Portland Brownstone Quarry which appeared in an article entitled Connecticut's Historic Geologic Sites by Robert J. Altomura in the July/August 1990 issue of *Connecticut Environment*. (See Appendix)

Much of the unconsolidated materials overlying bedrock near the site have been disturbed due to past quarrying activity. The unpublished Surficial Materials Map of

Connecticut, by J. Stone., 1985, indicates that the unconsolidated materials in the area of the proposed marina development is comprised of artificial fill. Generally speaking, this material consists of earth materials and/or man-made materials that have been deposited by man. Every effort should be made to ensure that buildings for the proposed marina development can be adequately supported by the artificial fill materials. This work can be determined by a competent geotechnical/soils engineer. Alluvial (floodplain) soils, which have also been disturbed, have been identified by the applicant's soil scientist mainly along the Connecticut River in the northern parts. Alluvium is generally composed of sand, gravel, and silt in layers containing variable amounts of organic material, but on the site, its texture is probably predominantly fine to very fine sand and silt whose thickness may be as much as 40 feet.

6. GEOLOGIC DEVELOPMENT CONCERNS

To construct the proposed canal, extensive land alteration, including the removal of about 78,000 - 80,000 cubic yards of rock, soil and fill material are necessary. Despite the availability of municipal sewer and water mains, the potential effects resulting from the canal construction and site preparation for the marina development warrant very careful examination. Geologic and hydrologic limitations and concerns include the following:

(1) In the area of the proposed access canal, shallow to bedrock conditions will likely require blasting in an area of residential, industrial and commercial buildings. The end result will be a ± 60 foot wide channel partly excavated in Portland Arkose whose side slopes are 1H:10V. Above the bedrock surface, the side slopes for the canal will consist of a 1H:1V cut in quarry tailings; and

(2) Due to site preparation activity such as blasting, filling and grading, using the site for a marina and other related buildings, and the construction of the canal that will hydraulically connect the quarry basin in Connecticut River, the character of the site and vicinity will change markedly.

The presence of shallow to bedrock soils in the northern parts suggests that blasting will be required for the proposed 8-10 foot deep canal. Any blasting that occurs on the site will require great care and strict supervision by persons experience with state of the art blasting techniques. A geotechnical engineer who has considerable experience with blasting should monitor, evaluate and oversee all blasting on the site.

Major blasting concerns for the site and vicinity include seismic shock and airblast. These concerns are especially significant due to the proximity of the fuel depots, industrial and residential buildings. Flyrock is another potential problem, but it should be satisfactorily

contained within the site. Increases in groundwater turbidity in the vicinity of the blasting can be expected as well as an increase in fracture porosity of the rock, possibly creating enhanced hydraulic conductivity and water storage capacity. Bedrock wells would most likely be affected by these potential impacts. However, since the area is served by a municipal water main this should not be a major problem.

There are certain blasting techniques that can minimize the potential environmental impacts of blasting but this will depend upon the blasting requirements of the site. Blasting methods such as multiple small charge blasting, use of decked charges and/or use of millisecond delays between detonation are a few techniques that can be employed to reduce blasting shock and seismic air blast. Also, cutting the sedimentary rock with rock saw may be another possible method for excavating the canal. This alternate method should be investigated.

Any blasting should be accompanied by a pre-blast survey. The applicants blasting contractor will need to determine a safe pre-blast survey radius. A pre-blast survey commonly ranges between 500 - 1500 feet, but ultimately depends upon the blasting requirements of the site. Because of the composition of the Portland Arkose, which includes some layers of silts and fine sands, the chance for increased turbidity problems in the quarry basin and the Connecticut River may be high due to the blasting, rock excavation and filling activity. Every effort should be made to protect surface water quality in the quarry basin and the Connecticut River from siltation. The proposed channel construction sequence indicated on the site plan, in addition to sound erosion and sediment control measures, will help to minimize the possibilities of adverse environmental impacts to the water bodies due to siltation.

Present plans indicate that substantial filling (about 160,000 cubic yards) of the quarry basins (north and south) with blasted brownstone, fines, and rock tailings will be required in

order to create areas for parking spaces, bathhouse and clubroom buildings as well as Marina Drive. This activity will also increase the potential for siltation problems to the quarry basin and the Connecticut River, if it occurs after the canal construction. It is prudent to take measures that minimize the possibilities of adverse environmental impacts to the quarry basin due to the filling activity. Due to the composition of the fill material, it is important to determine its surface bearing load values in terms of supporting buildings and parking lots. The filling activity will impact a "regulated area" as defined under Chapter 440 of the Connecticut General Statutes and therefore must be approved by the Portland Inland Wetland Agency. In reviewing the proposal, the agency should determine the impact of the proposed filling activity will have on the quarry basins. If the Agency determines that the area to be filled is serving an important function and that the impact of the proposed activity will be severe, they may deny the activity altogether or, at least, require measures that would minimize the impact, i.e., reduction in the number of parking spaces and boat slips, reduction in the size of ancillary buildings, etc. Because the area of the proposed filling activity exceeds one acre, a permit from the U.S. Army Corps of Engineers will probably be necessary. Also, the canal construction may require a diversion permit from the Department of Environmental Protection's Inland Water Resources unit. Robert Gilmore can be contacted at (566-7160) regarding this potential permit.

A final water related concern with respect to the canal construction that will be discussed further in the HYDROLOGY section of the report is the impact on water quality in the quarry basin once the hydraulic connection is made to the River. Technical reports by the applicants consultants made available to Team members on the review day indicate that water quality in the quarry basin is generally better than water quality in the Connecticut River.

7. HYDROLOGY

The site lies entirely within the Connecticut River watershed. Presently, the quarry basin is not hydraulically connected to the Connecticut River. However, it may be hydraulically connected subsurface by fractures, cracks and joints in bedrock or via porous fill material above bedrock, but this is not known for sure. The quarry basin, about ±24 acres in size, is characterized by two, deep basins, identified as north and south basins. According to information supplied by the applicant's technical consultant, the depth of the basins range between 70-75 feet deep for the north basin and 80-100 feet deep for the south basin. The basins are separated by a rock sill that was created by the former quarry operation. In places, Marina Drive, which is proposed to bisect the basin will be constructed on fill over the rock sill.

The drainage area for the quarry basin is estimated to be about 116 acres. Man-made structures such as culverts, diversions and road drainage were not considered for this drainage area. Additionally, the quarry basin appears to be fed by groundwater that flows through fractures, joints and permeable layers in the sedimentary rock. Water seeping out of joints, cracks and other openings was visible on the quarry walls during the fieldwalk.

According to a map entitled Water Quality Classifications for the Lower Connecticut River Basin, August 12, 1983, which was prepared by the Connecticut Department of Environmental Protection (DEP) Water Compliance Unit, surface water quality for the quarry basin has not been classified by the DEP to date and, as such, is considered as a class "A" water resource. A class "A" water resource may be suitable for drinking, recreational or other uses and may be subject to absolute restrictions on the discharge of pollutants, although certain discharges may be allowed. The segment of the Connecticut River which passes the proposed canal opening is classified by DEP as a "SC/SB" surface water resource. The classification (SC/SB) means the surface water is known to be degraded, probably due to a

variety of industrial, municipal and agricultural discharges. SC resources (the "S" preceding the "C" and "B" above indicate saline water conditions) may have limited suitability for certain fish and wildlife or recreational uses. Water quality would also probably preclude bathing. The DEP goal is to improve the water quality classification to SB which means it is generally suitable for recreational, agricultural or certain industrial uses such as process or cooling water.

Groundwater within the site and vicinity is class "GB". This means groundwater is within a highly urbanized area of intense industrial activity and where public water supply is available. The water may not be suitable for direct human consumption due to waste discharges, spills or leaks of chemicals or land use impacts. State goal is to prevent further degradation by preventing any additional discharges which would cause irreversible contamination.

In light of the preceding discussion, hydraulic connection of the quarry basin to the river by the proposed canal would be expected to lower water quality in the quarry basin, and may require re-classification of water quality. James Murphy of DEP's Water Compliance Unit (Water Planning and Standards) should be contacted regarding this possible permit. He can be reached at 566-7049.

In order protect surface water quality in the quarry basin and the Connecticut River during construction period, proper use of sedimentation and erosion control measures will be required. During this period, the appropriate installation, monitoring and maintenance of erosion control measures will be imperative so that surface water quality is not impaired due to siltation. Erosion and sediment control measures should be checked for adequacy upon installation and checked on a regular basis particularly before and after storm events to ensure adequate protection. Following the construction of paved areas (parking lots), catch basins equipped with hooded outlets and sumps be installed to trap sediments, floatables

and parking lot litter. Additionally, the applicant needs to understand the importance of good housekeeping measures (garbage and refuse collection), responsibility to maintain existing water quality in the quarry basin and river and appropriate handling storage, and disposal of fuel/petroleum tanks, sewage holding tanks, marine paints and solvents.

8. FLOODING CONCERNS

The Connecticut River has regular floods, which do occur in all months of the year. All of the facilities serving the proposed marina should be designed to handle flooding events so that pollution problems do not occur and marina facilities are properly protected. This should apply to storage areas for petroleum based products and all other marine supplies and materials such as paints and solvents. The most recent major flood was in June of 1984 with a flood height in Middletown of approximately 21 feet above mean sea level. This level of flood can virtually occur during any month (winter and spring floods from snow melt and storm events and floods from June through November from storm events and hurricanes). Floods of 10 feet occur quite regularly as is evidenced by the problems with Harbor Park, which is south of the site.

9. SOIL RESOURCES

The soils on this site as mapped in the Soil Survey for Middlesex County are urban-influenced. The map unit (UD) requires on-site investigation and evaluation to determine the suitability for use as woodland or recreation land. The permeability and stability of this complex is variable due to up to 2 feet of cut or fill that disturbed the soil profile previous to the Soil Survey.

The UD map unit may include small intermingled areas of undisturbed soils, similar to the band of Yalesville fine sandy loam soil (YaB) that is mapped between the quarry and Main Street. Yalesville soil is suitable for woodland, but has limitations for recreational development due to slope. The shallow rooting depth of 20-40 inches above bedrock may cause tree windthrow and surface seepage of water. The development plan should show protection for the marina area within the quarry in case of trees falling from the rim. Alternately, a woodland inventory is recommended to determine the age, health, and stability of trees on site and adjacent to the site. A well managed woodland will help to buffer high winds at the quarry rim.

The predominant land use is unmanaged woodland. There is a rough trail around most of the rim of the quarry. Soil erosion is evident in the lack of understory vegetation, channels cut by runoff from paved areas off-site, and the absence of forest litter. Exposed tree roots and steep slopes make the area hazardous for scenic trails although careful management could overcome this limitation in many sections. A conservation plan for the entire wooded acreage is recommended to include practices and alternatives such as select thinning, trail or walkway improvement, lawn or understory seeding at wider sections, and stormwater management .

The parking lots and storage areas uphill from the quarry require a buffer strip of

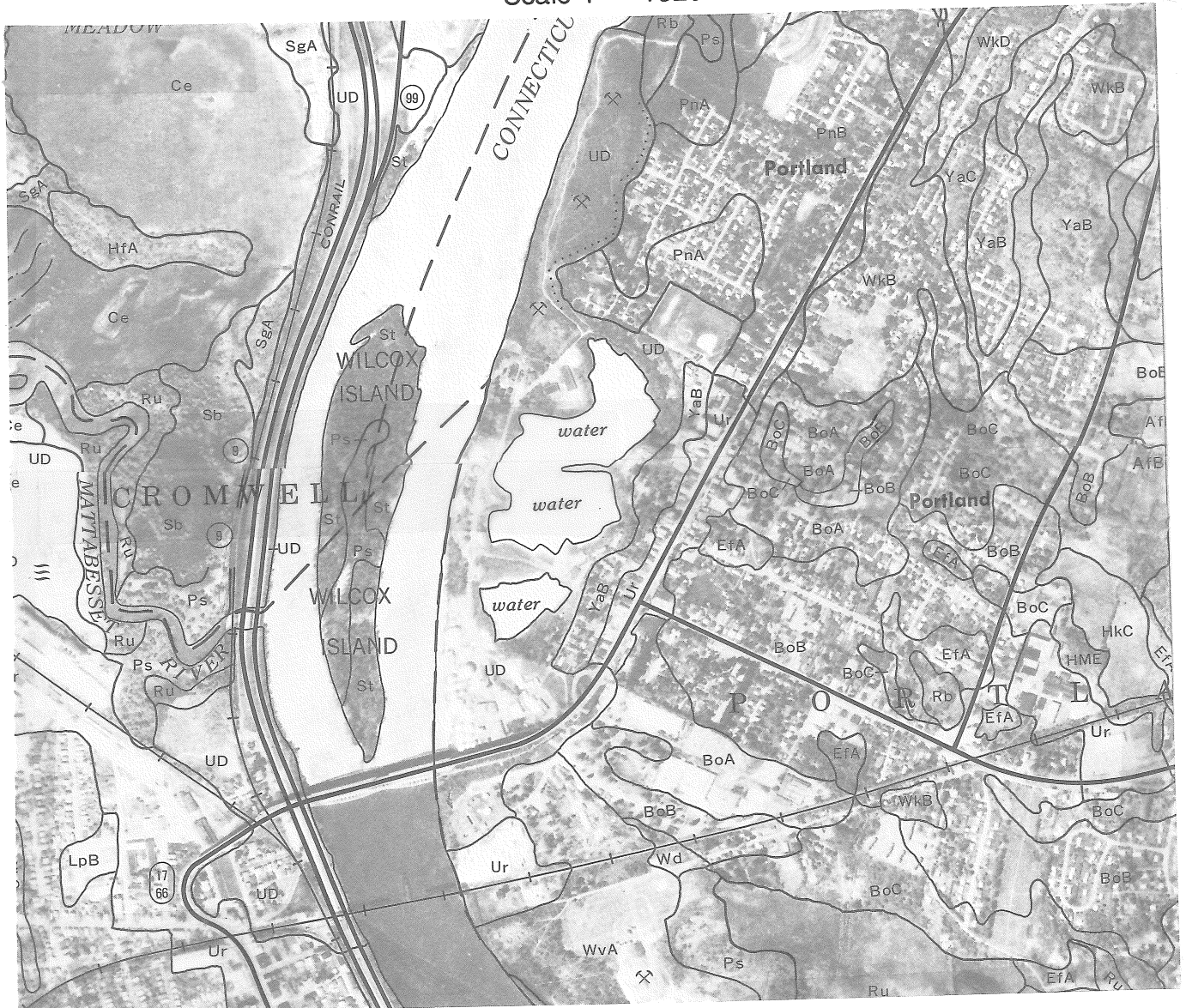
vigorous and well managed vegetation to protect the water quality in the runoff that reaches the quarry rim. Acquisition of adjoining land or procurement of conservation easements to create a scenic area of a manageable size should be accomplished prior to construction of the marina.

Recreational and educational access to the quarry by the public should be maintained. There are few sites as instructive as this one in the bedrock -soil relationship, or in the history of mining in the USA.



SOILS MAP

Scale 1" = 1320'



10. WILDLIFE COMMENTS

Habitat Type Descriptions

The habitat types and representative wildlife species have been described in a consultants report prepared for this development. The Team wildlife biologist's field review of this property corresponds to that report.

Impacts of Development

Vegetation removal in wetlands may have severe impacts on wildlife, especially reptiles and amphibians. One or several of the cover, food, breeding habitat, and hibernation areas may be altered. Species dependent on specialized habitat are eliminated and more adaptable species are reduced in numbers (Campbell 1973). Barriers, such as roads, to seasonal movement and population dispersal are also serious threats (Campbell 1973). To minimize impact maintain a 100 foot wide buffer zone of vegetation around wetland/riparian areas.

Mitigation of Disturbances

The use of buffers to limit disturbance to the flood-plain forest and seeding of disturbed areas should keep impacts to a minimum.

11. FISH RESOURCES

This section will address impacts to fisheries resources on the property and delineate appropriate measures necessary to effectively mitigate impacts.

Fish Population

Limited fish sampling efforts conducted by the applicant have revealed that at least three species of fish inhabit the quarry, they are: yellow perch, largemouth bass, and American eel. Additional fish sampling efforts may reveal the presence of other warmwater fish species. The present fish species complex may have either been stocked into the quarry or fish may have access to the quarry via underground conduits. The quality of fish habitat in the quarry is limited due to steep sloped walls which offer minimal cover and hiding habitat. Quarry fish species will utilize the near shore shallow (littoral zone) of the quarry.

Impacts

The following impacts on water and fisheries resources can be expected if proper mitigation controls are not implemented:

1. Construction site soil erosion and sedimentation : Construction activities involving the placement of fill directly into the quarry to create parking areas in concert with dredging activities associated with channel construction may lead to increased water turbidity levels either in the quarry or the Connecticut River. Increased water turbidity and the eventual settling of these materials could damage aquatic ecosystems in the following ways:

(1) Sediment reduces the survival of resident fish eggs and hinders the emergence of newly hatched fry. Adequate water flow, free of excess sediment particles is required for fish egg respiration and successful hatching.

(2) Sediment reduces the survival of aquatic macroinvertebrates. Since aquatic insects are important food items in fish diets, reduced insect populations levels in turn will adversely affect fish growth and survival. Fish require an excessive output of energy to locate preferred prey when aquatic insect levels decrease.

(3) Sediment reduces the amount of usable habitat required for spawning purposes. Excessive fines can clog and even cement gravels and other desirable substrate together. Resident fish may be forced to disperse to other areas not impacted by siltation.

(4) Turbid waters impair gill functions of fish and normal feeding activities of fish. High concentrations of sediment can cause mortality in adult fish by clogging the opercular cavity and gill filaments.

(5) Sediment encourages the growth of algae and nuisance proportions of aquatic macrophytes (CTDEP 1989). Eroded soils contain plant nutrients such as phosphorous and nitrogen. Once introduced into aquatic habitats, these nutrients function as fertilizers resulting in accelerated plant growth.

(6) Sediment contributes to the depletion of dissolved oxygen (CTDEP 1989). Organic matter associated with soil particles is readily decomposed by microorganisms thereby effectively reducing oxygen levels.

2. Fisheries Resources : Impacts to inland and anadromous fisheries resources will be limited to a discussion of fisheries habitat and fish movement.

(1) *Fisheries Habitat* - The placement of fill directly within the quarry will eliminate most of the available shallow water or littoral zone habitat. As previously discussed, the quarry lacks preferred habitat for finfish except for the presence of littoral zones, therefore, the elimination of such habitat represents a direct and irreplaceable habitat loss. The presence of a strong thermocline from early spring to late fall will limit fish distribution to the epilimnion stratum or uppermost warm layer of water which averages approximately 15 deep.

(2) *Fish Movement* - Channel placement will permanently connect the quarry to the Connecticut River. It is expected that fish species that reside in riverine habitat will move into the quarry, which will in effect become a deep, riverine cove. Therefore, it is expected that fish species diversity will increase in the quarry. It is difficult to predict whether or not residence will be permanent or seasonal in nature. From data presented by consultants, it does not appear that flow regimes within the newly created channel will attract fish. Anadromous fish that might stray into the quarry would be expected to migrate back out. The lack of post construction suitable fisheries habitat in conjunction with boat traffic associated with a 915 slip marina will make the quarry an undesirable environment for many fish species.

3. Water Quality : Private consultants have studied various water quality aspects of the quarry and what changes may be observed as a result of a creating a contiguous water body with the Connecticut River. In its present condition, the quarry is classified as in an early

mesotrophic (moderately fertile) condition of lake aging. Conversely, the Connecticut River in the Portland area is eutrophic (highly fertile). In particular, phosphorous levels in this section of the Connecticut River have been shown to be unusually high. Models have predicted that once connected, the trophic status of the quarry will change to late mesotrophic. This change would essentially mean an accelerated aging of the quarry with a tendency towards increased and longer lasting algal blooms. Increased phosphorous levels within the quarry may stimulate undesirable blue-green algal blooms. Through time the quarry will exhibit a water quality more reflective of Connecticut River conditions. Although the occurrence is difficult to predict and is more prevalent in lake/pond environments than in riverine habitats, fish kills could occur in the quarry due to low dissolved oxygen levels following an algal die-off. Increasing the possibilities of a dissolved oxygen deficiency are increases in the Biological Oxygen Demand (BOD) which is expected to occur in the epilimnion due to infiltration of Connecticut River water. Another water quality impact to be considered is the possibility of gasoline spills. Gasoline is toxic to fish, consequently, spills would result in fish kills.

Recommendations

The following recommendations should be considered to help mitigate expected impacts:

- 1. Develop an aggressive and effective erosion and sediment control plan :** The development of rigid erosion and sedimentation controls during fill and excavation activities will insure that water quality degradation due to construction activities will be kept to a minimum.
- 2. Develop shoreline angling access :** The marina provides a much needed facility for recreational boaters and boat anglers as well, but ignores the importance of shoreline angling access for local community residents. As mitigation for habitat losses in the quarry and wetland losses due to channel creation, a planned shoreline angling area is

recommended for this project. A walkway could be developed along the shoreline just north of the channel opening to provide this much needed shoreline angling access. Fishermen could utilize parking at the planned 81 space parking lot. The incorporation of a fishing pier would also greatly enhance shoreline fishing opportunities by providing more direct access to the main channel of the Connecticut River. Shoreline access would also provide the handicapped with additional fishing opportunities.

3. Develop contingency plans for water quality protection : It is recommended that dissolved oxygen levels be monitored during the summer to determine potential oxygen deficiencies. Mechanical aeration in the epilimnion may be required to ensure that suitable dissolved oxygen levels are maintained. Also, plans should be made to contain any potential gasoline spills that may enter the quarry and contaminate the Connecticut River.

Bibliography

CTDEP (Connecticut Department of Environmental Protection) 1989. Non Point Source Pollution: An Assessment and Management Plan. CTDEP, Hartford.

12. THE NATURAL DIVERSITY DATA BASE

The Natural Diversity Data Base maps and files regarding the project site have been reviewed. According to the information, there are no known extant populations of Federally Endangered and Threatened species or Connecticut "Species of Special Concern" occurring at the site in question. Brazos Brownstone Quarry is identified as a Natural Area Inventory site. In 1972 the Connecticut Forest and Park Association, Inc. prepared a Natural Area Inventory which included 459 sites. These were nominated as significant sites for one or more of the following attributes: geologic, hydrologic, biologic, archaeology, cultural, aesthetic, research/educational. Being listed as a Natural Areas Inventory sites does not impart any restrictions or provide legal protection, it identifies areas that should receive consideration before any proposed development is approved.

The Portland Brownstone Quarries are of unusual geologic interest for several reasons. Building stone from these quarries was quarried from the mid 1600s until the early part of the 20th century. Brownstone from these quarries was used throughout the northeast, and Portland Brownstone became a well known architectural material.

The Quarries have particular scientific significance because a large number of well preserved specimens and of dinosaur footprints were exposed during the quarrying operations. Some of these footprints were saved and are presently on exhibit at Wesleyan University. A summary description of the footprint finds is in: Guide to the Geology of Middletown Connecticut and Vicinity by W.N. Rice and W.G. Foye, 1927, Connecticut Geological & Natural History Survey 41, pp. 57-64.

Natural Diversity Data Base information includes all information regarding critical biologic resources available to us at the time of the request. This information is a compilation

of data collected over the years by the Natural Resources Center's Geological and Natural History Survey and cooperating units DEP, private conservation groups and the scientific community. This information is not necessarily the result of comprehensive or site-specific field investigations. Consultation with the Data Base should not be substituted for on-site surveys required for environmental assessments. Current research projects and new contributors continue to identify additional populations of species and locations of habitats of concern, as well as enhance existing data. Such new information is incorporated into the Data Base as it becomes available.

13. HISTORY AND PRESERVATION

The Portland Brownstone Quarries played an important role in the development of the town of Portland by providing material for the construction of buildings in the Portland area, as well as all over the United States, especially for the New York City brownstones. This site has been the source of stone for walls, chimneys, buildings and gravemarkers since the mid 1600's when stone was first removed as loose blocks at the base of what was then a massive cliff of stone. This cliff was quarried horizontally and vertically until 1936 when the spring freshet of the Connecticut River inundated the quarries.

During the quarrying period, waste stone, approximately 50% of the quarried material, was discarded over the river bank, building and extending the land area from what is presently Brownstone Avenue to what is now the riverbank, where brownstone schooners docked to load stone for shipment.

The Middletown school of gravestone carvers, who dominated the field in Connecticut from the late 1600s to the late 1700s, were the original owners and operators of the quarries. After 1788, the quarries were owned and operated by entrepreneurs from Portland and the surrounding area. Operation of the quarries provided the stimulus for ancillary business such as agriculture, shipping, shipbuilding and mercantilism. The quarries also drew workers and their families to the area. They provided stone for the construction of local churches, as well as funding for civic projects. Wesleyan University's presence in Middletown is due in part to Portland brownstone. All of Wesleyan's early buildings are constructed of brownstone, and most of the others contain brownstone.

The geological structure of the sandstone (brownstone) in the quarry area is also important. Quarrying was facilitated by the presence of vertical jointing and horizontal bedding within the bedrock to be quarried. This is one of only a few places within the Central

Valley which exhibits horizontal layering. The rest of the bedding within the Valley is tilted about 15 degrees. Fossils found in the Portland formation are also of scientific importance. These include raindrop imprints, mud cracks, ripple marks, tree casts and dinosaur footprints.

Plans for development and/or improvements in any of the area that was once part of the operation of the Portland Brownstone Quarries should include provisions which address the history of this site and preserve its historical and geological integrity.

During excavation of the site, including areas of waste accumulation, such as the canal, provision should be made to examine the material for fossils before it is removed from the site or used as fill. Provision should also be made for the storage and exhibition of these items both during construction and following the completion of the marina project.

These same provisions should be made for the quarry lake area where equipment of historic value, including derricks, buildings, railroad cars and the like were washed into the quarries during the 1938 hurricane.

Efforts should be made to preserve the historical and engineering integrity of those areas along the quarry perimeter which pertain to the operation of the quarry. These include derrick stands with their characteristic level, quarried blocks, the 1884 bell stand along Brownstone Avenue, the brownstone stairway into the quarry from what was the location of the Brainerd Company office and its surrounding quarrying artifacts (located between the WPA wall and Silver Street on Brownstone Avenue). These areas should be part of a walk with interpretive markers describing their use during the quarrying period.

Public access should be provided to the interior of the quarry, as well as the perimeter, especially for educational field trips. Geological trips to the quarries have been conducted since the mid 1800's. Professors from Wesleyan led numerous collecting trips. Many of their

specimens are on permanent public display in the lobby of the Wesleyan Science Tower and elsewhere around the world.

The developers, the State of Connecticut and the Town of Portland should work together in an effort not only to preserve the quarry area, but to establish a program of public benefit on a scale befitting the importance of the quarries to the nation, as well as the community. An interpretive walk connecting the quarries to Main Street structures of historic importance would broaden the scope of the project to include the town. Displays in a permanent exhibit could highlight structures of brownstone which can be seen in other parts of the United States, thus expanding the focus to the national level.

The historical significance of the Brownstone Quarries cannot be overemphasized. Future development in this area should be sensitive to that significance and should also carry on the tradition of benefiting the community as did the original quarrying operation. The developers appear to be approaching this project with that in mind. This should continue to be the approach regardless of designation of the site as a National Historic Landmark.

14. HISTORICAL GEOLOGIC AND SCIENTIFIC SIGNIFICANCE

The quarrying which began in the mid-1600's continued into the first third of the 20th century, nearly 300 years of operation. The brownstone became well known throughout the region as an architectural and structural building material. Although brownstone has not been quarried since the late 1930's, Portland Brownstone must be one of Connecticut's most well known natural resource products.

In addition to providing building stone for the region, the quarries provided unusual opportunities for geologists and others interested in natural science to examine the red-rock layers that form the bedrock of the Connecticut Valley. Much of the geologic interest was directed at the unusually good specimens of fossil dinosaur footprints and other bedrock features exposed during the quarrying.

Interest in the bedrock and knowledge about it was not limited only to geologists. The operation of these quarries was a major factor in the area's cultural development. Important parts of the history of Portland and Middletown relate directly to the existence of these quarries. Presumably for several centuries, much of the "common talk" and local affairs were concerned about rock (brownstone), events and finds in the quarries, and about the business of exporting rock. Portland may have a unique place in Connecticut history as the only (or one of the few) towns that had a stable natural resource activity other than agriculture driving its economy.

The quarries are of specific geologic interest for the following reasons:

1. They are the site of the most productive brownstone quarry in the region. The high quality brownstone was an important local building and structural construction material. The stone

became of increasing regional significance as it was shipped along the coast and brownstone buildings became fashionable in many major cities.

2. The Portland quarries provided an excellent opportunity for many early geologists to view and to study the brownstone rock and features related to it. Descriptions of the quarries and their rock features are included in many geologic studies, reports and field trips of the region. During the mid to late 1800's the young science of geology was developing concepts and theories about earth history. Geologists and students at local colleges and universities used rock exposures at the Portland Quarries to build and to argue their theories of the geologic history of the Connecticut Valley. In 1874 the American Association for the Advancement of Science had its [annual] meeting in Hartford, and a field trip for geologists was made to the Portland Quarries to view them and to see a large dinosaur trackway recently uncovered. A typical general description of the quarries exists in Rice and Foye (1927).

3. The quarries are of particular scientific significance because of the excellent specimens of dinosaur tracks that were uncovered. The fossils included footprints and in some cases lengthy trackways of several species and of a number of different individuals. Among the unusual trackways uncovered was that of *Otozoun moodi*, a four toed, twenty inch long print. The total trackway included a number of strides and was more than sixty feet in length. A number of the dinosaur track samples were removed, and some are on display at Wesleyan University. In addition to footprints, other fossils included what are believed to be casts of ancient tree trunks.

The quarries continue to be an important geologic site, visited frequently by geologists. These scientists come to see the quarry site and the character of the rock that was the building "standard" of one hundred years ago. The site is also of geologic interest because it is one of the few areas where the brownstone bedrock is nearly horizontal in position. Throughout most of the rest of the valley the rock layers are tilted to the east.

The Portland Brownstone quarries represent a very important part of the cultural, natural resource, and natural science history of the area. As land uses change in the area, it would seem to be a significant loss for the town to have the science and history of the quarries disappear. Ideally it would seem desirable to create some kind of small exhibit

center overlooking one of the quarries. Information could be preserved and exhibited about the historical, cultural and geologic significance of the quarries.

It is hoped that this section of the report and others clarify some of the geological significance of the site and stirs some interest in appropriate conservation of of the site's features and history.

Rice, W.N., and Foye, W.G., 1927, Guide to the Geology of Middletown, Connecticut, and Vicinity; State Geological and Natural History Survey Bulletin No. 41, pp 57-64.

15. ARCHAEOLOGICAL REVIEW

The Portland Brownstone Quarry is listed as a significant historic resource in the State of Connecticut's industrial and engineering inventory. Moreover, the National Park Service will be evaluating this historic property for consideration as a National Historic Landmark in the near future. While the extent of the physical modification to the quarry is minimal due to the proposed project, the effect upon the historic ambiance of the property must be considered.

The State Historic Preservation Office understands that the project will require regulatory approval by the U.S. Army Corps of Engineers. Therefore, it is recommended that the Corps of Engineers consult with the Advisory Council on Historic Preservation with regard to Section 106 and Section 110 of the National Historic Preservation Act of 1966. In particular, it is recommended that a Memorandum of Agreement be drafted which will provide for the implementation of appropriate mitigative measures to minimize the physical alteration of the Portland Brownstone Quarry.

The Office of State Archaeology agrees with the Connecticut Historical Commission's letter of September 21, 1990 to Mr. Keane Callahan, Robinson and Cole, that **1)** the National Park Service be enlisted to determine what level and kind of recordation is required for the property prior to any construction activity, and **2)** a data recovery plan be developed in consultation with the Connecticut State Historic Preservation Office for the recovery of industrial archaeological data. This plan shall be consistent with the Commission's **Environmental Review Primer for Connecticut's Archaeological Resources** and consist of the following:

- a. research questions to be addressed through data recovery;**
- b. methods to be used;**
- c. repository of recovered materials and records;**

- d. methods for involving the public in data recovery;**
- e. methods for disseminating results.**

The plan should be reviewed by the appropriate federal and state agencies prior to implementation.

The Office of State Archaeology and the Connecticut Historical Commission also share the concern expressed by the Connecticut Environmental Protection's Natural Resource Center that a professional monitoring program be developed regarding paleontological remains which may be discovered as part of the new channel which will link the marina with the Connecticut River.

In summary, the Portland Brownstone Quarry is a significant site of the state's industrial heritage. Federal and state legislations require review of proposed plans by regulatory agencies. A plan should be developed for data recovery during this review process. A detailed outline of this plan is proposed in the State Historic Preservation Office's letter to Mr. Keane Callahan on September 21, 1990. (Please see the Appendix for a copy of this correspondence)

16. PLANNING AND LAND USE CONCERNS

Land Use Implications

The use of the Brownstone Quarry as a marina with 915 boat slips, 250 parking spaces, a 24,900 sq. ft. restaurant and recreation center, a 11,900 sq. ft. marine service center and various related support facilities represents one of the most significant development proposals ever submitted to town officials. The town should try to minimize the impact the proposal might have on the land, water and air while at the same time maximize the social and economic benefits that might be derived from the project. Of special land use concern is tying the restaurant-marina complex to Main Street to achieve maximum economic integration of existing businesses and the proposed complex.

While easy vehicular access to the marina is desirable, another planning goal should be encouraging marina patrons to frequent existing businesses. The proposed improved road system with Brownstone Avenue connecting with Middlesex Avenue should encourage vehicular use by not only marina patrons but others as well. By bringing people to the marina, people are also eventually brought to Main Street.

Last year Jim Gibbons presented several workshops on Portland's Natural Resources in which he proposed the promotion of Portland's quarry sites as a basis for economic development. He suggested capitalizing on the Brownstone industry to provide a unifying central theme to Main Street businesses and public buildings. Significant brownstone buildings might be identified and a Brownstone Walk and Museum developed. This proposal seems even more pertinent given the proposed marina. The public should be provided access to the marina not only by car but by foot as well. This access should be done in such a way as to highlight the history of the quarry and its impact on the town.

Pedestrian access may be accomplished in a number of ways. Commerce Street, the right-of-way through the Senior Citizen Housing complex and Silver Street provide access from Main Street to the quarry.

In order to encourage a pedestrian "gateway" to the quarry, Commerce and Silver Streets should be analyzed to determine if present land uses are compatible with the area as a transitional zone. First floor uses such as shops, professional offices, and restaurants might be encouraged with residential units in second and third floors. Landscaping, as well as unique sidewalks and road surfacing (perhaps brownstone?) might enhance these areas.

Another possibility would be to provide direct access from Main Street over public land. To accomplish this, the Logano property on Silver Street might be secured thus providing a substantial parcel of town owned or controlled property from Main Street to the Quarry. Securing the Logano Parcel would allow the town to develop a park or a combination of open space and development. Under town control, compatible private development could be attracted to the area and proceeds from the sale would offset purchase and planning costs. A similar opportunity exists with the Geato property on the northern part of the quarry along Middlesex Avenue.

A Quarry Trail should also be considered. A ten foot easement around the perimeter of the quarry might be obtained as an open space dedication from the applicant. Once the easement is obtained specifics on trail construction can be developed. A minimum size trail might run from the proposed scenic overlook on Silver Street along the 6' wire fence northerly to Commerce Street. The trail could contain markers and other improvements that would highlight the history and geological significance of the quarry.

The issue of public access to the proposed development is an important one. This proposal may be one of a very few opportunities to get people safely to the Connecticut River.

The plans do not address the issue of public access. It is not clear if the boat ramp, for instance, will be available for general use or only the use of marina members. Similarly, the Marine Service Center and particularly the Restaurant/Recreation Center are both sited on locations that offer tremendous access to the river yet no provision is made to encourage public use. Something as simple as a gazebo or a series of benches at these spots might prove popular. As an example, the Connecticut River Museum in Essex allows people to walk on its docks and sit on benches. The area is a very popular one and there appears to be no adverse consequences to the Museum's "open" approach to its land.

Planning Concerns

While not an expert on marina design, Jim Gibbons has a few concerns based on his review of the applicant's maps.

Boat-Slip Density

In their book "Time-Saver Standards For Site Planning" by Joseph DeChiara and Lee Koppelman, the authors, state "the average harbor with all-slip moorage can berth about 15 to 20 boats per acre of navigable water area including the main interior channel, fairways and slip areas but not the entrance channel." It appears the surface water area in the quarry is a little less than 20 acres. Application of the standard of 15 to 20 boat slips per acre would result in a range of 300 to 400 slips in the quarry. The application calls for 915 slips or 515 to 615 more than recommended by DeChiara and Koppelman. The Commission should carefully analyze the number of proposed slips. It appears the applicant has proposed maximum coverage and several may be eliminated to insure safe passage through the marina.

Parking

Present Portland zoning calls for one parking space for every two slips. Hence, the 915 proposed slips will generate a minimum of 457 parking spaces.

DeChiara and Koppelman suggest three spaces for every four boats. When this standard is applied to the 915 proposed boats a demand of 684 spaces is generated or 227 more than required by Portland's regulations. The authors also caution that where larger boats are contemplated the ratio might be increased to three spaces per slip as larger boats tend to be used for in-marina social occasions and multi-family cruising. (Please also refer to the **REGIONAL PLANNER'S** comments)

Marine Services

There are basically three levels of services that marinas can offer and each generates different land demands. A simple harbor facility provides boat slips and associated parking. For harbors with service facilities, the minimum requirement is an area roughly equal to the car parking area. In a complete marina about twice the land area needed for boat owner parking is needed.

Marinas will often try to supplement income from slip rentals with income from ancillary facilities such as boat repair and sales, indoor storage, gasoline sales and snack bars. As marinas grow they often try to attract more revenue producing ancillary development.

Besides the Marine Services facility, which seems more oriented to river traffic, and a small "Storage" building located next to "Travel lift A," there are no provisions for boat servicing areas. In light of this it is suggested that the Commission specifically limit boat servicing to those areas. Of particular concern should be that parking areas are not used for boat storage, washing, fueling or servicing or that structures labeled as "office", "bathhouse" do not become boat garages. The Commission might wish the applicant to describe in writing the activities planned in each of the structures and parking areas and document that any change in use will require site plan revision and approval.

It is also not clear if the existing building adjacent to the proposed storage building is to be part of the marina and if so what specifically will it be used for.

Car-Trailer Usage and Parking

An average launching ramp or hoist will launch and retrieve about 50 trailered boats on a peak day. Hence, a need to provide car-trailer parking spaces with a greater length (plus or minus 40') than conventional car parking spaces. Because of staggered usage, car-trailer spaces will be needed for only 80% of peak day ramp use or 40 trailer spaces. About 30 car trailers can be parked per acre if pull through parking at 45 degrees is provided. This results in 1.33 acres of car trailer parking per ramp or hoist. The plan proposes one ramp and two travel lifts yet no car-trailer parking spaces are shown. An area of particular concern would be adjacent to the boat ramp where trailers might stack up during peak hours. Care should be taken to insure that cars and trailers do not end up parking on Brownstone Avenue or Silver Street.

Launching Ramps and Travel Lifts

Ample room should be provided so vehicles can maneuver beyond the top of the ramp or on the land surface next to the lifts. At the same time holding areas are needed in the water for boats awaiting their turn at the ramp or lift. Open water is also needed to safely launch boats from the ramp and lifts. Adequate open water appears to be provided adjacent to the launch ramp but additional area might be needed near Travel Lift B. One or both rows of slips or those on both sides near the lift might be eliminated to provide a more open launch area.

Many marinas have wash down facilities just outside the ramp maneuvering area. It is not clear if one is proposed here.

It is also not clear if the ramp will be open to the public or limited to marina members. If

it is available for public use at a fee, significant car-trailer traffic can be expected and proper provision made for waiting and maneuver areas.

Market Condition Implications

Discussions with UConn Marine Advisory Educators indicate that slip rentals are dropping as a result of present economic conditions. The marina proposed should result in a very attractive facility that should appeal to power boat owners from a wide geographic area. However, in tough economic times, people often relinquish luxury items such as boats and slip rentals.

The Commission in reviewing the site plan has to consider the possibility that the total complex might not be built. For example, it is possible that the recreation center might end up serving just the "Riverport Landing" housing units or that only Phase I of the marina might be built.

It is urged that the Commission to review the proposal as submitted as a detailed "concept plan" and to require each phase be reviewed in detail prior to actual construction. This approach is often used in large subdivisions or extensive gravel operations where several phases are planned over a number of years. The approach is helpful to the Commission as well as the applicant in that it encourages detailed review of each component and recognizes the possibility of adjustments in the original concept. The alternative is to specifically nail down each detail of the total project with stipulations that any change in the approved plan will require a new review and approval of the entire project.

Harbor Management - Boat Traffic

The construction of the marina will make Portland one of the most active boating areas on the Connecticut River. Several communities including Middletown have recently adopted Harbor Management Plans that analyze the water-land interface and boating activity.

If Portland does not have a Harbor Management Plan it should develop one.

Also, the marina could generate enough boat traffic to warrant a River Patrol Unit of the Police Force or a Harbor Master to regulate boat traffic.

The marina should also be analyzed in terms of its impact on existing boating activities in the area. For example, Middletown and Wesleyan have rowing crews and the impact of increased power boats on crew activities needs to be addressed.

17. REGIONAL PLANNER COMMENTS- **Environmental and traffic** **Considerations**

Environmental Considerations

The application package contains reports covering many of the potential implications of a river-quarry connection. However, the validity of such reports relies heavily on the proper implementation of pollution prevention measures. It must be realized that in order to maintain water quality in the quarry strict procedures and policies must be followed during construction and operation phases. Comprehensive chemical disposal controls, proper erosion and sedimentation control measures, appropriate water aeration methods and other pollution control methods must be introduced and enforced. Most of the information and evaluation methods provided in the reports are technical in nature. Subsequently their evaluation and determination of completeness can only be provided by relevant state and federal review authorities and possibly other qualified professionals not available at a local staff level.

The excavation of the channel to connect the river with the quarry site will likely result in a redefinition of the Connecticut River 100 year flood hazard line. Relevant information should be supplied to the DEP flood management section and possibly to the Federal Emergency Management Agency (FEMA).

Traffic Considerations

The traffic study, prepared by the applicant, was reviewed by the Team Regional Planner and the Midstate RPA traffic engineer, George Wallace. It is noted that the study concludes by stating the development will be compatible with existing traffic flow patterns, provided that a number of minor traffic control measures be implemented in conjunction with the proposed marina development. The report takes into consideration, as part of its evaluation, the proposed condominium development adjacent to the to the marina site.

However, it is Midstate RPA's understanding that the condominium development may be abandoned to develop 100+ single family dwellings. For planning purposes, the applicant should be required to indicate the traffic impacts associated with the later case and how they can be mitigated.

Another position taken in the report is that the path of least resistance for eastbound traffic is and will be to "make a right turn at the end of the bridge approach onto Main Street, follow to the intersection of Brownstone Avenue and proceed north on Brownstone Avenue to the quarry". It appears that the data submitted indicates that present eastbound Route 66 traffic going to the northern end of Brownstone Avenue favors turning left onto Silver Street rather than right onto Main Street. The claim that over 80% of the eastbound traffic heading for the marina will take a right on to Main Street may be questionable. Reconsideration of the primary site access, as it relates to eastbound traffic, may be warranted.

In considering the background studies used to determine parking requirements, it is stated from one study that, on an August weekend 12% of the boats were in use and on a July 4th weekend 40% of the boats were in use. Another study referred to in the traffic study stated that on an August weekend and a Labor Day weekend 38% of the boats were in use. If the 38% was representative of an August weekend; it is possible that the second study may have found, by correlating the data between the two studies, that the July 4th weekend may have had substantially greater than 40% of the boats in use. This indicates that the parking requirements for this development may need to be modified (increased) as the Phases are completed and actual site parking data and requirements can be determined. It is suggested that the applicant indicate where additional parking could be accommodated, if needed in the future.

Land Use Considerations

The project represents a unique approach toward allowing the public to recognize and

appreciate an historic feature existing along the Connecticut River. Though surrounded by industrial activity, this proposal certainly provides an opportunity to enhance an area in need of an activity that doesn't simply create more concrete, asphalt and steel. The commercial/recreation potential of the proposed land uses could benefit the Town as well as the developer. It is obvious that the proposal promotes recreation on and around the river, particularly for those choosing to rent or purchase a proposed slip. It has been expressed by the developer that public access and use of the site will be encouraged. Hopefully negotiations between the developer and the Town take advantage of this unique opportunity and the list of proposed public interest features becomes a reality as early into the site development as possible.

Landscaping will be an important function in assuring the developed site, as viewed from the land and the river, does not add to the areas present state of visual blight. Parking areas, in particular, should be screened so as to be unnoticed from off the site. Where practical, preservation of the existing "undisturbed" landscape should be exercised.

Conclusion

Through repeated discussions with the applicant and upon review of the items submitted, it is apparent that considerable time and effort have been put into the proposal. The contents of the application package appear to recognize many of the federal, state and local regulatory controls and concerns. With further clarification of and response to the items highlighted in this report and with continued interaction between the developer and the Town, the development will provide an extraordinary recreation facility along the Connecticut River.

APPENDIX

A. Excerpt from DEP Bulletin

B. State Historic Preservation Office Letter

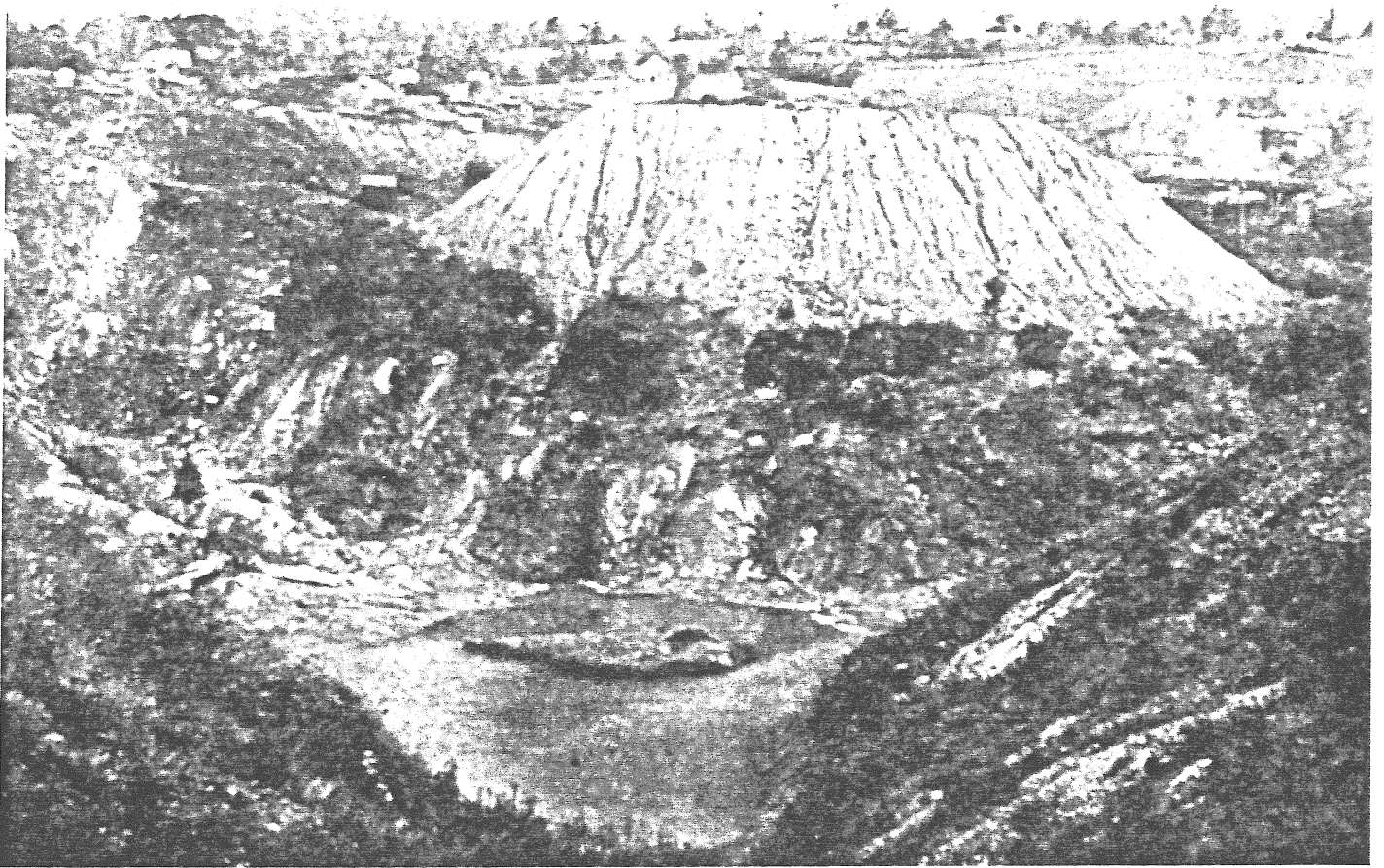


Figure 5. Abandoned pit at Ore Hill near Salisbury, Connecticut. At the time the photo was taken (1898 or earlier), the surface work had long since ceased and work was carried on at a depth of 150 to 200 feet below the surface, and beneath the pit is reported to have been honeycombed galleries. (Photo from Pynchon, 1899)

Connecticut's Historic Geologic Sites

by
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(The following is the second and final installment of an article which began in the June 1990 issue of Connecticut Environment.)

WITHIN CONNECTICUT'S BOUNDARIES occurs a number of significant historic geologic sites. Connecticut has received considerable attention from geological scientists and the mining industry. Some of these sites

have national significance. The following notes give some information on some of the outstanding geological historical sites in the state.

Geological sites are under constant threat due to development. Perhaps some of the sites below should be identified for preservation and management efforts so that they are not lost. Once these sites are lost, they are lost forever.

Ore Hill Iron Mine, Salisbury, Connecticut. The Ore Hill Mine (Figure 5) is an example of the iron mining operations of Connecticut referred to here as the "Salisbury Iron Mining District." The Salisbury district, centered at Salisbury, Connecticut, once was one of the

most important iron ore-producing areas in the nation. The district, which includes adjacent parts of New York and Massachusetts, centers at Salisbury. Connecticut produced 35,018 tons of ore in 1880 (Harte, 1944), nearly all limonite and hematite ore from Salisbury and Kent. Most of the iron mines of the Salisbury district are at or near contacts with the Stockbridge marble. The ores reportedly had a low phosphorous and a high manganese content, which resulted in physical properties that made "Salisbury iron" famous for the manufacture of railroad car wheels and weapons.

Salisbury iron was used for the cannons and armor of the U.S.S. Constellation (now stationed in Baltimore Harbor), the U.S.S. Constitution ("Old Ironsides" – now stationed in Boston), the cannons of New York City's Battery Park, and a chain across the Hudson River intended to prevent the British from passing northward during a part of the Revolutionary War (Harte, 1944). The Ore Hill Mine near Salisbury is believed to have been the largest producer of iron in the district (Harte, 1944; Hobbs, 1901).

In 1762, Ethan Allen bought an interest in the Ore Hill Iron Mine and built a forge and a blast furnace at the outlet of the Lake Wononscopomuc. A very large portion of the Colonists' cannon for the Revolutionary War came from that furnace, although by that time the investment had passed out of Allen's hands (Harte, 1944).

Portland Brownstone Quarries, Portland, Connecticut. Brownstone, the Mesozoic arkosic sandstone, was very fashionable in the late 1800s. In the latter decades of the 19th century, the brownstone quarrying industry in Portland was immensely prosperous. Rice and Foye (1927) of Wesleyan wrote: "For a number of decades a man who wanted to build a dwelling house of high grade in New York or Boston hardly dared to build anything but a brownstone front, and the brownstone came from the Jurassic of Connecticut and New Jersey."

The Portland quarries (Figure 6) were the king of the brownstone quarries in Connecticut, and perhaps in the country. Brownstone for use in buildings was shipped to New York, New Jersey, and as far away as California. An architectural style and look resulted from the availability of brownstone, the Portland being very highly prized. The brownstone era had a significant effect on the broad national patterns of U.S. history.

Quarry excavations have provided sedimentological and paleontological information of significance. Numerous geological studies have been conducted on those particular strata and this has led to a better understanding of these rocks. The most abundant fossils found in these quarries have been tracks and casts of tracks of dinosaurs. Most of these tracks were about six inches long and show three toes (a fourth rear toe very often did not leave an impression). One large track is reported to have been 20 inches in length. The museum at Wesleyan University, just across the river from the quarries, has a fine collection of dinosaur footprints, many obtained from these

quarries. In 1874, a series of more than 20 tracks (species: *Otozoum moodu*) was exposed on a stratum laid bare in the work of quarrying. In the summer of that year, the American Association for the Advancement of Science met in Hartford, and a large party of geologists visited the quarries to view those tracks (Rice and Foye, 1927).

Strickland Pegmatite Quarry, Portland, Connecticut. The Strickland Pegmatite Quarry on the west flank of Collins Hill exhibits what may be the best pegmatite cross-section in the Middletown Pegmatite District. The nearly complete cross-section (the root is not exposed) clearly shows the relationships of the granitic intrusion and the host metamorphosed sedimentary rocks.

Commercial mining of feldspar in New England goes back to the year 1825. Quarrying at the Strickland site began as early as 1840 (Foye, 1922). The Strickland-Cramer site is one of about 75 to 100 granite pegmatite quarries in the state. Strickland, however, stands out in several ways.

A small percentage of Connecticut's pegmatites contain small but significant amounts of rare metals. Strickland and the associated Cramer Quarry do. Both are considered rare metal pegmatites. Thus, in addition to the typical mineral components of granite (i.e. quartz and feldspar) there occur rare metal minerals such as beryl and tourmaline. Many of these rare metal minerals are beautifully colored and occur as well-developed crystals. Some material is of gem quality and numerous gemstones have been carved from minerals found here.

The pegmatite has a long and important scientific history. A preliminary search of the scientific literature resulted in the compilation of more than a dozen journal articles on Strickland. The New England Intercollegiate Geological Field Conference has conducted at least two



Figure 6. Quarry site and activities of the Portland Brownstone Quarries during 1889, Portland, Connecticut. Brownstone was very popular for building near the end of the 19th century and much of the brownstone for New York and Boston came from Portland. (Photo reproduced with permission of the Portland Library)

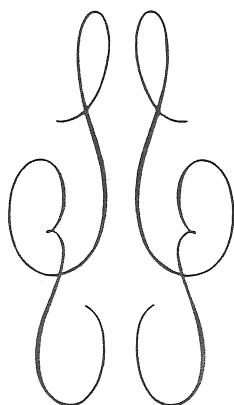
excursions to Strickland (Bannerman *et al.*, 1965; London, 1985). Mineralogical and petrological studies dominate the reports that were found, but significant radiometric age dating studies have also been a focus (e.g. Foye and Lane, 1934). Numerous articles have also appeared in many rockhound magazines.

In his publication, *The Minerals of Connecticut*, Schairer (1931), a chemist with the Carnegie Geophysical Laboratory in Washington D.C., described the site as a "mineralogist's paradise." Schairer probably based his statement on the fact that the minerals found here are high quality and of diverse nature. This fact has resulted in the popularity of Strickland as a teaching and collecting site.

Wolcott Brownstone Quarry, Manchester, Connecticut. The Wolcott Brownstone Quarry near the village of Buckland in Manchester, Connecticut, was once the most productive dinosaur bone locality in the Connecticut Valley. Three well-preserved skeletons of prosauropods (early plant-eating dinosaurs) plus two other fragmentary specimens were discovered. These skeletons were described in several papers by Marsh in the late 1800s (Galton, 1976). This site has yielded information of considerable scientific importance and could have been expected to yield additional data affecting theories, concepts, and ideas in science. However, the site was destroyed by recent development of a shopping mall that opened its doors in 1990. Preservation measures were ineffective in preserving this nationally significant locality.

For further information concerning these sites, the reader can contact the author at the Connecticut Geological and Natural History Survey, (203) 566-3540.

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STATE OF CONNECTICUT
CONNECTICUT HISTORICAL COMMISSION

September 21, 1990

Mr. Keane Callahan
Environmental Analyst
Robinson & Cole
One Commercial Plaza
Hartford, CT 06103-3597

SUBJECT: Malloy Development Corporation: Riverport Landing
Portland, Connecticut

Dear Mr. Callahan:

The State Historic Preservation Office has reviewed detailed plans entitled "Site Plan -- Marina and Support Facilities, Riverport Landing Marina" dated June 15, 1990, concerning the above-named project. Further, Dr. David A. Poirier, our staff archaeologist, has participated in an onsite review of the proposed undertaking. This office notes that the Portland Brownstone Quarry is listed as a significant historic resource in the State of Connecticut's industrial and engineering inventory. Moreover, the National Park Service will be evaluating this historic property for consideration as a National Historic Landmark in the near future. The State Historic Preservation Office believes that the Portland Brownstone Quarry is eligible for the National Register of Historic Places and supports the National Park Service's evaluation of this resource as a National Historic Landmark.

In the opinion of the State Historic Preservation Office, the proposed Riverport Landing Marina will have an adverse effect upon the historic industrial ambiance of the Portland Brownstone Quarry. We recognize that the extent of the physical modification to the quarry will be minimal. In addition, we expect that the proposed improvements will expand the opportunity for the general public to appreciate this important aspect of the nation's industrial heritage.

The State Historic Preservation Office understands that the project will require regulatory approval by the U.S. Army Corps of Engineers. Therefore, we recommend that the Corps of Engineers consult with the Advisory Council on Historic Preservation with regard to Section 106 and Section 110 of the National Historic Preservation Act of 1966. In particular, we recommend that a Memorandum of Agreement be drafted which will provide for the implementation of appropriate mitigative measures to minimize the physical alteration to the Portland Brownstone Quarry. This office suggests that the following stipulations would be appropriate:

1. Prior to all construction-related activities, the U.S. Army Corps of Engineers and/or the Malloy Development Corporation shall contact the National Park Service Mid-Atlantic Regional Office to determine what level and kind of recordation is required for the property. Unless otherwise agreed to by the National Park Service, the Corps of Engineers shall ensure that all documentation is completed and accepted by the Historic American Engineering Record prior to initiation and that copies of the documentation are provided to both HAER and the Connecticut SHPO.

TEL: (203) 566-3005

59 SOUTH PROSPECT ST. — HARTFORD, CONN. 06106

AN EQUAL OPPORTUNITY EMPLOYER

2. The U.S. Army Corps of Engineers and/or Malloy Development Corporation shall ensure that a data recovery plan is developed in consultation with the Connecticut SHPO for the recovery of industrial archaeological data from the Portland Brownstone Quarry. The plan shall be consistent with the Secretary of the Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37) and take into account the Council's publication, Treatment of Archaeological Properties (Advisory Council on Historic Preservation, draft, 1980), subject to any pertinent revisions the Council may make in the publication prior to completion of the data recovery plan, and the Connecticut SHPO's Environmental Review Primer for Connecticut's Archaeological Resources. The plan shall specify, at a minimum:
 - a. the research questions to be addressed through the data recovery, with an explanation of their relevance and importance;
 - b. the methods to be used, with an explanation of their relevance to the research questions;
 - c. the methods to be used in analysis, data management, and dissemination of data, including a schedule;
 - d. the proposed disposition of recovered materials and records;
 - e. the proposed methods for involving the interested public in the data recovery;
 - f. the proposed methods for disseminating results of the work to the interested public;
 - g. the requirement that the data recovery plan be submitted by the U.S. Army Corps of Engineers and/or Malloy Development Corporation to the Connecticut SHPO and the Advisory Council on Historic Preservation for 15 days review. Unless the SHPO or the Council object within 15 days after receipt of the plan, the U.S. Army Corps of Engineers and/or Malloy Development Corporation shall ensure that it is implemented.
3. The U.S. Army Corps of Engineers and/or Malloy Development Corporation shall consult with the Connecticut SHPO to develop a public benefit program. This program may include, but may not be limited to, one of the following: a popular booklet or report, a fixed exhibit or display, or development of interpretive markers, public presentations, lectures, or a local school program.

The State Historic Preservation Office shares the concern expressed by the Connecticut Department of Environmental Protection's Natural Resource Center that a professional monitoring program be developed regarding paleontological remains which may be discovered as part of the new channel which will link the marina with the Connecticut River. This office encourages the U.S. Army Corps of Engineers to include a paleontological monitoring program as an appropriate permit condition for the project.

We believe that Malloy Development Corporation's proposal is highly creative and sensitive to the surviving historicity of the Portland Brownstone Quarry. We look forward to working with all parties in the expeditious furtherance of the project as well as in the professional management of the state's industrial heritage. For further information please contact Dr. David A. Poirier, Staff Archaeologist.

Sincerely,



Dawn Maddox
Deputy State Historic
Preservation Officer

DAP:nlw

CC: Ms. Marie Bourassa/COE
Dr. Nicholas F. Bellantoni/OSA
Ms. Varerie DeCarlo/ACHP
Mr. Sid Quarrier/DEP, Nat.Res. Center
Ms. Elaine Sych/ Envir. Review Team
Mr. Harry Butowski/N.H.L.P.

ABOUT THE TEAM

The Eastern Connecticut Environmental Review Team (ERT) is a group of professionals in environmental fields drawn together from a variety of federal, state and regional agencies. Specialists on the Team include geologists, biologists, foresters, soil specialists, engineers and planners. The ERT operates with state funding under the supervision of the Eastern Connecticut Resource Conservation and Development (RC&D) Area — an 86 town region.

The services of the Team are available as a public service at no cost to Connecticut towns.

PURPOSE OF THE TEAM

The Environmental Review Team is available to help towns and developers in the review of sites proposed for major land use activities. To date, the ERT has been involved in reviewing a wide range of projects including subdivisions, landfills, commercial and industrial developments, sand and gravel excavations, elderly housing, recreation/open space projects, watershed studies and resource inventories.

Reviews are conducted in the interest of providing information and analysis that will assist towns and developers in environmentally sound decision-making. This is done through identifying the natural resource base of the project site and highlighting opportunities and limitations for the proposed land use.

REQUESTING A REVIEW

Environmental reviews may be requested by the chief elected official of a municipality or the chairman of town commissions such as planning and zoning, conservation, inland wetlands, parks and recreation or economic development. Requests should be directed to the chairman of your local Soil and Water Conservation District and the ERT Coordinator. A request form should be completely filled out and should include the required materials. When this request is approved by the local Soil and Water Conservation District and the Eastern Connecticut RC&D Executive Council, the Team will undertake the review on a priority basis.

For additional information and request forms regarding the Environmental Review Team please contact the ERT Coordinator: 203-345-3977, Eastern Connecticut RC&D Area, P.O. Box 70, Haddam, Connecticut 06438.