

MIDSTATE

regional
planning
agency

report 1

study
of

REFUSE
DISPOSAL

Conn P-43

The preparation of this report was financed by an urban planning grant from the Housing and Home Finance Agency under the provisions of section 701 of the Housing Act of 1954, as amended; by a regional planning grant from the Connecticut Development Commission; and by contributions from member municipalities.

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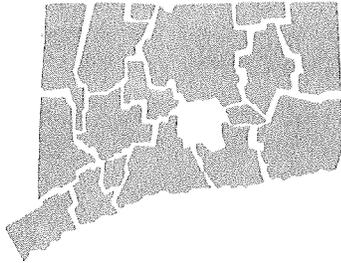
The Study of Refuse Disposal for the Midstate Planning Region was conducted under the supervision of Junius W. Stephenson, of the firm of Havens and Emerson, Consulting Engineers.

The Midstate Regional Planning Agency expresses its sincere appreciation for the cooperation of the numerous town and city officials whose valuable assistance is reflected throughout this report.

October, 1965.

MIDSTATE REGIONAL PLANNING AGENCY

CROMWELL DURHAM EAST HAMPTON HADDAM MIDDLEFIELD MIDDLETOWN PORTLAND



P.O. BOX 139 MIDDLETOWN, CONNECTICUT 06458 203 347-6180

November 2, 1965.

The Midstate Regional Planning Agency is pleased to submit to its member communities a report of the refuse disposal study of the Midstate Planning Region.

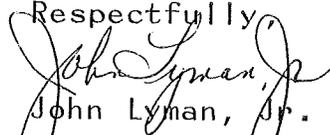
This report, which is the first of a series of study reports to be published by the Agency, is also the first overview of the problem of refuse disposal in our communities.

This study, as well as those to follow, is designed to fulfill several important planning functions. In addition to serving as a source of data for the comprehensive regional plan, it is an integral factor in achieving the following objectives.

1. The study is intended as a guide to Midstate's member communities. In this report, current refuse disposal practices are described, compared and analyzed, alternative methods are explored and evaluated, and future needs are estimated. From these, conclusions and general recommendations are drawn. This is to provide member municipalities with the basic information necessary for sound decisions concerning their future plans.
2. It is a fundamental belief of this Agency that the regional perspective provides greater latitude in determining an approach to the provision of community services. The option of solving local problems through intertown cooperation with neighbors having similar or complementary problems is not always evident in a strictly local approach. The regional perspective simply increases the alternatives available to a community in dealing with its problems.
3. An effective planning program which leads to realization of community objectives is predicated upon the coordinated provision of all necessary services and facilities, rather than the success of isolated programs at the expense of others. Toward this end, the Agency's studies may serve to provide an additional basis for a comparative evaluation of programs for community improvements.

Effective utilization of these studies will hopefully provide additional assistance in the decision making processes which channel development and bring the region closer to the realization of its goals.

Respectfully


John Lyman, Jr.

IRWIN MOSS KAPLAN, DIRECTOR

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September, 1965.

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(resigned 25 June 1965)
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Summer Intern, 1965
Summer Intern, 1965
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SURVEY AND ANALYSIS

Scope and Purpose of Study

The provision of means and facilities for satisfactory, nuisance-free disposal of refuse, including garbage, rubbish, and bulky materials, is a problem of increasing seriousness to both urban and rural communities throughout the nation today. The continued population growth, the increasing per capita rate of refuse production, and the decreasing availability of land for the purpose make it imperative that every community, whether large or small, highly developed or lightly populated, plan and provide for future refuse disposal. A twenty-year futurity is generally considered the minimum for which such plans and provisions should be made. Further, the recognition of refuse disposal as a public health consideration has resulted in a wide public demand, increasingly backed by legislation and provision for enforcement, that disposal be nuisance-free, and that the smoke, odors, dirt and dust, vermin, and insects heretofore associated with refuse disposal be eliminated. It is, therefore, the purpose of our study and this report to determine and summarize the refuse disposal practices of the seven communities served by the Midstate Regional Planning Agency, to recommend desirable immediate improvements in

those practices, and to set forth guidelines for refuse disposal planning for the next twenty years.

Present Conditions

The area is presently served by seven municipally operated dumps and an incinerator which is owned and operated by the City of Middletown. Locations of these facilities are shown on the accompanying map. Pertinent data on the dumps is summarized in the following Table I. Information on open burning and cover material is based on our observations; all other data are as reported by city and town officials.

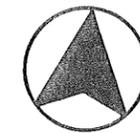
Our inspection of the dumping sites showed all to be better than open dumps, although none can be classed as sanitary landfills. At all except the Middletown garbage and trash dump, refuse is burned in the open prior to being placed in final position, although only a limited amount of carefully controlled burning is permitted at the Middletown bulky refuse dump. Elsewhere the operations result in odors and heavy smoke. All dumps are provided with an earth cover, although the frequency of placing this cover varies. In no instance had an earth cover been observed over either the active or inactive faces, and at several sites there was evidence that both burned and unburned material had lain for extended periods with-

REFUSE DISPOSAL STUDY

LEGEND

-  TOWN OWNED DUMPS
-  TOWN LEASED DUMPS
-  POTENTIAL DUMP SITES

MIDSTATE PLANNING REGION



0' 15000'

MIDSTATE
REGIONAL PLANNING AGENCY
CONN. P-43

THE PREPARATION OF THIS MAP
WAS FINANCED BY AN URBAN
PLANNING GRANT FROM THE
HOUSING AND HOME FINANCE AGENCY
UNDER THE PROVISIONS OF SECTION
701 OF THE HOUSING ACT OF 1954,
AS AMENDED, BY A REGIONAL PLANNING
GRANT FROM THE CONNECTICUT DEVELOP-
MENT COMMISSION, AND BY CONTRIBUTIONS
FROM MEMBER MUNICIPALITIES.

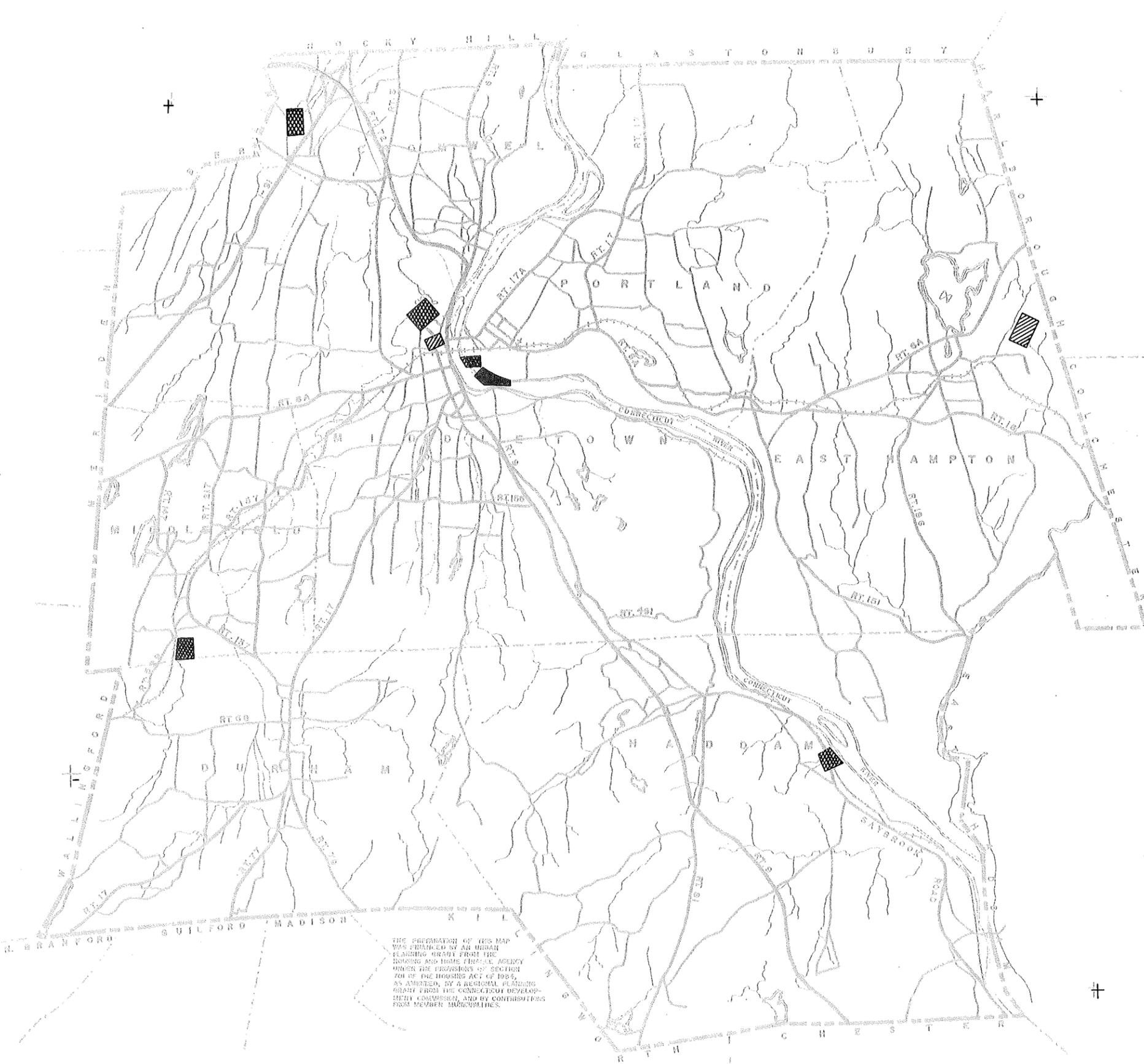


Table 1
REFUSE DUMPS

<u>Municipality</u>	<u>Owned or Leased</u>	<u>Notice for Lease Cancellation</u>	<u>Future Life-Years</u>	<u>Open Burning</u>	<u>Cover Material on Site</u>	<u>Extermination</u>	<u>Annual Cost</u>	<u>Other Site Selected</u>
Cromwell	Leased	Unknown	30(h)	yes	nearby	yes(g)	\$ 4,300	no
Durham	USES MIDDLEFIELD DUMP						1,100(b)	no
East Hampton	Owned	-	15-20	yes	no(a)	no	4,500(d)	no
Haddam	Leased(c)	-	2	yes	no	yes	725	yes
Middlefield	Leased	6 months		yes	no	no	2,200(b)	no
Middletown								
Garbage & Trash	Leased	6 months	10-15(f)	no	no	yes	50,000(e)	yes(f)
Bulky Refuse	Owned	-	10-15(f)	yes	no	yes	50,000(e)	no
Portland	Leased	Instant	20-25	yes	no	no	4,200	yes(i)

- (a) Purchased only when street sweepings, etc., not available.
- (b) Durham and Middlefield divide \$2,200 total annual cost. Rental-\$1,000, spread and cover-\$1,200.
- (c) No cost to the Town.
- (d) Annual Budget for sanitation.
- (e) Total refuse collection and disposal budget including depreciation.
- (f) 10-15 years total life at both sites. Can shift full operation to bulky refuse dump if necessary.
- (g) Once or twice a year. Ineffective.
- (h) Estimated dump life of series of abandoned clay pits on leased site.
- (i) Subject to approval of State Health Department and Water Resources Board. Town owned property with dump life estimated at 15-20 years.

CROMWELL
LEASED
DUMP
25 MAY 1965



EAST HAMPTON



TOWN-OWNED DUMP

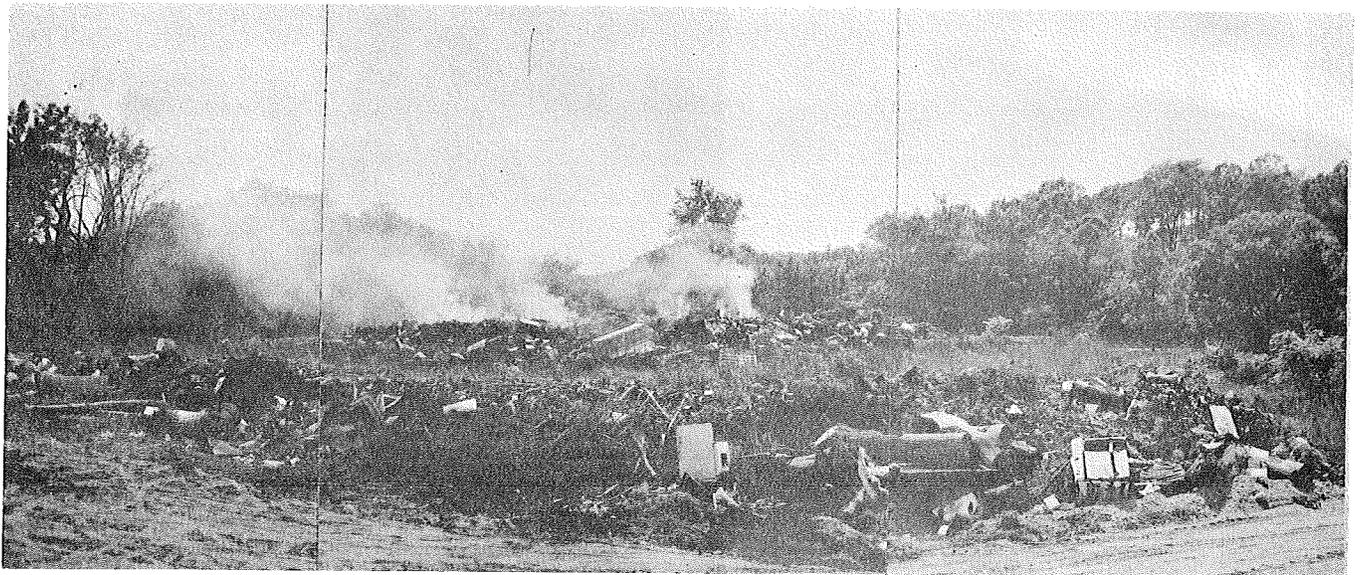
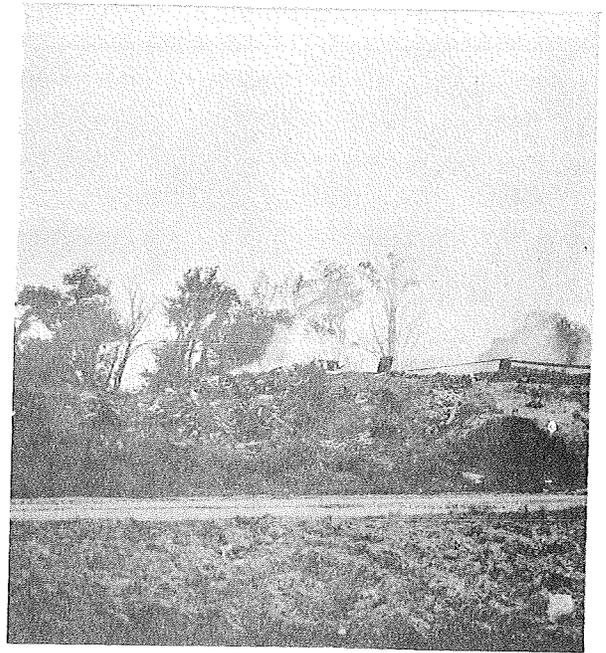
1 JUNE 1965



out being covered. The presence of insects, rats, and other vermin in varying numbers was reported or apparent at all sites. All dumps except those in East Hampton, Middletown, and Portland are on sites relatively remote from residences or other developed areas; however, it is reported that the frequency of complaints of dump nuisances is increasing throughout the area. At the East Hampton dump, open burning cannot be permitted unless the wind is to the north and away from adjacent residential areas to the south of the dump.

Of particular concern is the fact that five dumps are on leased land with provision for lease termination by either party on relatively short notice. Neither Durham nor Middlefield has an alternate dump site selected, and these communities could be in serious difficulty if leases on the present dump sites should be terminated. Under the present plan, Cromwell will use other abandoned clay pits on its leased site when the pit now being used is full, but the Town would also be in a serious situation if the lease should be terminated. Information available to us did not indicate what cancellation provisions are included in the present 30-year lease. It is estimated that the present Haddam dump will last not more than two years; however, the Town is currently negotiating with the State Park and Forest Commission to share a dump near Turkey Hill Reservoir with the Town of Chester, and

HADDAM
LEASED DUMP
1 JUNE 1965



MIDDLEFIELD
LEASED DUMP
SERVING DURHAM AND MIDDLEFIELD
25 MAY 1965



there is every indication that satisfactory arrangements for use of this dump can be made. Portland owns property to which it proposes to transfer dumping operations in the future; however, this town-owned property is on a flood plain and its use as a dump will require approval of both the State Health Department and the Water Resources Commission. Termination of the lease on Middletown's present garbage and trash dump site would result in transfer of all operations to the city-owned site which is currently used for disposal of bulky refuse; however, city officials estimate that this site would be adequate for an additional 10-15 years dumping estimated at an additional 15-20 years, appears to be in the most advantageous position of the seven communities for future refuse disposal.

None of the seven communities appears in immediate danger of losing its refuse disposal site; however, the position of those communities using leased dump sites must be considered precarious in planning for the future because of the ever present possibility of lease cancellations for any of a number of reasons, including conversion of the sites to other uses, proposed development of adjacent property, and the nuisances created. Further, it can safely be assumed that appreciation in value of properties adjoining the dumps will be seriously retarded because of their proximity to the present operations.



MIDDLETOWN
LEASED
GARBAGE AND
REFUSE DUMP
25 MAY 1965

CITY-OWNED
BULKY
REFUSE
DUMP
25 MAY 1965



From the foregoing, it is evident that communities now depending on leased land must make long term provision for refuse disposal at an early date. This can be accomplished by: (a) Purchase of land for dumps or sanitary landfill, (b) Long term lease of sites without provision for owner's cancellation, or (c) Construction of refuse incinerators.

The Middletown refuse incinerator was built in 1937 and enlarged in 1950. The original installation consisted of a single Decarie basket grate type furnace of unknown original design capacity. At a later date, this furnace was modified by the removal of the basket grates and installation of a rotating center cone and rabble arms. Based on present day design standards, we believe that this furnace should be rated at not more than 30 to 35 tons of mixed refuse in 24 hours. In 1950 the plant was enlarged by installation of a circular mechanically stoked furnace in space provided in the building. This furnace had an original design capacity of about 60 tons in 24 hours, although on the basis of present standards we believe it should be rated at not more than 50 tons.

The plant is not of modern design in that it is a floor dump operation requiring manual charging and manual removal of residue. At present, only a very small proportion of Middletown's refuse--an estimated 5 per

PORTLAND



LEASED DUMP

1 JUNE 1965



cent consisting primarily of paper, cardboard, and light wooden boxes--is burned in the incinerator with the remainder delivered to the dumps. Most of the burning is done in the older rectangular unit with the circular furnace, which is of later design, being used infrequently. Design and layout of this plant are such that it cannot readily be enlarged or converted to a modern installation, and we do not believe that it should be considered in the planning of future refuse disposal facilities for Middletown or adjacent communities.

MODERN REFUSE DISPOSAL PRACTICES

As the direct result of the previously noted public health considerations and the public demand that refuse disposal be nuisance-free, the only methods of disposal generally considered acceptable are sanitary landfill and high temperature incineration. Composting is currently receiving wide publicity in the press and periodicals, but to date has not proven satisfactory on a municipal scale in this country. Accordingly, composting should not be considered as a means of refuse disposal for the Planning Region.

Throughout the country more and more state health departments and other agencies are being empowered to control refuse disposal and to limit the methods used to those which are nuisance-free. As a result, open dumps and open burning are gradually being eliminated in most areas. In June, 1965, the Connecticut State Legislature passed Modified House Bill No. 2877, entitled, "An Act Concerning Refuse Disposal Areas." This act, which took effect July 1, 1965, empowers the Commissioner of Health to "examine all existing or proposed public sewerage systems, refuse disposal plants and refuse disposal areas," to "compel their operation in a manner which shall protect the public health," and to "order their alteration, extension, and replacement when necessary for the pro-

tection of public health." The act further provides that "No public sewerage system or refuse disposal plant shall be built or refuse disposal area established until the plan or design of the same and the method of operation thereof have been filed with the said commissioner."

Information received in conference with State Health Department officials indicates that the provisions of the act are already being rigorously enforced, and that the Department will require many of the present dumping and open burning operations in the Planning Region to be abandoned or converted to sanitary landfills. Of greater importance to the immediate area, however, is the retarding effect on future growth and development in the vicinity of the dumps if the nuisances resulting from the present operations are permitted to continue.

Without question, sanitary landfill is substantially less costly than incineration and should be adopted wherever possible. There are numerous variations in the method of operating a sanitary landfill, although it consists basically of compacting refuse in 6 to 10 foot layers and covering both the top surface and the active face with approximately six inches of earth at the end of each day. When the fill has reached the desired level, two feet of earth are spread over the last lift and the area can be developed for such uses as parking lots or recreational activities. Some settlement will occur during the first

few years, after which a landfill can usually be expected to support light construction. Sanitary landfills can usually be operated for \$1 to \$2 per ton of refuse, depending on the size of the operation, availability of cover material, and other local conditions.

By comparison with land fill, a modern refuse incinerator is a complex, costly, installation; however, in highly developed sections where the large areas required for landfills are not readily available, incineration is the most satisfactory means of disposal.

The design of incinerators to be built in Connecticut is subject to approval of the State Department of Health, must meet certain minimum criteria, and must include facilities for air pollution control to meet currently accepted standards. While the cost of incineration depends on many factors including local conditions, the total operating cost, excluding debt service, will usually lie between \$2 and \$6 per ton of refuse burned. As with sanitary landfill, the unit cost of incinerator plant construction and operation is lower for the larger installations.

From the foregoing, the economic desirability of converting the present dumps to sanitary landfills rather than turning to incineration is self-evident. The seven communities should make every effort to secure suitable landfill sites

and utilize them to the maximum. Only when the supply of suitable sites approaches exhaustion should incineration be considered, and at that time it will be highly desirable for the communities to combine to build one or two larger plants rather than seven smaller, more costly installations. It must be remembered, however, that, with incineration, sites for disposal of incinerator residue, non-combustibles and large bulky materials will still be required. The volume of this material may approach as much as 1/4 or more of the volume for sanitary landfill. A well-burned incinerator residue is an excellent fill material and the required disposal volume can frequently be held to a minimum by selling or giving the residue away for this purpose. Still, the change from landfill to incineration must be made while suitable sites remain available for disposal of the residue and unburned material. These sites should be adequate for use throughout the life of the incinerator which can be expected to be 20 to 30 years.

POPULATION AND REFUSE PRODUCTION

Population

Past , present, and estimated future populations of the seven communities are shown in the following, Table 2: These estimates were developed merely as a frame of reference for discussion of refuse production, and will be revised in subsequent population studies.

Table 2

PAST, PRESENT, AND ESTIMATED FUTURE POPULATIONS

<u>Location</u>	<u>1940</u>	<u>1950</u>	<u>1960</u>	<u>1964</u>	<u>1975</u>	<u>1980</u>	<u>1985</u>
Cromwell	3,281	4,286	6,780	7,200	12,700	15,000	17,500
Durham	1,098	1,804	3,096	3,600	6,800	8,300	10,000
East Hampton	2,955	4,000	5,403	6,000	8,800	10,000	11,500
Haddam	2,069	2,636	3,466	3,800	6,300	7,500	8,500
Middlefield	1,203	1,983	3,255	3,900	6,300	7,500	8,500
Middletown	26,495	29,711	33,250	35,000*	38,800	40,700	42,600
Portland	<u>4,321</u>	<u>5,186</u>	<u>7,496</u>	<u>8,100</u>	<u>11,700</u>	<u>13,400</u>	<u>15,000</u>
TOTALS	41,422	49,606	62,746	67,600	91,400	102,400	113,600

* 1965 Population as estimated by Superintendent of Public Works.

1940, 1950, and 1960 populations are from Federal Census Reports; 1964 and 1980 estimated populations are preliminary estimates of the Agency; 1975 and 1985 populations are taken from projections of the 1964 and 1980 estimates.

Refuse Production

Throughout the area, only the City of Middletown has municipal refuse collections, but these handle only a portion of the City's refuse, and records do not reflect the total production of the full population. The balance of the Middletown refuse and all refuse from the other six communities either is handled by private collectors who dispose of it on the various dumps, or is disposed of by individual residents or commercial or industrial establishments on the dumps, in backyard burners, or elsewhere. Accordingly, there is no information as to the actual refuse production of the area, although from experience in other Connecticut communities, we believe that refuse production of the seven Planning Region communities can be estimated with sufficient accuracy for present planning.

Records of communities throughout the nation show that refuse production may range from a low of two to a high of five or more pounds per capita per day depending on size and type of community and other factors. The records further show a trend to increased rate of production which can be expected to continue for the foreseeable future. We believe that refuse production for the overall Planning Region should be estimated at approximately 3 pounds per capita per day at present, 3.25 pounds per

capita per day in 1975, and 3.5 pounds per capita per day in 1985, with normal seasonal variation increasing these rates by about 15 per cent during months of peak production.

As previously noted, planning of refuse disposal facilities should be based on a minimum futurity of 20 years, although, in the case of incinerator construction, a shorter futurity may be used provided the plant is designed for enlargement or expansion as the need arises. Accordingly, based on the foregoing population and refuse production data, estimated total annual and daily average refuse production of the seven Planning Region communities for 1975 and 1985 is shown in the following, Table 3:

Table 3
ESTIMATED REFUSE PRODUCTION, 1975 and 1985, TONS

	<u>1975 @ 3.25 #/c/d</u>			<u>1985 @ 3.5 #/c/d</u>		
	<u>Population</u>	<u>Annual Total</u>	<u>Daily Average</u>	<u>Population</u>	<u>Annual Total</u>	<u>Daily Average</u>
Cromwell	12,700	7,520	20.6	17,500	11,190	30.6
Durham	6,800	4,030	11.1	10,000	6,380	17.5
East Hampton	8,800	5,210	14.3	11,500	7,350	20.2
Haddam	6,300	3,740	10.3	8,500	5,420	14.9
Middlefield	6,300	3,740	10.3	8,500	5,420	14.9
Middletown	38,800	23,000	63.0	42,600	27,200	74.5
Portland	<u>11,700</u>	<u>6,940</u>	<u>19.0</u>	<u>15,000</u>	<u>9,560</u>	<u>26.2</u>
TOTAL	91,400	54,180	148.6	113,600	72,520	198.8

Planning at this time for future refuse disposal facilities should contemplate disposal of the full production of each community at one point and should, therefore, be based on disposing of the quantities set forth in Table 3. If it were possible to determine the actual refuse production of the various communities, then the above table should be revised accordingly; however, in view of the various points and means of disposal used throughout the area, it is doubtful that this information can be determined reliably at this time.

SANITARY LANDFILLS

Table 4 is presented to show the estimated total and annual average sanitary landfill area requirements for the various communities for the next 20 years, based on refuse production as set forth in Table 3. These requirements are based on the refuse being placed in eight-foot layers or lifts, and on compaction to 750 pounds per cubic yard. Higher lifts would somewhat reduce the amount of cover material required but would not materially improve the compaction. The assumption is also made that suitable cover material will be available on the site; if cover material must be brought in, the area requirements will be increased some 10 to 15 per cent.

It is evident that area requirements are reduced as the number of lifts is increased. Obviously, therefore, a site which can receive several lifts is highly desirable; for example, the dump site at East Hampton, where refuse is now placed to a depth of 30 feet or more, will be highly desirable for a landfill, especially if cover material can be made available on the site.

The decision as to the method of sanitary landfill operation to be followed will depend in each instance on the site selected. The three basic methods of landfill are trench, area, and ramp, which are described as follows:

Table 4
SANITARY LANDFILL AREA REQUIREMENTS, 1965 - 1985

	<u>Acre- feet</u>	<u>Acres Req'd., 8-Foot Lifts</u>			<u>Acre- feet</u>	<u>Acres Req'd., 8-Foot Lifts</u>		
		<u>1 Lift</u>	<u>2 Lifts</u>	<u>3 Lifts</u>		<u>1 Lift</u>	<u>2 Lifts</u>	<u>3 Lifts</u>
Cromwell	12.7	1.60	0.80	0.53	254	31.8	15.9	10.6
Durham	6.8	0.85	0.42	0.29	136	17.0	8.5	5.7
East Hampton	8.8	1.10	0.55	0.37	176	22.0	11.0	7.4
Haddam	6.3	0.79	0.40	0.27	126	15.8	7.9	5.3
Middlefield	6.3	0.79	0.40	0.27	126	15.8	7.9	5.3
Middletown	38.8	4.85	2.43	1.62	776	97.0	48.5	32.4
Portland	<u>11.7</u>	<u>1.47</u>	<u>0.74</u>	<u>0.49</u>	<u>234</u>	<u>29.3</u>	<u>14.7</u>	<u>9.8</u>
Totals	91.4	11.45	5.74	3.84	1828	228.7	114.4	76.5

- a) Trench - This method is used on a level site. It consists essentially of excavating a trench; dumping, spreading, and compacting refuse in layers in the trench, and covering each day's accumulation of refuse, or cell, with excavated material. Trench width should be not less than twice the width of the bulldozer or tractor, and the length is limited only by site boundaries. The trench may be dug progressively, with each day's accumulation of refuse covered with excavated material obtained by further trenching; a long trench may be dug with excavated material stockpiled on both sides for use as cover; or two parallel trenches may be dug, with excavation of the second trench progressing to supply cover material for the first. Refuse is dumped into the trench either from the end or side, depending on local conditions.
- b) Area - The area method is used where there are ravines, gullies, abandoned quarries, gravel pits, or borrow pits, or other low or marshy areas to be filled. Refuse is dumped into the area, spread and compacted to the desired depth, and covered at the end of each day's operation. The number of lifts is determined by the depth of the area to be filled and the desired finished elevation. Cover material is borrowed from adjacent hillside.
- c) Ramp - In rolling areas, the landfill operation can be started by spreading and compacting refuse against

the slope of a bank which forms a natural ramp. Refuse is dumped at the bottom of the ramp and spread and compacted against the slope section in layers. At the end of the day, cover material is obtained from the foot of the ramp. A variation of the ramp method is used in filling marshy or river bottom areas where the filling can be started against a bank. In this case, refuse is dumped from the top of the ramp and the tractor works from the top and sides. In this operation cover material is obtained from the sides or is excavated from the foot of the ramp by clamshell bucket or dragline and stockpiled at the top of the ramp to dry before being used.

From the above, it is evident that there are numerous variations of the basic landfill operating methods, each depending on the topography and other features of the site. In each case, however, each day's accumulation of refuse should be thoroughly compacted and covered with at least six inches of compacted soil. The final cover should have a compacted depth of not less than two feet, and should be graded for drainage. The finished fill should be maintained regularly as long as there is indication of settlement, with any cracks or depressions filled promptly.

Almost any type of soil can be used for cover material if necessary, although the ideal soil consists of approximately

equal parts of sand and clay-silt, compacts readily, and does not shrink or crack on drying. Coarse soil may be difficult to handle and its use may require a greater depth of cover to prevent rodent infestation. Soils with a high clay content can present operational problems during wet weather, may tend to shrink and crack on drying, and may be difficult to excavate during cold weather. Where more than one site is available for a sanitary landfill, soil composition is an important factor in determining the site to be used; however, if suitable cover material is not available on the site selected, it must usually be hauled in from other locations.

d) Site Requirements - Among the more important factors to be considered in selecting landfill sites in the Planning Region are:

1. Soil composition, as discussed above.
2. Natural drainage. The site should drain naturally, both during and after completion of the landfill operation. The landfill should not alter the drainage pattern in a manner that adversely affects adjacent property.
3. Volume available for filling.
4. Landfills should not be built on or near springs, on watercourses or exposed rock strata, or in any location where seepage may be carried to water bearing strata or wells.

5. The site must be accessible from a paved road; however, if possible, it should be located in such manner that refuse trucks do not have to travel over main traffic arteries to reach it.

6. If possible, the site should, for esthetic reasons, be shielded from residential areas or highways by trees or topography.

e) Supporting Facilities - Basic equipment and facilities required on landfill sites in the Planning Region are as follows:

1. An all-weather access road from the site entrance to the active face of the fill. It is frequently desirable to reserve an area near the site entrance for depositing refuse in especially bad weather.

2. Water supply for fire fighting.

3. Shelter for operating personnel and equipment.

4. Suitable fences to retain blowing papers, etc.

5. Minimum operating equipment consisting of one suitably size bulldozer or tractor with blade.

Additional equipment will be needed if cover material must be hauled in to the site, and may be required for special site conditions.

6. Portable equipment for deodorization and disinfection.

7. Truck scales would be highly desirable to secure refuse production data which would be invaluable in future planning of incinerators.

Hauling distances within the Planning Region are so short that length of haul is not a major consideration. All other factors being equal, it is usually preferable to use the available site nearest the center of refuse production; however, when a new landfill is to be established and more than one site is available, it may be desirable to use a more remote site initially. When residents have become accustomed to the landfill and realize that the nuisances associated with open dumping have been eliminated, the operation may usually be transferred to a site closer to populated areas without complaint.

REFUSE INCINERATION

Incinerator Plant Capacities and Costs

Table 5 presents refuse incinerator plant capacities required to serve various combinations of Planning Region communities in 1965, 1975, and 1985, for 5 day weekly operation, one and two shifts a day based on the refuse production data presented in Table 3. For two shift operation, capacities shown include provision for burning peak monthly production during the 16 hour operating day. For single shift operation, capacities shown are based on average production; peak monthly production would be handled by overtime operation.

Incinerator plants to serve Middletown alone and Portland and East Hampton in combination are included in Table 5 inasmuch as these possibilities were suggested during our interviews with City and Town officials. The possibility of building a plant to serve Haddam, Chester, and Killingworth was also suggested, but such a plant is not included in the table since only Haddam is in the Planning Region. Other combinations of communities included in Table 5 are considered to be possibilities on the basis of our observations and the information received. Incinerator plant requirements for still other combinations can readily be determined.

Table 5

REQUIRED INCINERATOR PLANT CAPACITIES

	<u>Tons per 24 Hours</u>					
	<u>1965</u>		<u>1975</u>		<u>1985</u>	
	<u>Operation</u>	<u>2 Shifts</u>	<u>Operation</u>	<u>2 Shifts</u>	<u>Operation</u>	<u>2 Shifts</u>
Full Area	456	262	651	374	870	500
Cromwell, Durham, Middlefield, Middletown, and Portland	390	224	541	312	717	412
Middletown, Portland, and Cromwell	338	194	450	259	576	331
Middletown and Portland	286	164	360	207	441	254
Portland and East Hampton	97	56	146	84	203	117
Middletown	230	132	276	159	327	188
Middlefield and Durham	53	31	90	52	142	82

Table 6 shows recommended incinerator plant capacities for the various combinations of communities based on requirements presented in Table 5. This table also shows average weekly operating periods for 1975 and 1985, and estimated cost of construction of the various plants. These cost estimates are approximate, based on present design practice and costs and include two furnaces in each plant, together with air pollution control equipment to meet present requirements. More precise estimates can be prepared when exact requirements are known; however, at least two furnaces should be provided in all except very small installations to assure continued plant operation in case one furnace is out of service for any reason.

As previously indicated, larger incinerator plants are less costly to construct and operate per ton of refuse burned. This is illustrated by Table 7, which presents estimated operating cost per ton of refuse burned based on refuse production data in Table 3 and on the capacities, weekly operating periods, and construction costs in Table 6. These costs are further based on an assumed \$5,000 annual salary for incinerator plant personnel plus 20 per cent for vacations, sick leave, retirement plans, compensation, and other benefits.

Table 6

RECOMMENDED INCINERATOR PLANT CAPACITIES

	Design Year	Capacity T/24hrs.	Average Weekly Operation-Hours*		Estimated Construction Cost
			1975	1985	
Full Area	1985	500	56	80	\$2,750,000
Cromwell, Durham, Middlefield, Middletown, and Portland	1985	400	56	80	2,250,000
Middletown, Portland, and Cromwell	1985	350	56	72	2,000,000
Middletown and Portland	1985	300	48	64	1,750,000
Portland and East Hampton	1985	150	40	56	900,000
Middletown	1985	250	48	56	1,500,000
Middlefield and Durham	1975	100**	40	--	650,000

*Based on full 8-hour shifts.
 ** With provision for future expansion.

Table 7

ESTIMATED INCINERATOR PLANT OPERATING COSTS

	Plant Capacity T/24hrs.	Total Refuse, Tons		Cost per Ton Burned	
		1975	1985	1975	1985
Full Area	500	54,180	72,520	\$2.00	\$1.90
Cromwell, Durham, Middlefield, Middletown, and Portland	400	45,130	59,750	2.25	2.15
Middletown, Portland, and Cromwell	350	37,460	47,950	2.60	2.35
Middletown and Portland	300	29,940	36,760	2.70	2.45
Portland and East Hampton	150	12,150	16,910	3.75	3.45
Middletown	250	23,000	27,200	3.00	2.75
Middlefield and Durham	100	7,770	11,800	5.25	-

If debt service on construction cost would be included in the annual incinerator plant budgets, then this annual payment would be added to the totals used in determining the above operating costs.

As with sanitary landfills, it would be desirable to locate incinerator plants as near as possible to the centers of population and refuse production; however, in view of the relatively short hauling distances between any two points within the Region, this would not be a major consideration.

Joint Operation of Incinerator Plants

Construction and operation of incinerator plants to serve two or more communities are usually handled in one of two ways:

Incinerator Authority- An independent authority to construct and operate an incinerator plant to serve two or more communities in the State of Connecticut can be established through an act of the legislature. Such an authority would consist of one or more representatives from each of the participating communities. Costs would be allocated to the participating communities on the basis of either population or refuse production. Unless more accurate information on refuse production can be determined, allocation on the basis of population would probably be preferable for the Planning Region.

Construction and Operation by One Municipality - One municipality can build and operate an incinerator plant with capacity to serve its own needs as well as those of neighboring communities. This plan requires that long term contracts be entered into with neighboring communities guaranteeing to deliver stipulated minimum quantities of refuse to the incinerator for an agreed minimum charge. This plan has the disadvantage of placing the entire burden of construction, administration, and operation on one community.

REFUSE COLLECTIONS

As previously noted, most of the refuse produced in the seven Planning Region communities is handled by private collectors contracting with individual residents and commercial establishments. Many residents dispose of their own refuse by various means, and it is reported that in some communities, backyard burning has frequently been the cause of brush fires. Only Middletown has municipal collections, but this does not cover the City's entire production. Except for the Middletown municipal collection, little or no control is exercised over the private collectors' or individual residents' disposal methods.

As the area continues to grow, closer control of refuse collection will be necessary. Private disposal and backyard burning should be banned. While collection by private contractors may be satisfactory with closer control, a majority of communities throughout the nation have found that collection either by municipal forces or by municipal contract with a private collector is preferable. Control of a number of small private collectors is considerably more difficult and almost without exception the cost to individual residents under this plan is substantially higher.

Whatever the collection practices adopted by the various communities, certain minimum requirements should be established and enforced as follows:

1. Collection trucks should have watertight covered metal bodies.
2. Open trucks should be permitted only for handling larger objects which cannot be handled readily in closed trucks. Open trucks should have watertight bodies and should be provided with tarpaulins or covers while travelling from point of collection to point of disposal.
3. Trucks should be inspected periodically by local health officials and should be kept in good working order, clean, sanitary, and painted.
4. Trucks should be washed daily, using a disinfectant or deodorant during warm months.
5. Garbage should be collected at least twice a week during warm months, and once a week during the balance of the year. Collection of other materials should be not less frequent than once a week.
6. Hours of collection should be limited to daytime in residential areas.
7. Special collections should be required as necessary during cleanup week, to handle Christmas trees, etc.
8. The point or points of disposal of collected material should be clearly defined. Disposal at other points

within the municipality should not be permitted.

9. Collection trucks should be prohibited from standing on any street longer than is necessary for loading.

10. All private collectors should be licensed by the municipality.

CONCLUSIONS

The following conclusions are drawn from our study:

1. Present dumping operations throughout the area constitute a nuisance and potential health hazard and should be discontinued.
2. Sanitary landfill is the most economical acceptable means of refuse disposal and, therefore, should be adopted throughout the area where suitable sites are available.
3. High temperature incineration should be adopted for refuse disposal when sanitary landfill sites are not available for at least 20 years in the future.
4. One or two larger incinerators will be preferable to several smaller installations.
5. Establishment of an authority will provide the most satisfactory means of constructing and operating an incinerator to serve several Planning Region communities.
6. Continued growth of the area will require closer regulation and control of refuse collection.
7. The absence of records or information on refuse production in the various communities is a hindrance to the planning of refuse disposal facilities.

RECOMMENDATIONS

From our study and conclusions drawn, it is recommended that:

1. Present dumps be converted to true sanitary landfills.
2. If possible, each community secure a site or sites suitable for sanitary landfill for at least the next 20 years. Sites should be either municipally-owned or leased on a long term basis without right of cancellation by the owner.
3. Sanitary landfill operations be continued as long as suitable sites are available.
4. Incineration be adopted for disposal of refuse when future life of available landfill sites is less than 20 years.
5. Ultimate planning for refuse disposal be based on construction of one or not more than two incinerators to serve the entire area.
6. The respective communities adopt and enforce suitable ordinances establishing minimum standards for refuse collections.
7. Where possible, records of refuse production be maintained as an aid to future planning of refuse disposal.