INTEGRATED REPORT

for the

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

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UPPER CONNECTICUT RIVER
PUBLIC WATER SUPPLY MANAGEMENT AREA

TABLE OF CONTENTS

CHAPTER THREE
INTEGRATED REPORT

TABLE OF CONTENTS (Cont'd)

CHAPTER THREE
INTEGRATED REPORT

CHAPTER THREE
INTEGRATED REPORT

LIST OF TABLES

LIST OF FIGURES

UPPER CONNECTICUT RIVER

WATER SUPPLY MANAGEMENT AREA

CHAPTER THREE

INTEGRATED REPORT

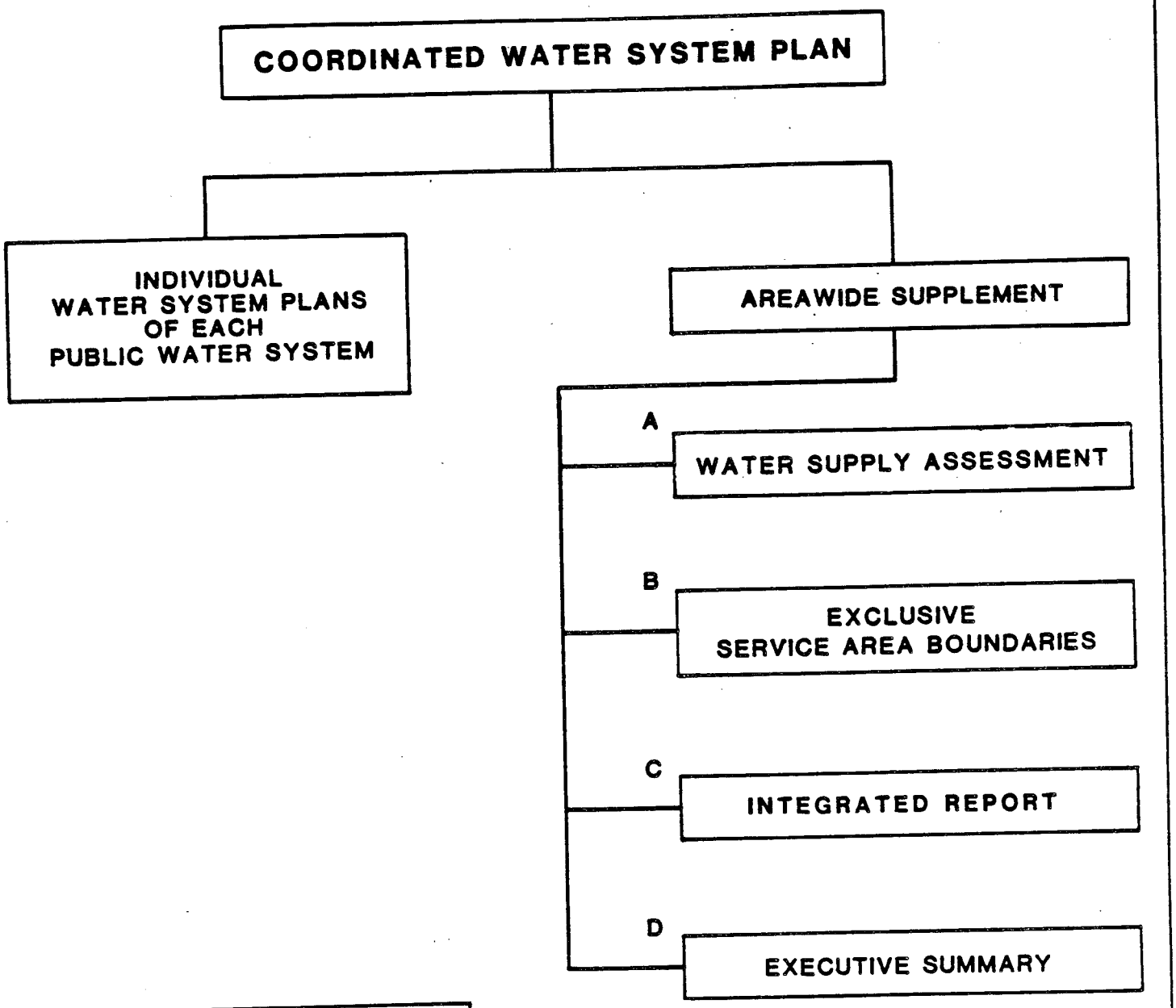
3.1 INTRODUCTION

3.1.1 The Coordinated Water System Planning Process

An Act Concerning a Connecticut Plan for Public Water Supply Coordination (Public Act 85-535) was passed by the Connecticut General Assembly in the 1985 legislative session. The Act provides for a coordinated approach to long-range water supply planning which addresses water quality and quantity issues from an areawide perspective.

The process is designed to bring together representatives of utilities and regional planning agencies in a Water Utility Coordinating Committee (WUCC) to discuss long-range water supply issues and to develop an areawide water supply plan. The plan addresses future needs and concerns and identifies potential conflicts over future water supply sources, competition for future service areas, or areas of anticipated growth where public water supply is not available.

As shown on Figure 3.1.1, the Coordinated Water System Plan for each Public Water Supply Management Area incorporates the individual water system plans from those utilities within the management area required to prepare such pursuant to Connecticut General Statutes Section 25-32d as well as the Areawide Supplement prepared under the auspices of the WUCC. The Areawide Supplement consists of four key components. The Water Supply Assessment is the first of these components, and constitutes the area's problem statement (constructed from the best available information at the time of writing) on which the remainder of the planning process is built. The Assessment's purpose is



PROJECT SCHEDULE

ITEM	TIME FROM PROJECT START
A	6 MONTHS
B	12 MONTHS
C & D	18 MONTHS
FINAL PLAN	24 MONTHS

FIGURE 3.1.1

COORDINATED WATER SYSTEM PLAN

to evaluate water supply conditions and to identify areawide water system issues, concerns and needs. The Water Supply Assessment is found in Chapter One of the Coordinated Water System Plan, and is separately bound.

The second component (Chapter Two), which is also separately bound, consists of the delineation of Exclusive Service Area Boundaries. During this phase of the process, each utility (WUCC member) within the management area had the opportunity to define the area that it is committed to serving in the future. The following factors were used in establishing exclusive service area boundaries:

- existing service area
- land use plans, zoning regulations and growth trends
- physical limitations to water service
- political boundaries
- water company rights as established by statute, special act or administrative decisions
- system hydraulics, including potential elevations and pressure zones
- ability of a water system to provide a pure and adequate supply of water now and in the future

The third component (Chapter 3) is the Integrated Report, which is designed to provide an overview of the individual public water systems within the management area; to address the areawide water supply issues, concerns and needs identified in the Water Supply Assessment; and to promote cooperation among public water systems. This report addresses the following:

- population, consumption and safe yield projections
- compatibility with land use plans
- alternative water resources for future supply needs
- interconnection between public water supply systems
- joint management or ownership of facilities
- satellite management program
- minimum design standards
- financial data related to regionally significant projects
- other uses of water resources

The fourth and final component is the Executive Summary, which is designed to serve as an abbreviated overview of the Coordinated Water System Plan for the management area.

3.1.2 Development of the Integrated Report

This report is a compilation and integration of information received to date, including all information received during the preparation of the Water Supply Assessment; more recent city and town legislation affecting water supply; and, most importantly, information provided by Individual Water Supply Plans submitted by those water utilities serving greater than 1,000 people or 250 customers, as required by the State. It must be pointed out, however, that these plans are still in a draft form and have not yet been approved by DOHS. If DOHS does not approve a utility's individual plan as it relates to consumption and safe yield projections, alternative water resources for the future, exclusive service area boundaries, or any other issues addressed in the Areawide Supplement, then the utility must appropriately revise its individual plan to the satisfaction of DOHS - a process which will also influence the content of both the Exclusive Service Areas Report and the Integrated Report.

3.2 POPULATION, CONSUMPTION, AND SAFE YIELD PROJECTIONS

3.2.1 Introduction

The projections presented in this section are based mainly on the data provided by the water supply systems as a part of the individual water supply plans. Data not provided by the utilities were obtained from the Final Water Supply Assessment. In some cases, data were calculated using available information from the individual plans or from the Assessment so that consistent information would be presented in the tables. Some inconsistencies between the individual plans and the Assessment were found. Since the information presented by utilities in their individual plans should be more recent and representative of current conditions and projections, this was used when available.

The assessment had identified 86 utilities within the Upper Connecticut River Water Supply Management Area. This total is reduced to 83 in the following discussion due to the recent purchase of the Vernon Water Department's assets by the Connecticut Water Company and the single individual plan prepared for the Berlin Water Control Commission and the Kensington and Worthington Fire Districts. The former system is included with the Western and Rockville Division of CWC, while the latter systems are jointly referred to herein as the Town of Berlin.

3.2.2 Water System Trends and Projections

3.2.2.1 Residential Population

The population projections for each water supply system and each town that they service are listed in Table 3.2.1. As noted above, there are a total of 83 utilities in the Upper Connecticut River Study Area; of these, 63 serve a customer base of fewer than 1,000 people. The remaining 20 utilities provide water to a densely populated core of the management area. Of the 20 major utilities, 15 have provided both total and service population figures in their individual plans for each municipality within their service area. Certain information that was

TABLE 3.2.1

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

POPULATION PROJECTIONS BY WATER UTILITY

UTILITY	COMMUNITIES SERVED	TOTAL POPULATION(1) 1986	1992	2000	2030	SERVICED POPULATION(2) 1986	1992	2000	2030
Avery Heights Water Assoc.	South Windsor	18290	19220	20580	25500	800	835	900	1115
Avon Old Farms School	Avon	12400	13400	14200	18900	430	461	492	655
Avon Water Company	Avon	12809	14610	16441	21141	5858	7015	8325	14773
	Simsbury	22750	22880	26160	33500	312	312	562	1485
	Total	35559	37490	42601	54641	6170	7327	8887	16258
Berlin	Berlin	15600	15410	15840	17200	12004	12040	12910	15480
Briarwood College	Southington	38180	39860	41580	48900	450	467	490	576
Bristol Water Dept.	Bristol	60250	60000	61470	67800	52328	56400	59000	67100
	Burlington	6020	6310	6540	7900	43	43	43	43
	Total	66270	66310	68010	75700	52371	56443	59043	67143
Burnham Acres Water Assoc.	South Windsor	18290	19220	20580	25500	124	129	140	173
CWC-Collinsville	Avon	12850	13650	14200	18900	386	683	1278	2835
	Burlington	6275	6380	6540	7900	126	128	131	158
	Canton	7975	8245	8650	10300	1994	2391	3028	5150
	Harwington	5390	5520	5920	7500	0	0	0	225
	Total	32490	33795	35310	44600	2506	3202	4437	8368
CWC-Northern Div./Somers	Somers	8910	8960	9030	10000	1337	1971	2619	4900
CWC-Western & Rockville	East Granby	4365	4555	4870	6100	87	137	195	305
	East Windsor	9180	9375	9680	11000	3121	3656	4453	6050
	Ellington	10340	10490	11710	14900	1034	1364	3513	8940
	Enfield	44200	46500	50200	61300	20774	24180	28614	42910
	South Windsor	19900	20170	20580	25500	7164	7866	9673	11985
	Suffield	9595	9695	9860	10800	4414	4848	5423	5940
	Vernon	29400	30600	32530	39400	13524	14382	17566	21276
	Windsor Locks	12270	12289	12320	12800	10307	11060	11088	11520
	Total	139250	143674	151750	181800	60425	67493	80525	108926
Chelsea Common Assoc. Inc.	East Granby	4350	4616	4870	6100	132	139	148	185
Chestnut Hill Hts Water Assn	Glastonbury	26610	28810	31830	43000	21	22	25	34
Chippanydale Assoc.	Bristol	59090	60290	61470	67800	35	36	36	40
Ciccio Court	Plainville	16990	17450	17500	19400	56	57	58	64
Connecticut Correct Inst	CCI	2821	3500	3500	3500	2821	3500	3500	3500
Cope Manor	Plainville	16990	17450	17500	19400	61	62	63	70
Country Gardens Apts.	Somers	8720	8948	9030	10000	74	76	77	85

TABLE 3.2.1

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

POPULATION PROJECTIONS BY WATER UTILITY

UTILITY	COMMUNITIES SERVED	TOTAL POPULATION(1) 1986	1992	2000	2030	SERVICED POPULATION(2) 1986	1992	2000	2030
East Granby Village Condos	East Granby	4350	4616	4870	6100	301	317	337	422
East Windsor Housing Auth	East Windsor	9340	9620	9680	11000	72	74	75	85
Ellington Acres Water Co	East Windsor	9340	9620	9680	11000	0	0	0	1100
	Ellington	10480	11152	11710	14900	2205	2518	2927	5960
	Somers	8716	8950	9030	10000	0	537	903	2000
	Total	28536	29722	30420	35900	2205	3055	3830	9060
Ellsworth Estates	East Windsor	9340	9620	9680	11000	300	308	311	353
Ethel Walker School	Simsbury	22400	23880	26160	33500	266	280	311	398
Farmington Line West Condos	Burlington	6020	8404	6540	7900	53	55	58	70
Farmington Woods Water Co	Avon	12400	13400	14200	18900	1230	1319	1409	1875
	Farmington	16770	17050	17610	19200	470	477	494	538
	Total	29170	30450	31810	38100	1700	1797	1902	2413
Grant Hill Associates, Inc	Bloomfield	19670	20630	22110	27200	92	96	103	127
Hazardville Water Company	East Windsor	9270	9600	9680	11000	0	0	0	66
	Enfield	44290	47250	50200	61300	19045	19845	20582	25133
	Somers	9270	8930	9030	10000	0	1518	1716	2600
	Total	62830	65780	68910	82300	19045	21363	22298	27799
High Manor Mobile Home Park	Vernon	28930	30438	32530	39400	235	245	264	320
Higley Village	East Granby	4350	4616	4870	6100	98	103	110	137
Hillsdale Water Co-op	South Windsor	18290	19220	20580	25500	23	24	26	32
Hilltop, Inc.	Farmington	16770	17050	17610	19200	88	89	92	101
Jensens Forest Hills Mobile	Southington	38180	39860	41580	48900	376	390	409	482
Juniper Club, Inc.	Bloomfield	19670	20630	22110	27200	69	72	78	95
Kenmore Road Assoc.	Bloomfield	19670	20630	22110	27200	110	114	124	152
Kimberly Lane Water Assoc.	Glastonbury	26610	28810	31830	43000	25	27	30	40
Lakeview of Farmington	Farmington	16770	17050	17610	19200	500	508	525	572
Latimer Farms Water Assn	Simsbury	22400	23880	26160	33500	28	30	33	42
Liebman Apartments	Ellington	10480	11152	11710	14900	46	49	51	65
Little Brook Road Supply	New Hartford	5100	5272	5350	6100	50	52	52	60
Llynwood, Inc.	Vernon	28930	30438	32530	39400	32	33	36	44

TABLE 3.2.1

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

POPULATION PROJECTIONS BY WATER UTILITY

UTILITY	COMMUNITIES SERVED	TOTAL POPULATION(1) 1986	1992	2000	2030	SERVICED POPULATION(2) 1986	1992	2000	2030
Manchester Water Department	Glastonbury	26610	28810	31830	43000	750	774	845	1125
	Manchester	51100	52700	54500	60500	48010	50000	52900	59900
	South Windsor	18290	19220	20580	25500	106	109	120	160
	Vernon	28930	30438	32530	39400	210	217	235	315
	Total	124930	131168	139440	168400	49076	51100	54100	61500
Maple Ridge Farms Water Assn	Farmington	16770	17050	17610	19200	93	94	98	106
Meadowbrook Apartments	Ellington	10480	11152	11710	14900	58	61	65	82
Meriden Water Dept.	Berlin	15600	15940	15840	17200	4	4	4	4
	Southington	38180	39860	41580	48900	130	135	142	167
	Total	53780	55800	57420	66100	134	139	146	171
Metacomet Village	East Granby	4350	4616	4870	6100	62	65	69	87
Metropolitan District Comm	Bloomfield	19670	20630	22110	27200	20140	20470	22110	32000
	East Granby	4350	4616	4870	6100	0	110	1500	2100
	East Hartford	53900	55340	57060	64000	52180	55100	57060	65000
	Farmington	16770	17050	17610	19200	1200	1500	1700	1900
	Glastonbury	26610	28810	31830	43000	16600	17760	19860	40000
	Hartford	136790	139390	143390	153900	135080	138890	143390	147000
	Manchester	50700	51460	52760	57000	1000	1500	1500	1500
	Newington	29840	31040	32140	37500	29350	30840	32140	39000
	Rocky Hill	16960	19160	21560	32300	15550	18860	21560	25000
	South Windsor	18290	19220	20580	25500	4500	4700	5070	6270
	West Hartford	61230	61138	60070	58700	61180	61210	60070	62000
	Wethersfield	26350	26630	27010	28500	27410	26570	27010	32000
	Windsor	26620	27980	29700	36500	27040	27740	29700	33000
	Windsor Locks	12460	12620	12320	12800	0	0	0	0
	Total	500540	515084	533010	602200	391230	405250	422670	486770
Neipsic Woods Section 3	Glastonbury	26610	28810	31830	43000	28	30	33	45
Neipsic Woods Water Assoc.	Glastonbury	26610	28810	31830	43000	65	70	78	105
New Britain Water Dept.	Berlin	15600	15940	15840	17200	205	205	205	205
	Farmington	18430	17130	17610	19200	406	560	760	1500
	New Britain	74240	72936	70810	66700	74240	72936	70810	66700
	Newington	29350	30940	32140	37500	673	910	1090	1900
	Plainville	16990	17450	17500	19400	93	93	93	93
	Total	154610	154396	153900	160000	75617	74704	72958	70398
New Hartford Water Dept.	New Hartford	5467	5477	5575	6325	1145	1128	1349	1506

TABLE 3.2.1

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

POPULATION PROJECTIONS BY WATER UTILITY

UTILITY	COMMUNITIES SERVED	TOTAL POPULATION(1) 1986	1992	2000	2030	SERVICED POPULATION(2) 1986	1992	2000	2030
Oakwood, Inc.	Glastonbury	26610	28810	31830	43000	135	144	161	218
Old Newgate Ridge Water Co.	East Granby	4350	4616	4870	6100	121	127	136	170
Orchard Hill Assoc.	Bloomfield	19670	20630	22110	27200	25	26	28	35
Penwood Assoc., Inc.	Bloomfield	19670	20630	22110	27200	55	57	62	76
Pine Hill, Inc.	Glastonbury	26610	28810	31830	43000	18	19	22	29
Plainville Water Company	Plainville	17120	17450	17500	19400	16264	16596	16646	18546
	Southington	38180	39860	41580	48900	404	404	404	404
	Total	55300	57310	59080	68300	16668	17000	17050	18950
Redwood Farms L&M Water Co.	Manchester	50700	51460	52760	57000	260	263	271	292
Reid Treatment Center	Avon	12400	13400	14200	18900	30	32	34	46
Rock Tree Apartments	Barkhamsted	3090	3294	3490	4400	58	61	66	83
Rolling Hills Water Assoc	Glastonbury	26610	28810	31830	43000	112	120	134	181
Salmon Brook Dist Water Dept	Granby	8460	9020	9760	12400	1000	1057	1154	1466
School Hill Assoc., Inc.	East Windsor	9340	9620	9680	11000	86	88	89	101
Shaker Heights, Inc.	Enfield	44980	47180	50200	61300	135	141	151	184
Sharon Heights Water Assoc.	Bloomfield	19670	20630	22110	27200	75	78	84	104
Snipsic Village Housing Auth	Ellington	10480	11152	11710	14900	97	102	108	138
Somers Elderly Housing Auth	Somers	8720	8948	9030	10000	69	71	71	79
Somersmill Water Assoc.	Somers	8720	8948	9030	10000	250	256	259	287
Southington Water Works	Southington	38580	39850	41580	48900	30216	31880	33264	39120
Tariffville Fire District	Simsbury	22400	23880	26160	33500	1980	2088	2312	2961
Taylor Trailer Park	Southington	38180	39860	41580	48900	83	86	90	106
Torrington Water Co.	Harwinton	5230	5574	5920	7500	6	7	7	9
Towpath Condominiums	Avon	12400	13400	14200	18900	120	129	137	183
Trailsend Company	Canton	8040	8404	8650	7900	48	50	52	61
Turkey Hill Apartments	East Granby	4350	4616	4870	6100	250	263	280	351
Unionville Water Company	Avon	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
	Burlington	6020	6310	6540	7900	0	0	600	3595
	Farmington	30204	31569	32632	39405	6947	11181	11944	14021
	Total	36224	37879	39172	47305	6947	11181	12544	17616
Vernon Village, Inc.	Vernon	28930	30438	32530	39400	320	334	360	436
Village Water Co of Simsbury	East Granby	4350	4616	4870	6100	70	74	78	98
	Granby	8460	9020	9760	12400	647	684	746	948
	Simsbury	22400	23880	26160	33500	13832	14585	16154	20686
	Total	35210	37516	40790	52000	14549	15343	16979	21733

TABLE 3.2.1
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POPULATION PROJECTIONS BY WATER UTILITY

UTILITY	COMMUNITIES SERVED	TOTAL POPULATION(1) 1986	1992	2000	2030	SERVICED POPULATION(2) 1986	1992	2000	2030
Wallens Hill Apartments	Barkhamsted	3090	3294	3490	4400	49	52	55	70
West Hill Lake Water Assoc	New Hartford	5100	5272	5350	6100	200	206	210	239
West Service Corp.	Suffield	9590	9800	9860	10800	400	408	411	451
Windsorville Water Assoc.	East Windsor	9340	9620	9680	11000	30	31	31	35
Wintergreen	Harwinton	5230	5574	5920	7500	40	42	45	57
Woodcrest Assoc., Inc.	Burlington	6020	6310	6540	7900	63	66	68	83
		892561	920198	950880	1077700	759298	798446	842467	995131

NOTES:
1. Population data from OPM or individual water supply plans, depending on the utility.
2. Service population projections were taken from individual plans, the final Water Supply Assessment, or calculated based on service connections and average household size, depending on the utility.
3. Population served for Avon and Farmington were provided as one number in the individual plan. The Farmington and Avon figures are presented together as Farmington projections.
4. Sum total population figures were taken from OPM projections.

not provided in individual plans was obtained from other sources, including the Final Water Supply Assessment, OPM projections, and various calculations based on service connections, average household size, and growth projections provided by each water utility. Projections for the remaining 68 utilities, including 4 large utilities (greater than 1,000 persons served) were taken from the Assessment, which was based on information obtained from questionnaires and Department of Health Services (DOHS) data. A majority of the small utilities responding to the questionnaires for the Assessment did not indicate that an expansion of their service area was contemplated. The population projections for these utilities were determined by using the percentage of population served identified in the Assessment and applying this to the OPM projections for each community in order to be consistent with the consumption projections presented in the Assessment.

Most of the major water utilities have developed data and projections for the years 1986, 1992, 2000, and 2030. The projections included in this report will be based on these four planning years. (The Assessment was based on 1986 data and projections for 1991, 2000 and 2030.) For the utilities that did not provide data for any of the four planning years, projections were modified using straight line interpolation to present consistent data for summation and comparison.

3.2.2.2 Residential Consumption

Consumption projections for each water supply system in terms of average daily demand are presented in Table 3.2.2. Projections for the major water systems were generally provided by the utilities in their individual plans. Projections for the smaller utilities were obtained and expanded from the Assessment.

The major water supply systems provided residential projections for most (or all) of the communities serviced. In most cases the data provided was determined by using per capita consumption factors based on existing data. Consumption values for years other than the four planning years were adjusted using per capita escalation factors determined

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd				NON-RESIDENTIAL CONSUMPTION gpd			
		1986	1992	2000	2030	1986	1992	2000	2030
Avery Heights Water Assoc.	South Windsor	60,000	63,903	70,655	95,911	0	0	0	0
Avon Old Farms School	Avon	32,250	35,283	38,655	56,365	0	0	0	0
Avon Water Company	Avon	453,829	526,125	624,375	1,107,975	364,556	545,727	720,456	1,222,073
	Simsbury	24,171	23,400	42,150	111,375	19,416	24,272	48,636	122,844
	Total	478,000	549,525	666,525	1,219,350	383,972	569,999	769,092	1,344,917
Berlin	Berlin	939,313	970,000	1,080,000	1,490,000	850,000	920,000	1,070,000	1,340,000
Briarwood College	Southington	33,750	35,723	38,471	49,566	0	0	0	0
Bristol Water Dept.	Bristol	4,040,000	5,300,000	6,000,000	8,800,000	1,240,000	1,800,000	2,000,000	2,900,000
	Burlington	4,000	4,000	4,000	6,000	0	0	0	0
	Total	4,044,000	5,304,000	6,004,000	8,806,000	1,240,000	1,800,000	2,000,000	2,900,000
Burnham Acres Water Assoc.	South Windsor	9,300	9,905	10,952	14,866	0	0	0	0
CWC-Collinsville	Avon	31,160	56,006	104,796	232,470	9,473	17,192	32,008	80,329
	Burlington	10,332	10,496	10,742	12,956	3,092	5,062	5,201	5,802
	Canton	163,508	196,062	248,296	422,300	106,138	139,385	183,838	265,216
	Harwington	0	0	0	45,750	0	0	0	6,004
	Total	205,000	262,564	363,834	713,476	118,704	161,639	221,047	357,350
CWC-Northern Div./Somers	Somers	61,500	90,700	120,500	225,400	29,340	38,174	48,299	85,253
CWC-Western & Rockville	East Granby	6,960	10,960	15,600	24,400	75,552	132,537	173,237	236,489
	East Windsor	249,680	292,480	356,240	484,000	236,226	321,979	408,764	556,201
	Ellington	82,720	109,120	281,040	715,200	68,175	79,158	148,410	310,163
	Enfield	1,661,920	1,934,400	2,289,120	3,432,800	934,123	1,172,591	1,328,467	1,896,438
	South Windsor	573,120	629,280	773,840	958,800	350,049	405,676	614,548	811,207
	Suffield	353,120	387,840	433,840	475,200	206,735	265,181	310,503	391,511

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd 1986	1992	2000	2030	NON-RESIDENTIAL CONSUMPTION gpd 1986	1992	2000	2030
	Vernon	1,081,920	1,150,560	1,405,280	1,702,080	784,403	843,833	919,704	1,195,009
	Windsor Locks	824,560	884,800	887,040	921,600	919,222	1,246,883	1,319,840	1,718,403
	Total	4,834,000	5,399,440	6,442,000	8,714,080	3,574,485	4,467,836	5,223,473	7,115,421
Chelsea Common Assoc. Inc.	East Granby	9,900	10,637	11,606	15,926	0	0	0	0
Chestnut Hill Hts Water Assn	Glastonbury	1,575	1,719	1,972	2,918	0	0	0	0
Chippanydale Assoc.	Bristol	2,625	2,725	2,858	3,454	0	0	0	0
Ciccio Court	Plainville	4,200	4,389	4,527	5,498	0	0	0	0
Connecticut Correct Inst	CCI	324,700	420,000	420,000	420,000	0	0	0	0
Cope Manor	Plainville	4,575	4,781	4,931	5,989	0	0	0	0
Country Gardens Apts.	Somers	5,550	5,793	6,018	7,302	0	0	0	0
East Granby Village Condos	East Granby	22,575	24,255	26,465	36,317	0	0	0	0
East Windsor Housing Auth	East Windsor	5,400	5,661	5,858	7,293	0	0	0	0
Ellington Acres Water Co	East Windsor	0	0	0	99,000	0	0	0	0
	Ellington	162,000	193,400	233,850	536,000	3,000	10,000	50,000	100,000
	Somers	0	35,600	72,150	180,000	0	0	0	0
	Total	162,000	229,000	306,000	815,000	3,000	10,000	50,000	100,000
Ellsworth Estates	East Windsor	22,500	23,589	24,407	30,385	0	0	0	0
Ethel Walker School	Simsbury	19,950	21,457	24,386	34,212	0	0	0	0
Farmington Line West Condos	Burlington	3,975	4,221	4,518	5,979	0	0	0	0
Farmington Woods Water Co	Avon	92,250	100,924	110,571	161,229	0	0	0	0
	Farmington	35,250	36,512	38,743	46,277	0	0	0	0
	Total	127,500	137,437	149,314	207,506	0	0	0	0

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd				NON-RESIDENTIAL CONSUMPTION gpd			
		1986	1992	2000	2030	1986	1992	2000	2030
Grant Hill Associates, Inc	Bloomfield	6,900	7,324	7,000	7,000	0	0	0	0
Hazardville Water Company	East Windsor	0	0	0	6,200	0	0	0	500
	Enfield	1,240,000	1,616,375	1,799,900	2,377,820	380,000	450,000	480,000	660,000
	Somers	0	123,625	150,100	245,980	0	10,600	12,200	20,400
	Total	1,240,000	1,740,000	1,950,000	2,630,000	380,000	460,600	492,200	680,900
High Manor Mobile Home Park	Vernon	17,625	18,751	20,746	27,528	0	0	0	0
Higley Village	East Granby	7,350	7,897	8,617	11,824	0	0	0	0
Hillsdale Water Co-op	South Windsor	1,725	1,837	2,031	2,757	0	0	0	0
Hilltop, Inc.	Farmington	6,600	6,836	7,254	8,665	0	0	0	0
Jensens Forest Hills Mobile	Southington	28,200	29,849	32,144	41,415	0	0	0	0
Juniper Club, Inc.	Bloomfield	5,175	5,493	6,088	8,206	0	0	0	0
Kenmore Road Assoc.	Bloomfield	8,250	8,757	9,706	13,081	0	0	0	0
Kimberly Lane Water Assoc.	Glastonbury	1,875	2,046	2,347	3,474	0	0	0	0
Lakeview of Farmington	Farmington	37,500	38,843	41,216	49,231	0	0	0	0
Latimer Farms Water Assoc.	Simsbury	2,100	2,259	2,567	3,601	0	0	0	0
Liebman Apartments	Ellington	3,450	3,716	4,033	5,622	0	0	0	0
Little Brook Road Supply	New Hartford	3,750	3,942	4,114	5,139	0	0	0	0
Llynwood, Inc.	Vernon	2,400	2,553	2,825	3,748	0	0	0	0
Manchester Water Dept (3)	Glastonbury	58,500	67,340	76,050	112,500	0	0	0	0
	Manchester	3,722,750	4,304,300	4,792,000	6,040,000	1,000,000	1,400,000	1,400,000	1,800,000
	South Windsor	8,270	9,480	10,800	16,000	0	0	0	0
	Vernon	16,380	18,880	21,150	31,500	0	0	0	0
	Total	3,805,900	4,400,000	4,900,000	6,200,000	1,000,000	1,400,000	1,400,000	1,800,000

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd				NON-RESIDENTIAL CONSUMPTION gpd			
		1986	1992	2000	2030	1986	1992	2000	2030
Maple Ridge Farms Water Assn	Farmington	6,975	7,225	7,666	9,157	0	0	0	0
Meadowbrook Apartments	Ellington	4,350	4,685	5,085	7,089	0	0	0	0
Meriden Water Dept.	Berlin	300	312	319	379	0	0	0	0
	Southington	9,750	10,320	11,114	14,319	0	0	0	0
	Total	10,050	10,633	11,433	14,698	0	0	0	0
Metacomet Village	East Granby	4,650	4,996	5,451	7,480	0	0	0	0
Metropolitan District Comm	Bloomfield	1,510,500	1,561,000	1,736,000	2,339,000	1,823,000	2,023,000	2,323,000	3,523,000
	East Granby	0	8,250	112,500	157,500	0	0	0	0
	East Hartford	3,913,500	4,067,000	4,336,000	5,328,000	8,861,000	9,861,000	11,661,000	13,661,000
	Farmington	90,000	93,000	99,000	118,000	912,000	1,012,000	1,212,000	1,812,000
	Glastonbury	1,245,000	1,354,000	1,559,000	2,307,000	532,000	632,000	732,000	1,132,000
	Hartford	10,131,000	10,458,000	11,115,000	13,070,000	9,113,000	10,113,000	12,013,000	14,113,000
	Manchester	75,000	77,000	82,000	97,000	0	0	0	0
	Newington	2,201,250	2,313,000	2,482,000	3,172,000	1,443,000	1,643,000	1,943,000	2,943,000
	Rocky Hill	1,166,250	1,319,000	1,552,000	2,547,000	812,000	1,012,000	1,212,000	1,812,000
	South Windsor	337,500	358,000	397,000	539,000	532,000	632,000	732,000	1,132,000
	West Hartford	4,588,500	4,664,000	4,712,000	5,044,000	2,328,000	2,528,000	3,128,000	4,628,000
	Wethersfield	2,055,750	2,026,000	2,120,000	2,451,000	812,000	1,012,000	1,212,000	1,812,000
	Windsor	2,028,000	2,115,000	2,331,000	3,139,000	2,328,000	2,528,000	3,128,000	4,628,000
	Windsor Locks	0	0	0	0	286,000	286,000	286,000	286,000
	Total	29,342,250	30,413,250	32,633,500	40,308,500	29,782,000	33,282,000	39,582,000	51,482,000
Neipsic Woods Section 3	Glastonbury	2,100	2,292	2,629	3,891	0	0	0	0
Neipsic Woods Water Assoc.	Glastonbury	4,875	5,320	6,103	9,033	0	0	0	0
New Britain Water Dept.	Berlin	18,799	17,425	17,425	17,425	11,829	15,088	16,482	19,106
	Farmington	37,230	47,600	64,600	127,500	23,426	41,216	61,104	139,800

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd				NON-RESIDENTIAL CONSUMPTION gpd			
		1986	1992	2000	2030	1986	1992	2000	2030
	New Britain	6,807,808	6,199,560	6,018,850	5,669,500	4,283,648	5,368,090	5,693,124	6,216,440
	Newington	61,714	77,350	92,650	161,500	38,832	66,976	87,636	177,080
	Plainville	8,528	7,905	7,905	7,915	5,366	6,845	7,477	8,668
	Total	6,934,079	6,349,840	6,201,430	5,983,840	4,363,101	5,498,215	5,865,823	6,561,094
New Hartford Water Dept.	New Hartford	62,900	99,600	101,200	112,950	49,500	51,600	54,400	64,900
Oakwood, Inc.	Glastonbury	10,125	11,049	12,676	18,761	0	0	0	0
Old Newgate Ridge Water Co.	East Granby	9,075	9,750	10,639	14,599	0	0	0	0
Orchard Hill Assoc.	Bloomfield	1,875	1,990	2,206	2,973	0	0	0	0
Penwood Assoc., Inc.	Bloomfield	4,125	4,379	4,853	6,541	0	0	0	0
Pine Hill, Inc.	Glastonbury	1,350	1,473	1,690	2,501	0	0	0	0
Plainville Water Company	Plainville	1,032,440	1,064,984	1,201,163	1,609,092	1,549,863	1,630,137	1,958,904	2,739,726
	Southington	30,300	30,906	31,714	34,744	0	0	0	0
	Total	1,062,740	1,095,890	1,232,877	1,643,836	1,549,863	1,630,137	1,958,904	2,739,726
Redwood Farms L&M Water Co.	Manchester	19,500	20,149	21,239	25,138	0	0	0	0
Reid Treatment Center	Avon	2,250	2,462	2,697	3,932	0	0	0	0
Rock Tree Apartments	Barkhamsted	4,350	4,687	5,149	7,112	0	0	0	0
Rolling Hills Water Assoc	Glastonbury	8,400	9,167	10,517	15,565	0	0	0	0
Salmon Brook Dist Water Dept	Granby	75,000	80,840	90,563	126,052	0	0	0	0
School Hill Assoc., Inc.	East Windsor	6,450	6,762	6,997	8,710	0	0	0	0
Shaker Heights, Inc.	Enfield	10,125	10,755	11,827	15,822	0	0	0	0
Sharon Heights Water Assoc.	Bloomfield	5,625	5,971	6,618	8,919	0	0	0	0
Snipsic Village Housing Auth	Ellington	7,275	7,835	8,505	11,856	0	0	0	0
Somers Elderly Housing Auth	Somers	5,175	5,402	5,612	6,808	0	0	0	0

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd 1986	1992	2000	2030	NON-RESIDENTIAL CONSUMPTION gpd 1986	1992	2000	2030
Somersmill Water Assoc.	Somers	18,750	19,573	20,332	24,667	0	0	0	0
Southington Water Works	Southington	2,690,000	2,860,000	3,120,000	3,940,000	1,190,000	1,200,000	1,257,000	1,381,000
Tariffville Fire Dist	Simsbury	148,500	159,720	181,520	254,660	0	0	0	0
Taylor Trailer Park	Southington	6,225	6,589	7,096	9,142	0	0	0	0
Torrington Water Co.	Harwinton	462	497	547	760	0	0	0	0
Towpath Condominiums	Avon	9,000	9,846	10,787	15,730	0	0	0	0
Trailsend Company	Canton	3,600	3,818	4,054	5,288	0	0	0	0
Turkey Hill Apartments	East Granby	18,750	20,145	21,981	30,163	0	0	0	0
Unionville Water Company	Avon	(2)	(2)	(2)	(2)	0	0	0	0
	Burlington	(2)	(2)	(2)	(2)	0	0	0	0
	Farmington	(2)	(2)	(2)	(2)	575,000	594,027	631,283	719,385
	Total	818,000	838,575	940,800	1,321,200	575,000	594,027	631,283	719,385
Vernon Village, Inc.	Vernon	24,000	25,533	28,250	37,485	0	0	0	0
Village Water Co of Simsbury	East Granby	5,250	5,641	6,155	8,446	0	0	0	0
	Granby	48,525	52,304	53,671	81,556	0	0	0	0
	Simsbury	1,037,400	1,115,779	1,268,073	1,779,018	400,000	570,000	640,000	820,000
	Total	1,091,175	1,173,724	1,327,899	1,869,019	400,000	570,000	640,000	820,000
Wallens Hill Apartments	Barkhamsted	3,675	3,960	4,350	6,008	0	0	0	0
West Hill Lake Water Assoc	New Hartford	15,000	15,768	16,457	20,556	0	0	0	0
West Service Corp.	Suffield	30,000	31,181	32,291	38,748	0	0	0	0
Windsorville Water Assoc.	East Windsor	2,250	2,359	2,441	3,039	0	0	0	0
Wintergreen	Harwinton	3,000	3,230	3,554	4,933	0	0	0	0
Woodcrest Assoc., Inc.	Burlington	4,725	5,018	5,371	7,108	0	0	0	0
		58,267,719	62,414,174	68,025,234	86,647,156	45,488,965	52,654,227	61,263,521	79,491,946

TABLE 3.2.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

CONSUMPTION PROJECTIONS BY WATER UTILITY (1)

UTILITY	COMMUNITIES SERVED	RESIDENTIAL CONSUMPTION gpd				NON-RESIDENTIAL CONSUMPTION gpd			
		1986	1992	2000	2030	1986	1992	2000	2030

NOTES:

1. Consumption based on figures obtained from individual supply plans or by applying per capita values to population projections, depending on the utility.
2. The Unionville Water Company did not provide individual community consumption figures. The figures shown represent system totals.
3. The Manchester Water Company figures for residential consumption include commercial and public authority use. The non-residential figures include industrial and unaccounted for water. These figures were taken from the individual plan.

from straight line interpolation of the projections provided in the individual plans.

The 1986 consumption figures projections for the small water systems were developed by applying a 75 gallons per capita per day (gpcd) factor to the residential population served to be consistent with the projections from the Assessment. The 1991 value was revised to a 1992 value by applying the .25 gpcd annual escalation factor used in the Assessment. (As noted in the assessment, this value was selected based on the recent experience of the larger utilities in the management area.)

3.2.2.3 Non-Residential Consumption

Table 3.2.2 also lists non-residential consumption projections for the Upper Connecticut River Management Area. Non-residential growth within the area represents the increase (or decrease, i.e., negative growth) in commercial, industrial, public and non-revenue water usage throughout the 50 year planning period. The commercial and industrial growth represents the increase in size and number of customers for the water utility. The public and non-revenue "growth" represents that percentage of the total water supplied that is not metered or charged to customers.

The major water supply systems have developed non-residential consumption projections in their individual plans. These projections were determined by reviewing available land within the serviced communities together with local zoning regulations, local and regional land use plans, and long term planning projections. This information was compared with existing data on commercial and industrial growth or decline within the service area. The individual utilities then developed consumption projections by applying standard or historical per capita use figures to the growth projections by using the number of employees or the available land and building area. Projections for public and non-revenue consumption were developed using existing data or

standard values to identify the percentage of total water usage for both categories.

The 63 small water systems did not submit individual plans or other information on future non-residential growth. However, fifteen of the small systems had significant non-residential consumption data identified in the Assessment. Projections for these utilities were taken directly from the Assessment. For the other 48 small systems, total consumption was assumed to be entirely residential.

3.2.3 Water Supply Conditions

3.2.3.1 Sources of Supply

The sources of supply for the water supply systems within the Upper Connecticut River Water Supply Management Area include both groundwater supply wells and surface water reservoirs. Each water supply system is listed in Table 3.2.3, along with the number of available groundwater and surface water sources and their corresponding safe yields. As shown, groundwater sources constitute the vast majority, in terms of the number of sources, of the supplies for the Area's utilities. However, in terms of the volume supplied, about two-thirds of the Management Area's water is obtained from surface sources. The ownership and use of surface water sources is limited to nine utilities within the Upper Connecticut River Area. Of these nine, only the Metropolitan District Commission (MDC) relies entirely on surface water sources. The remaining 74 systems rely on either groundwater sources or on other utilities through existing interconnections.

The largest single supplier of surface water is the [redacted] as well as [redacted] The largest single suppliers of groundwater include the Northern and Rockville Division of the Connecticut Water Company [redacted], the Manchester Water Department [redacted] and the New Britain Water Department [redacted]. Characteristic of

TABLE 3.2.3
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
SOURCES OF SUPPLY

UTILITY	AVAILABLE GROUNDWATER SUPPLIES No of Sources	AVAILABLE GROUNDWATER SUPPLIES Safe Yield mgd	AVAILABLE SURFACE WATER SUPPLIES No of Sources	AVAILABLE SURFACE WATER SUPPLIES Safe Yield mgd
Avery Heights Water Assoc.			0	0
Avon Old Farms School			0	0
Avon Water Company			0	0
Berlin			0	0
Briarwood College			--	--
Bristol Water Dept.			0	0
Burnham Acres Water Assoc.			0	0
CWC-Collinsville			0	0
CWC-Northern Div./Somers			0	0
CWC-Western & Rockville			0	0
Chelsea Common Assoc. Inc.			0	0
Chestnut Hill Hts Water Assn			--	--
Chippanydale Assoc.			0	0
Ciccio Court			0	0
Connecticut Correct Inst			0	0
Cope Manor			0	0
Country Gardens Apts.			0	0
East Granby Village Condos			0	0
East Windsor Housing Auth			0	0
Ellington Acres Water Co			0	0
Ellsworth Estates			0	0
Ethel Walker School			0	0
Farmington Line West Condos			0	0
Farmington Woods Water Co			0	0
Grant Hill Associates, Inc			0	0
Hazardville Water Company			0	0
High Manor Mobile Home Park			0	0
Higley Village			0	0
Hillsdale Water Co-op			0	0
Hilltop, Inc.			0	0
Jensens Forest Hills Mobile			0	0
Juniper Club, Inc.			0	0
Kenmore Road Assoc.			0	0
Kimberly Lane Water Assoc.			0	0
Lakeview of Farmington			0	0
Latimer Farms Water Assoc.			0	0
Liebman Apartments			0	0
Little Brook Road Supply			0	0
Llynwood, Inc.			0	0
Manchester Water Department			0	0
Maple Ridge Farms Water Assn			0	0
Meadowbrook Apartments			0	0
Meriden Water Dept.			--	--
Metacomet Village				

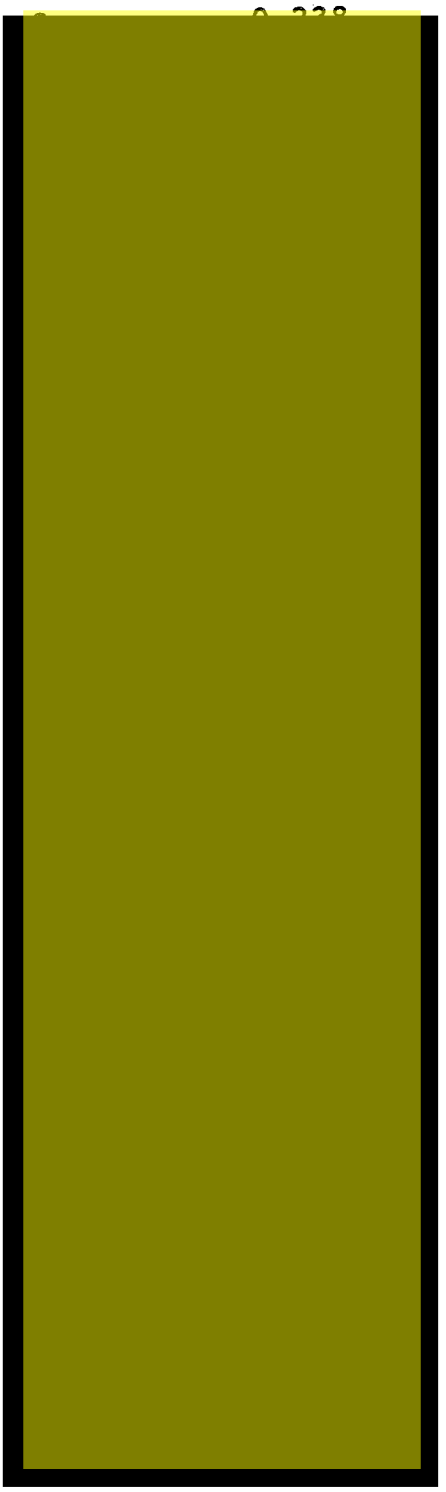


TABLE 3.2.3
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
SOURCES OF SUPPLY

UTILITY	AVAILABLE GROUNDWATER SUPPLIES No of Sources	AVAILABLE GROUNDWATER SUPPLIES Safe Yield mgd	AVAILABLE SURFACE WATER SUPPLIES No of Sources	AVAILABLE SURFACE WATER SUPPLIES Safe Yield mgd
Metropolitan District Comm				
Neipsic Woods Section 3			0	0
Neipsic Woods Water Assoc.			0	0
New Britain Water Dept.				
New Hartford Water Dept.			0	0
Oakwood, Inc.				
Old Newgate Ridge Water Co.			0	0
Orchard Hill Assoc.			0	0
Penwood Assoc., Inc.			0	0
Pine Hill, Inc.			0	0
Plainville Water Company			0	0
Redwood Farms L&M Water Co.			0	0
Reid Treatment Center			0	0
Rock Tree Apartments			0	0
Rolling Hills Water Assoc			0	0
Salmon Brook Dist Water Dept			0	0
School Hill Assoc., Inc.			0	0
Shaker Heights, Inc.			0	0
Sharon Heights Water Assoc.			0	0
Snipsic Village Housing Auth			0	0
Somers Elderly Housing Auth			0	0
Somersmill Water Assoc.			0	0
Southington Water Works			0	0
Tariffville Fire Dist			0	0
Taylor Trailer Park			0	0
Torrington Water Co.			0	0
Towpath Condominiums			0	0
Trailsend Company			0	0
Turkey Hill Apartments			0	0
Unionville Water Company			0	0
Vernon Village, Inc.			0	0
Village Water Co of Simsbury			0	0
Wallens Hill Apartments			0	0
West Hill Lake Water Assoc			0	0
West Service Corp.			0	0
Windsorville Water Assoc.			0	0
Wintergreen			0	0
Woodcrest Assoc., Inc.				

NOTES:
1. The Meriden Water Departm[illegible] the Torrington Water Company are located outside of the study area, but service small portions of the study area.

the geology of this area, about one-third of the utilities supplying groundwater use wells tapping sand and gravel aquifers, while the remainder rely on lower yielding bedrock wells.

3.2.3.2 Purchased Water

Some of the water supply systems within the Upper Connecticut River Area presently supplement their raw water sources by means of interconnections with adjacent utilities. These interconnections may be used to assist in meeting daily demands or may be maintained as an emergency supply for periods of peak demands (often associated with fire-fighting flows), or for times when existing supplies are unavailable due to equipment breakdown or failure. (Identification and further discussion of interconnections is provided in Section 3.5.)

The water systems that purchase or sell water to meet daily demand requirements are listed in Table 3.2.4. The contract limits and actual usage of the interconnections are presented in the table, together with the quantities identified by the utilities as part of their safe yield. The largest purchaser of water within the study area is the Town of Berlin, consisting of the Berlin Water Control Commission, the Kensington Fire District, and the Worthington Fire District. The three districts purchase, on average, 0.50 mgd from MDC, 2.00 mgd from the New Britain Water Department, and 0.30 mgd from the Town of Cromwell. Water is routinely purchased and sold between the three districts. The

[redacted]

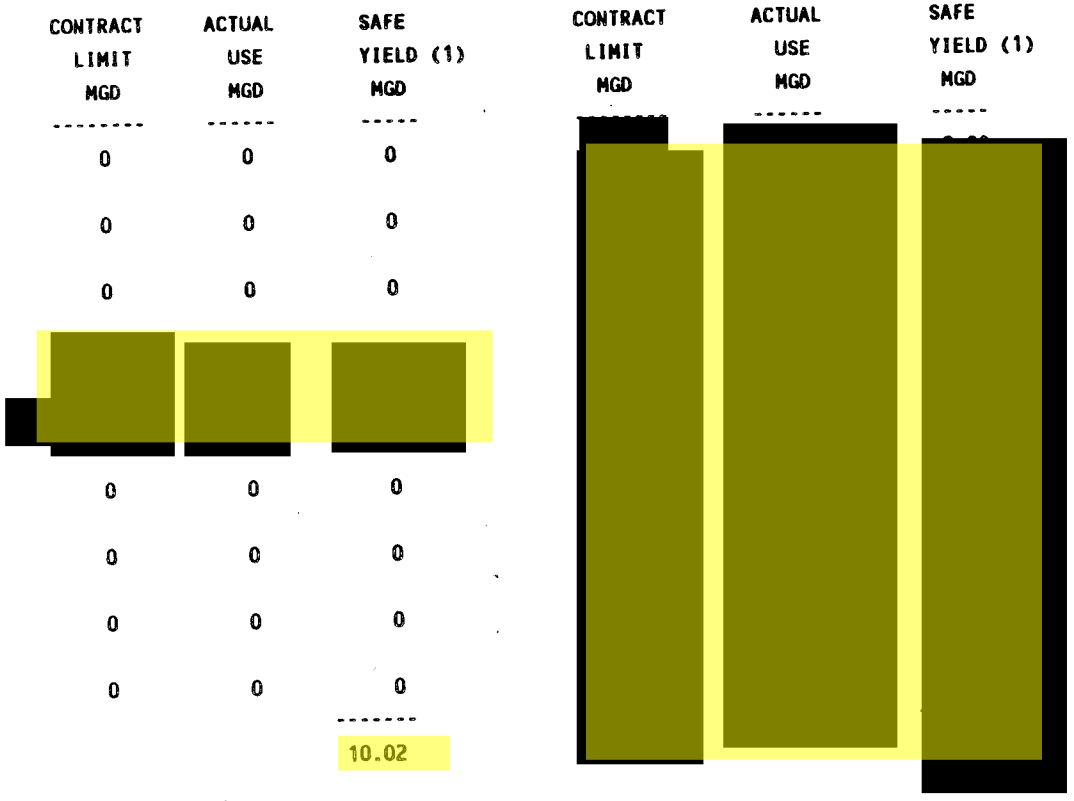
The Northern Division of the Connecticut Water Company purchased 0.022 mgd of water in 1987 from the Town of Longmeadow, Massachusetts. The New Hartford Water Department and the Unionville Water Company also purchase water from the MDC. The Water Supply Plan for the MDC identified 0.17 mgd of water sold to New Hartford in 1986. The Water Supply Plan for Unionville identified an equivalent safe yield of 0.49 mgd for the MDC interconnection. (The supplies from the Towns of Cromwell and Longmeadow are outside of the study area.)

TABLE 3.2.4

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

WATER SUPPLIES PURCHASED OR SOLD

UTILITY	WATER SOLD			WATER PURCHASED		
	CONTRACT LIMIT MGD	ACTUAL USE MGD	SAFE YIELD (1) MGD	CONTRACT LIMIT MGD	ACTUAL USE MGD	SAFE YIELD (1) MGD
Berlin (2)	0	0	0			
CWC-Collinsville	0	0	0			
CWC-Western & Rockville (5)	0	0	0			
Metropolitan District Comm						
New Britain Water Dept.						
New Hartford Water Dept.	0	0	0			
Plainville Water Company	0	0	0			
Southington Water Works	0	0	0			
Unionville Water Company	0	0	0			
			10.02			



NOTES:

1. Safe yield values were identified in the individual plans, and used in Table 3.2.5 to determine system safe yields, and supply surplus or deficit.
2. Berlin purchases 0.30 mgd from the Cromwell Fire District.
3. Actual usage figures are not available in the individual plans.
4. Value represents the hydraulic capacity of the interconnection(s). Contract limits were not identified in individual plans.
5. CWC-Western and Rockville system purchases 0.02 mgd from the East Longmeadow Water Company in Massasschusetts.
6. Based on safe yields identified by purchasing utilities.
7. Contract limits for Berlin are 2 mgd. Contract limit (leased) to Southington is 1 mgd.
8. Contract limit for Plainville was not identified in individual plans.
9. The 0.32 mgd purchased by Berlin and CWC-Western and Rockville represent supplies

In addition to the systems which regularly purchase water, [redacted]

3.2.3.3 Current Safe Yields

The total safe yields for existing sources serving each of the water supply systems are presented in Table 3.2.5. The safe yields listed represent the safe yield from groundwater and surface water supplies as well as water purchased or sold through interconnections. The safe yields were obtained from the individual plans, or, if not available, from Table A.2 of the Assessment. Safe yield estimates for groundwater sources were determined by using 90 percent of the pump capacity for an 18 hour duration for each day. The pumping capacity was determined from pump tests performed in accordance with Section 19-13-B51k of the Regulations of Connecticut State Agencies. Operating data or design capacity were used if pump test data were not available to the utilities. The safe yield estimates obtained from the Assessment were based on DOHS figures for estimated source yield. Safe yield estimates for surface water supplies were developed using standard mass curve methods based on stream flow records, as recommended by the Connecticut Department of Environmental Protection (DEP) and the Department of Health Services (DOHS). Water systems that utilize interconnections to supplement water supplies provided safe yield information based on quantities identified or contractual agreements.

3.2.3.4 Future Water Supply Needs

The projected water supply surplus or deficit for each water system is shown in Table 3.2.5, and was computed using the consumption

TABLE 3.2.5

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT

UTILITY	TOTAL CONSUMPTION mgd				PROJECTED SURPLUS/(DEFICIT)(2) mgd			
	1986	1992	2000	2030	86	1992	2000	2030
Avery Heights Water Assoc.	0.06	0.06	0.07	0.10	0.18	0.17	0.17	0.14
Avon Old Farms School	0.03	0.04	0.04	0.06	0.03	0.03	0.03	0.01
Avon Water Company	0.86	1.12	1.44	2.56	0.81	0.55	0.23	(0.89)
Berlin	1.79	1.89	2.15	2.83	1.87	1.77	1.51	0.83
Briarwood College	0.03	0.04	0.04	0.05	----	----	----	----
Bristol Water Dept.	5.28	7.10	8.00	11.71	2.57	0.75	(0.15)	(3.86)
Burnham Acres Water Assoc.	0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.04
CWC-Collinsville	0.32	0.42	0.58	1.07	0.19	0.09	(0.07)	(0.56)
CWC-Northern Div./Somers	0.09	0.13	0.17	0.31	0.30	0.26	0.22	0.08
CWC-Western & Rockville	8.41	9.87	11.67	15.83	5.34	3.88	2.08	(2.08)
Chelsea Common Assoc. Inc.	0.01	0.01	0.01	0.02	0.03	0.02	0.02	0.02
Chestnut Hill Hts Water Assn	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Chippanydale Assoc.	0.00	0.00	0.00	0.00	----	----	----	----
Ciccio Court	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.02
Connecticut Correct Inst	0.32	0.42	0.42	0.42	0.65	0.55	0.55	0.55
Cope Manor	0.00	0.00	0.00	0.01	0.03	0.03	0.03	0.03
Country Gardens Apts.	0.01	0.01	0.01	0.01	0.06	0.06	0.06	0.06
East Granby Village Condos	0.02	0.02	0.03	0.04	0.03	0.03	0.03	0.02
East Windsor Housing Authority	0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05
Ellington Acres Water Co	0.17	0.24	0.36	0.92	0.10	0.02	(0.10)	(0.66)
Ellsworth Estates	0.02	0.02	0.02	0.03	0.05	0.05	0.05	0.05
Ethel Walker School	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.03
Farmington Line West Condos	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02
Farmington Woods Water Co	0.13	0.14	0.15	0.21	0.29	0.28	0.27	0.21
Grant Hill Associates, Inc	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04

TABLE 3.2.5

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT

UTILITY	TOTAL CONSUMPTION mgd				PROJECTED SURPLUS/(DEFICIT)(2) mgd			
	1986	1992	2000	2030	86	1992	2000	2030
Hazardville Water Company	1.62	2.20	2.44	3.31	2.26	1.68	1.44	0.57
High Manor Mobile Home Park	0.02	0.02	0.02	0.03	0.01	0.01	0.01	0.00
Higley Village	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Hillsdale Water Co-op	0.00	0.00	0.00	0.00	0.04	0.04	0.04	0.04
Hilltop, Inc.	0.01	0.01	0.01	0.01	0.05	0.05	0.05	0.05
Jensens Forest Hills Mobile	0.03	0.03	0.03	0.04	0.05	0.05	0.05	0.04
Juniper Club, Inc.	0.01	0.01	0.01	0.01	0.04	0.04	0.04	0.04
Kenmore Road Assoc.	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Kimberly Lane Water Assn	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Lakeview of Farmington	0.04	0.04	0.04	0.05	0.04	0.04	0.03	0.03
Latimer Farms Water Assn	0.00	0.00	0.00	0.00	0.02	0.02	0.02	0.02
Liebman Apartments	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Little Brook Road Supply	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Llynwood, Inc.	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03
Manchester Water Department	4.81	5.80	6.30	8.00	4.89	3.90	3.40	1.70
Maple Ridge Farms Water Assn	0.01	0.01	0.01	0.01	0.06	0.06	0.06	0.06
Meadowbrook Apartments	0.00	0.00	0.01	0.01	0.13	0.12	0.12	0.12
Meriden Water Dept.	0.01	0.01	0.01	0.01	(3)	(3)	(3)	(3)
Metacomet Village	0.00	0.00	0.01	0.01	----	----	----	----
Metropolitan District Comm	59.12	63.70	72.22	91.79	3.22	(1.36)	(9.88)	(29.45)
Neipsic Woods Section 3	0.00	0.00	0.00	0.00	0.03	0.03	0.03	0.03
Neipsic Woods Water Assoc.	0.00	0.01	0.01	0.01	0.08	0.08	0.08	0.07
New Britain Water Dept.	11.30	11.85	12.07	12.54	6.24	5.69	5.47	5.00
New Hartford Water Dept. (5)	0.11	0.15	0.16	0.18	0.16	0.12	0.11	0.09

TABLE 3.2.5

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT

UTILITY	TOTAL CONSUMPTION mgd				PROJECTED SURPLUS/(DEFICIT)(2) mgd			
	1986	1992	2000	2030	1986	1992	2000	2030
Oakwood, Inc.	0.01	0.01	0.01	0.0	0.07	0.07	0.07	0.06
Old Newgate Ridge Water Co.	0.01	0.01	0.01	0.0	0.08	0.08	0.08	0.07
Orchard Hill Assoc.	0.00	0.00	0.00	0.0	0.01	0.01	0.01	0.01
					----	----	----	----
Penwood Assoc., Inc.	0.00	0.00	0.00	0.0	0.00	0.00	0.00	0.00
Pine Hill, Inc.	0.00	0.00	0.00	0.0	0.65	0.53	0.07	(1.12)
Plainville Water Company	2.61	2.73	3.19	4.1				
Redwood Farms L&M Water Co.	0.02	0.02	0.02	0.0	0.05	0.05	0.05	0.05
Reid Treatment Center	0.00	0.00	0.00	0.0	0.02	0.01	0.01	0.01
Rock Tree Apartments	0.00	0.00	0.01	0.0	0.01	0.01	0.01	0.01
Rolling Hills Water Assoc	0.01	0.01	0.01	0.0	0.03	0.03	0.03	0.03
Salmon Brook Dist Water Dept	0.08	0.08	0.09	0.0	0.58	0.58	0.57	0.53
School Hill Assoc., Inc.	0.01	0.01	0.01	0.0	0.03	0.03	0.03	0.02
Shaker Heights, Inc.	0.01	0.01	0.01	0.0	0.03	0.03	0.03	0.02
Sharon Heights Water Assoc.	0.01	0.01	0.01	0.0	0.03	0.03	0.03	0.03
Snipsic Village Housing Auth	0.01	0.01	0.01	0.0	----	----	----	----
Somers Elderly Housing Auth	0.01	0.01	0.01	0.0	0.02	0.02	0.02	0.02
Somersmill Water Assoc.	0.02	0.02	0.02	0.0	0.00	0.00	0.00	0.00
Southington Water Works	3.88	4.06	4.37	5.1	1.79	1.61	1.30	0.35
Tariffville Fire District	0.15	0.16	0.18	0.2	0.19	0.18	0.16	0.08
Taylor Trailer Park	0.01	0.01	0.01	0.0	0.01	0.01	0.00	0.00
Torrington Water Co.	0.00	0.00	0.00	0.0	(4)	(4)	(4)	(4)
Towpath Condominiums	0.01	0.01	0.01	0.0	0.04	0.04	0.04	0.04
Trailsend Company	0.00	0.00	0.00	0.0	0.02	0.02	0.02	0.02
Turkey Hill Apartments	0.02	0.02	0.02	0.0	0.08	0.08	0.08	0.07

TABLE 3.2.5

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

PROJECTED WATER SUPPLY SURPLUS OR DEFICIT

UTILITY	TOTAL CONSUMPTION mgd				PROJECTED SURPLUS/(DEFICIT)(2) mgd			
	1986	1992	2000	2030	1986	1992	2000	2030
Unionville Water Company	1.39	1.43	1.57	2.04	0.25	0.21	0.07	(0.40)
Vernon Village, Inc.	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.03
Village Water Co of Simsbury	1.49	1.74	1.97	2.69	3.96	3.71	3.48	2.76
Wallens Hill Apartments	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
West Hill Lake Water Assoc	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01
West Service Corp.	0.03	0.03	0.03	0.04	0.51	0.51	0.51	0.50
Windsorville Water Assoc.	0.00	0.00	0.00	0.00	----	----	----	----
Wintergreen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Woodcrest Assoc., Inc.	0.00	0.01	0.01	0.01	----	----	----	----
	104.57	115.91	130.22	167.46	39	27	13	-24

NOTES:

1. The estimated safe yield represents the total available surface and groundwater supplies presented in Table 3.2.3, adding water purchased and subtracting water sold, presented in Table 3.2.4.
2. The projected surplus or deficit was determined by subtracting the estimated safe yield from the total consumption for each year.
3. Meriden Water Department has 38 customers within the study area. The utility's remaining service area is outside of the study area.
4. Torrington Water Company serves 1 industrial customer, 1 public authority and 2 houses. The utility's remaining service area is outside of the study area.
5. Consumption does not include unaccounted for water; safe yield can be increased as necessary through greater use of MDC raw water connection from Barkhamsted Reservoir.

projections developed earlier in conjunction with the total safe yields currently available. Using the total consumption projections for the 5, 20 and 50 year planning periods with the current safe yield estimates, the adequacy of present supply systems to meet projected demands was identified. The projected water supply surplus or deficit was calculated assuming that all existing supplies and all agreements to purchase or sell water will be maintained throughout the planning period.

As shown in Table 3.2.6, there are eight individual water systems which are projected to have deficits at some time in the planning period. The MDC is projected to have the largest supply deficits throughout the planning period, increasing from around 1 mgd in 1992 to approximately 29 mgd in 2030. The Bristol Water Department is projected to have the second largest supply deficit, requiring an additional 3.9 mgd of supply by 2030. (The 2030 MDC deficit of slightly over 29 mgd is consistent with the projections of the Assessment and the original MDC Water Supply Plan. Subsequent work on the MDC's Strategic Plan has produced a somewhat lower 2030 deficit of approximately 24 mgd, with a zero supply balance shown for 1992 and a 5.5 mgd deficit predicted for the year 2000. These more recent figures will be used in the balance of the document.)

Although the MDC has the largest projected deficit amount, the supply deficits that require the largest percentage increase in system supply include the Ellington Acres Water Company and the Collinsville Division of the Connecticut Water Company, with respective increases of 254% and 110% required to overcome supply deficits by 2030. The Avon Water Company and the Plainville Water Company will require additional supplies by 2030 that represent approximately 53% and 34% of existing supplies, respectively. Even though the Western and Rockville Division of the Connecticut Water Company requires only a 15% increase in supplies, the 2030 deficit of 2.08 mgd is the third largest deficit projected in the planning area.

Each water supply deficit presented in Table 3.2.6 represents a potential water supply concern and should be carefully evaluated by the

TABLE 3.2.6

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

WATER SYSTEMS WITH FUTURE SUPPLY DEFICITS

Utility	Projected Deficit, MGD 2000	2030
Avon Water Company	-	0.89
Bristol Water Department	0.15	3.86
CWC - Collinsville Division	0.07	0.56
CWC - Western & Rockville	-	2.08
Ellington Acres Water Company	0.10	0.66
Metropolitan District Commission	5.50	24.00
Plainville Water Company	-	1.12
Unionville Water Company	-	0.40
	5.82	33.57

utilities and by the WUCC on an ongoing basis. The supply deficits projected for the MDC, the Bristol Water Department and the Connecticut Water Company represent by far the majority of the future supply shortfall. However, the other smaller water systems are projected to have deficits that may be large percentages, and even multiples, of their existing supplies. These deficits could have a potentially greater impact due to the larger relative financial requirements associated with meeting these projected needs. Although some utilities may purchase additional quantities to satisfy immediate deficits, the development of additional supply sources is essential for the projected demands up to the year 2030. It is important to recognize that the supply deficits for the individual water systems should be reviewed on both an areawide and an individual basis, since some systems may not have the financial, technical, or water supply resources necessary to meet their future supply needs.

In addition to the eight water systems with future supply deficits, there are seven water systems that have not provided any supply information. These utilities are shown in Table 3.2.5 with no projected surplus or deficit for the entire planning period. The total projected demand for these seven systems ranges from 59,400 gpd in 1986 to 77,200 gpd in 2030. The combined demand is less than 0.08 percent of the total consumption for the study area, and therefore will have a minor overall impact.

3.2.3.5 Population Not Serviced

Although the percentage of the population that is serviced by public water supplies increases through the 50 year planning period, approximately seven percent of the area's total population will remain dependent on individual water supplies by 2030. The population in each community not serviced by public water supplies is summarized in Table 3.2.7. By applying a per capita consumption factor of 75 gpcd to the 1986 population projections and escalating the consumption factor by 0.25 gpcd per year, the projected residential consumption in unserviced areas would range from 9.4 mgd in 1986 to 8.9 mgd in 2030.

TABLE 3.2.7
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
UNSERVICED POPULATION PROJECTIONS BY COMMUNITY

COMMUNITIES SERVED	UNSERVICED POPULATION 1986	1992	2000	2030
Avon	(1)	(1)	(1)	(1)
Barkhamsted	2983	3177	3369	4247
Berlin	3387	3691	2721	1511
Bloomfield	(3)	(3)	(3)	(3)
Bristol	6727	3854	2434	660
Burlington	5735	6018	5640	3952
Canton	5998	5959	5570	5089
Colebrook	1260	1290	1350	1500
East Granby	3229	3284	2017	2244
East Hartford	1720	240	0	(3)
East Windsor	5731	5462	4721	3209
Ellington	7040	7056	5045	(4)
Enfield	5026	3014	853	(4)
Farmington	(2)	(2)	(2)	(2)
Glastonbury	8568	9494	10800	670
Granby	6813	7280	7860	9986
Hartford	1710	500	0	6900
Hartland	1470	1560	1670	2100
Harwinton	5184	5521	5868	7209
Manchester	2644	2199	2292	2597
New Britain	0	0	0	0
New Hartford	3900	4033	4092	4666
Newington	(3)	(3)	(3)	(3)
Plainville	646	642	640	627
Rocky Hill	1410	300	0	7300
Simsbury	5982	6585	6788	7928
Somers	6990	4522	3385	49
Somers CCI	0	0	0	0
South Windsor	5606	5588	4689	(4)
Southington	6521	6498	6780	8045
Suffield	4776	4544	4026	4409
Vernon	12323	12842	11497	13925
West Hartford	50	(3)	1070	(3)
Wethersfield	(3)	60	0	(3)
Windsor	(3)	240	0	3500
Windsor Locks	2153	1560	1232	1280
	125582	117014	106410	103603

1. Avon service populations do not include population served by the Unionville Water Co.
2. Farmington service populations include Avon population served by Unionville Water Co.
3. Towns that are 100% served by one water system. Saturation population figures developed by water companies result in community population served exceeding 100%.
4. Population projections from more than one water company add up to greater than 100% served.

The majority of the unserviced population is located in the western and northern portions of the study area. The towns of Colebrook and Hartland are projected to remain 100% dependent on private water supplies, while approximately 96 percent of Barkhamsted will remain on private water supplies. These communities typically have a much less dense population than the central and southern portions of the state, and would require nearby water systems to extend their service areas over large areas relative to a small service population for that system. The financial requirements for starting a system to supply a small number of customers over such large areas would normally be one of the prohibitive factors in considering such a system. These communities are also located within watersheds for some of the larger water systems, and any future development would be limited to that allowed by the current or future source protection measures of the communities and water companies.

Conversely, unanticipated future development of areas within these communities could offset somewhat the financial requirements of servicing these private water supplies. Assuming that there would be little or no impact on present or future supplies in the area, this future development might allow a water system to eventually be extended to service some of the remaining population or a new system could be initiated to serve these communities. It is also possible that contamination of private supplies may require an extension of a water system to provide potable water to these areas.

3.2.4 Conclusions and Recommendations

There are 83 utilities within the Upper Connecticut River Area that presently provide water to approximately 90 percent of the area population. The population served by public water supply systems is anticipated to increase from approximately 750,000 to almost 1 million people during the 50 year planning period.

The total water consumption for the area is projected to increase from 106 mgd to 168 mgd, resulting from increases in service population together with increases in commercial and industrial water demands.

Eight individual water systems are projected to have water supply deficits at some time in the planning period. Although additional water could be purchased by these systems, future supplies are essential to meeting the increasing demands of the area.

The data presented in this section is based mainly on the individual plans, most of which are currently in a draft form. Therefore, this section is subject to modifications after the individual plans are reviewed by the State. It is recommended that the population and consumption projections be finalized in a consistent manner by the water systems for direct comparison and analysis of the area's water supply needs. The WUCC and the individual systems should also update and maintain the individual plans so that accurate population, consumption, and safe yield estimates closely reflect the area's current needs throughout the planning period.

3.3 ALTERNATIVE WATER RESOURCES FOR FUTURE SUPPLY NEEDS

3.3.1 Available Resources

The identification of alternative water resources for the Upper Connecticut River Water Supply Management Area has been an ongoing task in the region. Potentially significant future water supply sources have been addressed in previous reports and studies, as well as in the Water Supply Assessment. These previous reports and studies have considered the significant stratified drift aquifers within the Management Area, surface area impoundments, and the Area's rivers and streams. A listing of potential surface water sources was provided in Table 1.5A of the Assessment, with a listing of the stratified drift aquifers within the area that have been evaluated for long-term yields provided in Table 1.5.

An updated list of surface water sources is provided in Table 3.3.1, and was compiled from information found in both the individual plans and the Water Supply Assessment. Table 3.3.2 provides an updated list of groundwater sources, and was compiled from only the individual plans, since the data in the plans is more accurate and current than the general stratified drift information provided in the Assessment. The information presented in Table 3.3.2 identifies specific sources located in both stratified drift and rock aquifers which have been, or are anticipated to be, tested, studied and evaluated for meeting future demand requirements for each system.

The potential yields shown in the tables represent, in most cases, the safe yields for the sources. (For the purposes of this planning process, safe yield is defined as the yield available during a 99 percent dry year, or a dry year with a one in 100 chance of occurrence.) These safe yields were estimated using accepted engineering and planning methods, and are sufficient for this study. However, as the individual projects approach completion (or after they are placed in service), more accurate values should be identified and applied to the planning process

TABLE 3.3.1
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE SURFACE WATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield, MGD	Arrangements Required to Develop Potential Source(3)	Water Quality Classification (4)
Bristol Water Dept.	(1) [redacted]		- Environmental Assessment and permitting underway. - Land acquisition almost complete. - Land acquisition, permitting, water rights required.	Proposed reservoir w/goal of Class AA classification. Depends upon point of withdrawal
Bristol Water Dept.	Poland River Diversion	0.6	- Feasibility study completed. Land acquisition, permitting required. - Impact must be assessed on Terryville wells; may require seasonal pumping.	N.A.
Connecticut Water Co. Western and Rockville Division	(1) Connecticut River, initial increment WTP	5	- Use as water source currently prohibited. High coliform counts: non-point sources in CT and MASS; many WWTP discharges. WTP required.	Classification depends upon point of withdrawal, although highest classification is Class B.
Manchester Water Department	(1) [redacted]		- Dam seepage losses above average. - Additional yield developed through increase in storage.	Class AA
Metropolitan District Commission	(1) [redacted]	[redacted]	- Must ensure compatibility with other river uses. Historic conflicts with other uses, potential designation as "wild and scenic river," and 4 downstream segments in Basin that do not meet Class B water quality goals. Yield based on maximum withdrawal, allowing for other uses.	West Branch Reservoir Class AA Colebrook Reservoir Class A, with goal of Class AA

TABLE 3.3.1 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE SURFACE WATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield, MGD	Arrangements Required to Develop Potential Source(3)	Water Quality Classification
Metropolitan District Commission	Modifications of East Branch Farmington River Reservoir System	10	- Lower minimum operational levels in existing reservoirs. - Non-summer use of Lake McDonough in drought conditions.	East Branch Class AA Lake McDonough Class A
New Britain Water Department	(1) Lamson Corner Reservoir Project o Burlington Brook Diversion	4.0 (1) 2.5 (1) (2)	- Road relocation, permits, agreement w/MDC, diversion permit and report required.	Class A
New Hartford Water Department	[redacted]	N.A.	[redacted]	Class AA
Plainville Water Company	(1) Crescent Lake (Plainville Reservoir)	0.4	- Yield based on new filter WTP. Poor water quality, even with treatment. Source not used for many years.	Class AA
	(1) Tullers Reservoir AKA Simsbury Reservoir	0.5	- Needs treatment, not intended for future use by utility	Class AA
	(1) Thrasher Brook	2.9	- N.A.	Classification depends upon point of withdrawal.
	(1) East Branch Salmon Brook	6.0	- Land requirements over 2000 acres. Two town roads, one state road to be relocated.	Classification depends upon point of withdrawal.
	(1) West Branch Salmon Brook	10.0	- N.A.	

TABLE 3.3.1 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE SURFACE WATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield MGD	Arrangements Required to Develop Potential Source(3)	Water Quality Classification
Connecticut Water Co. Western and Rockville Division	Scantic River Reservoir	N.A.	- Large amount of existing development adjacent to river in the vicinity of impoundment; land requirements over 2,000 acres.	Classification depends upon point of withdrawal.
Connecticut Water Co. Western and Rockville Division	Broad Brook Diversion to Shenipsit Reservoir	7	- 7 mgd based on 3 months of highest stream flow per year. Dam overflow may need to be raised.	Classification depends upon point of withdrawal.
Connecticut Water Co. Western and Rockville Division	Scantic River Diversion to Lake Shenipsit	5	- Pumping from Scantic River during 8 months of highest stream flow.	Classification depends upon point of withdrawal
		12-20	- Construction of a new dam together with diversion. Yield depends on overflow elevation.	

NOTES:

1. Identified in the Final Water Supply Assessment.
2. New Britain Water Department projects the safe yield of the project to be 2.5 MGD in individual plan.
3. Identified in individual plans or taken from Assessment, whenever available; also note that diversion permits will be required for withdrawals in excess of 50,000 gpd.
4. Water quality is also dependent on present and future development in privately-held watershed areas - a point taken up in greater detail in Section 3.4.

TABLE 3.3.2

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

POTENTIAL FUTURE GROUNDWATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield MGD	Qualification to Use of Potential Source[1]	Water Quality Classification[2]
Avon Water Company	[redacted]		Future development may affect water quality Located in R-30 residential zone. Aquifer location No. 43-14	GA
Avon Water Company	[redacted]		- Future development may affect water quality Located in R-40 residential zone - Possible legal constraints since wells are outside of Roaring Brook watershed.	GA
Avon Water Company	[redacted]		Future development may affect water quality Located in R-40 residential zone	GA
Avon Water Company	[redacted]		Future development may affect water quality	GA
Town of Berlin	[redacted]		Engineering and construction of production well and 2000 L.F. of 12 inch DI main	GA[3]
Town of Berlin	Woodlawn Road Wells	0.8	Engineering and construction of production well	GA[3]
Bristol Water Dept.	Hoppers Wellfield	1.0	Engineering and construction of production well	GA
CWC - Somers Division	Gulf Road Tank Site	0.04	Non-point source pollution (septic systems, soil erosion and sedimentation). Aquifer location no. 43-6.	GA
CWC - Collinsville Division	Well Site, Area III	0.29	Rock well. Land acquisition, testing and permitting required. Non-point source pollution (septic systems, soil erosion and sedimentation).	GA
CWC - Western and Rockville Division	[redacted]	[redacted]	Located adjacent to duck sanctuary. Non-point source pollution (septic systems, soil erosion and sedimentation) Lack of sanitary protection; maintaining viability of sanctuary may limit yield.	GA

TABLE 3.3.2 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE GROUNDWATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield MGD	Qualification to Use of Potential Source[1]	Water Quality Classification[2]
CWC - Western and Rockville Division	[redacted]	[redacted]	Hydrogeologic investigation required for use of Scantic River for recharge. Proximity of Kement Landfill to the river will require extensive monitoring. Pollution from erosion, runoff, sewage sludge disposal. Aquifer location No. 42-7.	GA
CWC - Western and Rockville Division	Windsor Locks Well Field	0.6	Inactive Well Field. EDB contamination requires granular activated carbon treatment.	GB/GAA
CWC - Western and Rockville Division	Farnham Well Site	-	Inactive well. High levels of sodium, chloride, nitrate, solids, iron, manganese. Little sanitary protection. Reverse osmosis treatment recommended.	GB/GAA
Ellington Acres Water Co.	New Well	N.A.	One well in stratified drift aquifer. Location survey, sub-surface exploration, testing, land acquisition and permits required.	GA or GAA[3]
Hazardville Water Comp[redacted]	[redacted]		New wells located in active wellfield. Incremental yield estimated, no studies or evaluations performed	GAA
Hazardville Water Company	Town of Enfield Property	N.A.	Being considered for one or two wells	GA
Town of Manchester	[redacted]		Would be used to augment Lydall Reservoir	GB/GAA or GAA
Town of Manchester	[redacted]		Well rehabilitation	GB/GAA
MDC	New Well Fields in the S. Glastonbury, Simsbury/ Granby, or Simsbury aquifers	4 - 8	Depends on local land use, groundwater protection regulations, well field and system logistics, Safe Drinking Water Act regulations, well technologies, and cost of development; greater yields may be available, potential to be investigated prior to new surface source development.	GA or GAA[3]

TABLE 3.3.2 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE GROUNDWATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield MGD	Qualification to Use of Potential Source[1]	Water Quality Classification[2]
New Hartford Water Company	New groundwater sites	N.A.	Location survey, sub-surface exploration, testing, land acquisition, permits required.	GAA or GA[3]
Plainville Water Company	[redacted]		Well rehabilitation	GAA
Southington Water Dept.			Inactive well due to VOC contamination. Packed tower air stripping facility being constructed.	GB/GAA
Southington Water Dept.	[redacted]		Inactive well due to TCE contamination. Packed tower air stripping facility anticipated.	GB/GAA
Southington Water Dept.	[redacted]		The DEP permit hearing is closed and SWWD is awaiting the distribution of a recommended decision. A Joint River Management Plan was developed in cooperation with the DEP Water Resources Unit, South Central Connecticut Regional Water Authority and Meriden Public Works Department. This Management Plan was submitted in a joint hearing before the DEP. The Management Plan [redacted] approvable by the DEP by [redacted] Quality through implemen[redacted] reduction plan.	GA
Southington Water Dept.	Tomasso Well Field	1.5	Land acquisition, feasibility study, testing and permits required. Roaring Brook may be required for recharge.	GA
Southington Water Dept.	Additional well fields o Woodruff Street o Southwest Southington o Pleasant Street o South End Road	N.A.	Location survey, feasibility study, testing, land acquisition and permits required.	GA

TABLE 3.3.2 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
POTENTIAL FUTURE GROUNDWATER SUPPLY SOURCES

Identifying Utility	Supply Source	Potential Yield MGD	Qualification to Use of Potential Source[1]	Water Quality Classification[2]
Unionville Water Company	Connecticut Sand and Stone Well	0.65	Under construction	GAA
	Charles House Well #4	0.32	Currently being tested.	GAA
	Monce Pond Well #1	0.2	Well in place, tested.	GAA
	Monce Pond Well #2 and #3	0.14	Sites available. Feasibility study, testing, permits required	GAA
	Stich Well	0.85	Site tested 20 years ago. Land aquisition, feasibility study, testing, and permits required	GA
	Connecticut Sand and Stone Well #2	0.7 - 1.4	Preliminary explorations done. Rights from two parties required	GAA
	Charles House Well #5	0.43	Preliminary exploration. No further action until well is needed	GAA
	Oakridge Well #1	0.14	Rock well in place. Development and yield testing pending	GAA
	Oakridge Well #2	0.3	Rock well in place. Development and yield testing pending	GAA
	Pondwood Well #2	0.1	Rock well in place. Development and yield testing pending	GAA
	Pondview	0.1	Rock well in place. Development and yield testing pending	GAA

NOTES:

1. Indentified in individual plans or taken from Assessment, whenever available; diversion permits will also be needed for withdrawals in excess of 50,000 gpd.
2. No information provided in individual plans. Potential or existing contamination or water quality problems are listed in the Qualifications to use of potential source, where available.
3. Better location information needed.

to identify whether or not additional supplies will eventually be required.

3.3.2 Future Supply Alternatives

Water supply sources that have been specifically proposed by utilities to meet future needs or to be reserved for future development as a potable source are listed in Table 3.3.3. Some utilities also anticipate modifications to existing surface water treatment facilities in addition to new sources as a means of meeting future demands. These modifications are listed in Table 3.3.4. Both Tables 3.3.3 and 3.3.4 identify the approximate schedule for implementation of the sources or treatment improvements through the planning period.

Several of the potential sources listed in Tables 3.3.1 and 3.3.2 were dropped from consideration by the utilities in their draft individual plans. Some of the reasons for the elimination of potential sources include existing or former contamination/water quality problems, excessive development in the area, source distance from the service area, and/or economic reasons (relatively high cost of source development compared with yield). Water quality and the cost of development appear to be the major factors influencing the utilities' decisions as to whether or not to develop certain alternate sources for future needs, as well as the order in which those sources that remain feasible will be developed.

In total, there are nine surface water sources tentatively proposed for development by 2030, with projected yields from these sources of as much as 42 mgd. An additional 6 mgd could be made available from the proposed modifications to surface water treatment facilities. There are 19 groundwater sources proposed for development, with the safe yields of these sources projected to be as much as 27 mgd.

TABLE 3.3.3
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
FUTURE WATER SUPPLY SOURCES
PROPOSED IN DRAFT INDIVIDUAL PLANS

Water Utility	Source	Additional Supply to System, MGD		
		1992	2000	2030
Avon Water Company	[redacted]	1.4	1.4	1.4
		-	0.4	0.9
		-	-	1.4
		-	-	2.9
		1.4	1.8	6.6
Town of Berlin	[redacted]	-	0.5	0.5
	Woodlawn Road Well Field	-	0.8	0.8
		-	1.3	1.3
Bristol Water Dept.	[redacted]	1.7	1.7	1.7
		-	0.8	0.8
		-	0.9	0.9
	Poland River Diversion	0.6	0.6	0.6
		2.3	4.0	4.0
Connecticut Water Co. Collinsville Division	Rock Well, Area III	-	0.29	0.29
Somers System	Gulf Road Tank Well Site	0.04	0.04	0.04
Western and Rockville Systems	[redacted]	0.5	0.5	0.5
	Windsor Locks Well Field	0.6	0.6	0.6
	[redacted]	-	-	3.0
	Initial increment, Connecticut River WTP	-	-	5.0
		1.14	1.14	9.14
Ellington Acres Water Company	New well	(1)	(1)	(1)
Hazardville Water Co.	[redacted] (2)	0.4	0.8	1.2

TABLE 3.3.3 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
FUTURE WATER SUPPLY SOURCES
PROPOSED IN DRAFT INDIVIDUAL PLANS

Water Utility	Source	Additional Supply to System, MGD		
		1992	2000	2030
Town of Manchester	[redacted]	0.5	0.5	0.5
		-	0.6	0.6
		-	0.9	0.9
			2.0	2.0
Metropolitan District Commission	East Branch Farmington River Reservoir system modifications	10.0	10.0	10.0
	New well field(s) (3)	4.0	8.0	8.0
	[redacted]	-	-	20.0
		14.0	18.0	38.0
New Britain Water Dept.	Lamson Corner Reservoir Project Burlington Brook Diversion	2.5	2.5	2.5
New Hartford Water Dept.	[redacted]	(4)	(4)	(4)
Plainville Water Co.	[redacted]	0.4	0.4	0.4
	Reactivation of Crescent Lake (Plainville Reservoir)	-	0.4	0.4
		0.4	0.8	0.8
Southington Water Department	[redacted]	0.66	0.66	0.66
	[redacted]	2.00	2.00	2.00
	Tomasso Well Field	0.75	1.5	1.5
	Reactivate Well #6 - Air Stripping	-	1.42	1.42
		3.41	5.58	5.58

* Project completed in mid-1988

TABLE 3.3.3 - (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
FUTURE WATER SUPPLY SOURCES
PROPOSED IN DRAFT INDIVIDUAL PLANS

Water Utility	Source	Additional Supply to System, MGD		
		1992	2000	2030
Unionville Water Co.	[redacted]	0.65	0.65	0.65
		0.32	0.32	0.32
		0.43	0.43	0.43
		1.40	1.40	1.40

NOTES:

1. Plans for new sources identified, but no further quantities provided.

2. Based on "incremental" safe yield of 0.4 mgd.

3. Potential exists for higher yields in aquifers being considered - a possibility which will be fully explored by MDC prior to developing the West Branch of the Farmington as a potable supply. Aquifers under consideration include the following:

   - Simsbury
   - Simsbury/Granby
   - S. Glastonbury

4. Treatment rquired of present and projected demand from the Reservoir; yield could be expanded as necessary. Alternate groundwater sources would reduce need for surface supply.

TABLE 3.3.4

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

TREATMENT PLANT IMPROVEMENTS TO INCREASE POTABLE WATER SUPPLY

ADDITIONAL SUPPLY TO SYSTEM, MGD

UTILITY	IMPROVEMENTS	1992	2000	2030
Connecticut Water Co. Collinsville Division	[redacted]	0.15	0.15	0.45
Western & Rockville Division	[redacted]	1.0	5.4	5.4
Plainville Water Co.	New WTP at Plainville Reservoir		(1)	(1)
New Hartford Water Co.	[redacted]		(2)	(2)

NOTES:

1. Source was previously abandoned and WTP dismantled. Capacity of 0.4 MGD included in Table 3.3.3.
2. Current raw water source used for fire flow and supplemental source. Quantities not identified in individual plan.

3.3.3 Supply Constraints and Conflicts

In identifying future water supply sources, constraints on the development or use of the sources should (and for the most part, have been) considered by the various utilities in their draft individual plans. These considerations include the impacts on other resources, water quality and treatment concerns, delivery and distribution, interconnection limitations, and the concerns of "host" towns where new regional sources are proposed for development.

A source's impact on other resources would include impacts on other supply sources as well as other uses of the water resources. The establishment of a new surface water source can be advantageous to groundwater supplies that have recharge areas within the proposed watershed, but can also negatively impact surface and groundwater sources located downstream of the proposed diversion. Any new groundwater sources could also affect nearby wells and stream flows depending on the amount of water to be withdrawn.

Host town concerns have already been expressed for many of the surface supplies noted in Table 3.3.3, and may also arise for several of the proposed groundwater supplies. These concerns are varied, and raise issues ranging from "home rule" concepts to requests for supply guarantees from the developed resource. The WUCC notes that many of these issues are legal in nature, and cannot be addressed in this report. However, all WUCC members are committed to fair and equitable treatment of host towns, and have agreed to timely negotiations regarding reasonable allocations of the yield of developed resources with host towns based on overall demand projections and cost allocations.

The various WUCC members who have identified future supplies are aware of potential conflicts, and have already started to work with the various regulatory agencies, citizens groups, and neighboring utilities who might be impacted by additional diversions or withdrawals of water. The WUCC has discussed this topic in several meetings, including a special meeting held on June 7, 1988 for the sole purpose of reviewing

source needs and conflict potential. Results of this discussion, in terms of the various utilities that have proposed new sources (Table 3.3.3), are summarized in the following paragraphs.

- Avon Water Company

As noted in Table 3.3.3, the Avon Water Company has incorporated the potential development of four groups of well sites in its individual plan. No specific conflicts have been identified for t[redacted] or [redacted] sites. DEP has expressed some concern over the impact of the [redacted] low stream flows in the adjacent Roaring Brook, and the potential impact of these wells on the safe yield of the nearby groundwater sources used by the Farmington Woods Water Company. DEP has also expressed concern over the impact of the propose[redacted] low flows in the Farmington River, and has noted the presence of both a plant of special concern and a unique habitat in the vicinity of the proposed wellfield. The site [redacted] also in or near a critical habitat which must be avoided in preparing detailed construction plans. In a general sense, DEP is concerned over the impact of Avon's total groundwater use plans on surface flows, and will evaluate this impact carefully in reviewing future diversion requests.

- Town of Berlin

The Berlin Water Control Commission is also proposing the development of two wellfields in order to provide a better margin of safety in the future for their system. No potential use conflicts have arisen over the development of these water sources, although the need for source protection through appropriate planning and zoning has been noted. (Further review of potential conflicts will be necessary as more detailed location information becomes available.) Some volatile organic contamination has been noted in presently inactive wells, and the possibility that air stripping may be required in the future on all wells has been raised in Berlin's Individual Plan.

- Bristol Water Department

As noted in Table 3.3.3, the Bristol Water Department has proposed two surface water projects to meet water demands through the planning period [redacted] been planned for at least 20 years, and involves the creation of a new reservoir through the damming of the [redacted] with additional feed to the reservoir via diversion of both the main stem of [redacted] The [redacted] is a much simpler project, and involves pumping water which overflows an existing water supply reservoir as a supplement to a second existing reservoir.

Although the [redacted] project has been envisioned as a supplement to the City of Bristol's water supply, all impacted areas (including about 350 acres which would be inundated) are located in the Town of Harwinton. This has led to sometimes bitter controversy, with organized citizens' groups formed to fight against creation of the proposed reservoir. This opposition has also been expressed at the polls, with a referendum voted down which would have set aside 350,000 gallons per day of the reservoir's yield for the Town of Harwinton.

Concerns expressed by citizens' groups revolve about two basic issues: the right of Bristol to take land by eminent domain in the Town, and the environmental impacts associated with the loss of approximately 140 acres of wetlands associated with the creation of the reservoir. The Connecticut Water Company has also expressed some concern over the diversion o[redacted] since the Company's Terryville and Thomaston Divisions have also proposed a downstream diversion of this brook as a future water source. [redacted]y also impact the Hopper Meadow Swamp Natural Area, which is located along the Brook's East Branch.

The [redacted] diversion has not been as controversial in a public sense, although the Connecticut Water Company has again expressed some concern over the impact of such a diversion on the recharge characteristics of their [redacted] which lie along the River

downstream of the proposed diversion. Potential low flow reductions in the River also concerns DEP, since downstream waste load allocations have been set based on present minimum flows (this is also an issue of concern wit[redacted] which are tributary to waste load allocation streams).

The Bristol Water Department is sensitive to these concerns, and has continued to search for additional groundwater sources as an alternative to these surface supplies. Recent studies by the Department have indicated the potential for an additional 1 mgd in groundwater drawn from the Hoppers wellfield located in the northwest section of Bristol. The development of this groundwater source will ease present peak day problems experienced by Bristol, and will provide sufficient safe yield to meet average day demands until well past the year 2000. Bristol feels that the additional groundwater source will delay the need for the [redacted]ion, and provides time to better develop the [redacted] [redacted]posal to address the concerns which have been raised. Although the Bristol Water Department is pursuing the [redacted] project as a water source for Bristol alone, it may be that the eventual Cooks Dam concept will call for the reservoir to perform more as a regional source of supply DEP is presently seeking assurance from Bristol that they will participate in a future interconnection program as shown to be appropriate. (Bristol is presently reluctant to export water due to occasional peak day shortfalls.)

- Connecticut Water Company

As shown in Table 3.3.3, the Connecticut Water Company has proposed relatively minor new well development for their Collinsville Division and Somers System, with more extensive groundwater and surface water development proposed for the Company's Western and Rockville Systems. Apart from minor concerns over the need for appropriate control of adjacent development, no particular constraints or conflicts have been identified for the supplies proposed for the Collinsville Division, the Somers System, and t[redacted]

More significant concerns and constraints are in evidence for the Windsor Locks and [redacted] The Windsor Locks field has been shut down since 1984 due to EDB contamination from an as-yet undefined source, with CWC continuing to protect the recharge area in the hope of eventually re-opening this wellfield (probably in conjunction with treatment using granulated carbon). A variety of lesser concerns are present for the [redacted] including the proximity of the Kement and Enfield landfills and existing or ongoing residential development. All these situations are being monitored closely by CWC as well as by State and local officials.

The Connecticut River has also been identified as a source of supply by the Western and Rockville System of CWC. The River is currently designated as a Class B resource, since it receives treated wastewater effluent at various locations within Connecticut and upstream states. Class B waters are prohibited for use as a water supply under State law, although under this planning process their consideration as potential sources is permitted. The CWC recognizes this limitation, but still considers the Connecticut River to be a viable future supply alternative. The CWC has indicated in their individual plan that the construction of a treatment plant on the Connecticut River, well upstream of the nearest wastewater discharges in Connecticut, has several advantages over other alternatives. These include the location of intake and treatment facilities near the center of demand, the elimination of long transmission mains, and the minimal land requirements associated with this option. DEP acknowledges these advantages, but continues to be concerned over the lack of control which any Connecticut agency may have over continuing upstream waste discharges which originate in Massachusetts. (The State has suggested investigating interconnecting with the Springfield, Massachusetts water system as a potential alternative to use of the Connecticut River.)

Some concerns have also been raised by the Hazardville Water Company over the impact of expanded CWC use of their [redacted] Wellfield, which is adjacent to Hazardville's [redacted] Sufficient data is not available to adequately evaluate this impact, but

it is clear that close coordination and communication will be necessary between the two water companies if the expanded use of either wellfield become a reality (Hazardville proposes such an expansion in their individual plan).

- Ellington Acres Water Company

No conflicts or constraints are reported in the Ellington Acres individual plan for the new wells required to meet additional projected system demands.

- Hazardville Water Company (HWC)

The principal conflict inherent in HWC's future supply plans is the proximity of CWC's [redacted] to HWC's [redacted] wellfield, which is proposed for expansion. Additional representatives are concerned over potential recharge impacts to wellfields along the Scantic River should any upstream diversions be constructed. Such a diversion was considered at one time by CWC, but will not be necessary if the use of the Connecticut River as a source of potable water is eventually permitted by the State.

- Town of Manchester

Manchester proposes only to expand the use of existing sources, and no conflicts or constraints have been identified. Some concern has been expressed over the detectable levels of organic compounds which have been noted in several of Manchester's wells. Careful future controls will have to be applied to land use in the vicinity of these sources, with the possibility of water treatment eventually being required using packed tower aeration or carbon adsorption.

Should a wellfield be lost due to contamination or should unanticipated demands arise, Manchester has also developed a series of alternatives potentially available to obtain additional water. These include the following:

1. Develop additional groundwater supplies within Manchester (previous studies indicate relatively low potential yields).

2. Purchase finished water from MDC or CWC.

3. Divert water from Diamond Lake in Glastonbury (following a thorough water quality study).

4. Divert water from Bolton Lake (now Class B waters); would require a thorough water quality study to reclassify or a change in State policy and law to use if classification is not changed.

5. Develop additional groundwater sources in Coventry (potential yields of up to 20 mgd, but significant transmission requirements to connect this source to the existing system).

6. Divert Connecticut River water (Class B waters; constraints and conflicts in terms of future competing uses of the River and in terms of the need to alter State policy and law as discussed previously in conjunction with the Connecticut Water Company's future source options).

- Metropolitan District Commission (MDC)

As previously noted, the MDC is expected to experience by far the greatest new source need in the Management Area, with supply deficits expected by the mid-1990's if additional sources are not implemented. The MDC has studied this problem in great detail, and has developed a strategic plan which sets priorities for meeting projected water demands. Steps recommended in the strategic plan include the following:

1. Enhance operation of the present reservoir system on the East Branch of the Farmington River.

2. Develop additional groundwater supplies to the extent feasible.
3. Encourage water conservation and demand control; investigate use of non-potable water for key industrial users.
4. Utilize water from the [redacted] system on the Farmington River.

No particular conflicts have been associated with the first three steps in the MDC program, although specific actions have only been defined for enhancement of the East Branch reservoir system. (These are primarily operational in nature, and involve lowering the historical minimum pool levels in the [redacted] by ten feet and limited use [redacted] as a backup water supply.) Conflicts may present themselves as the MDC defines new groundwater sources (particularly in terms of the planned or potential use of those sources by other utilities), while the use of non-potable water by industries will require detailed investigations and negotiations before its potential and associated impacts can be fully assessed. Conservation programs and results are a key variable, and may delay the timing when other resources must be brought on line and the degree to which these resources must be used. An effective conservation program could delay implementation of th[redacted]ystem until very late in the planning period, as could greater-than-expected groundwater yields.

The [redacted] is already impounded by the U.S. Corps of Engineer[redacted] and the MDC's Goodwin Dam. MDC has rights to up t[redacted]he Class A and AA water which these facilities are capable of storing. The MDC estimates that up to 20 mgd can be withdrawn from the [redacted]stem without adversely affecting other important uses of the River, although a withdrawal of such a magnitude is unlikely for the forseeable future. The MDC is planning to utilize all other available resources, including the modifications to its existing East Branch system and new groundwater sources noted above, to meet system demands up to the year 2010, at which time t[redacted]Branch may be needed for drought standby.

The use of th[redacted]Branch prior to 2010 would take place only if unanticipated increases in demand from outside the MDC exclusive service area occur in conjunction with severe drought conditions.

Although MDC does not foresee the need to even begin the drought contingency use of [redacted]anch system prior to 2010, concerns have been raised again over the potential impact of reductions in the River flow on aquatic habitats, recreational opportunities, aesthetics, wetlands, hydroelectric potential, and waste assimilation. These concerns undoubtedly will be examined and re-examined over the next two years as part of the Wild and Scenic River Study of the West Branch of the Farmington River being conducted by the U.S. Department of the Interior (anticipated for completion by October 1, 1990), as well as by the MDC as it moves forward with the implementation phases of its strategic water plan.

Clearly, the findings of the Wild and Scenic River Study, further MDC studies, and ongoing studies and modeling efforts being undertaken by DEP will combine to play a critical role in determining to what degree (if any) the West Branch may serve as a future potable water source for the region. The WUCC strongly supports all efforts geared to establishing a river management plan that will provide for the compatible, mixed use of the West Branch of the Farmington River, consistent with the requirements of the Water Diversion Policy Act of 1982.

- New Britain Water Department

Since at least 1928, the City of New Britain has considered the creation of the Lamson Corner Reservoir as a potential water supply supplement. Creation of this Reservoir would involve damming Whigville Brook at Lamson Corner and diverting flow from Burlington Brook to the one billion gallon reservoir created by the dam. Affected land areas would all be in the Town of Burlington, although most of the area is now owned by the City of New Britain.

Significant concerns have been raised by the residents of Burlington over this conceptual plan. These have included fears over the impacts of reduced flow on the aesthetics of Burlington Brook (including downstream waterfalls) as well as on the Brook's ability to continue to function as a cold water fishery and nursery. Concern has also been voiced over the inundation of the Major Curtis Swamp along Whigville Brook, as well as over the perceived lack of benefits which would accrue to the Town of Burlington if the project is constructed. Major Curtis Swamp has been identified as a wetland of special concern, and provides a "level bog" type of habitat which could support at least four plant species of special concern. At this time, DEP believes that development of the Lamson Corner Reservoir would be inconsistent with the preservation needs of the Major Curtis Swamp.

In response to these concerns, New Britain has pointed out the long-standing nature of the proposal and the fact that water demand in their system has not reached the levels anticipated as late as the early 1970's which would have necessitated the construction of the Lamson Corner Reservoir. No need for this source is now apparent through at least the year 2030, with this conclusion likely to change only if significant non-residential demands unexpectedly arise in New Britain's service area.

- New Hartford Water Department

The major issues facing New Hartford are not associated with raw water quantities, but rather the need to either meet drinking water standards through treatment of Barkhamsted Reservoir water or to develop new groundwater sources. New Hartford also shows a clear need to improve system operation as a conservation measure, with present production reported to be 260 percent of consumption.

- Plainville Water Company (PWC)

PWC's individual plan notes that all but peak day supply requirements can be met through rehabilitation of the existing Woodford Avenue wells. To insure a continuous supply, the plan recommends returning to the use of the Plainville Reservoir with appropriate treatment. In and of itself, this proposal creates no conflict, although, as subsequently discussed, it does diminish the potential for a supply option otherwise available to the Southington Water Department.

- Southington Water Department

Southington's plans to expand the use of existing well fields or to develop new wellfields have solidified recently through development of a Joint River Management Plan for the Quinnipiac River in the course of review of the [redacted] application. The Management Plan provides [redacted] pumping reductions in response to Quinnipiac River flows. This Plan results in the [redacted] Diversion being DEP-approvable. The Management Plan includes a three-stage reduction protocol addressing all diversions in the Southington system.

These limitations have been proposed by DEP in an effort to guard against the future depletion of critically low surface flows in the Quinnipiac River and the consequent potential for downstream degradation of the river below several treated wastewater discharges. Groundwater withdrawal limitations would be set in a 3-step fashion based on the measured flow in the Quinnipiac River, and would range from 10.89 mgd at a river flow of 80 CFS, down to 7.9 mgd at a river flow of less than 50 CFS.

Another possible solution might be to provide supplemental flow to the river from the Plainville Reservoir. However, Plainville's possible use of this reservoir as a water source would preclude this source being

available for consideration by Southington. Discussions between the two utilities regarding Southington's use of the Plainville Reservoir continue.

Superficially, this does not appear to be a problem, since Southington's projected year 2030 demand is only 5.32 mgd. However, it must be remembered that this is an average daily demand, with 2030 peak day consumption likely to be around 9.32 mgd (as per the estimate in Southington's individual plan). Some of this peak demand can be met by short-term increases in surface water use. However, the most stringent groundwater withdrawal limitation of 7.9 mgd will still create a peak day demand deficit of 1.42 mgd in 2030, with smaller peak day deficits evidenced as soon as the withdrawal limitations are placed in effect. (It should also be noted that Quinnipiac River flows below 50 cfs are not particularly uncommon, having occurred 73 days in 1986 and 40 days in 1987.) Southington has proposed interconnecting with several utilities to meet this peak day deficit should the DEP plan be implemented, including New Britain, MDC, Bristol, and/or the South Central Connecticut Regional Water Authority. Given the supply surplus of 5.0 mgd projected for New Britain on an average day basis, interconnection with this system is the most likely solution to Southington's potential peak day shortfall. The possibility of dilution flow from Plainville Reservoir should not be entirely discounted, and the WUCC recommends further study to determine if such a system can be implemented in light of Plainville's projected peak demands.

- Unionville Water Company (UWC)

Unionville's proposed groundwater supplies are all in areas which have been well established as potential sources in previous studies. However, DEP has again raised concerns over the impact of increased groundwater withdrawals on the Farmington River, and this issue will have to be carefully evaluated before any new large-scale withdrawals can begin.

3.3.4 Areawide Concerns

In addition to the specific concerns outlined above, there are several broad issues of areawide significance. As an example, the potential for contamination of the major stratified drift aquifers, as well as bedrock aquifers, in the Upper Connecticut River Area was highlighted in the Assessment. These contamination problems have been documented by the utilities, but it is anticipated that additional problems will be realized with increased monitoring and better detection. These additional problems may increase the demand on the utilities as wells are abandoned or removed from service. Some utilities and towns have undertaken aquifer protection programs to reduce the contamination problem, but as demands increase, these contaminated sources may need to be cleaned up and treated using current technologies. The treatment required will have a major impact on the cost of supplying the water, and may become a limiting factor in deciding whether or not to draw from these sources. The treatment required for both surface and groundwater sources is becoming a more restrictive factor in source availability as amendments to the Safe Drinking Water Act (SDWA) begin to take effect. At a minimum, the SDWA will require filtration for all surface sources, with disinfection required for all supplies regardless of source. Many sources may also require additional treatment for specific water quality or contamination problems.

It should also be noted that the Water Diversion Policy Act administered by the Connecticut Department of Environmental Protection now serves as a vehicle for insuring the compatibility of the various uses of water resources from which a diversion has been requested. A permit is required under the diversion program for any withdrawal of 50,000 gallons or more during any 24-hour period from either a surface water or groundwater source. Applications for flow diversion permits must include all physical details of the work, as well as the diversion's probable effects on the following:

- public water supplies
- water quality
- wastewater treatment needs

- flood management
- water-based recreation
- wetland habitats
- waste assimilation
- agriculture
- fish and wildlife
- low flow requirements
- groundwater
- adjacent wells
- hydropower

Decisions as to the appropriateness of a diversion request are made by the Commissioner of the Department of Environmental Protection. However, the Commissioner must inform the chief executive officer of the municipality in which the diversion is to take place (among others) that a diversion application has been filed, with a hearing mandatory if the diversion will cause a transfer of flow from one regional drainage basin to another. If flow transfer is within a regional basin, notice of the application must be placed in a newspaper of general circulation in the affected area, and also be mailed to the chairpersons of the local conservation commission and wetlands agency. Public hearings will be held for any proposed diversion if petitions signed by at least 25 people are received by the Commissioner which make such a request.

3.3.5 Source Implementation Plan

In all, there are eight utilities in the Upper Connecticut River Management Area which are projected to experience an average day demand deficit relative to present safe yield at some time during the planning period. These include the following:

Utility	2000	2030
Bristol Water Dept.	0.15	3.86
CWC-Collinsville Div.	0.07	0.56
Ellington Acres Water Co.	0.10	0.66
Metropolitan District Comm.	5.50	24.00
Avon Water Co.	-	0.89
CWC - Western & Rockville Systems	-	2.08
Plainville Water Co.	-	1.12
Unionville Water Co.	-	0.40

Of the average day deficits projected by the year 2000, those associated with the Ellington Acres Water Company and the MDC are likely to actually be in evidence by the early to mid-1990's if present sources are not expanded or new sources brought on line within the next several years. Deficits for both Bristol and CWC-Collinsville will not be theoretically in evidence until the late 1990's. CWC-Collinsville projected needs will be met by both developing the Area III rock well and by the use o[redacted]Plainville's needs can only be partially met by proposed raw water sources, and there will be a long-term need for this system to rely on an interconnection to New Britain to meet projected system demands.

In addition to the eight utilities noted above, and as discussed in Section 3.3.3, seven other utilities have also indicated a need for source expansion over the planning period. These include the Berlin Water Control Commission, the Hazardville Water Company, the New Hartford Water Company, the Town of Manchester, the New Britain Water Department, and the Town of Southington. As also noted in Section 3.3.3, it does not appear that new source development is likely to be required for New Britain over the planning period, while New Hartford's system needs are likely to be met by treatment of existing sources or through better system control and conservation. New source development, or reactivation of historic sources, is needed for the other five systems in order to either provide a margin of safety relative to projected average day demands or to satisfy daily or seasonal peak demands. The latter issue is particularly pressing for Southington,

with peak day shortfalls already in evidence and peak day source expansion severely limited by the DEP proposed groundwater withdrawal limitations.

Overall, the WUCC recommends a new source implementation program very similar to that shown in Table 3.3.3 as originally proposed by the individual utilities. The only new source proposed in Table 3.3.3 which is not part of the WUCC-recommended plan is the Lamson Corner Reservoir (New Britain Water Department). The WUCC also recommends that the Cooks Dam project be delayed somewhat, with the safe yield envisioned from this project partially compensated for by groundwater from the Hoppers wellfield.

As discussed in Section 3.5, the WUCC is strongly in favor of a program of interconnections between utilities whenever physically and financially feasible. Many of these interconnections will serve to strengthen systems in terms of emergency capabilities, with a few needed to supplement system safe yields. The most pressing need for system supplementation in terms of peak demand is associated with the Southington situation, and the WUCC recommends that a Southington-New Britain interconnection be implemented in conjunction with Southington's efforts to both begin use of th[redacted]llfield in accordance with the negotiated Joint Management Plan, and to make regular use of potential stream flow supplementation via Plainville Reservoir releases. An average day shortfall is also projected for the Plainville Water Company after the year 2000 even if all new proposed sources are implemented, and the WUCC also recommends that Plainville expand the use of its present interconnection with New Britain.

In terms of quantity, the major water supply issue facing the Management Area is associated with the MDC system and its demands. The WUCC concurs with the MDC strategic plan concept and with the order in which future supplies are to be developed (East Branch modification, full use of available groundwater, an[redacted], all in conjunction with a program of water conservation). The WUCC believes that several elements of the MDC plan should be universally applied,

including the need for water conservation programs in conjunction with new source development, and the need to constantly re-evaluate the timing of, and need for, future projects.

Thus, the WUCC recommends an action plan which addresses immediate needs and sets priorities for source development to meet future needs without a specific timetable, thereby allowing better data to be developed and the impact of conservation programs to be better assessed. The recommended program for each utility in the area which is projected to need source expansion is as follows:

- Avon Water Company
  1. Beg[redacted]evelopment as soon as possible.
  2. In response to future system demands, develop (in order) the propos[redacted] sites; consider earlier development [redacted] Site if environmental concerns in terms of low flow impact prove to be significant at th[redacted].

- Town of Berlin
  1. No immediate action required; develop t[redacted] Woodlawn Road wellfields as shown to be appropriate; prior to wellfield development assess the potential for expanded use of finished water from New Britain.

- Bristol Water Department
  1. Begin Hoppers Wellfield development as soon as possible.
  2. Following investigation of groundwater potential, develop safe yield needs and timing f[redacted] including seasonal pumping schedules (if needed[redacted]
  3. Divert Poland River water.

- CWC - Collinsville
  1. Begin u[redacted]uct water as soon as possible.
  2. Develop the Area III [redacted]own to be appropriate.
  3. Expand the use of th[redacted]st-2000).

- CWC - Somers
  1. Develop th[redacted]as soon as possible.

- CWC - Western and Rockville

  1. Develop [redacted] and Windsor Locks Wellfields (treatment facilities) as soon as possible.
  2. Modify t[redacted] soon as possible.
  3. Develop t[redacted]).
  4. If shown to be necessary after full development of other feasible sources, the WUCC concurs with CWC's desire to maintain the conceptual potential for eventually implementing intake and treatment facilities for Connecticut River water (post-2000).

- Ellington Acres Water Company

  1. Develop new wells in existing wellfield as soon as possible; expand as needed to meet demand.

- Hazardville Water Company

  1. Begin development of th[redacted] as soon as possible.
  2. Continue phased development [redacted] as appropriate.

- Town of Manchester[redacted]

  1. Reactivate W[redacted]as soon as possible.
  2. Reactivate [redacted]when needed to maintain appropriate margin of safety.
  3. Expand storage capabilities o[redacted]r when needed, again as a means of maintaining an appropriate margin of safety.
  4. Should unanticipated needs arise or present sources be lost, develop the alternative sources identified in Manchester's individual plan.

- Metropolitan District Commission

  1. Modify East Branch Reservoir operation as soon as possible.
  2. Thoroughly investigate available groundwater; implement new groundwater sources as required.

3. Strive to reduce new source requirements through a continuation and expansion of water conservation programs.

4. As shown to be necessary after full development of other feasible sources, begin drought contingency use of t[redacted] (post-2000).

- New Britain Water Department

1. No new source development.

2. Interconnect to Southington as soon as possible (various other interconnections to New Britain and other systems should also be implemented early in the planning period, as discussed in Section 3.5).

- New Hartford Water Department

1. No new source development; reduce existing production through changes in system operation.

- Plainville Water Company

1. Rehabilitate [redacted] as soon as possible.

2. [redacted] iate.

3. As system needs increase, compare cost-effectiveness and efficiency of further expanding interconnection use or reactivating Plainville Reservoir.

- Southington Water Department

1. Continue to pursue [redacted] approvals with DEP through implementation of the negotiated Joint Management Plan.

2. Continue negotiations to secure the use of Plainville Reservoir for streamflow augmentation.

3. Interconnect with New Britain.

- Unionville Water Company

1. Develop [redacted] soon as low flow issues can be resolved for the Farmington River.

2. Devel [redacted] needed in an average day demand sense until post-2000; to be developed earlier to strengthen system safety factors).

Apart from those projects slated to begin as soon as possible, the time at which future projects are actually needed should be set based on actual system demands and defined safe yields. Conservation programs could act to significantly reduce demands by a given year over those projected in the individual plans, as could residential or commercial growth rates lower than those anticipated herein. However, the WUCC recommends that all projects proposed in individual plans continue to be considered as potential future supply sources. This recommendation is made for a variety of reasons, including the following:

- Estimated yields may change considerably as individual plans are finalized, and further deficit situations may become evident.

- Any projection of population or water consumption for a 50 year period is extremely tenuous, and could change dramatically in the future.

- One of the major concerns expressed by DEP is the presently unknown impact many of the proposed groundwater withdrawals may have on the low flow characteristics of nearby surface streams. If surface flow impacts are evidenced, and if other uses of the stream are thereby adversely affected, some sort of restriction (or prohibition) may be placed on the expanded use of these groundwater resources.

- Alternative sources may be needed to replace existing sources which become contaminated or to supplement existing sources during short or long-term emergencies and/or natural or man-made disasters.

- Utilities may wish to develop new sources for reasons other than safe yield shortfalls, such as economics, location within the

system, ability to meet peak demands, quality and quantity of water available, etc.

- Problems could develop with individual wells which would require an unanticipated expansion of public water supplies.

- The safe yield information is suspect for many of the smaller systems in the Management Area, while several of these small systems also suffer from inadequate management. It is likely that a number of these systems will be incorporated within the service areas of larger utilities over the planning period, thereby increasing demands over those projected herein.

3.3.6 Conservation

The topic of conservation has been of particular interest to the WUCC, and has been discussed at length in several meetings. Ultimately, each utility's individual plan will review specific conservation measures to be taken, with these plans and conservations steps becoming an integral part of the overall Coordinated Water Plan, which must be approved by the Department of Health Services.

While it has no mandate to develop areawide conservation programs, the WUCC strongly encourages its members to fully support and encourage conservation programs within the individual member's systems and to encourage member utilities to routinely budget funds for the development and refinement of conservation programs and conservation education. The WUCC further encourages the public to use water-saving devices. The types of programs, amount budgeted, and probable results will vary from utility to utility. Programs and budgets will be documented in individual plans, with results incorporated into the continuing new source planning effort by the WUCC.

An important first step in gaining hard data regarding the impact of conservation in Connecticut is about to be taken by MDC

through the implementation of an extensive domestic retrofit pilot program. This program will lean heavily on public education regarding the benefits of water conservation, and the MDC also intends to test different devices available to its customers. In another conservation program, the MDC will also investigate the potential for the substitution of non-potable water for potable water in various industrial uses, with this program being conducted as a joint effort by the MDC and several of its larger industrial customers.

These conservation programs will be reported upon by the MDC to the other members of the WUCC, who may adopt similar program techniques as appropriate. It should be remembered, however, that MDC's efforts at conservation may prove to be more or less successful than those in other utilities of a variety of reasons, including the following:

- MDC does face a future safe yield shortfall, and a case can be made for significantly delaying major capital expenditures through conservation (such a case would be more difficult to make for a utility which shows a long-term water surplus).

- Greater savings in industrial use may be possible within the MDC service area than in areas with a lower commercial/ industrial base.

- The MDC service area may be less affected by the peak demands associated with lawn sprinkling than more suburban systems; many of these latter systems can only show conservation benefits if they act to reduce the sprinkling demand.

Before developing a new source, utilities must consider and analyze the value/cost-effectiveness of conservation efforts towards reducing demand. The Areawide Supplement is a conservative document which has attempted to outline needs over a fifty year period assuming no mitigation of demand through conservation (in fact, per capita demand has been presumed to escalate). Although

the list of potential sources should continue to be the comprehensive one presented herein, the time at which thses sources must be implemented will be constantly re-evaluated by the WUCC and the State, with conservation programs having the potential to move source implementation times back - perhaps even beyond the 50 year planning horizon. As an example, the most controversial proposed surface source [redacted] River) could be delayed from its present 2010 implementation date to 2016 if conservation resulted in a five percent decrease in demand in the MDC service area, and to 2024 if a ten percent decrease was achieved. (Of course, these dates could be pushed even further back if MDC's groundwater exploration program is more successful than anticipated herein.)

Several other points have also been made during the WUCC's consideration of conservation. Those which found consensus agreement among WUCC members include the following:

- Savings in demand brought about by conservation should not be regarded as a new "source" of water. Conservation's only effect on new source planning will be a delay (sometimes indefinitely) in the time when additional new sources must be brough on line.

- A distinction should be made between water-saving programs which are based on the concept of system management (particularly leak control) and the need to alter consumer's actions or lifestyles. Conservation through system management is entirely under the control of the utilities, and is an integral part of each utility's present operating strategy. Conservation programs which rely on altered consumption patterns range from short-term bans or advisories against unnecessary water use to plumbing modifications designed to reduce usage for various everyday activities. Advisories concerning unnecessary water use are generally designed to lower peak consumption during times of shortage, and usage

patterns typically return to previous levels when consumers perceive that the "crisis" period has ended. Changes in long-term per capita average water use patterns are much more difficult to predict due to the need to instill a conservation ethic in consumers and the lack of enforcement capability for excessive use.

- The WUCC points out that investor-owned water utilities now have no means of enforcing even short-term bans against unnecessary water use, and recommends that action be taken on the State level to provide for such enforcement capabilities.

- The WUCC also recommends that programs designed to alter long-term usage patterns be applied on a State-wide basis - particularly if those programs call for plumbing modifications. (It should be noted that DPUC now had a docket number for conservation, and has held public hearings on this topic.)

- Significant conservation may cause water rates to rise, although the postponement or avoidance of capital investment in supply sources made possible by lowering demand may offer long term rate mitigation in some cases.

3.4 LAND USE COMPATIBILITY

3.4.1 Introduction

The Upper Connecticut River Water Supply Management Area is blessed with numerous water supply resources, as depicted on Figures 3.4.1 and 3.4.2. Figure 3.4.1 shows major stratified drift aquifers, while Figure 3.4.2 shows existing and potential water supply watersheds as defined by the WUCC in individual plans or by regional or State agencies. Table 3.4.1 provides a listing of the surface water sources depicted on Figure 3.4.2.

The delineation of stratified drift aquifers is taken from the Connecticut Department of Environmental Protection's ARC/INFO Geographic Information System and is based on maps developed by Meade (1978) and Mazzaferro (1986). The major stratified drift aquifers are defined as areas underlain by stratified drift deposits that have a saturated thickness of 10 feet or more and are thought to be capable of yielding moderate to large amounts of groundwater. Aquifer names have not been provided since they are not used on a statewide basis, and since names were not provided in the individual plans or community plans of development. The existing water supply watershed areas were taken directly from the CTDEP Records available in the ARC/INFO System. The proposed watershed areas were delineated using the Atlas of the Public Water Supply Sources and Drainage Basins of Connecticut and input into the ARC/INFO System. ARC/INFO was also utilized by the WUCC to determine the present zoning classifications within water supply resource (watershed and aquifer) areas, and to demonstrate the degree of incompatible land use in each town in the Management Area.

The percentage of water supply resource areas within the Upper Connecticut Area is presented by community in Table 3.4.2. As shown, more than 52% of the Upper Connecticut Area can be classified as being within an existing or potential water supply watershed or underlain by a stratified drift aquifer with a saturated thickness of at least ten

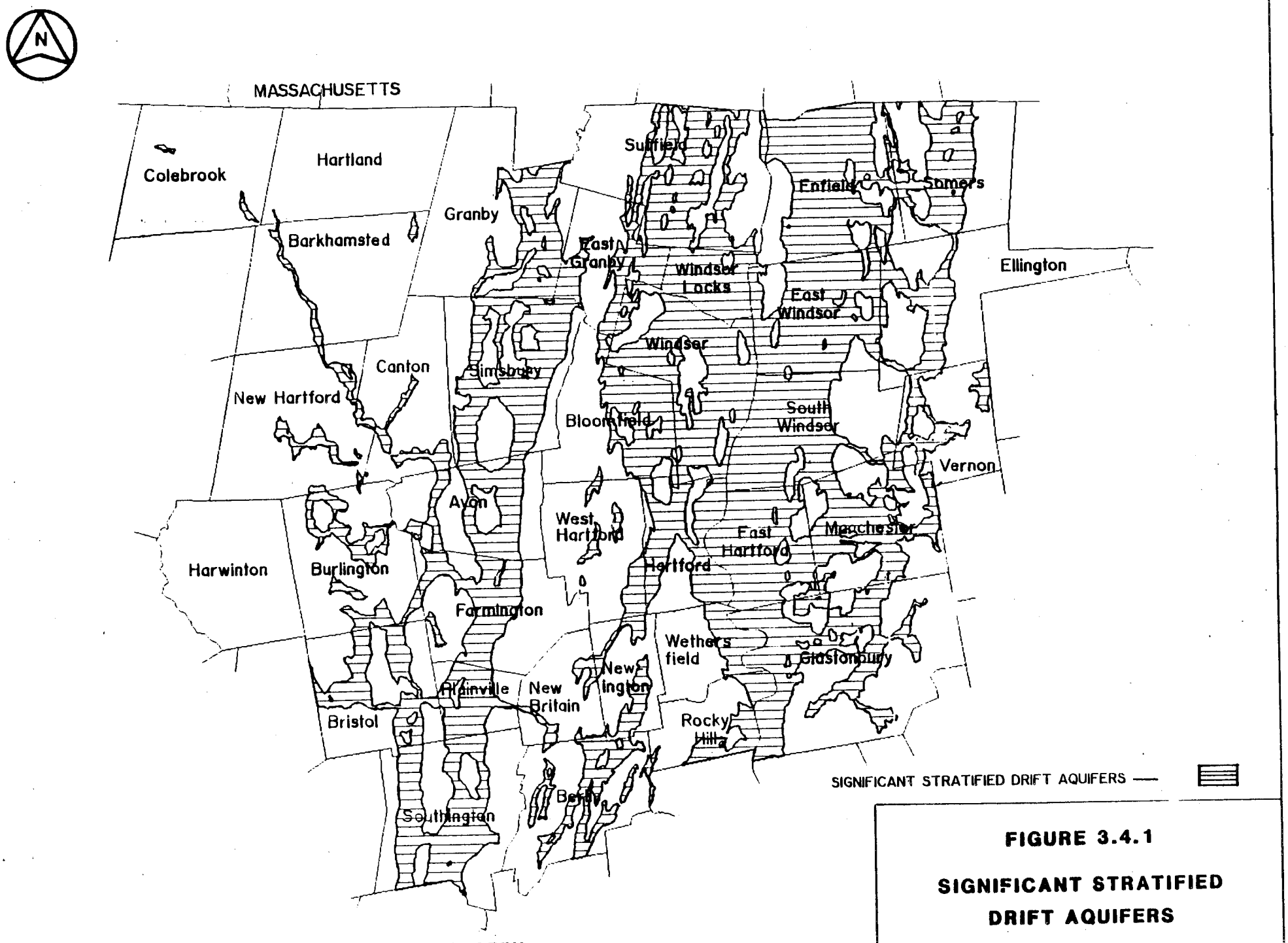
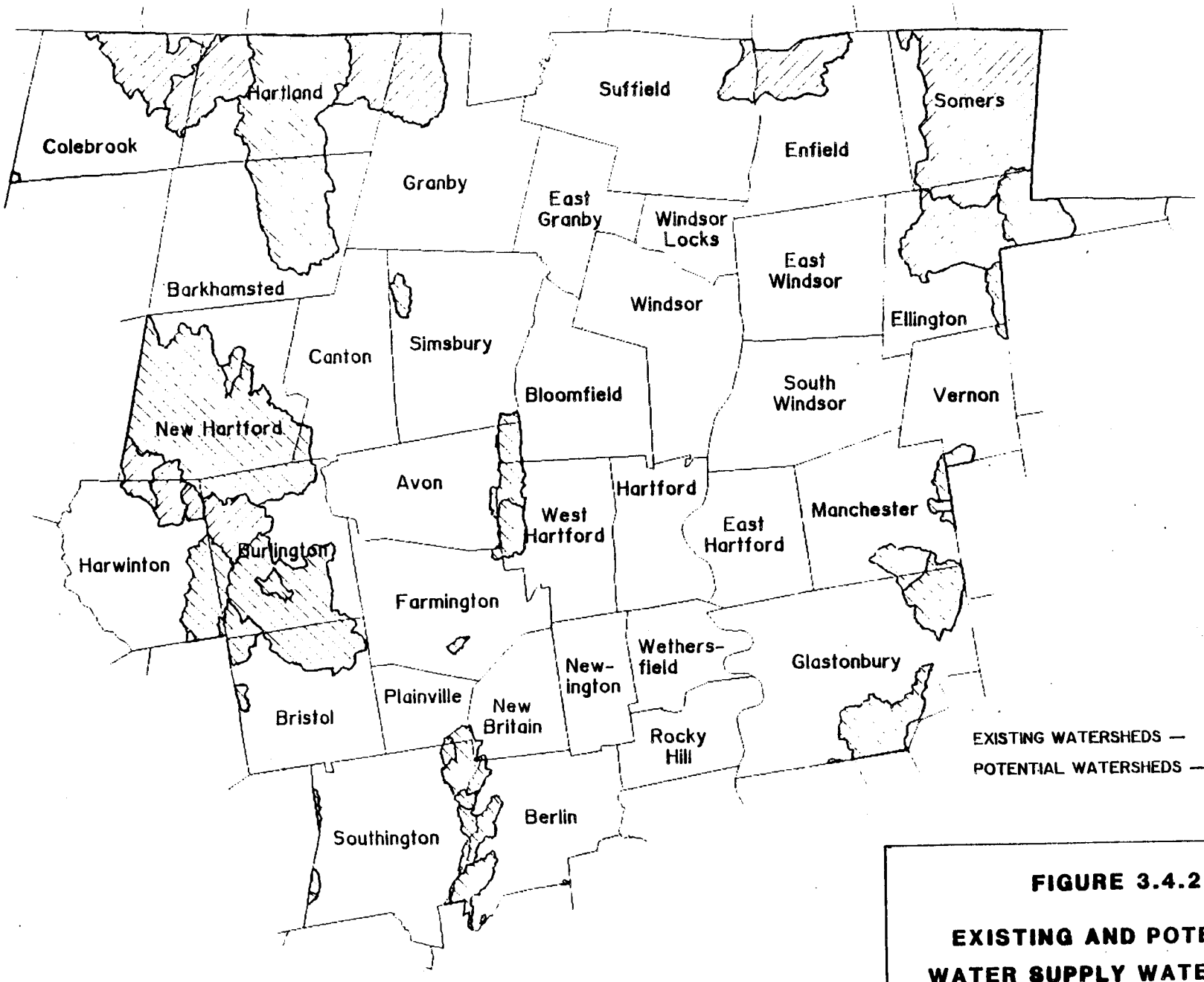


FIGURE 3.4.1

SIGNIFICANT STRATIFIED DRIFT AQUIFERS

SOURCE - CONN. DEP GEOGRAPHICAL INFO. SYSTEM



SOURCE - CONN. DEP GEOGRAPHICAL INFO. SYSTEM

FIGURE 3.4.2

EXISTING AND POTENTIAL WATER SUPPLY WATERSHEDS

TABLE 3.4.1

UPPER CONNECTICUT RIVER WATER SUPPLY RESOURCES WATERSHED LOCATIONS

MUNICIPALITY	WATER SUPPLY WATERSHED	EXISTING OR POTENTIAL
Avon	[redacted]	
Barkhamsted		
Berlin		
Bloomfield		
Bristol		
Burlington		
Canton		
Colebrook		
Ellington		
Enfield		
Farmington		

TABLE 3.4.1 (continued)

UPPER CONNECTICUT RIVER WATER SUPPLY WATERSHED LOCATIONS

MUNICIPALITY	WATER SUPPLY WATERSHED	EXISTING OR POTENTIAL
Glastonbury	[redacted]	
Granby		
Hartland		
Harwinton		
Manchester		
New Britain		
New Hartford		
Plainville		
Simsbury		
Somers		

TABLE 3.4.1 (continued)

UPPER CONNECTICUT RIVER WATER SUPPLY WATERSHED LOCATIONS

MUNICIPALITY	EXISTING OR [redacted]
Southington	
Suffield	
Vernon	
West Hartford	

NOTES:

1. Surface Water Watershed located within study area but servicing customers outside of study area.

TABLE 3.4.2

PERCENT OF WATER SUPPLY RESOURCE AREAS BY MUNICIPALITY

MUNICIPALITY	TOWN AREA (SQ. MI.)	TOWN AREA AS % OF MANAGEMENT AREA	% OF TOWN CLASSIFIED AS WATER SUPPLY RESOURCE AREA	% OF MANAGEMENT AREAS WATER SUPPLY RESOURCE AREAS WITHIN TOWN (2)
AVON	23.5	2.5	42	2
BARKHAMSTED	39.0	4.1	32	2
BERLIN	27.0	2.9	43	2
BLOOMFIELD	26.4	2.8	46	2
BRISTOL	27.0	2.8	46	2
BURLINGTON	30.6	3.2	76	5
CANTON	25.0	2.6	14	1
COLEBROOK	33.0	3.5	28	1
EAST GRANBY	17.4	1.9	42	1
EAST HARTFORD	18.1	2.0	86	3
EAST WINDSOR	26.8	2.8	81	3
ELLINGTON	34.8	3.6	61	4
ENFIELD	33.8	3.6	72	5
FARMINGTON	28.7	3.0	36	2
GLASTONBURY	52.5	5.5	57	6
GRANBY	41.3	4.3	41	3
HARTFORD	18.4	1.9	63	2
HARTLAND	34.5	3.6	75	5
HARWINTON	31.4	3.3	25	5
MANCHESTER	27.2	2.9	56	3
NEW BRITAIN	13.3	1.4	14	1
NEW HARTFORD	38.3	4.0	74	6
NEWINGTON	13.2	1.4	28	1
PLAINVILLE	9.9	1.0	64	1
ROCKY HILL	13.9	1.5	34	1
SIMSBURY	34.5	3.6	56	4
SOMERS	28.7	3.0	89	6
SOUTHINGTON	36.9	3.8	54	4
SOUTH WINDSOR	28.5	3.0	64	3
SUFFIELD	43.1	4.5	46	4
VERNON	18.6	1.9	30	1
WEST HARTFORD	22.2	2.4	29	1
WETHERSFIELD	13.0	1.4	30	1
WINDSOR	31.2	3.3	75	5
WINDSOR LOCKS	9.2	1.0	96	2
TOTALS	950.9	100.0		100.0

(1) Water Supply Resource Areas include major stratified drift aquifers and present and potential watershed areas.

(2) Town Water Supplyu Resource Areas Management Area Water Supply Resource Areas.

Date Source: Conn. DEP Geographical Information System

feet. Six communities within the Management Area have water supply resource areas covering greater than 75% of the town area. These six towns include Burlington, East Hartford, East Windsor, Hartland, Somers, Windsor and Windsor Locks.

In reviewing the information presented in Figures 3.4.1 and 3.4.2, some qualifications should be borne in mind, including the nature of existing land use within each town and the suitability of the various potential sources for eventual development as a water supply resource. Several towns (notably Windsor Locks) can do little to alter their present land use patterns, and can provide future water supply resource protection only by insuring that inappropriate land uses do not spread into areas that are now protected. Additionally, many of the potential resources are not now classified as suitable for development as a public water supply resource, and would require either a change in existing land use or the elimination of existing sources of pollution.

A check of the State DEP water quality classification maps shows some aquifer areas in 22 of the Management Area's towns which are not likely to be developed as a water source due to their present quality or incompatible land use. Most of these are scattered small sites, although more significant areas are found along the Southington/Bristol border, throughout central Bristol, and through large portions of New Britain, East Hartford, and Hartford. Except for the potential use of the Connecticut River proposed as a contingency plan by the Connecticut Water Company, no similar quality classification obstacles are apparent for the existing and potential water supply watersheds.

The character of growth in the various communities which make up the Upper Connecticut River Area has been shaped by the zoning regulations and/or plans of development, or lack thereof, established by the communities. Those communities desiring a strong commercial/industrial base attempted to set aside areas attractive for such

development -- typically open flat areas near public water and sewer services or amenable to on-site water supply and wastewater disposal, and with convenient transportation access. The combination of these factors often led to the establishment of commercial/industrial areas over important groundwater aquifers. In general, land use patterns have not been particularly sensitive to water resource needs and, as a result, incidences of groundwater contamination have become more frequent. (A summary of cited and potential groundwater contamination problems is given in Table 3.4.3.) Although surface water sources are generally more isolated from such development, they are still vulnerable to degradation from inappropriate development or land use within their watersheds.

These instances of real or potential water contamination illustrate the need to better understand the relationship between community development and water supply requirements. For the communities in the Upper Connecticut River area, this relationship has been brought into clearer perspective by recent legislation enacted by the State of Connecticut. This legislation, Public Act 85-279 entitled "An Act Concerning the Protection of Public Water Supplies," requires municipal planning and zoning commissions to include consideration of existing and potential surface and groundwater source protection in their local plans and regulations.

Some communities have already taken steps to protect their water supply resources, as illustrated in Table 3.4.4. Unfortunately, only a few communities have put significant effort into developing protection programs. Zoning restrictions or special districts are found only in Canton, Enfield, Farmington, Simsbury, and Vernon, with these restrictions offering varying degrees of protection. The need for water resource protection is noted in the Plans of Development for 13 of the other communities within the Management Area, with four plans (Harwinton, Manchester, Plainville, and South Windsor) recommending the creation of special watershed and/or aquifer protection districts.

TABLE 3.4.3

SUMMARY OF CITED AND/OR POTENTIAL GROUNDWATER CONTAMINATION PROBLEMS (1)

COMMUNITY	CONTAMINATED WELLS	SPILLS	LANDFILLS ACTIVE	LANDFILLS CLOSED	ACTIVE LAGOONS/ SLUDGE BEDS	ACTIVE IND. WASTE DISCHARGES TO GROUND	LARGE/ FAILING SEPTIC SYSTEMS	SALT STORAGE PILES
AVON	2	3	1	1	0	0	0	2
BARKHAMSTED	1	0	1	0	0	0	0	1
BERLIN	2	2	2	2	1	5	0	1
BLOOMFIELD	0	2	0	1	0	3	0	2
BRISTOL	9	3	1	0	8	5	0	0
BURLINGTON	0	0	1	0	0	0	0	1
CANTON	3	4	1	1	0	0	0	2
COLEBROOK	1	1	0	0	0	0	0	1
EAST GRANBY	2	1	1	0	1	1	0	1
EAST HARTFORD	0	4	1	2	4	1	0	2
EAST WINDSOR	9	3	3	1	0	0	0	2
ELLINGTON	3	0	2	0	0	0	0	1
ENFIELD	4	3	1	2	0	0	0	1
FARMINGTON	2	5	1	1	1	2	1	3
GLASTONBURY	0	1	1	2	2	1	1	2
GRANBY	2	1	1	0	0	0	0	1
HARTFORD	0	10	1	1	0	0	0	5
HARTLAND	0	0	2	0	1	0	0	1
HARWINTON	0	0	0	0	0	1	0	2
MANCHESTER	6	3	2	0	0	2	0	2
NEW BRITAIN	0	1	0	0	0	0	1	1
NEW HARTFORD	1	1	0	1	1	1	0	2
NEWINGTON	0	1	1	3	0	1	0	3
PLAINVILLE	1	5	2	1	4	4	0	1
ROCKY HILL	0	0	2	0	0	1	0	2
SIMSBURY	7	1	1	3	0	1	0	3
SOMERS	2	1	1	0	1	0	0	3
SOUTHINGTON	9	14	1	2	9	2	0	4
SOUTH WINDSOR	6	2	1	1	0	0	0	2
SUFFIELD	3	2	1	2	0	0	0	1
VERNON	5	4	1	0	1	1	0	3
WEST HARTFORD	0	4	2	2	0	0	0	1
WETHERSFIELD	0	2	0	1	0	0	0	2
WINDSOR	1	1	1	1	3	0	0	3
WINDSOR LOCKS	3	1	0	1	2	2	0	1

SOURCE: CTDEP
LEACHATE AND WASTEWATER DISCHARGE SOURCES; CONNECTICUT RIVER BASIN (FEBRUARY, 1987), UPPER HOUSATONIC

TABLE 3.4.4

INVENTORY OF ADOPTED OR PROPOSED WATER SUPPLY PROTECTION MECHANISMS (1)

Community	Watershed Supply By:			Aquifer Protection By:		
	Special District	General Use Restriction	Required Open Space	Special District	General Use Restriction	Required Open Space
Avon	-	-	P	-	P	P
Barkhamsted	-	P	-	-	P	-
Berlin	-	P/Z	-	-	-	-
Bloomfield	-	-	-	-	-	-
Bristol	-	-	-	-	-	-
Burlington	-	P	-	-	P	-
Canton	Z	-	P	-	-	-
Colebrook	-	-	-	-	-	-
East Granby	-	-	-	-	-	-
East Hartford	-	-	-	-	-	-
East Windsor	-	P	-	-	P	-
Ellington	-	P	P	-	-	-
Enfield	-	-	-	Z	Z	-
Farmington	-	-	-	Z	-	-
Glastonbury	-	-	-	-	-	-
Granby	-	-	-	-	P	-
Hartford	-	-	-	-	-	-
Hartland	-	-	-	-	-	-
Harwinton	P	P/Z	-	P	P/Z	-

TABLE 3.4.4 (continued)

INVENTORY OF ADOPTED OR PROPOSED WATER SUPPLY PROTECTION MECHANISMS (1)

Community	Watershed Supply By: Special District	Watershed Supply By: General Use Restriction	Watershed Supply By: Required Open Space	Aquifer Protection By: Special District	Aquifer Protection By: General Use Restriction	Aquifer Protection By: Required Open Space
Manchester	P	P	P	P	P	-
New Britain	-	-	-	-	-	-
New Hartford	-	P	-	-	P	-
Newington	-	-	-	-	-	-
Plainville	-	-	-	P	P	-
Rocky Hill	-	-	-	-	-	-
Simsbury	-	Z	-	-	P	-
Somers	-	-	-	-	-	-
Southington	-	-	-	-	-	-
South Windsor	-	-	-	P	P	-
Suffield	-	-	-	-	P	-
Vernon	Z	-	-	-	-	-
West Hartford	-	-	-	-	-	-
Wethersfield	-	-	-	-	-	-
Windsor	-	-	-	-	-	-
Windsor Locks	-	-	-	-	-	-

P = Included in Plan of Development

Z = Included in Zoning Regulations

In addition to implementing water resource protection measures, it is also important that the pertinent information about such water supply protection programs be disseminated to the general populace, as well as to public officials responsible for implementing the programs, since the membership on a community's planning and zoning commission may change regularly. In an effort to further this program of information and education, this section of the Integrated Report examines land use issues and their relationship to the Upper Connecticut River Water Supply Management Area's water supply needs.

3.4.2 Community Planning and Zoning

3.4.2.1 Community Planning

The communities within the Upper Connecticut River Area utilize a plan of development to define long-term development and conservation goals, including the identification of service needs such as sewers and public water supply. Every town's plan of development should include a discussion of local water supply resources and the need for their conservation due to present and projected future use. A listing of aquifer and watershed protection measures that have been considered and/or adopted for use by each community is provided in Table 3.4.5. These protection measures have principally been obtained from the individual plans of development, supplemented by a review of zoning regulations, and are an expansion of the overview information provided in Table 3.4.4.

Thirteen towns did not address any form of water supply protection at all in their plans of development. These are Bloomfield, East Granby, East Hartford, Glastonbury, Hartford, New Britain, Newington, Rocky Hill, Somers, West Hartford, Wethersfield, Windsor and Windsor Locks. In addition, four towns (Bristol, Colebrook, Hartland and Southington) have not yet adopted a plan or provided the WUCC with their plan of development. Of the remaining eighteen towns in the Management Area, only Canton, Enfield, Farmington, Simsbury and Vernon

TABLE 3.4.5

WATER SUPPLY PROTECTION MEASURES

Avon	. Adequate protection regulations for major aquifer areas recommended in Plan of Development.
	. Open space plan protects streams and water supplies, on a temporary basis.
	. Community Facilities Plan required utilizing open space for watershed protection and other compatible uses.
Barkhamsted	. Policies protect groundwater supplies through proper land use management techniques.
	. Discourages development in public water supply aquifers and watersheds that are "potentially hazardous or unsuitable."
	. Recommends review of zoning regulations and zoning maps to insure allowed uses are consistent with protection of Barkhamsted's water supply aquifers.
	. Recommends cooperation with public and private organizations to protect the Farmington River.
Berlin	. Recommends adopting provisions to existing zoning regulations and subdivision requirements to permit town control over streambelts and waterbodies.
	. Large lot zoning specific to Hallmere Reservoir area.
Burlington	. Goals established to protect potential ground and surface water sources.
	. Limit development in watershed areas outside of water company jurisdiction to very low densities.
	. Regulate land use activities that return large amounts of water back into the ground.
	. Discourage facilities that handle or store hazardous materials from locating within aquifers or watersheds.
	. Safeguard and protect water supply aquifers and watersheds from contamination and pollution.

TABLE 3.4.5 - (Continued)

WATER SUPPLY PROTECTION MEASURES

Canton	. Sweetheart Mountain is protected as the Nepaug Reservoir watershed.
	. Recommends preserving open space for watersheds.
Colebrook	. Plan goal is to protect existing and potential public water supplies.
East Windsor	. Restrict or prohibit land uses which have the potential to pollute aquifers and watersheds.
Ellington	. Recommends preservation of watersheds by reserving open space.
	. Recommends lower densities surrounding Crystal Lake.
Enfield	. Adopted aquifer protection ordinance to preserve the quality and quantity of the town's groundwater resources.
	. Regulates land uses capable of contributing pollutants to aquifers which may be needed for present and future supplies.
	. Aquifer protection zones developed.
Farmington	. Adopted aquifer protection regulation.
Granby	. Recommends adopting aquifer protection regulation.
Hartland	. Plan states zoning goal to be water supply protection.
	. Town policy is to refer all subdivisions to Hartford County Conservation District to ensure adequate environmental protection.
Harwinton	. Proposed Groundwater Action Project sets standards for a watershed protection overlay zone, site plan, review, subdivision regulations, underground storage of hazardous materials, and toxic and hazardous materials ordinance. (zoning provision enacted regarding hazardous waste handling)
	. Goal to preserve the quality of surface water supplies by limiting the density of development and regulating the use of land within the watersheds of drinking water reservoirs.

TABLE 3.4.5 - (Continued)

WATER SUPPLY PROTECTION MEASURES

Harwinton (cont'd.)	. Proposed enactment of a streambelt protection amendment.
	. Implement a comprehensive public education program on water quality protection.
Manchester	. Provide extensive open space for watershed areas; land use map specifically calls out watershed designations.
	. Proposes aquifer protection zones.
	. Develop regulations for handling, storage and disposal of hazardous wastes which may negatively affect aquifers.
	. Support for detailed groundwater studies.
New Hartford	. Natural resources policy discourages development in aquifer recharge areas and recommends protecting the quality of aquifers.
	. Restricts or prohibits land uses which have the potential to pollute surface waters and aquifers.
Plainville	. Recommends adopting aquifer protection zones.
	. Recommends no new septic systems in recharge areas and prohibit use of septic cleaners and degreasers in recharge areas.
	. Recommends including waste inventories and disposal plans during site plan review process.
	. Recommends regulating underground storage tanks.
Simsbury	. Controls development in public water supply watersheds through use of R-160 zoning; plan of development discourages development in public water supply aquifers.
	. Protect aquifers through proper land management, designating land uses consistent with the protection of wells and aquifers.
	. Policy to promote education regarding maintenance of on-site and sewage disposal systems.

TABLE 3.4.5 - (Continued)

WATER SUPPLY PROTECTION MEASURES

South Windsor	.	Proposes aquifer protection program, designation of aquifer protection zones and adoption of land use restrictions.
	.	Recommends regulating uses which handle or generate contaminants by keeping away from aquifers.
Suffield	.	Encourages identification and protection of aquifers.
Vernon	.	Watershed Protection/Historic zone for protection of Shenipsit Lake.

have zoning restrictions or special districts for aquifer or watershed protection. Special districts are proposed in four other communities, including Harwinton, Manchester, Plainville, and South Windsor.

Different levels of aquifer protection exist throughout the study area, as well as throughout the state. Typically, aquifer protection overlay districts are drawn to cover the entire area and adjacent recharge zones of a stratified drift aquifer. Prohibitions and restrictions in the district are applied uniformly across this area. However, the Connecticut DEP is recommending an evolution of these groundwater protection policies to reflect different strictness levels within such traditional overlay districts. The basic protection strategies that may be implemented, depending on the critical aquifer component and existing land use conditions, include: land acquisition, land use regulation to prevent the siting of high-risk activities, and increased monitoring, inspections and regulation of the more threatening land use activities.

The 1987 Connecticut DEP report entitled "Protection of High and Moderate Yield Stratified Drift Aquifers" recommended restrictive controls (land acquisition, for example) in the relatively small "wellfield areas"; stringent protection (partial land acquisition or strict regulation of both future and existing land uses, for example) in the larger surrounding "drawdown areas"; and somewhat less stringent but still meaningful controls (existing and future land use restrictions, for example) in the remainder of the overlay district or "recharge areas". Additional protection may also extend to upstream "indirect recharge areas", which are largely protected through State surface and groundwater protection strategies.

The 1988 Report of the Aquifer Protection Task Force to the General Assembly builds upon the 1987 DEP report, recommending a plan of action to begin Statewide protection of aquifers. The Task Force concluded that all stratified drift aquifers with existing public water supply wellfields should be mapped by 1992, with those of

potential importance to water supply mapped in detail after the completion of the WUCC planning process. This recommendation was acted upon by the passage of Public Act 88-324, which requires a generalized mapping of present and potential supply aquifers by July 1, 1990, with more detailed mapping completed by July, 1992. The Task Force also recommended that each town either designate an existing land use commission, or form a new commission, for the purpose of carrying out an aquifer protection program using the data obtained from the mapping program. The Task Force asked that its term be extended an additional year to allow further study of several aspects of the aquifer protection problem.

3.4.2.2 Community Zoning and Other Land Use Controls

Each community maintains a set of zoning regulations in order to control new development. Once a determination has been made as to the level of protection needed, additional actions should be taken to adequately protect existing and potential water supplies through local zoning and other regulatory mechanisms.

Revisions to the zoning regulations with the aim of water supply protection generally involve the prohibition of certain land uses from specified aquifer protection zones, or restrictions on development within the watershed areas of reservoirs. Once identified, the area's zoning designation may be changed to a low-risk use, such as low-density residential, or may become an aquifer protection overlay zone where land uses now allowed by right may be permitted subject to a special permit review by the Zoning Commission. If water supply protection measures lead to the exclusion of certain industrial and commercial uses from existing zones, other areas of town which might accommodate those uses without threatening water resources or downstream and neighboring uses should be considered.

Zoning controls are especially effective in restricting incompatible new development in defined aquifer protection zones. However, controlling existing land uses through new zoning regulations is difficult. State guidelines suggest that communities now include a clause in their zoning that any reoccupancy of an existing building by a new use be in conformance with present zoning in order to allow a review of changes for potential effects on water supplies. Local legislative bodies may also enact ordinances to protect surface water supplies in conjunction with zoning controls. Ordinances may be flexible in that they may apply to existing land uses, to certain water supply watersheds, or to the entire town.

Existing policies pertaining to aquifer and watershed protection for the communities in the Upper Connecticut River Area have been summarized in Table 3.4.5. However, the regulations are not consistent from community to community, and many of the zoning classifications are broad in the type of development that may be allowed. In many cases, the plan of development policies pertaining to aquifer and watershed protection have not yet been implemented through the adoption of appropriate zoning or other land use control regulations. Furthermore, local land use control commissions have the latitude to grant variances or special permits within each classification already adopted, including residential zones.

Many water utilities have evolved solely from a need to supply water to residential developments or multi-family housing complexes. The Assessment pointed out that several of these systems have been plagued with problems stemming from insufficient managerial, informational, or financial resources. However, the efforts of the Upper Connecticut River WUCC to develop exclusive service areas has helped to implement recent state laws to improve the quality of water supply management for new or expanded community systems.

Public Act 84-330 sets criteria which water companies must meet before beginning construction or expansion of a public water supply system. A water company must demonstrate that the area in question cannot be served by an existing system, that the system will be built to appropriate engineering standards, that the company is capable of operating the system reliably and efficiently, that the system does not result in a duplication of service, and that all Federal and State water supply standards are met. In addition, PA 84-330 states that "no proposal for a development using water supplied by a company incorporated on or after the effective date of this act shall be approved by a planning commission or combined planning and zoning commission unless such company has been issued a certificate" stating that it meets the above criteria. If a proposal is approved without a certificate, the municipality becomes responsible for ensuring adequate water supply to the development in the event that the utility at any time is unable or unwilling to provide adequate service to the consumers.

Review of each municipality's subdivision regulations in the study area shows that few address water supply requirements. It is important for municipalities to recognize and address this issue. Responses to the proliferation of inferior systems may include the prohibition of new residential subdivisions served by small private water companies altogether, or permitting high density residential development only in areas where public water supply is already available.

Pursuant to Special Act 85-84, the Department of Environmental Protection has prepared a report (January, 1987) on the "Protection of High and Moderate Yield Stratified Drift Aquifers". A land use hierarchy was included in the report and originally developed in a guidance document titled "Protecting Connecticut's Groundwater" (September 1984). The classifications from the report are defined as follows:

- Category A - land uses which provide maximum protection to high and moderate yield aquifers including:

  - water utility owned and maintained land

  - designated open space, passive recreation with no permanent facilities

  - state or local government-owned forest land

  - managed forest land, privately owned

  - developed recreation land use, public parks (excluding active recreational areas such as golf courses)

- Category B - land uses posing minimal risks to high and moderate yield aquifers, including:

  - field crops - permanent pasture, hay crops, corn and vegetable production

  - low-density residential and certain institutional uses (density of less than one dwelling per two acres)

- Category C - land uses which pose slight to moderate risks to ground water, including:

  - agricultural production
    (1) livestock

    (2) tobacco crops, nurseries and orchards

  - golf courses

  - medium density residential (one dwelling per one-half to two acres)

- Category D - land uses considered to pose a substantial risk to ground water, including:

  - institutional use - schools, colleges, hospitals, nursing homes, prisons

  - high density housing (greater than one dwelling unit per one-half acre)

  - certain commercial uses

    (1) conventional office buildings not including "professional" office or retail activity

    (2) banks, restaurants and other stable, domestic sewage limited uses

. Category E - land uses which pose a major threat to ground water should be banned in drawdown areas and banned or strictly regulated in recharge areas, including:

- retail commercial development (discharges limited to domestic sewage)

- commercial uses with chemical wastes in addition to domestic sewage as a result of the services offered by

  (1) professional offices, medical, veterinary, etc.

  (2) commercial retail processors, furniture strippers, dry cleaners, photo processors, beauty shops, appliance repairs, etc.

  (3) auto body shops, service stations, machine shops, junkyards, etc.

  (4) industrial uses, manufacturing, processing, research and storage facilities, all of which have the potential to cause contamination

Because of the great variations in zoning ordinances among the communities in the Upper Connecticut River Area, a simplified zoning classification system was developed as follows:

RH - High Density Residential Zoning (D Category)

- 0-39,990 sq. ft. per dwelling unit
- Mobile homes
- Planned residential development 0-39,990 sq. ft. per dwelling unit
- Planned residential development

RL - Low Density Residential Zoning (A to C Category)

- Greater than or equal to 40,000 sq. ft. per dwelling unit
- Planned residential development - greater than 40,000 sq. ft.

M - Multiple Family Residential Zoning (D Category)

- Apartments, condominiums, etc.

C - Commercial Zoning (D Category)

- Includes planned commercial development

I - Industrial Zoning (E Category)

- Includes planned industrial development

A - Agricultural Zoning (C Category)

O - Open Space (A Category)

- Includes floodplains, parks, reserves, and other dedicated open space

Community zoning, grouped in terms of the simplified classifications, are listed in Table 3.4.6 for 34 of the 35 communities in the Management Area. Zoning classifications for the City of Hartford were not completed due to the complexity and variety of zones now present in the City, and the reduced significance of zoning in Hartford in terms of water supply resource protection relative to other towns in the Management Area.

The DEP land use heirarchy for groundwater protection is not strictly followed in the simplified zoning classification system which is used in this section. For example, residential zoning districts allowing one dwelling unit per one-half acre are considered a medium density residential, Category C (slight to moderate) risk use in the DEP land use heirarchy, but are classified as a high density residential, Category D (substantial) risk use in this report. The analysis which follows should, therefore, only be viewed as a starting point for identifying potential conflicts between zoning and land use policies, and water supply resource protection goals. Actual municipal water supply protection programs should be based on a detailed study of resources requiring protection, and more precise evaluation of how zoning and land use policies relate to the protection of ground and surface water supplies.

Just as commercial/industrial activities can impact ground waters, they may contaminate surface water supplies. Not only will contaminants discharged to a stream or river within a drainage basin ultimately reach the water intake structure of the water utility, but contaminated ground waters will also contribute to the stream flow which reaches the water intake. Consequently, those categories which

TABLE 3.4.6

ZONING ANALYSIS (1)

	RH	RL	M	C	I	A	O
Avon	R-15 R-30	RU-2A R-40		OP NB C5 CR CP-A CP-B	I IP	A	EL ROS
Barkhamsted		RA-2 RA-1		B-1 B-2 RSDD PVDD PD	I-1 I-2		
Berlin	R-21 R-15 R-11 R-7	R-86 R-43		RB PS GC OL	LI HI PI		MR FP
Bloomfield	R-30 R-20 R-15 R-10 RB-20 GA	R-80 R-40	MFER PLR PEC	B PO	IND1 IND2 DDZ		
Bristol	R-25 R-15 R-10	R-40	A	BA BB BC	IP-25 IP-3 IP-1 I		
Burlington	R-30 R-15	R-45	AR-15	NB CB	I-1 I-2		
Canton	AR-1	AR-3 AR-2	GA	B-1 SB POD SBD	HI LI RLI IPD		FPD

TABLE 3.4.6 - Continued

ZONING ANALYSIS

	RH	RL	M	C	I	A	O
Colebrook		A D		B C			
East Granby	R-30 R-20 PRD	R-60 R-40	GA EH	B	I	A	FP Q
East Hartford	R-2 R-3 R-4 R-6			B1-A B1 B2 B3 B4	I-1 I-2 I-3		
East Windsor	R-1 R-2 R-3 A-1	A-2		B-2 B-1	M1	A-1 A-2	
Ellington	LR	AA A RA	MF	C PC	I IP		
Enfield	R-17 R-33 SDD	R-88 R-44		B-R B-L B-G	I-1 I-2 IP		
Farmington	R-30 R-20 R-12 R-9 UR	R-80 R-40	R-9 (cluster) RDM RA	B1 B2 BR PR	C1 C2 CR		FL
Glastonbury	AA A	CR RR AAA		PBD PT CD	PI I		RL FZ

TABLE 3.4.6 - Continued

ZONING ANALYSIS

	RH	RL	M	C	I	A	O
Granby	RA	RU RR	PDM	C-1 C-2 P-1 PD	I I-2		
Hartford							
Hartland		R-1		B-1			
Harwinton		CRA TRA LHA	GA	RSA PRSA	LIA PIPA ICA		
Manchester	RR AA RA RB RC CUD		PRS RRc RM aa	B1 B2 B3 B4 B5 CBD	I		
New Britain	SR1 SR2 SR3 RO		A-1 A-2 A-3 T	OP B-1 B-2 B-3 B-4	I-1 I-2 I-3 TP		
New Hartford	R-30 R-15	R-160 R-80 R-60 R-45		B-1 B-2 PB	I IP		
Newington	R-20 R-12 R-7 RD		RP	B B-TC B-BT PD CD	I		PL

TABLE 3.4.6 - Continued

ZONING ANALYSIS

	RH	RL	M	C	I	A	O
Plainville	R-20 R-15	R-40	R-12 R-11 R-10 R	CC GC FC	RI GI Q TP		FP
Rocky Hill	R-20 RM	R-40	RH T	NB C HC EOD	OI M		FP
Simsbury	R-30 R-25 R-15	R-160 R-80 R-40	RD	B-1 B-2 B-3 PO SCZ	I-1 I-2 I-3		FP
Somers		A A-1		B	I		
Southington	R-20/25 R-12 RO	R-80 R-40		CB B	I-1 I-2		
South Windsor	AA-30 A-30 A-20	RR A-40 DA-15	MF-A MF-AA	RC GC RO DC	I IP		
Suffield	R-25 R-20 R-15 R-11	R-90 R-45	PDA	C-1 C-2 PDB	I PDIP		
Vernon	R-10 R-15 R-22 R-27 MHP PRS PND NR-10 RC	GZ R-40		C-10 C-20 CAX OC	GI IP FZ-ID HI SED		CP RW

TABLE 3.4.6 - Continued

ZONING ANALYSIS

	RH	RL	M	C	I	A	O
West Hartford	R-20 R-13 R-10 R-6 RO SD RI	R-80 R-40	RM-4 RM-3 RM-3R RM-2 RM-1 RM-MS	BD BOL BN BC BS BG	IP IE IG IR		RP
Wethersfield	AA A-1 A B C SRZ		MDR HDR EH	B-1 B-2 PDB O	IP I		FP
Windsor	AA A R-13 R-11 R-10 R-8			B-1 B-2 B-3 P RC W PUD	I-1 I-2	AG	NZ
Windsor Locks	AA A B R-DRD			B-1 B-2 B-DRD	I-1 I-2 I-3		

(1) Zoning classifications include water supply resource and non water supply resource areas (i.e. the entire town)

pose high risk to ground water sources also pose a high risk to surface sources.

In addition to zoning considerations, communities and water suppliers must be cognizant of the transportation arteries which cross the area's aquifers and surface water drainage basins. Road salting and storage are common practices on the roads within the study area, and many hazardous materials are transported via local highway and rail systems. Hence, accidental spills pose a significant risk to both ground and surface water sources. Most communities already have emergency response procedures to deal with such accidents. An upgrading of these procedures by each municipality is now in progress as mandated by the Superfund Amendment and Reauthorization Act, with response measures also included in each water utility's individual supply plan.

3.4.3 Conflicting Land Use and Water Supply Needs

Plates 3A and 3B illustrate the principal unconsolidated and stratified drift aquifers and water supply watersheds in the Upper Connecticut River Area with the seven DOHS zoning classifications superimposed over the aquifer and watershed areas. The plates were developed by combining the aquifer and watershed areas together with the town boundaries and zoning classifications in the ARC/INFO System. The zoning classifications shown on Plates 3A and 3B represent an approximation of those found in each community. This is due to both inconsistencies in zoning practices that exist from one town to another and the varied sizes and scales of available zoning maps from each town. These inconsistencies required that certain areas along community borders be extended in any given direction to provide as much consistent zoning coverage of the Upper Connecticut area as possible without presenting sizable "gaps" in the map. In addition, varying zoning regulations resulted in transportation corridors, water bodies and reserved park areas being either zoned or unzoned. The

areas on the map that are not delineated with any zoning classification are a result of this discrepancy.

Conflicts between zoning and the use of existing and potential water supplies are illustrated in Tables 3.4.7 and 3.4.8, where aquifers and watersheds are quantified by the zoning classification associated with each. Each table has been structured such that the percentages in each town total one hundred, meaning that town zoning outside of water resource areas has not been taken into consideration. As shown in Table 3.4.7, the percentage of aquifer areas in the highest risk zoning classifications (RH, M, E, and C) varies significantly, ranging from 0 to the upper 90's. Particularly high percentages of high density residential zoning are noted for Burlington (91%), East Windsor (74%), and Manchester (75%), while unusually high multiple family zoning is noted for Plainville (35%). High industrial zoning percentage are noted for Bloomfield (41%) and Windsor Locks (45%), with several other town's industrial zones covering 20 percent or more of the local stratified drift area.

Table 3.4.8 shows that the surface water supplies are reasonably protected in most cases. However, high density residential zoning is noted for several towns, including Bristol (72%), Burlington (96%), Vernon (80%), and West Hartford (99%). Other conflicts are minimal.

In reviewing the data to identify conflicts between municipal zoning and water supply resource protection, it is important to understand the general nature of source information. The variability of individual zoning regulations was discussed previously, and could have an impact on the accuracy of Tables 3.4.7 and 3.4.8. The borders between zoning classifications may have been shifted during the mapping process, which could result in an incorrect distribution of zoning within a water supply area. Of equal concern are the general locations of major stratified drift aquifers. The actual limits of the formations are based on limited geological data up to 1986. In many cases the actual limits of the formation may not match the

TABLE 3.4.7

ZONING CLASSIFICATIONS AND RISK CATEGORIES OF MAJOR STRATIFIED DRIFT AREAS (1)

COMMUNITY	PERCENT COVERAGE OF ZONING AREAS (2)							
	RH/D	RL/A-C	M/D	I/E	C/D	A/C	O/A	Other (3)
AVON	19	32	0	8	7	12	22	0
BARKHAMSTED	1	35	0	0	9	0	0	55
BERLIN	17	47	0	25	8	0	3	0
BLOOMFIELD	51	5	1	41	2	0	0	0
BRISTOL	51	20	3	19	7	0	0	0
BURLINGTON	91	0	0	6	2	0	0	1
CANTON	32	48	0	8	11	0	0	1
COLEBROOK	0	76	0	0	24	0	0	0
EAST GRANBY	24	2	2	33	3	27	9	0
EAST HARTFORD	62	0	0	19	15	0	0	4
EAST WINDSOR	74	12	0	8	4	0	0	2
ELLINGTON	1	59	2	30	8	0	0	0
ENFIELD	46	28	0	19	5	0	0	2
FARMINGTON	20	23	3	14	3	0	37	0
GLASTONBURY	19	34	0	7	4	0	34	2
GRANBY	46	43	1	8	2	0	0	0
HARTFORD	--	--	--	--	--	--	--	--
HARTLAND	0	100	0	0	0	0	0	0
HARWINTON	0	0	0	0	0	0	0	0
MANCHESTER	75	0	3	14	8	0	0	0
NEW BRITAIN	61	0	4	20	15	0	0	0
NEW HARTFORD	7	88	0	3	2	0	0	0
NEWINGTON	50	0	7	17	25	0	1	0
PLAINVILLE	15	0	35	22	11	0	11	6
ROCKY HILL	24	2	0	21	14	0	34	5
SIMSBURY	10	57	1	10	2	0	20	0
SOMERS	0	96	0	3	1	0	0	0
SOUTHINGTON	60	21	0	10	9	0	0	0
SOUTH WINDSOR	12	61	2	21	4	0	0	0
SUFFIELD	12	67	1	18	1	0	0	1
VERNON	67	4	0	10	18	0	1	0
WEST HARTFORD	59	0	11	26	4	0	0	0
WETHERSFIELD	21	0	1	1	2	0	75	0
WINDSOR	36	0	0	19	4	26	0	8
WINDSOR LOCKS	44	0	0	45	4	0	0	7

(1) Risk Categories
A - virtually no risk
B - minimal risk
C - slight to moderate risk
D - substantial risk
E - major threat to water supply

(2) Column headings show zoning category followed by risk category. Percentages are approximate, and are meant to be used for comparative purposes only.

(3) Represents unzoned areas containing transportation corridors, major water bodies and reserved parklands.

Source: Conn. DEP Geographical Info. System.

approximate boundaries shown on the maps. In addition, the delineation of these stratified drift areas should not be construed as being equal throughout the Upper Connecticut Area, since the quantity and quality of the available groundwater varies throughout the formation with soil conditions and depths (quantity)and existing land uses and zoning (quality). These generalities could be refined by the State or by individual WUCC's or other organizations as newer data become available. However, the precise nature of reporting this data is not the important issue, which is to make water utilities as well as state, regional, and local planners aware of the interrelation of water supplies and land use and zoning and the importance of protecting these water sources through coordinated growth.

In those areas where development of the type that constitutes a substantial risk or major threat to water supply has already occurred, little can be done to eliminate the risk unless a change of use requiring zoning approval is proposed. However, communities can institute procedures to identify the degree of risk posed by the existing development and work to create programs to help control the release of hazardous materials to the environment either through the passage of appropriate Town-wide ordinances or through cooperative efforts with the owners of existing facilities. For those areas which are zoned such that they would be classified as I or C and where development has not occurred, the communities have the opportunity to rezone to provide greater protection for existing and future ground and surface water supplies. As an alternative, the communities can carefully regulate the type of development which occurs within the present zoning. For example, "wet" industries may pose a greater degree of risk than those which do not generate liquid wastes that can readily enter ground or surface waters. In order to make the necessary decisions in such cases, the individuals who administer the zoning regulations must be aware of what types of industries pose the greatest degree of risk and which areas are the most critical in terms of water supply. Thus, it is important that the members of a

community's zoning and planning commissions be educated as to the areas of the community which are important to water supply and which types of development pose a significant degree of risk to these supplies.

In addition, through zoning and plans of development, the municipalities should either foster development at densities which facilitate the use of traditional water and sewer facilities, or encourage development at a density whereby only on-lot systems would be necessary. Exclusive service areas should be designated to overlap areas planned for higher densities, while on-lot densities should be coordinated with both the areas outside of a utility's exclusive service area and those portions of an exclusive service area where protection of a resource, such as a public water supply, is essential. The object would be to avoid development at an in-between level which may, over time, require the provision of water and/or sewer services to areas of scattered development. These services may then encourage additional development which can be detrimental to sound planning and possibly the protection of ground and surface water supplies. Futhermore, the cumulative effects of incremental growth on a water supply source should be taken into consideration in a municipality's planning, programs and regulations.

The involvement of representatives of water utilities with a community's planning and zoning process can also be instrumental in the protection of a utility's water resources. Communities should make an effort to seek the input of water supply professionals in their planning processes, since their collective efforts can be a key for protecting the future water supplies of the community. Also, where a utility has an existing or proposed water supply source which requires greater municipal regulatory protection, the water company should state in its individual plan that it will actively lobby local governments for the provision of local protection.

The preparation of DEP's report on the "Protection of High and Moderate Yield Stratified Drift Aquifers" (pursuant to Special Act 85-84) is designed to stimulate understanding of the procedures and needs for protecting the State's ground water supplies. Some communities have already taken steps to implement regulations for protecting their water resources, as shown in Table 3.4.4.

This document, and examples of procedures taken by some communities, provide guidance as to the type of efforts and/or regulations that communities should implement to protect their vital water resources. It is important that the communities, in cooperation with the suppliers of their water, implement programs to protect their water resources. In Section 3.3 of the Integrated Report, potential future water supplies for the Upper Connecticut River Water Supply Management Area are identified. It is important that those sources which represent key future water supplies for the region be protected now. If these protection efforts are delayed, the development which occurs prior to the tapping of these resources may threaten their viability. Thus, community leaders must be aware of potential future supplies so that community planning efforts properly address these areas, and appropriate protective zoning regulations are instituted or continued for the strict protection of both present and future water sources.

3.4.4 Conclusions and Recommendations

Community planning and development of zoning regulations have only recently been sensitive to the protection of water resources, as evidenced by the increasing passage of water supply protection measures in the individual towns. A review of Plates 3A and 3B indicates that the majority of the communities in the Upper Connecticut River Water Supply Management Area have significant land areas that may pose a risk to water resources based on existing zoning. Although State legislation requires that community planning and zoning commissions consider existing and future water resource protection in their planning and zoning regulations, communities still have much to do in

terms of implementing the appropriate protection strategies, as shown in Table 3.4.4.

Communities in the Upper Connecticut Area which have not taken sufficient steps to protect their existing and future supplies (as identified as part of this coordinated planning process) should set up an ad hoc committee to establish appropriate protection procedures, both for watersheds and for aquifers (as recommended by the Aquifer Protection Task Force). Representatives of each community's water suppliers should be invited to participate in the development of the community's water resource protection strategies. Substantive guidance on the planning process recommended for developing a municipal ground and surface water protection program, including alternative protection mechanisms, can be obtained through the DEP Water Compliance Unit (566-7049). Guidebooks on groundwater and watershed protection may also be purchased through the Capitol Region Council of Governments (552-2217). In this way, municipalities can establish priorities for protecting existing and potential water supply sources, and select those protection strategies appropriate to the water supply source and the community.

The recommended planning process for developing a municipal water supply source protection program includes the following key elements:

- Inventory of Existing Local Protection Programs;
- Inventory of Existing and Proposed Water Supply Resources, Land Use and Zoning, and Water Supply Demand;
- Definition of Areas Requiring Protection;
- Identification of Inadequacies in the Present Protection Program; and
- Selection and Drafting of Protection Mechanisms (Regulatory and Non-Regulatory).

Communities need to work with the businesses within their bounds to establish what types of hazardous substances are in use. The Resource Conservation and Recovery Act (RCRA) regulates the use of

hazardous materials, but excludes users who handle less than 100 kilograms (220 pounds) of hazardous materials per month. Local ordinances should be used to ensure that all users, including those not covered by RCRA, have adequate hazardous material handling procedures. Spill control procedures should be established for the appropriate businesses to minimize the possibility of accidental spills. Emergency response procedures must be set up in the event such spills do occur. Good models for such hazardous materials control ordinances exist: Burlington, Manchester and Plainville have identified plans to control or limit hazardous discharges in certain areas.

Appropriate protection zones must be established to ensure the long-term viability of critical water resources. In addition, public education programs should be established to gain resident support and involvement in the watershed protection programs that are established. All members of the community's planning and zoning commissions must be made aware of the importance of water resource protection so that they can properly implement the established regulations. A successful protection program needs the involvement and commitment of all facets of the community and the commitment of those principally responsible for implementation of the program.

REFERENCES

1. Connecticut Department of Health Services, et al; "Working Draft Watershed Protection Handbook", March 1988.

2. Connecticut Department of Environmental Protection, "Protection of High and Moderate Yield Stratified Drift Aquifers", 1987.

3. Harrison and Dickinson, Connecticut Department of Environmental Protection, "Protecting Connecticut's Groundwater", 1984.

4. Connecticut Office of Policy and Management, State Policies Plan for the Conservation and Development of Connecticut, 1987-1992", adopted June, 1987.

5. Aquifer Protection Task Force, "Report of the Aquifer Protection Task Force to the General Assembly," March 1988.

3.5 COORDINATION AND COOPERATION BETWEEN WATER UTILITIES

3.5.1 Introduction

In previous portions of the Areawide Supplement we reviewed the current arrangements for water supply in the Upper Connecticut Public Water Supply Management Area, the service areas for each purveyor, and the water supply arrangements for the foreseeable future based on land use and new supplies. It is now appropriate to discuss their interface with each other.

No water utility can exist in complete isolation from its neighbor, be they contiguous or separated by many miles. At times of drought, emergency or even minor problems, it is comforting to be able to turn to a fellow professional for assistance. Public Act 85-535 and its Regulations suggest three main areas of cooperation:

- Interconnections
- Joint use of Facilities
- Satellite Management

It is convenient to analyze these three areas of coordination together, as they form the basis of actions for the common good and lead to other benefits, such as standardization in design. Each is briefly reviewed in the following paragraphs in terms of generally-accepted definitions and standards, present use in the management area, and WUCC policy toward future use.

3.5.2 Interconnections

3.5.2.1 Concepts and Criteria

There are many definitions of "Interconnection." We prefer the Critchlow definition as modified by Greenburg and Hordon:

> "Permanent pipe connections between adjacent water supply systems including all utility links whether

or not they are regular or emergency, two-way or one-way."

Interconnections serve many functions, but fall into three main categories:

1. Daily use (regular), where one utility supplies another on a daily basis and the water transferred is simply another source of water to the receiving utility.

2. Intermittent use for the transfer of water on an emergency basis.

3. Intermittent use as an as-needed safe yield supplement.

These three types should be distinguished since, as shown in Table 3.5.1, they differ in some important details. However, all three would require a "sale of excess water permit" in accordance with Section 22a - 358 of the General Statutes which requires DOHS approval of such transfer of water.

Daily use interconnections assume that the receiving utility will require the transfer of water for a long period, certainly until they have time to prospect for a new source and construct the necessary pipework, treatment and storage facilities. Otherwise, they are simply becoming a part of the distribution system of the supplying utility. Construction will be permanent with the meter, valving and pipework in a chamber. In terms of legal and financial aspects, there is typically a contract dictating the terms of sale of the water, defining the contract period, responsibility for maintenance, and terms for cancellation.

The philosophy of the daily use type of interconnection must be based in part upon the quantity of water required - which may constitute either a portion or up to 100 percent of the requirement of the receiving utility.

Emergency use interconnections, on the other hand, have quite a different reasoning, and the following philosophy is suggested for use within the Upper Connecticut WUCC:

TABLE 3.5.1

DAILY AND INTERMITTENT USE INTERCONNECTIONS

FACTOR	DAILY	INTERMITTENT	
		EMERGENCY	SUPPLEMENTAL
Short-term Purpose	As a temporary source of raw water where circumstances militate against provision of a new source	Back-up use in emergency	Supplements safe yield of other sources
Long-term Purpose	The first step in regionalization of water supplies	Remains simply as backup for potential emergencies	Supplements safe yield of other sources
Diameter	As needed for capacity required	Minimum necessary in order to reduce initial capital cost. High velocity and heavy head loss can be tolerated for short periods	As needed for capacity required
Meter	Essential to measure amount of water transferred for payment	Desirable but not essential	Essential to measure amount of water transferred
Pressure Drop	Minimum, to reduce energy compatible with capacity	Whatever circumstances of transfer dictate	Minimum if regular use anticipated, but higher losses could be tolerated with irregular use
Testing	Seldom, as in constant use (quality testing as required)	Essential, as pipes are normally unused	Essential, especially with infrequent use
Flushing	Unnecessary as flow is continuous	Essential, as there is a "dead-end" in each system	Essential, especially with infrequent use
Agreement	Essential, particularly to cover payment	General agreement only as circumstances of use will vary	Essential, since each utility's safe yield is impacted

1. Interconnection should be fully operational at all times.

2. Inspection should be scheduled at least twice each year and the interconnection flushed out as frequently as found necessary, but not less than annually.

3. In an emergency, mandatory conservation should reduce demand by 15 percent. Therefore, an emergency interconnection should be able to supply 85 percent of the non-drought average demand for the peak month.

4. Utilities must coordinate with emergency and drought response plans, document the existence of interconnections to the State, and report upon testing and maintenance programs.

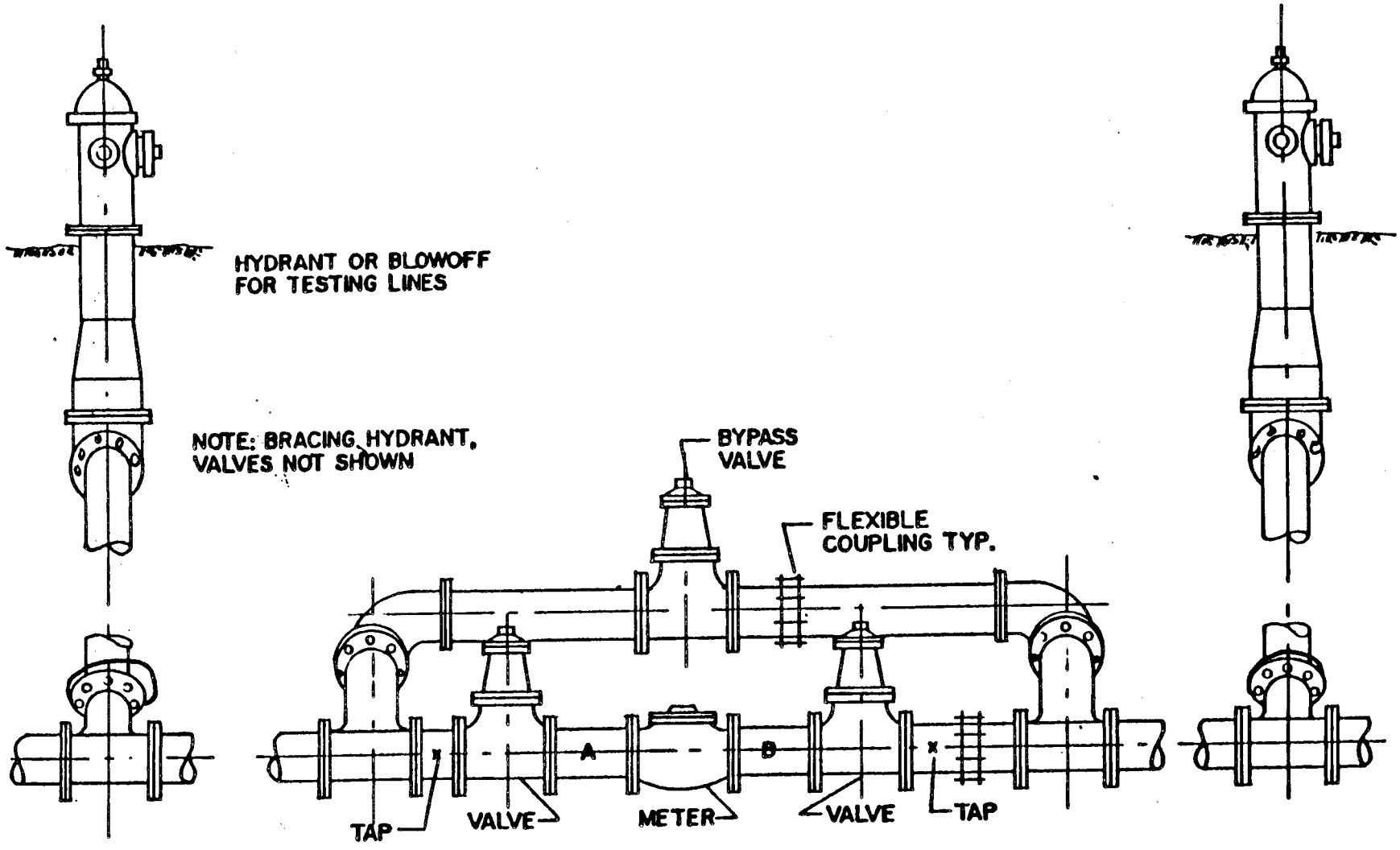
5. Consideration should be given to metering devices such as Dall tubes, Dall orifices, conventional turbine meters, or Venturis as more economical and less maintenance intensive than other types of meters.

6. Other means of backup should be reviewed along with interconnection(s), including system storage, alternative sources such as groundwater versus surface water and vice versa, standby well(s), tanker trucks, standby equipment such as spare motors, generators. Generally the most vulnerable items in a utility are the ones in most need of backup.

The philosophy for an interconnection which is designed to supplement safe yield generally incorporates that espoused for both emergency and daily use.

3.5.2.2 Typical Interconnections

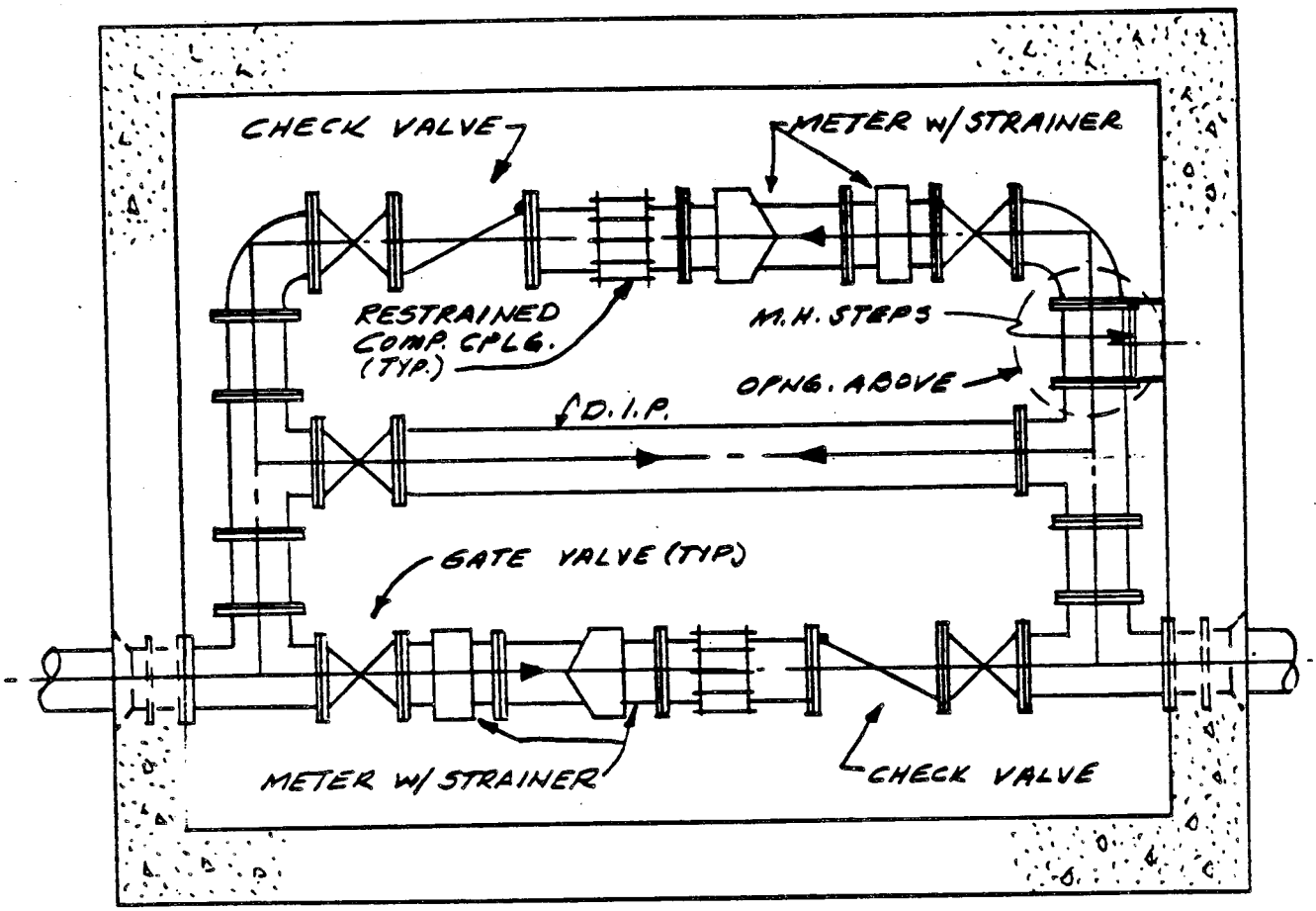
Figures 3.5.1 and 3.5.2 show sketches of a typical interconnection. In the first example, either utility can receive supplies from the other if a bi-directional water meter is used. Alternatively, as shown in Figure 3.5.2, two meters would be required to measure flows from either source. Both types of arrangements are in use and are comparable in installation cost, although the dual meter approach tends to be more reliable. In either case, provisions are included to bypass the meter for service and maintenance.



METER AND INTERCONNECTING PIPING TO BE SIZED IN ACCORD WITH ANTICIPATED FLOW. PIPES A & B COULD BE REDUCERS IF APPROPRIATE TO CONDITIONS

FIGURE 3.5.1

HYPOTHETICAL INTERCONNECTION WITH SINGLE BIDIRECTIONAL METER



PLAN

NO SCALE

FIGURE 3.5.2

HYPOTHETICAL INTERCONNECTION WITH DUAL METERS

The basic criteria for such interconnections are as follows:

1. Physical connection between the two systems using piping adequately sized to transmit the water required at the differential pressure concerned.

2. Rugged meter(s) sized to suit the anticipated flow, complete with isolating valves.

3. Flexible coupling to permit removal of pipes or meter(s) if required.

4. Bypass for emergency use to allow the interconnection to be used at times when the meter is out of service.

5. Taps on each side of the meter isolating valves to check pressures prior to use and to empty pipes for dismantling for meter(s) servicing/calibration.

6. Hydrants nearby for use in testing for water sampling, flushing and flow measurement.

7. Meter pit (optional) enclosing meter body and the two tappings as a minimum, and as a maximum, all pipework and thrust restraints. Note that emergency interconnections may be needed in a hurry and flushing should be possible at a moment's notice day or night. Manhole covers must be capable of being opened quickly, meter reading taken, and valves opened as fast as readings on the pressure gauges will allow without causing surges. Battery-operated emergency lighting may also be considered. Design will, of course, vary from site to site depending on the quantity of water being transferred and the pressures pertaining; pumping may be required and incorporated.

3.5.2.3 Advantages and Disadvantages

The main advantages to interconnections include the following:

1. A readily available backup source for augmenting supply at times of emergency or peak demand.

2. May be less expensive than developing additional sources or providing standby power for emergency use.

3. Interconnection between utilities of similar size can provide emergency service for both.

4. Regular interconnections may defer or eliminate the need to develop additional sources.

5. Water quality may be improved by replacing sources of inferior quality.

6. Costs may be reduced by eliminating the need for expensive treatment.

7. Additional supply can be provided to areas where source development is not feasible.

Disadvantages include:

1. Regular interconnections must be maintained and the meters calibrated.

2. Water quality differences between the systems may be noticeable to consumers, especially for interconnections not used on a regular basis.

3. Water quality differences may create problems in terms of deposition or suitability for sensitive use requirements (e.g., industrial applications with established water pretreatment requirements).

4. Interconnections for emergency use must be flushed prior to activation.

5. Access and maintenance of emergency interconnections must be kept up so that they are operational when needed.

6. Long distances between utilities can make interconnections expensive.

7. Drought conditions can affect both utilities so that supply is not available when needed.

8. Pressure differences between systems may require pumping or pressure reducing valves.

9. Interconnections are frequently located at the fringes of the distribution systems and may be small diameter pipes with limited capacities.

3.5.2.4 Current Use in Management Area

Interconnections within the Upper Connecticut River Water Supply Management Area that are currently in use, or have been identified as being planned or implemented in the individual plans, are listed and briefly described in Table 3.5.2. (Interconnections are listed alphabetically in terms of the supplying utility.) As shown in the table, interconnections between water systems are a relatively routine feature within the Upper Connecticut Area, both as a regular supply source and as

TABLE 3.5.2

INTERCONNECTIONS IN THE UPPER CONNECTICUT MANAGEMENT AREA

Utility From	To	Capacity and/or Diameter	Contract?	Meter?	Comments
[redacted]			Yes	Yes	- Routinely used interconnection
			Yes	Yes	- Routinely used interconnection
			No	No	- Consumption from aggregate retail customer's meters
			No	No	- Emergency two-way supply
			Yes	No	- Routinely used two-way inter-connections; consumption determined from aggregate retail customer meter readings
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	No	
			Yes	Yes	- Routine use as supply for 16 homes
			Yes	No	- Two connections for emergency use
			Yes	8"	- Proposed for mutual aid in emergencies
			Yes	Yes	- Emergency two-way supply
			Yes	Yes	[redacted]

TABLE 3.5.2

INTERCONNECTIONS IN THE UPPER CONNECTICUT MANAGEMENT AREA
(Continued)

Utility From	To	Capacity and/or Diameter	Contract?	Meter?	Comments
[redacted]			-	-	- Proposed to serve 200 homes with EDB - contaminated wells
			Yes	Yes	- Routinely used interconnection
			Yes	Yes	- Routinely used interconnection
			Yes	Yes	- Routinely used interconnection
			No	No	- Comsumption from aggregate retail customer's meters
			No	No	- Emergency two-way supply
			Yes	Yes	- Routinely used interconnection
			Yes	Yes	- Emergency use due to unfiltered nature of source
			Yes	Yes	- Capacity as per contract limit - Theoretically used only until Berlin is self-sufficient
			Yes	Yes	[redacted]
			Yes	Yes	it, ed

TABLE 3.5.2

INTERCONNECTIONS IN THE UPPER CONNECTICUT MANAGEMENT AREA
(Continued)

Utility From	To	Capacity and/or Diameter	Contract?	Meter?	Comments
[redacted]			Yes	Yes	[redacted]
			Yes	Yes	- 3 interconnections for emergency use and peak flow backup
			-	No	- Emergency and peak demand backup supply; can supply up to 50,000 gpd on an emergency basis
			-	Yes	- Routinely used interconnection
			Yes	Yes	- Interconnections are primary water source for Kensington FD; 5 mgd capacity at 20"
			-	-	- Inactive emergency interconnection
			Yes	Yes	- Retail sale of finished water (Plainville reports only two connections, with only the 12" reported to be routinely used)
			-	-	- Not a system connection: use of a well supply
			Yes	Yes	- Water purchased can be increased in case of emergency; also limited to 20 mgal per 3 month period
			-	-	- Emergency use only

TABLE 3.5.2

INTERCONNECTIONS IN THE UPPER CONNECTICUT MANAGEMENT AREA
(Continued)

Utility	Capacity and/or Diameter	Contract?	Meter?	Comments
[redacted]		Yes	No	- Routinely used two-way interconnections Comsumption determined from aggregate retail customer meter readings.
		Yes	No	
		Yes	No	
		Yes	No	
		Yes	No	
		Yes	No	
		Yes	No	
		Yes	No	

(1) Listed as retail interconnect to Berlin WCC in N. Britain WD Individual Plan

an emergency source. The Metropolitan District Commission and the Connecticut Water Company are the principal providers of raw and finished water to other utilities, with New Britain also playing a significant role in terms of finished water supply. Overall, there are 38 active interconnections between WUCC members, with several more either proposed or going through an approval process as identified in the individual plans. In addition, the distribution systems of the Berlin WCC and Worthington Fire District are extensively and routinely interconnected. None of these interconnections are metered nor under a contractual arrangement, and they have not been included in the Table 3.5.2 listing. Both the Berlin WUCC and the CWC Northern Division also routinely receive flow from other utilities outside of the WUCC, while the Berlin WCC and the Town of Middletown have an agreement for emergency two-way supply.

Of the active interconnections between WUCC members, (apart from those between the Berlin WCC and the Worthington Fire District) 25 are used routinely or as part of a seasonally-needed supply, with 13 for emergency use (generally to meet fire flow demands). With few exceptions, the interconnections listed in Table 3.5.2 are regulated through contractual agreements, with all routinely-used (and most emergency) connections metered for billing or record purposes.

3.5.2.5 Future Interconnections

Interconnections can and should play an increasing role in the Upper Connecticut area's water supply picture where feasible. When two or more utilities are located within close proximity of each other an interconnection may offer a cost-effective solution to the development of an alternative supply source. However, as the distance between two utilities increases, the cost of an interconnection can become financially prohibitive. For example, the cost of a one-half mile run of 6- or 8-inch ductile iron pipe can easily exceed $100,000. Such a cost represents a significant financial investment for most of the area's utilities. Thus, distances in excess of one-half mile represent a logical barrier beyond which interconnections involving the area's smaller utilities is not

feasible. DPUC's regulations (Docket No. 84-09-18), which became effective on September 28, 1987, for Application Procedures and Criteria for Issuing Certificates of Public Convenience and Necessity for Small Water Companies defines "feasible interconnections" as follows:

> "... the extension of an existing utility's water mains is considered feasible to serve a proposed project with at least fifteen service connections or twenty-five persons if the developer's investment for such extension, including service connections and appurtenances, is less than $5,000 (construction costs only) per dwelling or office unit and if there is sufficient supply and storage facilities to accommodate the anticipated demand available from the existing utility. If there is insufficient supply and storage available from the existing utility, the cost of developing such facilities may be included in the water main extension proposal, as additional items."

Within the Upper Connecticut River Management Area, the vast majority of the smaller utilities are located within one-half mile or less of a larger utility, and some form of future interconnection is likely to be feasible, at least in terms of construction cost. Interconnections are likely to be particularly appropriate for many of the utilities reported in the Water Supply Assessment to have problems with inadequate safe yields, a single source of supply, seasonal water use restrictions, or some degree of source contamination. These utilities are listed in Table 3.5.3, along with previously reported problems and the most likely neighboring utility to interconnect with.

As shown in the table, there are a total of 52 utilities who could theoretically utilize an interconnection to alleviate reported existing problems. Forty-three of these are presently within, or nearly within, one-half mile of the proposed supply utility, while the balance will likely be within an economically feasible distance of the supply utility at some point during the planning period as the major utilities expand within their exclusive service areas. The urgency associated with obtaining an interconnection will vary from utility to utility, with the WUCC recommending the following priority ranking:

1) Utilities which exhibit both quantity and quality problems
2) Utilities which exhibit quality problems only

TABLE 3.5.3

POTENTIAL INTERCONNECTION SOLUTIONS
TO REPORTED EXISTING PROBLEMS

Utility	Reported Problems	Interconnect To:
[redacted] ol	- Single source	[redacted]
	- Organohalides	
	- Seasonal deficiencies	
	- Single Source	
	- Elevated sulfate, iron, manganese, sodium (1 well) - Insufficient peak hour capa	
oc.	- Elevated hardness and sodiu - Insufficient peak hour capa	
ts	- Elevated sodium	
	- Single source	
	- Single source - Insufficient peak hour capa	
ute	- TCE contamination	
	- Single source - Insufficient peak hour capa	
	- Elevated coliform	
	- Elevated nitrates	
	- Elevated coliform	
	- Single source - Elevated coliform	
	- Interconnection required for expansion past 1,000 customers	
	- Single source - Insufficient peak hour capacity	
	- Chromium contamination	

TABLE 3.5.3

POTENTIAL INTERCONNECTION SOLUTIONS
TO REPORTED EXISTING PROBLEMS
(Continued)

Utility	Reported Problems	Interconnect To: (1) (2)
[redacted]	- Single source - Elevated sodium, iron, manganese, sulfate - Insufficient peak hour capacity	[redacted]
	- Single source - Elevated nitrates	
	- Single source - Elevated hardness, sodium, sulfate	
	- Single source - Elevated coliform	
	- Elevated hardness and iron	
n	- Insufficient peak hour capacity	
	- Single source	
	- Single source - Elevated taste, odor, nitrates, sodium, Gallionella - Insufficient peak hour capacity	
[redacted]	- Single source - Insufficient peak hour capacity	[redacted]
	- Insufficient peak hour capacity	
	- Single source - Elevated sodium	
	- Single source	
	- Single source - Elevated hardness	
	- Single source - Low pH	
	- Elevated sodium	
	- Single source	

TABLE 3.5.3

POTENTIAL INTERCONNECTION SOLUTIONS
TO REPORTED EXISTING PROBLEMS
(Continued)

Utility	Reported Problems	Interconnect To:
[redacted]	- Single source - Elevated pH and sodium	[redacted]
	- Single source - Elevated sulfate	
	- Single source	
	- Single source - Insufficient peak hour capacity	
ion	- Single source - EDB contamination - Insufficient peak hour capacity	
	- Single source - Insufficient peak hour capacity	
	- Single source	
ng	- Insufficient peak hour capacity	
	- Single source - EDB contamination - Insufficient peak hour capacity	
[redacted]	- Limited future groundwater withdrawals permitted by DEP resulting in insufficient peak day capacity	[redacted]
	- Use restrictions during high demand periods	
	- Single source - Insufficient peak hour capacity	
	- Single source - Corrosive water	
	- Elevated hardness	
	- Detectable TCE and PCE - Elevated coliform - Insufficient peak hour capacity	

TABLE 3.5.3

POTENTIAL INTERCONNECTION SOLUTIONS
TO REPORTED EXISTING PROBLEMS
(Continued)

Utility	Reported Problems	Interconnect To:
[redacted]	- Single source - Insufficient peak hour capacity - Contamination potential	[redacted]
	- Single source - Insufficient peak hour capacity	
	- Single Source - Insufficient peak hour capacity	
	- Single source	
	- Single source	

(1) Interconnection may need to be delayed until appropriate expansion takes place within exclusive service area of supplying utility.

(2) Interconnection would exacerbate predicted 2030 deficit for supplying utility if new sources are not developed.

(3) Sum of full demand of all recommended interconnections would create a supply system deficit by 2030.

(4) As per previous proposals.

3) Single source utilities
4) Utilities with insufficient supply to meet peak seasonal demands
5) Utilities with insufficient peak hour capabilities (a condition which may or may not be alleviated by interconnecting)

For many of the supply utilities, any interconnecting program will have to be carefully coordinated with the development of the new supply sources discussed in Section 3.3 in order to avoid worsening any deficit situation projected with the continued use of existing sources.

As noted in Table 3.5.3, either the MDC or one of the various divisions of CWC are most often likely to be called upon to serve as the supply utility for interconnections. The MDC has indicated their willingness to supply water on an intermittent emergency basis to any utility operated in accordance with generally accepted industry standards, providing such interconnections are feasible in regard to engineering, sufficiency of supply, and cost. Similar considerations would also be investigated thoroughly before MDC would agree to future interconnections for daily use.

However, MDC is quite concerned over the potential problems associated with interconnections to small, community well systems which may not be built or operated in accordance with minimum industry or State standards. These concerns include the following:

- MDC's water conservation program could be compromised by interconnecting to systems that experience high leakage or other significant quantities of unaccounted-for water.

- User equity may be a problem, in that individuals now on private wells must pay assessments or development costs in order to connect to MDC's distribution system. No such costs are inherent to a program of interconnection to an existing community well system.

- There is a potential for mechanical and water quality problems where cross connections exist, or are created, with old well systems.

In many instances, these concerns may be addressed through system upgrading, better metering, contract negotiations, etc., while others may require a replacement of service via the extension of the supply utility's mains. The exact requirements and conditions necessary for each interconnection will vary from system to system, and each must be carefully examined by water supply professionals prior to committing to long-term recommended solutions.

Of course, options other than interconnections may well be available to the utilities shown on Table 3.5.3, including new source development, source protection, treatment, etc. - each of which will again have to be carefully evaluated by a water supply professional familiar with the site-specific needs of the utilities on either side of a potential interconnection. On the other hand, interconnecting may be an attractive future option for other utilities in the Management Area that are not shown on Table 3.5.3 as a means to provide supply to expanded portions of their service area or to increase overall system reliability.

Although a system of extensive interconnections between utilities is likely to always have some obstacles to overcome, primary continuing impediments to interconnection are likely to include:

- takeover fears by the smaller utility
- fees charges by the larger utility
- system head differences
- water quality compatibility
- State approval for flow diversions

The last item is the subject of some controversy, with the Connecticut DEP's current interpretation of flow diversion requirements and approval needs expanded to include interconnections. Gaining approval for

an interconnection as a flow diversion can be a time-consuming and expensive process, and may be the deciding factor in many cases as to whether or not an interconnection is, in fact, feasible.

3.5.2.6 Future Agreement Requirements

As interconnections become even more common in the Upper Connecticut Management Area, agreements containing standard terms and conditions will be required. Elements of such an agreement generally include:

- term of agreement,
- quantity to be taken with restrictions on times of day if applicable, storage details, etc.,
- price of water, mechanism for future price adjustments and frequency of payment,
- pressure of water at point of transfer,
- factors mitigating the contract - i.e. Acts of God, civil disturbance, strikes, etc.,
- notice required to terminate,
- metering devices required and ways to estimate quantities should the devices become inoperative,
- apportionment of cost of design and construction for the interconnection,
- apportionment of maintenance costs, frequency of testing, flushing mains, etc., and
- location, type of water (raw or finished) and water quality guarantees, if any.
- minimum purchases or standby charges.

3.5.2.7 Recommendations

The following recommendations are made as being essential to any continuing regional interconnections program in the Upper Connecticut River Management Area:

1. Given the potential financial burden to smaller utilities of the area for interconnection installation, financial assistance programs similar to those recommended in Chapter 2 for aiding orphan utilities are needed to foster an interconnection program for the area. Examples of financial programs include the following:

   - 100 percent grants
   - combination grants and loans
   - revolving state loan fund with low interest which a utility borrows from and returns payment to for future use by other utilities.
   - large utilities finance capital improvements with smaller utilities amortizing the cost of these improvements with the large utilities.

2. The WUCC feels very strongly that interconnections should not be subject to DEP's flow diversion requirements, and that adequate assurances and State oversight is already provided through the individual plan process and existing DOHS regulations.

3. The State should take an active role in the overall coordination of interconnections and provide the motivation for developing accurate data and integrating this data into a viable management tool. It is anticipated that the utilities' individual plans will help set the framework for this data base.

4. It must be recognized that there are disincentives to interconnect which must be overcome. Water supply is, ultimately, a social and economic commodity, transferred to customers through private and public agencies, each with their own political, social and economic responsibilities and each having to operate under diverse regulatory controls. Interconnections planning for effective and equitable transfer of water, particularly

under emergency conditions, should be overseen by an independent body, by the WUCC, or the State.

5. The WUCC endorses the philosophy and use of interconnections as appropriate. It is recommended that priority effort be directed toward the development of a consistent and reliable program of generating, confirming and updating information on interconnections, with particular emphasis on emergency links. (This recommendation should ultimately be satisfied by the final individual plans prepared by each utility.)

6. It is recommended that the basic requirements for data include:
   (a) A consistent definition of flow quantities available through an interconnection; this is particularly important for flows which cannot be measured directly.
   (b) Determination of actual flow quantities and the physical condition of interconnections. Each direction of flow through the interconnection is to be evaluated separately.
   (c) Operation of the interconnection must be specified and access to valve controls confirmed.
   (d) The impact of operating interconnections which have not been utilized for long periods of time should be evaluated. Data on operating integrity, siltation and potential stagnant water quality problems are to be evaluated.

7. Emergency interconnections, which see little or no use for extended periods, should be inspected at regular intervals, not less frequently than annually, with semi-annual inspections preferable. Provisions for updating data on a regular basis are necessary for an effective, continual planning effort. Changes in the operating status of an interconnection may occur as a result of age, changes in distribution system functioning, construction of other interconnections and so forth.

8. A comprehensive program of testing of interconnections should be prepared and implemented. Both quantitative and qualitative tests should be carried out (particularly testing water quality), with priority emphasis on emergency links.

In summary, the WUCC supports the philosophy and endorses the use of interconnections where feasible throughout the Upper Connecticut Public Water Supply Management Area. Permanent, daily use interconnections represent an integral part of a regular distribution network and require no additional consideration of design and maintenance than any other part of the system. Interconnections also constitute a functional means for providing emergency supplies for utilities, and, as appropriate and as economics allow, interconnections can well be regarded as the first step in the development of a regional system.

Emergency interconnections, on the other hand, are designed for intermittent use and require different treatment - including frequent flushing, testing and recording results. They are part of a wider emergency plan which includes other means of maintaining supply (albeit more expensive) in an emergency situation. For this reason alone they must be inspected frequently to ensure they are in a state of instant readiness.

3.5.3 Joint Use or Ownership of Facilities

3.5.3.1 Concepts

The regulations for Public Law 85-535 are specific in requirements for this portion of the coordinated plan. They require a plan for joint use, management or ownership of services, equipment, or facilities, including:

> "aa. A list of existing and planned shared or joint use facilities, together with documentation from the utilities involved outlining limitations on and arrangements and schedules for development, use, operation, and maintenance of such facilities.

bb. Identification of services and equipment which could be made available to other utilities such as, but not limited to, leak detection and repair and emergency equipment."

In general, there are three broad categories of possible joint use: infrastructure, equipment, and manpower and facilities. Infrastructure implies major engineering works of the type associated with the supply, conveyance and treatment of water. Examples include the following:

Water Source
Raw Water Storage
Transmission Mains
Treatment Facilities
Distribution Mains
System Storage

Equipment is the second major joint use category. This category includes the typical contractor's equipment associated with main extensions carried out "in-house" by a utility, as well as equipment of the type which is very specific to water supply, such as pressure gauges and recorders, portable chlorination injectors, leak detectors, flow gauges, field communication apparatus, mobile generators and similar emergency items. A general equipment list would normally include the following:

Compressors
Water Tankers
Excavation Equipment
Pipe Stores
Special Pipes
Fittings
Jointing Equipment
Pipe Cutting Equipment
Meters
Leak Detection Equipment
Pumping Equipment
Standby Generator

Manpower and facilities make up the third joint use category. Manpower skills range across the whole spectrum of water supply from chief engineer to meter reader. While the equipment category covers something of the contractor's expertise, manpower strays into the field of consulting, be it engineering, accounting, or even satellite services. In

general, manpower and facilities that could be available for joint use include the following:

Meter Reading
Meter Testing Equipment
Records
Billing
Office Facilities
Computer Facilities
Skilled Manpower
Engineering
Laboratory Facilities
Public Relations

3.5.2.2 Advantages and Disadvantages

As with interconnections, the principal advantages of joint use generally accrue for the smaller utilities in the management area who might not otherwise be able to afford to develop major new water sources or to maintain specialized equipment inventories and the breadth of staff expertise available through joint use. However, larger utilities may also benefit by making better use of specialized staff and equipment and by realizing increased returns on water sources and system facilities with capacities over the short-term needs of the larger utility. Serviced populations of both the large and small utilities will benefit in terms of rate reductions associated with both the elimination or redundancies in equipment, facilities, and staff and the fuller use of already-developed water supply sources.

Disadvantages are not clear-cut, and primarily revolve about the impact of unforeseen future conditions, which could include the following:

- unanticipated demands on joint use water sources
- overlapping or competing demands for joint use items
- failure of critical joint use facilities (treatment plants, pumping stations, storage, etc.)
- abuse of loaned equipment

3.5.3.3 Current Use In Management Area

At present, the only formal joint use arrangement in effect in the Upper Connecticut Management Area is New Britain's lease of the 1 mgd Patton Brook well to the Southington Water Department. This well is physically located in Southington near raw water transmission facilities owned by New Britain. Since the surface water carried in these pipelines must be filtered before use, it was felt to be more efficient to allow Southington to directly utilize the water from the Patton Well source.

No other formal examples of joint use are reported within the Upper Connecticut River Management Area. (Of course, it would be possible to define any of the existing interconnections as a joint use, particularly those which serve as a routine source of raw or finished water.) It is likely that some sharing of equipment has taken place on an informal basis in the past, with no contract terms drawn up. It has been the experience of the previous WUCC (Housatonic) that the WUCC process itself has fostered a greater understanding of the resources and needs of neighboring utilities, and examples of shared equipment and/or joint use have increased since the WUCC process began. Hopefully, an increase in joint use and sharing of resources will also be an outcome of the WUCC process for the Upper Connecticut area.

3.5.3.4 Future Use in the Management Area

As at present, future joint use in the Upper Connecticut Area is likely to be dominated by infrastructure - particularly in terms of raw or finished water sources. This will be especially true if the many interconnection recommendations made herein are followed, with the smaller utilities then able to "jointly use" the supply, transmission, and treatment facilities that might otherwise be economically unfeasible. Interconnections may also provide the opportunity to construct joint use storage or pumping facilities which may serve to alleviate many of the peak hour insufficiencies noted in Table 3.5.3.

This is not to say, however, that other joint use arrangements will not continue (or increase) within the management area. For example, it is likely that loaning of equipment from one utility to another will remain a common practice, particularly during emergency situations. It is also very possible that joint use laboratories could be established by utilities in order to more cost-effectively meet the requirements of the 1986 Safe Drinking Water Act (SDWA). Some form of joint use, or shared facilities, is likely to be necessary for all smaller utilities within the Management Area as the monitoring requirements of the SDWA take effect. Significant sharing of staff for specialized (or routine) functions begins to fall into the category of satellite management - a topic which is the subject of the following section of this report.

3.5.4 Satellite Management

3.5.4.1 Concepts

Connecticut regulatory agencies consider "small" water systems to be those which serve a population base of less than 1000 people. As noted in Section 3.2, 63 of the 83 water utilities in the Upper Connecticut WUCC fall into the category of small utilities, and are the most likely candidates for some future form of satellite management.

The American Water Works Association[3] sees the small water system dilemma as follows:

> "Small systems have a basic problem rooted in their small size: specifically, a relatively limited economic base to deal with the water quality problems facing them. This has presented financial, management, operational, quantity and quality problems that severely challenge the ability of the owners as well as those responsible for legislation, planning, advice, regulation and support. In many cases they present serious health problems as the records show the small systems have disproportionately higher incidences of drinking water

quality and monitoring problems. It is pertinent that 62 percent of the small water systems are privately owned with private ownership increasing significantly as the systems decrease in size. Ownership is significant as publically owned systems are eligible for public grants and loans, are non-profit, are subject to statutory restrictions, in many states are not subject to public utility commission rate control, and are subject to political pressures. The privately owned small systems are quite often a secondary concern of the owner, are not eligible for public grants or loans and find commercial loans hard to obtain."

The owners and operators of small water systems are often faced with situations that adversely affect their ability to provide an adequate system to their customers. Such problems of insufficient capital and operation and maintenance (O&M) costs cannot be spread over sufficient customers to keep individual rates at a reasonable level. The limited revenues and assets are the fundamental problem whether it is raising sufficient capital for expansions or repairs or for the salaries to attract skilled management. Moreover, many small water systems are located in rural or other low density areas with low population growth rates; these systems have no predictable larger customer tax base in the future to finance capital improvements.

Sharing this burden with one or more other utilities is often a great advantage. Regionalization or satellite management can be of great benefit to the smaller utilities: however, it follows that if one side benefits, so must the other. Advantages to the larger utility must be obvious, probably financial or quid pro quo. There must be an element of profitability.

Satellite management can exist in many different degrees, ranging on the one hand from the simple provision of a wholesale service through varying degrees of technical, managerial and operational help either on a handshake basis or through a written contract, to the other extreme where the utility manager by outright purchase assumes complete ownership and operational responsibility.

It must be remembered that satellite management is but one of the alternatives for a small utility plagued by the problems of small

utilities, particularly the lack of adequate working capital both for administration and for renewal of infrastructure. Such options as merging with adjacent small water utilities, formation of a water district, formation of regional water utilities and the like are possibilities not covered in this report.

Perhaps the most important inducement to seek assistance by means of satellite management is the effect of the Safe Drinking Water Act and the Safe Drinking Water Amendments Act of June 1986. The frequent monitoring, analysis and reporting of water quality will be far outside the capabilities of most small water utilities. When the full impact of all the regulations under the 1986 Act is known, some means of relief will likely be essential for many smaller utilities.

3.5.4.2 Types of Management

The range of management options varies from one extreme of complete isolation to the other extreme of complete management by the larger utility. In some cases, utility owners may request a transfer of ownership to a qualified agency. In other cases, utilities may require only support services utilizing qualified professionals on a contract or fee basis. It is convenient to divide this wide range of options into two basic types, referred to herein as structural and non-structural options.

Non-structural options are generally limited to those which allow the smaller utility to retain its complete identity, service area, management, and, in the case of a town utility, its own "Home Rule." Non-structural options simply emphasize a change in business practice or in technical assistance, but the important factor is that the organization and control of the water system remains essentially intact and unaltered. Structural options, on the other hand, create a new management structure to operate the water system: there is a permanent change in the status of the existing water supplier.

There are many different ways in which satellite management can be achieved, particularly in the degree of assistance provided by the larger utility. The success of any satellite operation is very much dependent upon the resources of that larger utility. In order to ensure that it has adequate resources to meet both the current and future needs of the smaller utility, a prequalification process is recommended.

DPUC's recently promulgated (September 28, 1987) regulations for issuing certificates of public convenience and necessity for smaller water companies provide a good framework for developing prequalification criteria for satellite managers. These regulations require the applicant to sufficiently illustrate financial, managerial and engineering capabilities to own and operate a new water company. The ability to provide satellite management requires all of the same qualities, and these capabilities need to be demonstrated prior to designating a utility as a possible satellite manager for the Upper Connecticut Public Water Supply Management Area. The State (DOHS and DPUC) is the most appropriate administrator of a program to collect and review the necessary materials to support the capability of a utility to provide satellite management, and to maintain a standing list of satellite managers that potential developers or other utilities may contact for such services.

In reviewing the qualifications of potential managers, the satellite must decide which areas need reinforcement and whether these are, in fact, obtainable from the large utility. Factors to be considered should include the support available, resources of the larger organization, condition of the satellite system, the distance between the two, and the type of ownership, quite apart from political and statutory aspects, which will also play a role in the decision-making process. Some examples of the scope of agreement are as follows:

Non-structural (Informal Agreement)	Structural (Formal or Contractual)
Joint purchasing agreements for chemicals	Creation of a new water supply entity
Joint hiring of personnel	Change in policy of an

Joint storage facilities
Share billing equipment
Provide water on emergency basis
Share use of O&M personnel
Share joint technical equipment
Exchange of supplies on an emergency basis
existing entity
Creation of an association or water supply corporation
Special districts

As with joint use arrangements, informal agreements are far more prevalent than written agreements because of the convenience. In some cases an informal agreement is preliminary to a contractual arrangement, sorting out problems before a structural contract is made.

3.5.4.3 Advantages and Disadvantages

Before considering the pros and cons of the various types of satellite management, it is perhaps beneficial to review the situation of "no-action." Here, the present water utility will maintain complete responsibility for its system. All infrastructure improvements and capital projects would be the responsibility of the utility. The responsibility for conforming with the administration and operation requirements of the Safe Drinking Water Act is that of the water utility, and improvements required by the Act, such as disinfection, water treatment and the like would have to be financed by the utility. This may pose a problem to a water system owned by a private individual or a small housing association since it is unlikely that public funding assistance programs would apply to this structure. The necessity of collecting samples, payment of laboratory fees and public notification also required by the SDWA may also cause a problem. It must not be forgotten that there is a liability potential for civil suits filed under the Safe Drinking Water Act which would be a severe drain on the finances of the very small utilities. For these reasons, the time has come for each small utility to review its future very carefully and to determine the advantages of widening the management, or even ownership, of the utility.

As noted above, the range of satellite management can lie anywhere between the "no-action" alternative through to complete merger or change in

ownership with a larger utility. Advantages and disadvantages of the satellite management process in general are presented in Table 3.5.4. The two primary satellite management alternatives of structural and non-structural management (and their corollaries) have their own advantages and disadvantages; each of which is briefly reviewed in the following paragraphs.

(1) Non-Structural Options - Informal Agreement

An informal agreement is the most flexible form of cooperation between utilities, and carries the advantage of being achieved without any user approval required. Water systems can generally agree to share such items as laboratory facilities, storage facilities, billing equipment, provide a supply of water on an emergency basis or even share O&M functions. The following gives an indication of the advantages and disadvantages of informal agreements:

Advantages	Disadvantages
Easy to create, implement or change	Not legally enforceable
Adjustable for the duration of the need	No formal continuity when top staff level changes occur
Easy to terminate	Easy to terminate
Could be the forerunner of a more formal type of agreement	Gives possibility for misunderstandings and misinterpretations

This type of agreement is generally arranged informally between superintendents or engineers, sometimes with a telephone call. It is generally a loose arrangement which is ideal for minor items. For more important matters, a basic service contract (where the agreement appears in writing) may be more appropriate so as to provide a somewhat greater degree of control.

(2) Joint Service Contracts

The next step away from informality and/or a basic service contract is a joint service agreement, by which each party would share or exchange certain activities. Joint service contracts are used most frequently in

the planning, contracting, constructing and possibly operating of joint facilities such as the development of a new raw water source, the ownership of such facilities as storage, laboratory, maintenance, or vehicles, and could also include bulk purchase of chemicals and other stores. As an example, the type of circumstance under which this could occur is when a series of small water utilities find that their wells, although independent, take water from a common aquifer which could become increasingly polluted. It would consequently behoove them to seek a new joint source of water and to exploit this by pumping, treatment and distribution to each of the utilities for their own independent distribution pipework. Staff, particularly municipal employees, would retain their same conditions of employment with the utility concerned. Although an improvement to the area as a whole would result, corporate identity and Home Rule is retained. The following gives the advantages and disadvantages of joint service agreements:

Advantages	Disadvantages
Easily created	Certain impact on local autonomy and policy control
Minimal disruption of existing structure	Difficult to distribute costs equally
More permanent than a basic service contact	Difficulty in computing overhead costs
Realization of economy of scale savings	More difficult to terminate
More efficient use of new personnel and equipment	Problems supplying alternate service if shared facility fails
Ability to provide specialized services	
Increased overall efficiency of service	
No user approval required	

(3) Structural Options

There are a series of structural options available to water utilities, the common basis being the creation of some type of new water supply entity. Associations or non-profit water supply corporations are one alternative, a local special purpose district is another, as is the expansion or creation of an investor-owned utility. Perhaps the most powerful

of these options is the areawide special district or authority which may take in, either by voluntary action or ordered takeover, several municipalities. These districts or authorities are highly autonomous, and normally depend upon the revenue bonding market for funding. The general advantages and disadvantages of structural options can be summarized as follows:

Advantages	Disadvantages
Can be relatively easy to create	Power to raise funds spelled out in Charter
Authorized to acquire water sources	Limited powers in relation to other governmental units
Construct and operate a distribution system	Quasi-governmental entity
Power of eminent domain	
Authorized to issue bonds	
If public, not for profit operation	
Normally more efficient than local government	
Greater financial flexibility	
Provides centralized planning and coordination	

3.5.4.4 Current Use in the Management Area

Satellite management is not a widespread practice within the Upper Connecticut River Management Area, although it does occur to some extent. Current examples include the following:

- [redacted]

- Briarwood College uses the utility management firm of R. J. Black and Sons for non-routine maintenance and repairs.

- [redacted]

- Wintergreen, which operates Harwinton Senior Citizens' Housing, has a service contract with the Torrington Water Company for system operation and maintenance.

- Higley Village and Metacomet Village are both owned and operated by Metacomet Homes, Inc.

- The previously separate Unionville and Farmington Water Companies are now run as a single unit since their 1984 merger.

- Redwood Farms' water system was recently sold to Aqua Treatment and Service, Inc.

- Avon Water Company owns and operates the water distribution system in a portion of Simsbury under an agreement with the Village Water Company (Village W.C. has a perpetual right to purchase these facilities at book value if they so request.)

- Late in 1988, the Bridgeport Hydraulic Company signed an agreement with the Plainville Water Company to provide complete management of the Plainville system.

3.5.4.5 Potential for Future Use

Although there are not many utilities presently providing satellite management in the area, several, including CWC, MDC, the Granite State Gas and Electric Company. and R. J. Black and Sons have expressed an interest in providing, or expanding, such service in the future. It is also anticipated that the State's desire not to allow the proliferation of new water systems will provide an impetus for increased satellite management. Due to the proximity of the majority of the smaller systems in the Upper Connecticut area to larger utilities, it is likely that satellite management will include the eventual incorporation of many smaller systems into a larger system.

Overall, we regard the potential for future use of satellite management (or takeover of small utilities) as being very great within the Upper Connecticut Area. Quite apart from the normal day-to-day operation of a

utility, with its inevitable problems, a turning point in water supply in the United States has now been reached with the enactment of the Safe Drinking Water Act Amendments of 1986 mentioned earlier. This Act requires many changes in water treatment, ranging from disinfection of ground water supplies to mandatory filtration of surface water, and will inevitably reflect on the cost of supplying water on a small scale. In addition, all public water systems serving 25 or more people are required to comply with sampling and reporting requirements for maximum contaminant levels for such contaminants as inorganic and organic chemicals, turbidity, radionuclides and coliform bacteria. This places a serious economic burden upon the small water systems not only for sampling and analysis costs, but also to meet the new capital construction and maintenance costs. Regular monitoring is required and, if a sample exceeds the MCL for the contaminant concerned, water systems are required to report to the state within 48 hours. The 1986 Amendments to the Act directs the U.S. EPA to set primary drinking water standards on eighty-three contaminants within the next three years. Ultimately, regulations will be made to determine the frequency of sampling by each utility. Whatever the future situation, it is certainly going to impose greater financial burdens on the small utility. Protection of raw water supply and the routine monitoring and analysis costs will be the initial emphasis of regulatory agencies, with a substantial increase in shared laboratory facilities or satellite management undoubtedly occurring due to this reason alone.

At present, the WUCC believes that some form of satellite management will eventually become a necessity for all individually run small systems in the Upper Connecticut Public Water Supply Management Area, whether it be in terms of contracting for operation and maintenance assistance, provision of laboratory services, or system takeover. The most likely candidates for comprehensive satellite management services (or system takeover) are those systems which have reported existing problems in terms of the quality of water available through their existing supply sources or in terms of their financial capabilities. Drawing on the summary previously provided in Table 3.5.3, supplemented by Assessment information, these would include the following:

Avery Heights Water Association[1]
Briarwood College[2]
Burnham Acres[1]
Chelsea Commons[1]
Chestnut Hill Heights
East Windsor Housing Authority
Ellsworth Estates
Ethel Walker School
Farmington Line West Condos[1]
High Manor MHP
Higley Village[1]
Hillsdale Water Co-op[1]
Hilltop, Inc.[1]
Juniper Club, Inc.[1]
Liebman Apartments[1]
Llynwood, Inc.
Maple Ridge Farms[1]
Metacomet Village[1]
Neipsic Woods Section 3[1]
Oakwood, Inc.
Orchard Hill Association[1]
Penwood Association[1]
Rock Tree Apartments[1]
School Hill Association[1]
Somersmill Water Assoc.[1]
Trailsend Water Company[1]
Turkey Hill Apartments
Vernon Village, Inc.[1]
Wallens Hills Apartments[1]

(1) Systems also have reported or potential quantity as well as quality problems.

(2) Likely to require satellite management beyond present nonroutine maintenance.

For many of these small utilities (and for those with quantity of supply deficiencies), the potential for system takeover is greatly diminished if future interconnections allow the abandonment of present sources of supply, thereby eliminating the need to satisfy treatment and monitoring requirements. Whether or not these systems remain as independent entities will then depend upon their continuing financial health and the feasibility of cost-effectively providing operation and maintenance services for their distribution systems.

REFERENCES

1. Coordinated Plan for Clark County, Washington, March 1983

2. Regionalization Options for Small Water Systems
EPA, Office of Drinking Water, Washington, D.C., June 1983

3. Institutional Alternatives for Small Water System
AWWA Research Foundation - December 1985

4. Chester A. Ring III and Tom Cawley
(President and Executive V.P. respectively)
Elizabethtown Water Co., NJ Interview and Personal Communication

3.6 MINIMUM DESIGN STANDARDS

The State of Connecticut has included minimum design criteria as a portion of its recently-published Final Regulations for issuing certificates of public convenience and necessity for small (less than 1000 customers) water companies. This section briefly reviews these criteria, discusses their adequacy, and recommends additional minimum standards where necessary.

3.6.1 DPUC Design Criteria

The Final Regulations noted above were published by DPUC on September 28, 1987, and included design criteria as Section 16-262m-8. This Section of the regulations begins by providing a summary of key definitions, and then goes on to identify criteria associated with facility location, design population and demand, water supply requirements, source protection, well construction and water quality, atmospheric storage tanks, on-site standby power, transmission and distribution systems, materials of construction, fire protection, service pipes (service connections), and pump house requirements. Key points for each of these topics include the following:

- Definition of terms:

  - average daily demand = representative 24 hour water usage computed at 75 gallons per person per day.

  - peak hour demand = one-third of the average daily demand.

  - safe daily yield of a water supply system = all water delivered to the system from all sources operating simultaneously at their individual safe yields for an 18 hour period.

  - safe yield of a well = for unconsolidated aquifers, a site-specific determination based on the impact of dry period minimum water table elevations on the yield of the well and the impacts of decreased streamflow or pollutant induction; for confined or bedrock aquifers, 90 percent of the hourly yield for 18 hours per day, hourly yield based on a cone of depression which holds stable for 24 hours (lower

yields to be used if the calculated figures would cause unacceptable associated impacts or when records indicate the yield to be less than calculated.)

- Facility location (including treatment plants, pumping stations, storage tanks, etc.; excluding water intakes and connecting pipelines):

  - above the 100 year flood plain and outside of the floodway boundary.

  - all chlorine storage and use areas at least 300 feet from any residence.

  - not in an area subject to fires or other natural or man-made disasters.

- Water Supply Requirements:

  - must maintain a system safe yield of 115% of average daily demand.

  - must be capable of meeting average daily demand with largest well or pump out of service.

  - must subject all wells to a 72 hour yield test in which drawdown is to a stable level for at least 24 hours; test should be performed during summer dry periods if possible.

  - periodic review required of yield, especially for deep rock wells.

- Source Protection:

  - minimum distances established to septic systems, buried oil tanks, sanitary sewers, surface waters, drains, and miscellaneous pollutant sources; separation distances required increase as well capacities increase, with greater distances required for high-rate gravel-packed wells with high bedrock levels and soil percolation rates.

  - control of separation space must be by the water supply owner.

- Well Construction and Water Quality:

  - well construction based on the previously-promulgated Regulations of the Well Drilling Industry.

  - quality must conform to State requirements, with suitable treatment required if necessary.

- each well must be equipped with a level probe, low water level pump shut-off, and lightning protection devices.

Atmospheric Storage Tanks:

- must be equipped with bolted entry hatches, capped and locked filler pipes, sight glass gauge, screened vent pipe, high and low water signal system, drain valve with discharge to the ground (not to a sanitary sewer).

- usable tank capacity equal to the greater of 200 gallons per residential customer or the system's average daily demand, with allowances made for commercial and industrial use.

- hydropneumatic tanks and transfer pumps must be sized to accommodate peak hourly demand; at least two transfer pumps operating alternately must be installed between the atmospheric and hydropneumatic tanks, each capable of pumping the peak hourly rate and each protected by low water shutoff controls.

- the usable volume of the hydropneumatic tank shall allow for storage of five minutes discharge from the largest transfer pump.

On-Site Standby Power:

- should have a permanent or portable generator to power the largest well pump, one transfer pump, all booster stations, and all treatment systems.

- fuel storage must be above ground with full containment.

Transmission and Distribution System:

- minimum distribution pipe = 6 inches; smaller permitted in cul-de-sacs or areas where the system cannot be extended.

- minimum distribution pipe = 8 inches where fire protection is provided.

- all mains to be installed within the rights-of-way of paved roadways to facilitate access.

- normal operating pressures to be between 35 and 125 psi at service connections, with pressure reducers provided where needed.

- dead-ends are to be avoided, with blow-offs installed if a dead-end is necessary.

- isolation valves required to facilitate repairs and flushing and at all intersections of water mains.

- customer booster pumps are prohibited except in extreme circumstances.

- a means of air relief must be provided at system high points and protected from flooding or contamination.

- all appurtenant structures such as chambers, pits, etc. shall not be connected to a sewer, and must drain to the ground surface or to underground absorption pits.

- pipes must be laid with a minimum cover of 4.5 feet (deeper if greater frost penetration is expected), provided with freezing protection at aerial crossings, and kept clean during installation; trenches must provide suitable bedding for at least six inches below the pipe invert, be kept as free of water as possible, continuously and uniformly backfilled in tamped layers to a height great enough to protect the pipe, covered overnight or when work is halted (with the pipe plugged).

- minimum separation distances are established between water lines and gravity and force sanitary sewers, drains, and/or manholes; force sanitary sewer restriction are inviolate, while alternate protection means such as sleeving, encasement, etc. can be provided upon approval where clearances cannot be maintained between crossing water mains and gravity sanitary sewers and drains.

. Materials:

- in general, AWWA standards must be met for all materials, coatings, equipment, and testing.

- tracer wires must be used with nonmetallic pipe

- all facilities must be disinfected and meet appropriate pressure and leakage tests before being put into service.

. Fire Protection:

- requirements for fire protection set on a case-by-case basis.

- whenever fire protection is required, it must be in accordance with the recommendations of the Fire Underwriter's Insurance Services Office, DPUC, and the utility that will eventually own the water system.

- no fire hydrants will be permitted unless at least 150,000 gallons of water are in atmosphere storage.

Service Pipes:

- minimum size = 3/4 inch; depths similar to distribution requirements.
- separate fire service connection.
- direct service to be provided from the water main without crossing intervening properties; separate metered connection for each unit adaptive to individual ownership (with some exceptions, such as high-rise apartment complexes, multi-storied homes, commercial buildings, and high-rise condominiums, which will be reviewed on a case-by-case basis by DPUC).
- shutoff valves to be provided at property line and interior of premises, with detector check meter on fire service.
- no interconnection between public and nonpublic systems without special permission.

Pumphouse Requirements:

- rodents and small animals shall be prevented from entering facilities; locked gates and fences to be provided, along with suitable lighting, HVAC, and access facilities.
- all manual and automatic controls, wiring and appurtenances to be installed in accordance with the National Electrical Code and provided with over and under voltage protection.
- easily-read instantaneous and totalizing meters must be installed to measure each source of supply independently.
- water treatment to be in accordance with procedures established by DOHS.

3.6.2 Review of DPUC Criteria

With the several references to previous State regulations, AWWA standards, Department of Health Services standards and regulations, the Public Health Code, and the National Electric Code, the DPUC design criteria become fairly comprehensive in scope, and can serve as a basic minimum design framework for all water companies, regardless of size. However, case-by-case exceptions to these criteria should be made if justifiable, particularly for larger utilities which do not fall under the jurisdiction of the DPUC regulations. Some specific examples of areas which should be subject to flexible interpretation include the following:

- average day and peak hourly demands different than those defined in the DPUC criteria should be acceptable if adequate historical information is available to justify a deviation (true for both large and small systems).

- the safe daily yield of systems which do not rely on confined or bedrock aquifers should be based on all sources operating simultaneously at their safe yield for a 24 hour (rather than 18 hour) period.

- facility location (especially wells) should be permitted within flood plains with proper protection.

- a 15 percent margin of safety between safe yield and average day demand may be excessive for certain systems, and should be examined on a case-by-case basis to determine the true adequacy of the source and system.

- only fuel oil stored on a wellfield or water supply watershed should be required to be installed aboveground; other storage should be done in accordance with DEP and EPA regulations based on site-specific criteria (in particular, underground storage may be preferable in areas where vandalism is a concern).

- pressure gauges should be an acceptable alternate for sight glass gauges on storage tanks; both should be adequately protected from vandals.

- emergency power may not be necessary for all portions of certain systems - high level systems may still deliver water at adequate pressure during power outages.

- where required due to unavailability of roadway rights-of-way or other engineering considerations, main placement should be permitted in easements which are out of the rights-of-way of a paved road.

- blanket permission should be given to allow master meters on "vertical" developments (e.g. high-rise office buildings, apartments, condominiums, etc.) regardless of their potential for individual unit ownership (individually metered connections should still be provided for "horizontal" developments.)

- it should be clear that pumping of chambers or pits is acceptable for areas where permanent drains are not feasible.

- in order to avoid repumping, it may occasionally be cost-effective to exceed the maximum pressure of 125 psi specified in the DPUC regulations, with pressure regulators provided at individual service connections.

- in special cases, it may be advisable to allow temporary or permanent individual booster pumps to serve homes which are either an excessive distance from, or elevation above, the distribution system, subject to the following conditions:

  - in no case can system pressures be less than 25 psi
  - the booster pump is needed as a temporary measure as a system is upgraded
  - properly installed and approved backflow preventers are provided, along with low water pressure cut-off switches
  - if possible, the need for a booster pump should be noted on the legal description of the property

- case-by-case flexibility should be granted for variations in minimum depth of cover, with depths of less than 4.5 feet allowable with proper protection and insulation.

A review of other generally-accepted standards also shows some minor deficiencies in the DPUC criteria, with suggested additions including the following:

- A two to three foot safety factor should be included for facilities elevation above the 100 year flood level.
- Surface water intakes should be designed to allow selective withdrawal from multiple levels, with protection by coarse screens or racks on each intake; intake velocities should be less than 0.5 fps.
- Status of remote pumping stations should be telemetered to a central location; pressure gages should be required on the discharge line from each pump (again, some flexibility may be needed for smaller systems.)
- Minimum and maximum clearance to the ground of six and thirty-six inches, respectively, should be specified for overflow and drain pipes from storage facilities; provisions should be included to drain the storage facility without service interruptions; properly-protected vents should be required; a maximum level variation should be required based on a case-by-case analysis.
- Reference should be made to AWWA or Ten State Standards for items such as flushing methodology at system dead ends; minimum isolation valve spacing, pipe restraints at bends, tees, dead ends, etc.; and minimum acceptable classes of various materials.

- Fire protection connections should be treated as system dead ends, with appropriate provisions made for regular flushing (further cross-connection control regulations on fire protection connections will be forthcoming from DOHS).

3.6.3 Individual Utility Standards

The DPUC regulations as noted are designed to address smaller utilities with a customer base of less than 1000. They do, however, provide a good framework for all utilities within the Water Supply Management Area to use. Many larger utilities have their own minimum design standards which parallel or in some instances are more stringent than those set forth earlier in this section. Those utilities which do possess more stringent standards (or site-specific variations of the DPUC standards) have the right to require developers to comply with these standards when constructing an extension to their existing system or service area. The new DPUC regulations (Section 16-262m-7) appear to support this contention by stipulating that the "specifications for materials, equipment, and testing shall be in accordance with ... the specified water utility which will eventually own the system ...". It is important for a utility to maintain consistency of design parameters throughout its service area as system expansion occurs, and to provide the appropriate pipe sizing to be consistent with continued expansion of the system.

3.6.4 Impact on Existing Systems

Concern has been expressed by some WUCC members that the criteria set forth in the new DPUC regulations (Sections 16-262m-1 to 16-262m-9) could have a significant impact on smaller systems if they desire to expand. This concern is specifically related to whether an entire system would have to be brought up to the minimum design criteria if expansion occurs, even if the water utility has provided an adequate supply of water at sufficient pressure to their customers. DPUC has stated that it is their intent to review an entire existing system for conformance to the regulations if expansions of five percent or more are contemplated by a regulated water company, with particular emphasis during this review on whether or not the proposed expansion will compromise existing service under any potential

average or peak demand conditions. The regulations do allow for a hearing process for aggrieved parties with which situations such as this could be addressed. However, it is uncertain if this process would look favorably upon the smaller systems.

3.6.5 Fire Protection Issue

Much discussion during subcommittee meetings revolved around the issue of fire protection. Although some comments were made which called for uniform State-wide standards for fire protection, the subcommittee ultimately decided it was best to continue to leave the decision as to whether or not fire protection is to be provided in the hands of the community fire marshall. If fire protection is to be provided, standards will be those used by the local community, or, at the community's option, those recommended by the State Fire Marshal. These requirements will normally conform to either ISO (Insurance Standards Organization) or NFPA (National Fire Protection Association) standards, leaving open the possibility that a utility which provides service to more than one community may have to meet differing requirements.

[redacted]

[redacted]

From a minimum design standards point of view, fire protection becomes a difficult subject to address in terms of general requirements for the various WUCC members. The new DPUC regulations do address this issue to some degree, stating that a minimum 8-inch diameter pipe (and at least 150,000 gallons of storage) be used for systems providing fire protection. Suggestions have been made that the WUCC's minimum design standards call for 8-inch pipe whenever a system might eventually be called upon to supply fire protection. This is a sensitive issue for the smaller utilities, however, and is probably best left to case-by-case analysis, bearing in mind that initial installation of smaller pipe may preclude the eventual cost-effective provision of conventional fire protection.

3.6.6 Conclusions and Recommendations

The new DPUC regulations for issuing certificates of public convenience and necessity for small utilities set forth minimum design criteria under Section 16-262m-8. These criteria provide an excellent framework from which to build the minimum design standards for the Water Management Area for both small and large utilities. These criteria have the advantage that they are set in law, and are thus legislatively supported. Additional items which may be added to enhance these have been suggested for the WUCC's consideration. It is recommended that these DPUC criteria be used as the basis for the WUCC minimum design standards with appropriate additions made on a consensus basis.

It must also be made clear that individual utilities have the right to impose their own site-specific standards within their existing or exclusive service areas. Furthermore, it is also important that the regulatory agencies support the imposition of these generally more stringent standards and preclude developers from attempting to shop for the cheapest service.

The WUCC has a continuing concern regarding the impact of any accepted set of minimum design standards. It was generally agreed that such rules or standards are essential and, at a minimum, must be applied to new systems or greatly expanded system. However, it is also important that some realistic measure be incorporated for upgrading the existing portion of systems desiring to expand. For example, a system which is adding two or three houses, although it may represent a five percent or greater expansion, is certainly a different issue than expansion encompassing one hundred or more customers. There is indeed merit to having streamlined procedures for existing smaller utilities desiring minimal degree of expansion - a practice which DPUC intends to follow on a case-by-case basis.

In reviewing the draft versions of this document, DPUC again noted that the principal use of the minimum standards will be the evaluation of new small water systems. Expansion should be "substantially" in compliance with minimum standards, with DPUC examining expansion requests principally in terms of the expanded system's ability to continue to provide a continuous and adequate supply of water for existing and future customers with a reasonable margin of safety. New facilities needed to provide adequate service or safety margins will be required to meet minimum design standards.

3.7 FINANCIAL DATA

Table 3.7.1 provides a listing of the capital costs (present dollars) associated with the development of the new water sources identified in Section 3.3. All costs have been obtained from the utilities' individual plans or have been estimated by the utilities apart from the individual planning process. (Operation and maintenance costs for new source development or major projects have not been defined in the individual plans.) Although several of the costs shown for improvements recommended by 1992 have been estimated with some degree of detail, this is not the case for most of the 1992 estimates and for all of the year 2000 and 2030 estimates. It cannot be emphasized strongly enough that these costs are listed for illustrative purposes only, and may change dramatically as design details and constraints are fully developed.

Although the estimated expenditures shown in Table 3.7.1 are significant, they are likely to be dominated over the planning period by the capital, operating, and maintenance costs associated with routine system repair and upgrading projects; not to mention the expense of everyday system operation and preventative maintenance. Thus, proper fiscal planning by the various utilities will generally allow funds to be made available for the new source improvements without significant adverse long-term impacts to the rate structures that would have otherwise been in place. (Some short-term impacts may be in evidence for towns such as Southington, which has extensive short-term source development needs.)

The financing issue is multifaceted, and includes topics such as rate structures for customers, capitalization of improvements, and bonding issues. In the Upper Connecticut Area there is a broad cross-section of the type of utility structure encountered, including those which are essentially an adjunct of a residential or multi-family housing complex, privately or investor-owned companies, and municipal utilities. This difference in structure may impact the manner in which

TABLE 3.7.1

UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA

ESTIMATED COST OF PROPOSED CONSTRUCTION PROJECTS

WATER UTILITY	PROJECT	CAPITAL COSTS 1992	2000	2030
Avon Water Co.	[redacted]	$ 350,000	-	-
		$ 150,000	-	-
		-	$ 200,000	-
		-	$ 125,000	-
		-	-	$ 350,000
		-	-	$ 150,000
		-	-	$1,050,000
Berlin	[redacted]	-	$ 100,000	-
		-	162,000	-
	Woodlawn Road Well Field	-	125,000	-
Bristol Water Dept.	[redacted]	(2)	-	-
		(1)	-	-
		-	(1)	-
		-	(1)	-
		-	-	(2)
Connecticut Water Co.	Rock Well Area III	-	(2)	-
	[redacted]	(2)	-	-
		$ 900,000	-	-
	Windsor Locks Well Field	$2,500,000	-	-
	[redacted]	-	-	(2)
	Initial Inc Conn River WTP	-	-	(2)
Ellington Acres Water Co.	New Well in Northern Portion of Service Area	$ 110,000	-	-
Hazardville Water Co.	[redacted]	$ 200,000	-	-
Town of Manchester	[redacted]	$ 35,000	-	-
		-	$ 100,000	-
		-	$10,000,000 (4)	-
MDC	E. Branch Farmington River Reservoir Systems Modifications	$2,500,000	$ 2,500,000	-
	New Well Fields	$10,000,000	$10,000,000	-
	[redacted]	-	-	$80,000,000
New Britain	Lamson Corner Reservoir Project (Burlington Brook Diversion)	-	$ 3,000,000 (3)	-
New Hartford Water Co.	[redacted]	$1,600,000	-	-

TABLE 3.7.1 (Continued)
UPPER CONNECTICUT RIVER WATER SUPPLY MANAGEMENT AREA
ESTIMATED COST OF PROPOSED CONSTRUCTION PROJECTS

WATER UTILITY	PROJECT	CAPITAL COSTS 1992	2000	2030
Plainville Water Co.	[redacted]	$ 200,000	-	-
Southington Water Dept.	[redacted]	$ 733,500	-	-
	Reactivate Well #6-Air Stripping	$ 750,000	-	-
Southington Water Dept	[redacted]	$ 20,000	-	-
		$ 450,000	-	-
		530,300	-	-
		250,000	-	-
		439,300	-	-
	Tomasso Well Fields			
	Well #11-Tests	$ 20,000	-	-
	-Well	470,000	-	-
	-Main	$ 283,000	-	-
	Well #12-Well	$ 250,000	-	-
	-Main	$ 283,000	-	-
Unionville Water Co.	[redacted]	$ 200,000	-	-
		$ 200,000 (5)	-	-
		$ 150,000 (5)	-	-

Notes:
1. A total of $9,600,000 was given fo[redacted].
2. Capital cost estimates were not id[redacted]
3. In New Britain's capital improvement plan as a long-range item; not shown to be needed during the planning period.
4. Likely to be a post-2030 source improvement.
5. Developed by 1992 to increase system safety factor.

rate schedules are established. For example, a small, homeowner-run utility may charge a nominal fee to cover miscellaneous water service, but with no long-term view towards replacement of worn-out equipment. An investor-owned company obviously must have a rate structure which provides a return on investment, as well as a plan for the capitalization of future needs or improvements. A municipal utility typically covers operating and debt service through its rate structure, while improvements are normally financed through bond sales, which may or may not be included as a rate increment. Since a municipality provides a number of different services requiring bond monies to its residents, there is a potential for conflict as to how bond money should be used, especially if the limits of a community's bonding capacity are stretched. (This limitation can be overcome by issuing revenue, rather than general obligation, bonds.)

The water utilities in the Upper Connecticut River Area utilize standard, accepted methods of financing for water system improvements. These include bonding, municipal loans, developer's contributions, connection fees, and water service revenues. All of the projects anticipated in the next 10 to 20 years could be financed by any of these, or similar methods. The only significant project now thought to be required beyond that time frame are the various improvements to the Colebrook/West Branch system proposed by MDC. The MDC, as a very large utility, has the capabilities and resources to overcome most financial burdens, and can likely also finance these improvements through conventional means.

Smaller utilities may need to turn to alternate financing sources over the planning period to meet a variety of needs, including new source development, system enhancement, or to complete interconnection programs. Good examples of special financial programs for water supply systems have been developed by the New Jersey Department of Environmental Protection (NJDEP). The NJDEP recently has initiated a low-interest loan program for the rehabilitation or repair of publicly owned water supply transmission facilities and for the construction of new interconnections or the repair, replacement or reconstruction of

existing interconnections. The financial terms for both loan programs specify an interest rate of 4.5% per annum with 10 to 20 year maturity periods. Similar programs, as appropriated by the Connecticut State Legislature, could be pursued by the water systems. The utilities should continue to work with government officials to develop financial vehicles that can be used to help meet the needs of each system and the Upper Connecticut River Area. Suggested programs include the following:

- 100 percent grants
- combination grants and loans
- revolving state loan fund with low (or zero) interest which a utility borrows from and returns payment to for future use by other utilities.
- financing of small utilities' costs by larger utilities with a negotiated payback.

APPENDIX A

EXTRACT OF REGULATIONS CONCERNING INTERCONNECTIONS, JOINT USE AND SATELLITE MANAGEMENT

A.1 Interconnections

Plans for any necessary interconnection of both raw and treated water between public water systems for both daily and emergency water supply use, which shall include:

(a) A list and description of existing and future interconnections. Specify legal, technical and financial requirements for use and any source, hydraulic or contractual limitations for use. Identify source of supply, size, location, operating controls and management. Include a schedule for facility development, noting limitations to proposed development, and a schedule for negotiation of any new contract or renewal for sale or purchase of water.

(b) Assessment of the need for and impact of potential interconnections between public water supply systems within the management area and with adjacent public water supply management area.

(c) Discussion and assessment of water quality compatibility between interconnections.

A.2 Joint Use

A plan for joint use, management or ownership of services, equipment, or facilities, including:

(a) A list of existing and planned shared or joint use facilities together with documentation from the utilities involved outlining limitations on and arrangements and schedules for development, use, operation, and maintenance of such facilities.

(b) Identification of services and equipment which could be made available to other utilities such as but not limited to leak detection and repair, and emergency equipment.

A.3 Satellite Management

A plan for satellite management or transfer of ownership which shall include:

(a) Identification of utilities which have both the ability and willingness to assume satellite management of another system or systems, whether within or outside the public water supply management area, and a map identifying areas within which the respective utilities will provide satellite management.

(b) Identification of public water systems willing to have satellite management provided by another utility, or willing to transfer ownership to another utility.

(c) Development of a water system satellite management program and schedule for its implementation.