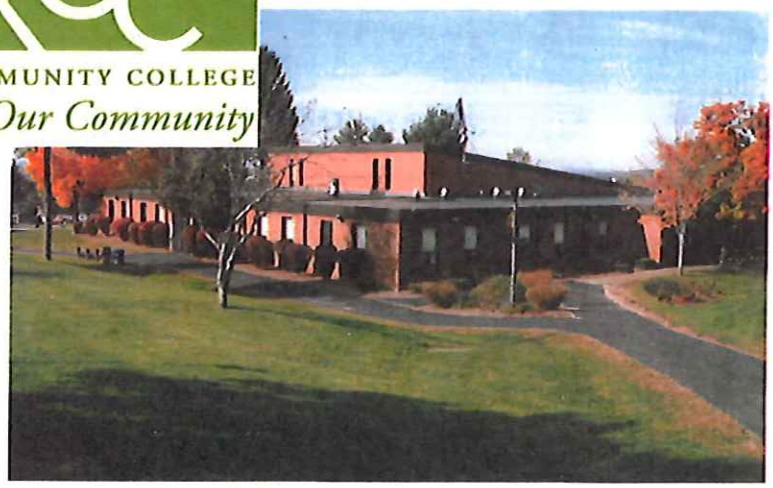
February 2014

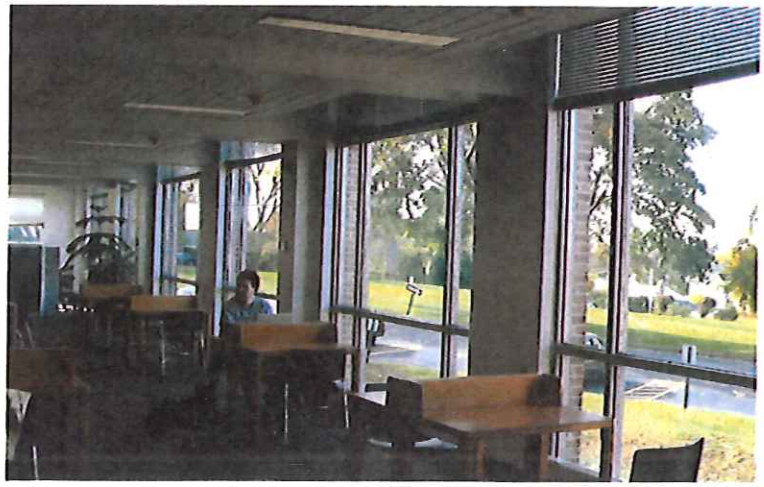
Educational Master Plan and Facilities Master Plan

Middlesex Community College

Middletown, Connecticut

MIDDLESEX COMMUNITY COLLEGE
The College of Our Community





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FACILITIES MASTER PLAN

EXECUTIVE SUMMARY

"With the changing economy, no one has lifetime employment. But community colleges provide lifetime employability."

Barack Obama

Community colleges are a unique American invention that started more than 100 years ago. Since then, the nation's 1,132 community colleges welcome more than 13 million students annually. Citizens from all walks of life that have a desire to learn can attend a community college. Middlesex Community College (MxCC), one of 12 public community colleges in Connecticut, exemplifies the comprehensive mission with an open-access admissions policy and a comprehensive array of educational programs that serve the needs of the local community.

Nationally, community colleges are being challenge to educate an additional five million students with degrees, certificates, or other credentials by 2020. Middlesex Community College is willing to do their share. This type of 21st-century thinking will require a highly coordinated approach to educational planning. In today's planning environment, strategic and educational planning is closely aligned with environmental scanning, where local and regional information (i.e., demographic, economic, and workforce data) are assumed to be a driver of future enrollments. These assumptions are the premise of this study.

This Educational Master Plan is an all-inclusive planning document that furthers MxCC's vision for the future through the development of key academic and planning initiatives. This document is intended to guide the institution's educational direction through the year 2023, providing a framework for the Facilities Master Plan.

This study was developed through a college-wide collaborative process that engaged campus constituents and community members in discussions about the college's vision, internal and external trends, and campus planning as related to educating students. The Educational Master Plan consists of multiple sections, each building upon its predecessor, culminating in a well-documented plan of action regarding enrollments, programs and support services that form the foundation for the Educational Master Plan and related Facilities Master Plan.

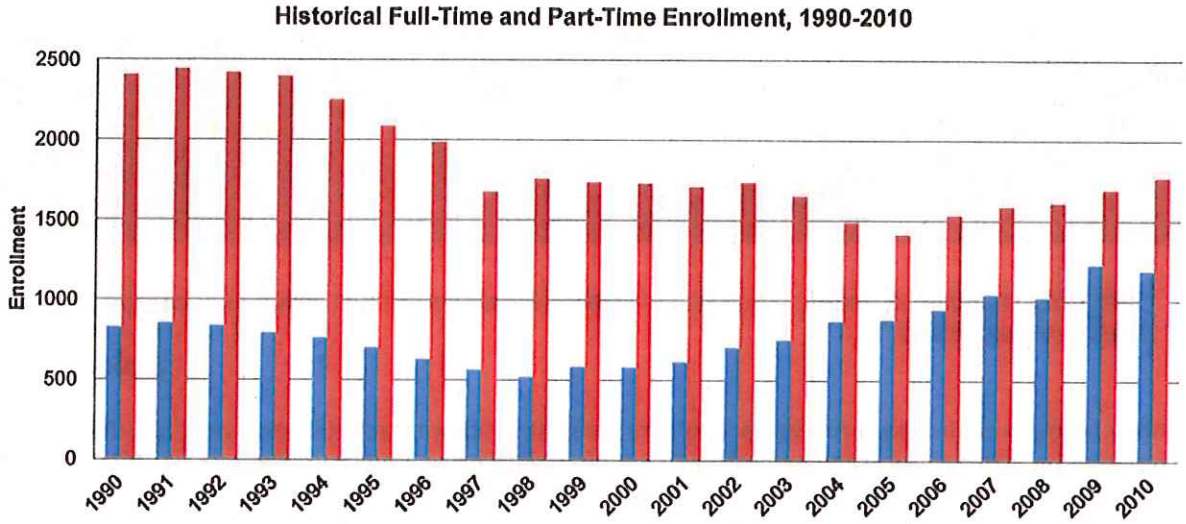
MXCC Strategic Priorities 2011-2016

I. Foster Student Success
II. Promote Economic and Workforce Vitality
III. Incease Visibility in Our Service Region
IV. Increase Community Partnerships
V. Optimize Curriculum
VI. Grow Enrollment
VII. Create and Maintain a Vbirant Collegiate Environment
VIII. Promote Leadership
IX. Enhance and Support Developmental Education
X. Secure Alternative Funding Sources
XI. Commit To and Achieve Sustainability

Section 1 provides an introduction to the Educational Master Plan and historical overview of the College. This section also includes the College's current Mission and Vision, and Strategic Planning Priorities. These provide direction to the overall study.

Section 2 explores both the internal and external environments that will impact the College. Internal factors provide evidence of the full-time student growth (blue bar) from 1998 through Fall 2010, as noted in the graph on page 2.

External factors include an analysis of state, county and service area demographics, population changes by race/ethnicity, age, and other relevant variables. In summary, the Connecticut population is aging and becoming more diverse. The number of high school graduates is expected to decline slightly over the planning period. Despite recent efforts, ACT data and historical developmental education course enrollment data suggest that not all students are fully prepared to enter college. Section two also reviews employment sector trends as related to jobs and skill training. This section ends by conveying the implications of the occupational analysis.



Source: State of Connecticut Department of Higher Education Collegiate Enrollments 1990-91 to 2010-11

The section culminates with a review of population projections for MxCC's service area. The service area population is projected to increase approximately 3% between 2010-2025. Participation rates were calculated and used to develop enrollment projections. Mid-level projections were used for planning purposes and note a 34% growth rate over the planning period.

Educational Master Plan Enrollment Summary – Mid-Level Projection

Site	Fall 2012 Duplicated Headcount	Fall 2012 FTE	Current FTE/HC Ratio	Projected Duplicated Headcount Fall 2023	Projected FTE Fall 2023	Projected HC/FTE Ratio
Middletown Campus	2577	1447	0.56	3461	2000	0.58
Meriden Center	615	250	0.41	825	371	0.45

Section 3 reviews the results of the classroom and teaching laboratory utilization. The utilization documents the efficiency and effectiveness of academic resources. The section begins by looking at classroom scheduled use by day and hour for the 16 classrooms at MxCC. Classroom utilization by building and by room capacity is documented. On average, MxCC used classroom 33 hours per week at 64% student station occupancy, with an average of 19 ASF per station.

Teaching laboratory utilization by building was summarized for the 13 teaching labs. Laboratories used for scheduled instruction averaged 19 weekly room hours at 81% student station occupancy.

The classroom and laboratory utilization findings are analyzed based on a national perspective after each section.

Utilization Summary

	Classrooms	Laboratories
Weekly Room Hours	33	19
Student Station Occupancy	64%	81%
ASF per Student Station	19	35
Average Enrollment	22	19
Number of Rooms	16	13

ASF = Assignable Square Feet

Section 4 summarizes the environmental scan and addresses potential impacts on instruction. The academic plan overview includes the following areas:

1) Recruitment and Retention
2) Workforce and Technical Programs
3) Adult and Continuing Education
4) Pedagogy and Technology

The key themes which emerged from this section include continued enrollment growth as a result of new technical program development and the expansion of existing programs to support state and local economic development initiatives. There is also a desire to enhance both academic support and student oriented support services to increase retention rates for both full and part time students.

Section 5 introduces 14 Educational Initiatives based on three themes. Each initiative is tied to both the space needs analysis and the physical master plan. Many of these initiatives address existing deficiencies while others focus on a multitude of spaces needed for new and expanded programs and student support services.

Educational Master Plan Initiatives

Campus Connections

1. Student Collaborative & Study Areas
2. Recreation/Fitness Center
3. Enhanced Student Center
4. Student Activities/Community Event Space

Academic Programs and Instruction

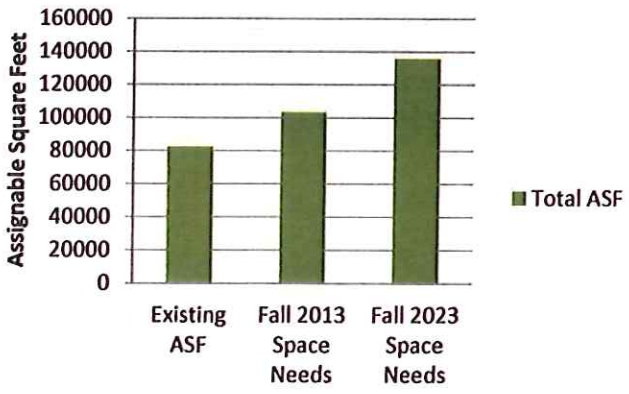
5. Appropriate Classrooms and Technologies for Newer Pedagogies
6. Specialty Laboratories for New and Existing Programs
7. Fine and Digital Arts
8. Relocation of Machine Technology Program
9. Full Time Faculty Offices and Adjunct Faculty Suites
10. Auditorium/Performance Venue

Student and Academic Support

11. Faculty Development/Technology Center
12. Realignment of Student Services – One Stop Center
13. From Library to Learning Commons
14. College Readiness and Completion

The initiatives were translated into physical space needs in *Section 6*. For Fall 2013, application of the space guidelines generated need for 103,087 ASF, or a deficit of 20,922 ASF when compared to existing space.

Campuswide Space Needs Analysis



As the MxCC campus grows to an institution of approximately 3,500 headcount students and develops new program offerings over the next 10 years, a total need of 135,746 ASF was generated. The additional need of 49,258 ASF is approximately the space contained within Founders, Snow and Wheaton Halls combined.

While the Educational Master Plan is intended to support the academic mission, the space needs findings provides a vision for completing the physical master plan towards an improved environment that will allow Middlesex Community College to continue to fulfill its role as a leader in higher education in the State of Connecticut.

Sections 7 through 15 contain the Physical Master Plan. The Facilities Master Plan developed for Middlesex Community College provides a clear process for interpreting systems and their interrelationships. The facilities master plan builds on these system interactions, identifying the optimal size and program offerings, space allocation scenarios, site acquisition strategies, density and capacity guidelines, campus character, adjacencies, and phasing. This understanding provides the foundation for accommodating new campus opportunities in an orderly, efficient and appropriate manner; it also provides the context for comprehensive evaluation of alternative academic policy and development decisions.

Five paramount issues guide the physical planning process for Middlesex Community College:

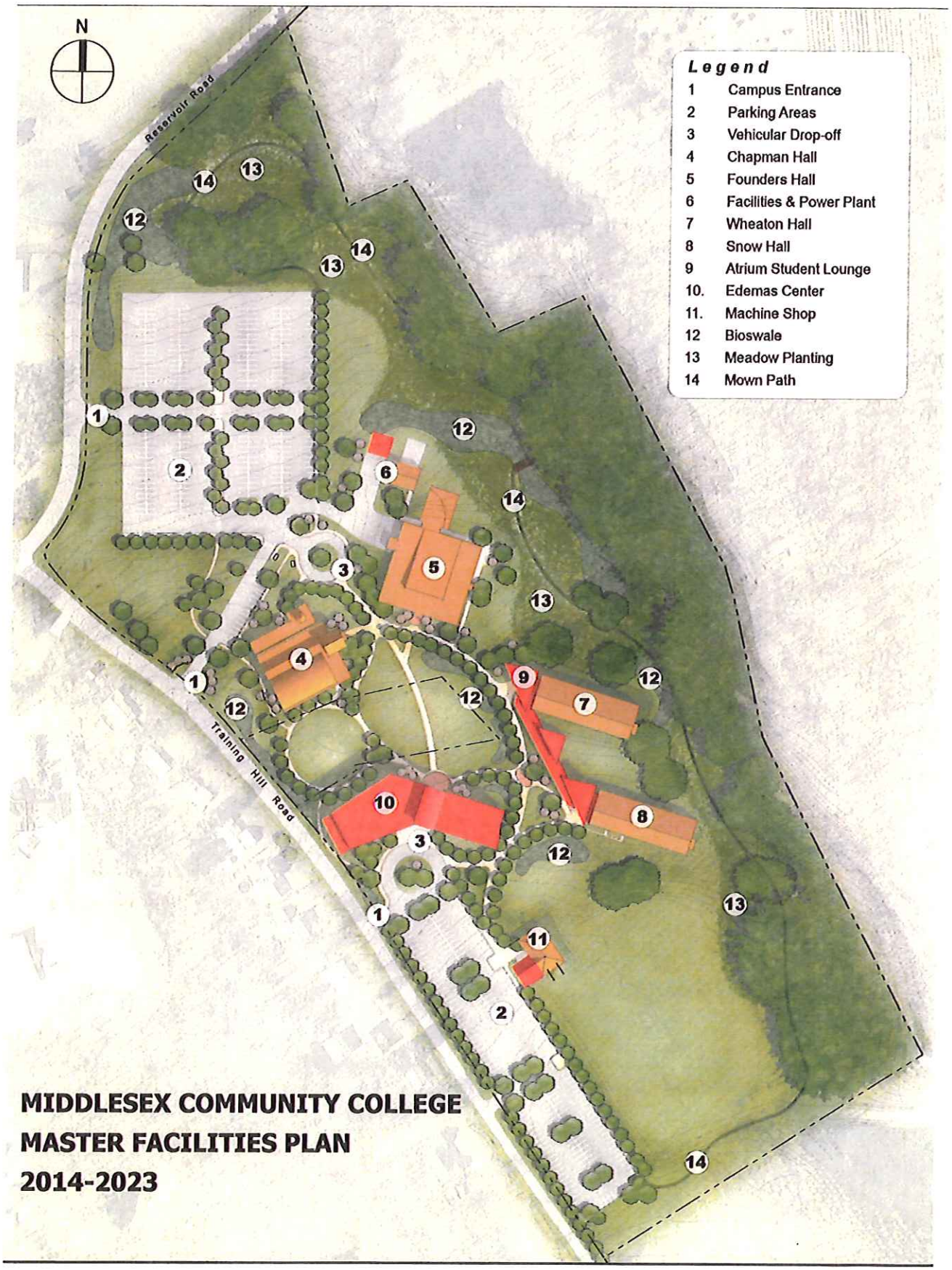
- Preservation
- Integration
- Renewal
- Adaptability
- Development

The planning process punctuated these issues and defined a way to address them by

1. Investigation
2. Problem recognition
3. Solution

The issue of preservation with regard to visual character is addressed in the landscape and open space planning while the programmatic needs of the campus are met. Utilities, Circulation, Parking, and Landscaping are part of this consideration. The issue of integration of campus elements is addressed in the land use and landscape and open space plan. Functional areas are unified through the suggested use of similar materials design, texture, and color to form a cohesive whole at each campus building and within the campus spaces. The issue of renewal of campus facilities will be addressed in a specific plan that prioritizes the modern academic programs considering both initial and life cycle costs.

A framework is established for relocations and renewal of buildings and grounds of the campus, as noted in the plan on Page 5. The issue of adaptability of campus space, buildings and programs is the key ingredient in allowing the college to maintain itself in the changing academic world. The facilities plan supports the nature of change in the continuing evolution of the academic programs. The issue of development is addressed with renewal and adaptability transforming existing facilities to adequately meet the needs of up-to-date teaching and research requirements. Overall, the plan proposes replacement and new facilities to support the mission of Middlesex Community College.


N
Reservoir Road
Training Hill Road
Legend
1 Campus Entrance
2 Parking Areas
3 Vehicular Drop-off
4 Chapman Hall
5 Founders Hall
6 Facilities & Power Plant
7 Wheaton Hall
8 Snow Hall
9 Atrium Student Lounge
10. Edemas Center
11. Machine Shop
12 Bioswale
13 Meadow Planting
14 Mown Path
MIDDLESEX COMMUNITY COLLEGE
MASTER FACILITIES PLAN
2014-2023

INTRODUCTION

The Educational Master Plan (EMP) was developed to be an all-inclusive planning document that integrates key components of Middlesex Community College's (MxCC's) strategic goals and objectives. Through the study of the external environment and current best practices, initiatives were developed that allow the College to achieve both academic and student success over the next ten years. The results of the EMP openly support the direction outlined in the campus Master Plan.

The Educational Master Plan has been developed through a college-wide collaborative process that engaged stakeholders in a discussion about MxCC's future over an eight month period spanning from May 2013 through December 2013. Since 2011, the strategic priorities of MxCC have been to foster student success, increase visibility, and community partnerships while striving to fulfill its robust mission of promoting economic and workforce vitality. This Educational Master Plan builds upon the planning objectives created by the College.

The EMP strives to connect multiple planning efforts of the college while providing general direction for educational programs and services through 2023. Critical elements of the EMP include development of new programs to match occupational demand, understanding changing demographics, and providing an enhanced level of academic support services to ensure student success.

The purpose of the Educational Master Plan is to guide the College in understanding the challenges and opportunities the future may present while guiding the College in the need for additional buildings and the renovation of existing facilities.

Brief History and Description of the College

Founded in 1966 as a branch campus of Manchester Community College, Middlesex Community College became an independent member of the Community College System in 1968. In 1973, the College moved to its present 38-acre campus, which overlooks the scenic Connecticut River and the city of Middletown, at 100 Training Hill Road. Enrollment at Middlesex, one of 12 public two-year community colleges in Connecticut, has grown from an original class of 320 to more than 3,000 full and part-time students. Since 1968, more than 8,300 students have graduated from Middlesex Community College. In 1998, MxCC opened a new learning center located in downtown Meriden at 55 West Main Street. Students have the option of enrolling in credit, non-credit, day, evening, and weekend courses at this location.

MxCC strives to lead the sustainability efforts of the region through modeling sustainable practices and educating students and the community about conservation and environmental stewardship. In April 2012, the MxCC President signed the American College and University Presidents' *Climate Commitment*, and is now in the process of developing an institutional plan for climate neutrality.

Middlesex Community College is accredited by the Board of Governors for Higher Education and by the New England Association of Schools and Colleges, Inc., which accredits schools and colleges in the six New England states. Accreditation by the Association indicates that the institution has been carefully evaluated and found to meet standards agreed upon by qualified educators.

Programs

Students attending MxCC are preparing for entry into a growing career field or are seeking transfer to a baccalaureate institution for further study. In response to student and community needs, MxCC currently offers more than 45 degrees and certificates. Offerings include 24 associate degrees ranging from General Studies and Fine Arts to more technological degrees such as Radiologic Technology and Broadcast Cinema. An additional 21 certificates are offered in a diverse array of professions that allow students to seek employment upon completion. The College also has Fast Track Health Careers and non-credit programming to provide non-credit courses, workshops and conferences for skill development, career enhancement and personal enrichment.

Courses are held days, evenings, weekends, and online, as the College provides flexibility for working students and those with families. In addition, MxCC has more than 12 student clubs and organizations, including Phi Theta Kappa and the Student Environmental Association for Sustainability. In addition, the College shares its resources and addresses community needs through numerous credit and non-credit courses, business programs, cultural activities, and special events.

Campus and Facilities

The Middletown campus is located on a scenic hillside overlooking the Connecticut River valley, about a mile and a half from the center of Middletown. The MxCC campus of today can be characterized by it memorable vistas with an adjacency to natural resources and reservoirs. Nestled in a residential area, the campus is close to walking and biking trails, and open gathering spaces.

The Middletown Campus has four main buildings: Snow, Wheaton, Founders and Chapman Halls.

- Snow Hall, completed in 1973, with 17,070 assignable square feet of space contains classrooms, computer and art laboratories, faculty offices, and a student lounge.
- Wheaton Hall (1973), with 17,422 assignable square feet of space contains classrooms, science laboratories, faculty and staff offices, and a small student lounge.
- Founders Hall (1972), with 16,631 ASF of space, houses the president, academic, administrative, and student services offices, the student center and cafeteria.
- Chapman Hall, (1992), at 31,200 ASF, is the newest facility on the campus and home to the Jean Burr Smith Library. The building also contains a large multipurpose room, and classrooms and computer laboratories for the Digital Media program.

The site also includes a facility for the physical plant. The maintenance building, constructed in 1991, has approximately 2,600 ASF devoted to space for vehicle and equipment storage and supplies.

In addition to ample free student parking, a municipal bus route stops at the campus twice hourly.

The Meriden Center is located at 55 West Main Street in downtown Meriden. The Center, a 16,000 square feet leased facility, provides quality educational opportunities and programs to a diverse student and community population, through day, evening and weekend credit and non-credit courses, accelerated classes, business and industry training, and seminars. Most services offered at the main campus are also available at the Center.

The College also leases a 3,000 ASF concrete block building in Meriden to deliver courses in its Manufacturing Technology program.

As the Meriden Center and the manufacturing buildings are leased facilities, they are not the focus of this study. It is anticipated the College will continue to lease the Meriden Center during the life of the master plan.

Integration with Campus Planning Systems

The Educational Master Plan and Facilities Master Plan processes began concurrently during the Spring 2012 semester. The outcomes of the Educational Master Plan have direct implications for the Facilities Master Plan, which guided the future physical development of the Middletown campus. As these two processes are directly connected, future enrollment growth and space for the development of new programs and student support and success models is evident.

Committee Membership and Meetings

The Academic Master Plan was developed with diverse representation of faculty, staff, administrators, and student representatives from MxCC. The process was informed by the President and her executive staff, which was comprised of the executive leadership of the campus and the decision-making body for the planning process.

Multiple meetings were conducted with faculty and staff, including deans, faculty chairs, directors, and other staff during the course of the study. In an effort to better understand the external environment and needs of businesses in the College's service area, meetings were also scheduled and conducted with the Chair of the Regional Advisory Council and the MxCC Foundation Chair, as well as selected members of MxCC program advisory boards.

Several presentations were made at all-college functions where a large majority of faculty and staff were in attendance.

Planning Statements

The Mission and Vision statement in conjunction with the Strategic goals for the 2011 – 2016 timeframe were developed in advance of the Educational Master Plan. Priorities in the areas of Student Success, Economic and Workforce Vitality, Community Partnerships, Curriculum, and Enrollment Growth, as well as Alternative Funding and Sustainability, were integrated into decision-making components of the process and are evident in the outcomes. This included development and selection of academic initiatives, enrollment projections, and final recommendations. The planning statements, as well as the strategic goals and objectives for 2011-2016, are listed in the remainder of this section.

Mission and Vision

In all it does, Middlesex Community College strives to be the college of its community. By providing high quality, affordable, and accessible education to a diverse population, the college enhances the strengths of individuals through degree, certificate, and lifelong learning programs that lead to university transfer, employment, and an enriched awareness of our shared responsibilities as global citizens.

Strategic Plan Priorities

Student success is our foremost priority at Middlesex Community College. We are committed to partnering with our students to help them achieve their individual objectives. We are dedicated to providing an environment centered on personal, academic, and career growth. Whether pursuing a degree or certificate, transferring to a baccalaureate program, preparing for employment, developing new workplace skills or pursuing personal enrichment, students will find experienced faculty, staff and administrators committed to offering individual attention and support. It is our goal to provide an engaging environment conducive to lifelong learning and the development of citizenship and broad interests amongst our community. The priorities of this Strategic Plan have been established to support this commitment.

I. FOSTER STUDENT SUCCESS
We will continuously strive for excellence in all that we do to support and promote student success.

II. PROMOTE ECONOMIC AND WORKFORCE VITALITY
We will assume a leadership role in economic and workforce vitality in the communities we serve.

III. INCREASE VISIBILITY IN OUR SERVICE REGION
We will be recognized in our service region as a vibrant and responsive educational institution that provides high quality and inclusive learning opportunities in a student-centered environment.

IV. INCREASE COMMUNITY PARTNERSHIPS
We will actively collaborate and develop partnerships with organizations in our service region to anticipate and respond to community needs.

V. OPTIMIZE CURRICULUM
We will develop and strengthen credit and non-credit programs that anticipate and meet the needs of individuals, businesses and communities with customized delivery systems.

VI. GROW ENROLLMENT
MxCC will achieve enrollment growth and improved student retention.

VII. CREATE AND MAINTAIN A VIBRANT COLLEGIATE ENVIRONMENT
We will create and maintain a vibrant learning environment.

VIII. PROMOTE LEADERSHIP
We will create an environment in which all members of the college community have the opportunity to demonstrate leadership.

IX. ENHANCE AND SUPPORT DEVELOPMENTAL EDUCATION
We will be recognized within the educational community as an institution that provides comprehensive academic and educational support to students entering the College in need of developmental education.

X. SECURE ALTERNATIVE FUNDING SOURCES
We will identify and cultivate funding resources to enhance student success.

XI. COMMIT TO AND ACHIEVE SUSTAINABILITY
We will work to achieve more sustainable practices as an institution, encourage sustainable initiatives at the College and in the community, and provide increased opportunities in sustainability education while encouraging good citizenship and global awareness by all.

INTERNAL/EXTERNAL ENVIRONMENTAL SCAN

Introduction

The environment in which community colleges must function is a complex set of social, cultural, political, and economic conditions that affect the goals of the college and their internal operations. Comprehensive environmental scanning should not be limited to reviewing external forces of change; the internal environment should be evaluated as well.

Scanning the internal environment involves analyzing and using information about the institutional resources (human, financial, facilities, technology), organizational climate and internal communication, enrollment trends, student demographics, student success and progress, student services, and other similar elements and processes that assist the college in determining how to proceed in the planning process.

This section reviews findings from the internal and external environmental scan. Together, these two areas offer a comprehensive and current overview of the College and local environment. The development and review of environmental scanning data is crucial to the College's success as this section provides an accurate and holistic picture of existing and future conditions while creating the foundation for the academic planning process.

Middlesex Community College operates in a community composed of a multifaceted set of geographic, demographic, social, political, and economic conditions that shape the unique character of the College's service area. The research literature in community college planning notes that educational offerings and services provided by a community college are greatly affected by its external surroundings.

The purpose of this section is twofold: First, review the historical and current enrollment, student demographics, and other relevant data to understand where the college is today. Second, summarize the results of the environmental scan for the Middlesex service area. This includes demographic, economic and workforce data as well as past work sessions with advisory members.

Finally, the list of implications noted at the end of this section examines the connections between the internal and external environments and the relationship between these variables. The outcomes and implications of the environmental scan influenced the development of recommendations regarding future enrollments, new programming, technology, and long-range opportunities during the planning period and beyond. These will be reviewed in the next section of this document.

Unit of Study

Middlesex Community College primarily serves Middlesex County in south central Connecticut. For this study, population data was analyzed at the State and County level as the small geographic area of the State allows employment from several regions. Student enrollment data was provided as aggregate data.

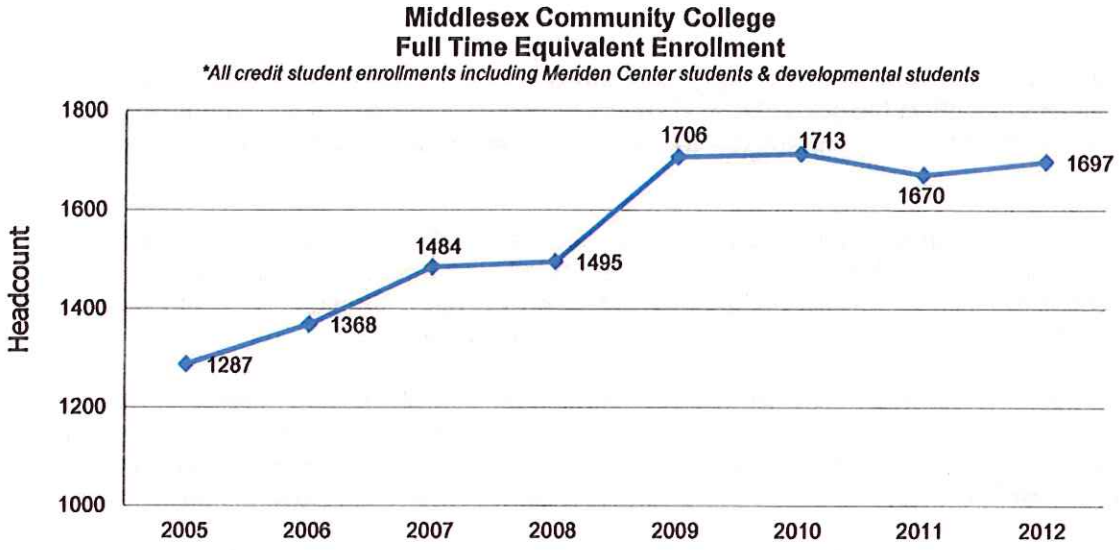
Internal Scan

The information in this section was obtained from the Middlesex Department of Institutional Research and the Connecticut State Department of Higher Education.

Key findings include a steady increase in enrollments, which leveled off in Fall 2010 due to capacity of existing resources. The enrollment data also shows that Middlesex Community college has a younger and increasingly diverse student body. The external scan will discuss the potential effect of population trends on Middlesex Community College's future student demographic.

Exhibit 2.1: Historical Full-Time Equivalent (FTE) Enrollment

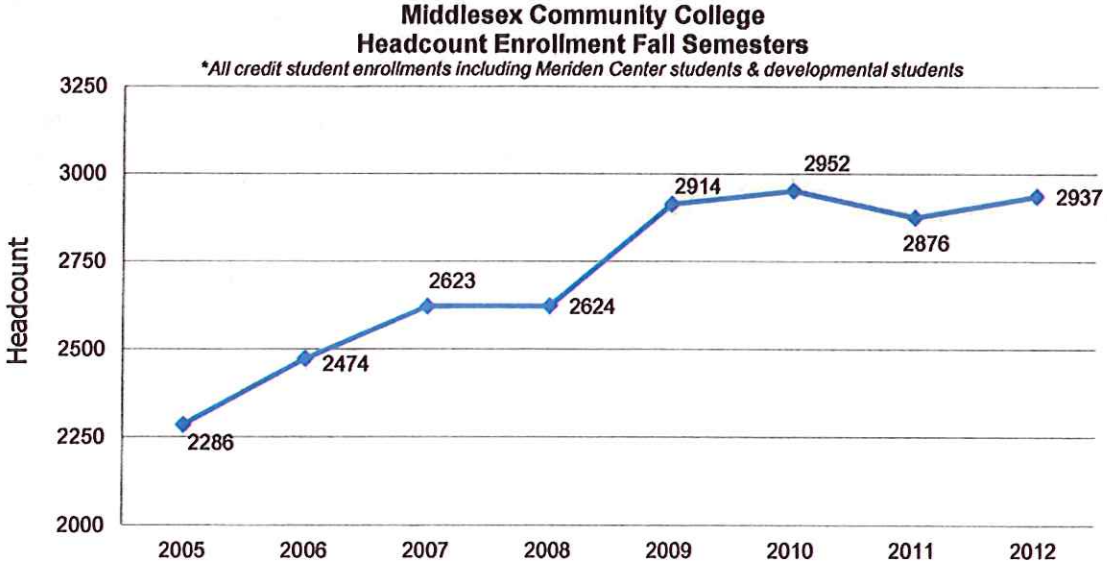
The chart below shows FTE enrollments from Fall 2005 through Fall 2012. Enrollment increased by 24 percent from 2005 to 2012; it peaked in Fall 2009 and then plateaued, as space is unavailable for new programs.



Source: Middlesex Department of Institutional Research

Exhibit 2.2: Historical Fall Headcount Enrollment (Total and Full-Time vs. Part-Time)

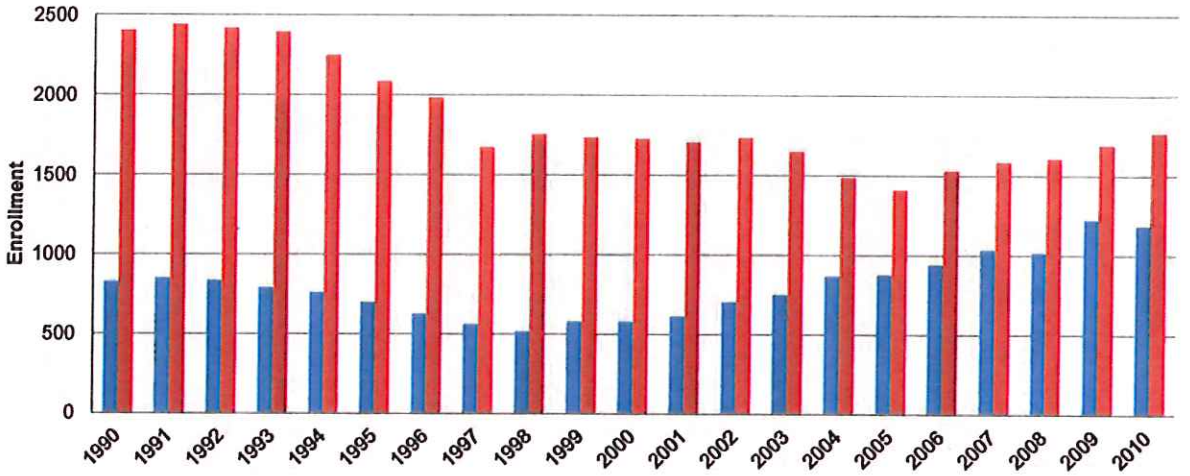
The first chart shows headcount enrollment from Fall 2005 through Fall 2012. As with FTE enrollments, the highest enrollment was in Fall 2009, with headcount enrollment level remaining steady through Fall 2012.



Source: Middlesex Community College of Institutional Research

The following graph illustrates full-time versus part-time headcount enrollment. Full-time students are those who have registered for 12 or more credit hours. The number of full-time students was highest in Fall 2009, and currently remains steady. At a national level, full-time students at community colleges tend to be younger and more representative of a traditional college-going population. The leveling off of full-time enrollment since Fall 2009 may reflect improved economic conditions. However, higher tuition and state budget cuts may also be a factor. Full-time enrollment has more than doubled since 2000. This most likely reflects the increasing number of students who are choosing to attend a community college before transfer.

Middlesex Community College
Historical Full-Time and Part-Time Enrollment, 1990-2010

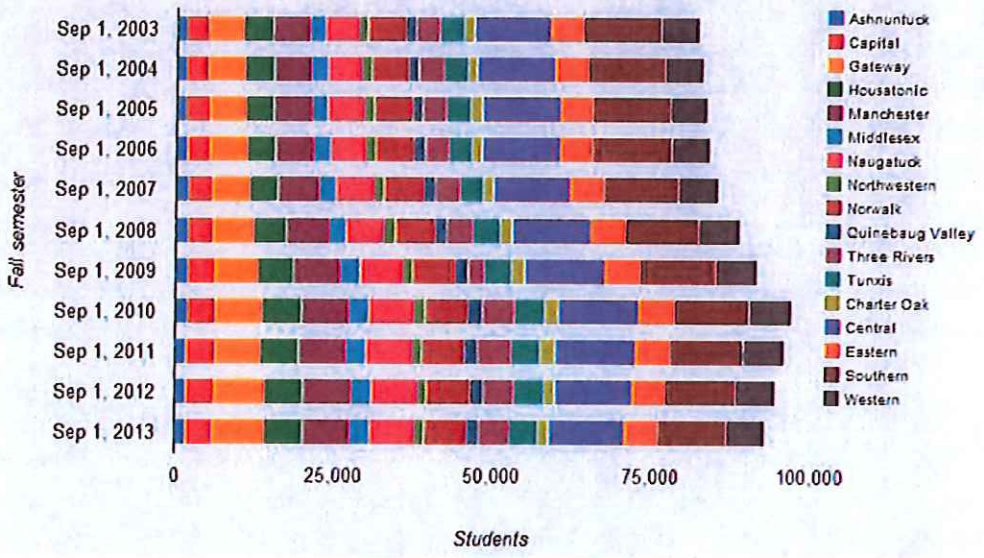


	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Full-Time	827	851	836	790	761	700	629	562	517	582	581	614	704	752	867	876	943	1037	1017	1222	1186
Part-Time	2403	2438	2417	2395	2249	2085	1982	1675	1756	1735	1728	1706	1736	1648	1487	1410	1531	1586	1607	1692	1766

Source: State of Connecticut Department of Higher Education Collegiate Enrollments 1990-91 to 2010-11

The third graph provides a snapshot of changes in enrollment trends in Connecticut for the last ten years. While there has been a decline in statewide higher education enrollment since 2009, Middlesex Community College enrollment has increased slightly during that time period.

Enrollment Trends at Connecticut Universities and Community Colleges

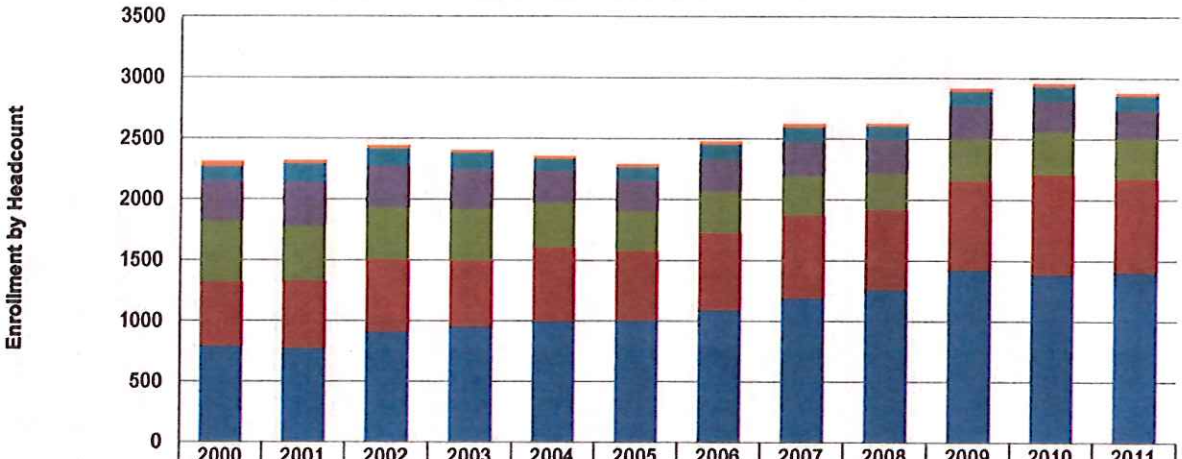


Source: State of Connecticut Board of Regents for Higher Education

Exhibit 2.3: Historical Fall Credit Enrollment by Age

This graph demonstrates enrollment by age from Fall 2000 to Fall 2011. Students 29 and younger have increased significantly in the last decade, with students 21 and younger accounting for 49 percent of Fall 2011 enrollment, and students in the 22-29 age bracket making up 27 percent of Fall 2011 enrollment, for a total of 76 percent. However, enrollment of students 30 and older has decreased somewhat over the last decade; to continue enrollment growth, Middlesex Community College will need to target slightly older residents.

Middlesex Community College
Fall Enrollment by Age from 2000-2011



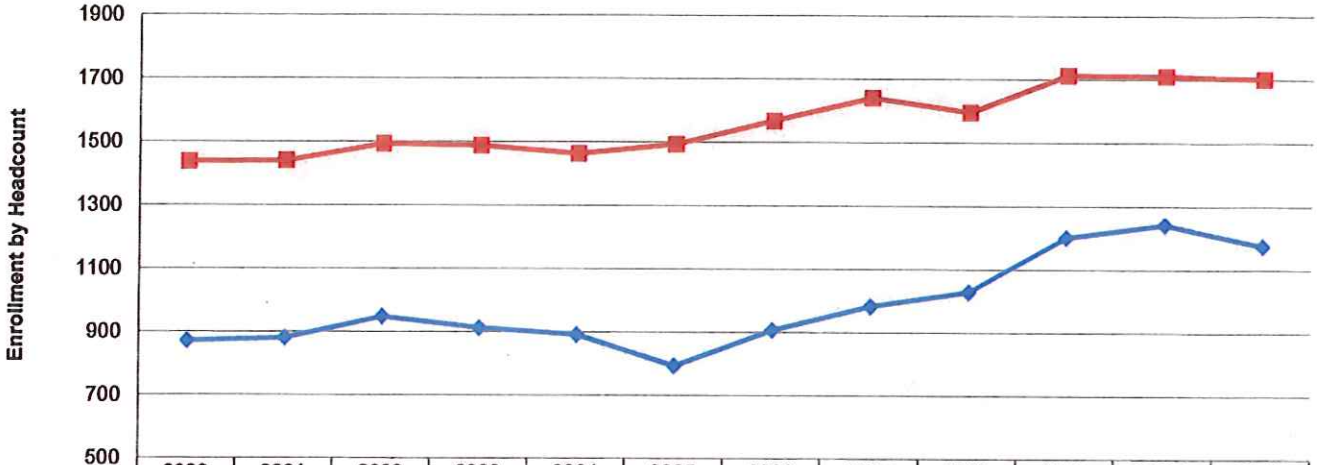
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
65 and Older	41	28	25	19	21	22	23	32	20	23	24	20
50-64	113	148	140	137	102	111	122	119	108	118	118	120
40-49	336	364	343	323	259	250	262	277	283	272	249	227
30-39	498	449	430	429	369	327	340	325	296	344	356	336
22-29	532	556	596	541	606	569	639	681	660	736	821	771
21 and Younger	789	774	906	951	997	1007	1088	1189	1257	1421	1384	1402

Source: IPEDS Data Center

Exhibit 2.4: Historical Fall Credit Enrollment by Gender

The percentage of women attending Middlesex Community College has stabilized, while the percentage of men is slightly less than the peak enrollments of Fall 2009. The ratio of women to men is consistent with most community colleges across the country.

Middlesex Community College
Historical Fall Enrollment by Gender, 2000-2011



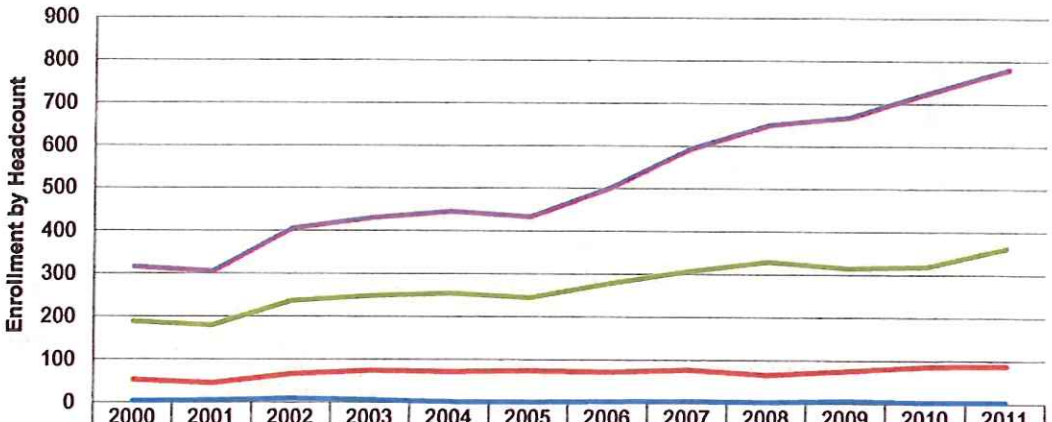
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Men	871	880	947	912	891	793	906	982	1028	1201	1241	1174
Women	1438	1440	1493	1488	1463	1493	1568	1641	1596	1713	1711	1702

Source: IPEDS Data Center

Exhibit 2:5: Historical Fall Enrollment by Ethnicity

Middlesex Community College is becoming more diverse, with a modest increase in Black students and a significant increase in Hispanic students. An increasingly diverse population will continue to affect community college enrollments in the future.

Middlesex Community College
Fall Enrollment by Ethnicity, 2000-2011



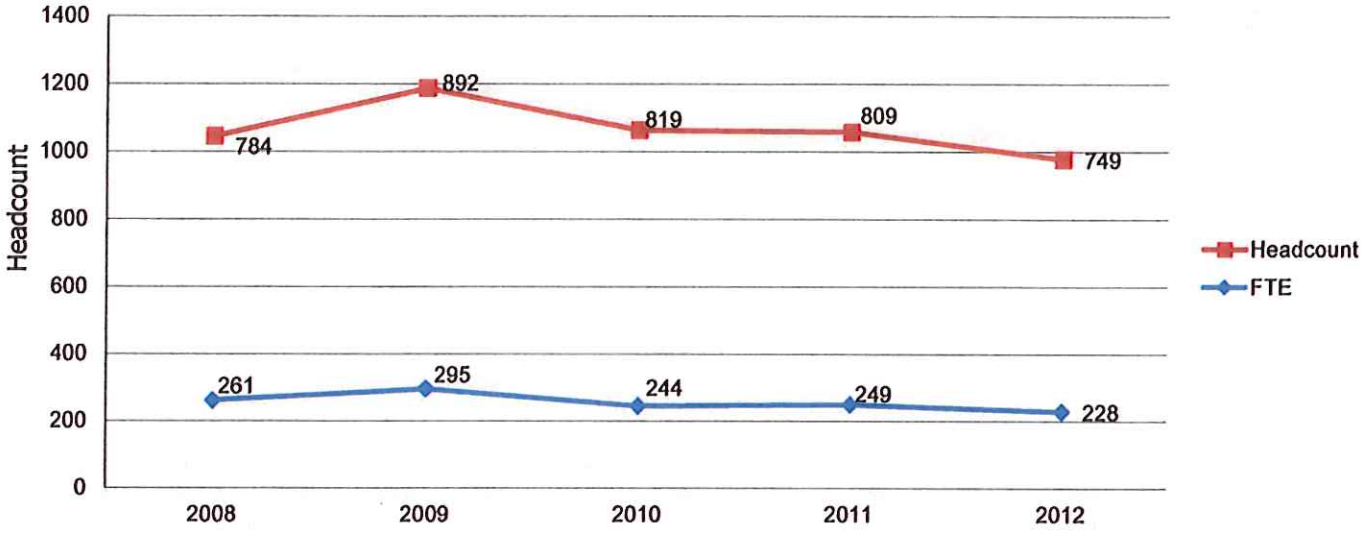
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Hispanic	128	126	169	182	191	189	224	286	320	352	406	418
Black non-Hispanic	136	134	170	174	182	170	205	230	263	239	233	274
Asian or Pacific Islander	49	41	57	68	70	73	69	73	63	70	83	85
American Indian/Alaska Native	4	5	10	7	3	2	4	5	4	7	4	4

Source: IPEDS Data Center

Exhibit 2.6: Developmental Education Fall Enrollment

Enrollment in developmental education has changed very little since 2008, with a steady number of FTE enrollments and an increase in Fall 2009 that corresponds to increased overall enrollment for that semester, followed by a slightly downward trend.

Developmental Education (Basic Skills)
Fall Enrollment
**FTE based on total credits in developmental math & English*

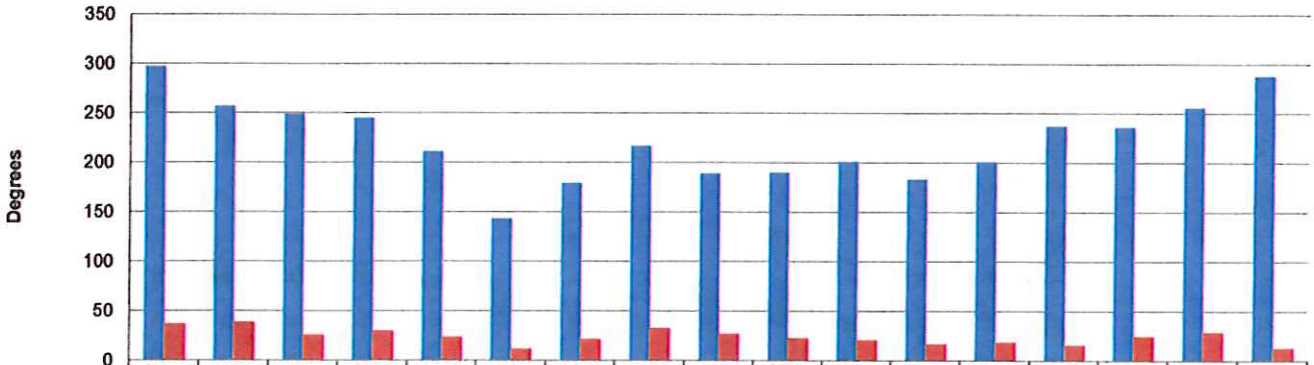


Source: Middlesex Community College

Exhibit 2.7: Historical Degrees Granted

This chart shows associate degrees and certificates granted over a 16-year period. Following a decline, the number of degrees granted started to increase in 2000, to a total approaching 1995 levels. The number of certificates is somewhat variable but has slightly declined overall. The growing number of degrees granted reflects changing student goals.

Middlesex Community College
Historical Degrees and Certificates Granted, 1995-2011



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Associate's	297	257	249	245	211	143	179	217	189	190	201	183	201	237	236	256	288
Certificates	37	39	26	30	24	12	22	33	27	23	21	17	19	16	25	29	13

Source: State of Connecticut Department of Higher Education Degree Completions Database

External Scan

Statewide Demographic Analysis

This section will review and analyze current and future population demographics, as developed by the Connecticut State Data Center (University of Connecticut). The purpose of this section is to understand how future population and other demographic trends will influence student enrollments over the next 10 to 20 years.

The calculations and assumptions that form the basis for these population projections are drawn from historical patterns of population change. Thus, these projections reveal how populations may evolve over the next 15 years, if historical patterns continue to hold true. However, there is no guarantee that the projected trends will occur. A host of external influences, such as public policy initiatives at the state and federal levels or significant shifts in economic structure, may lead to new patterns of change in the population.

The findings in this section demonstrate slower population growth and an aging of Whites, while growth continues among young non-White residents, primarily Hispanics.

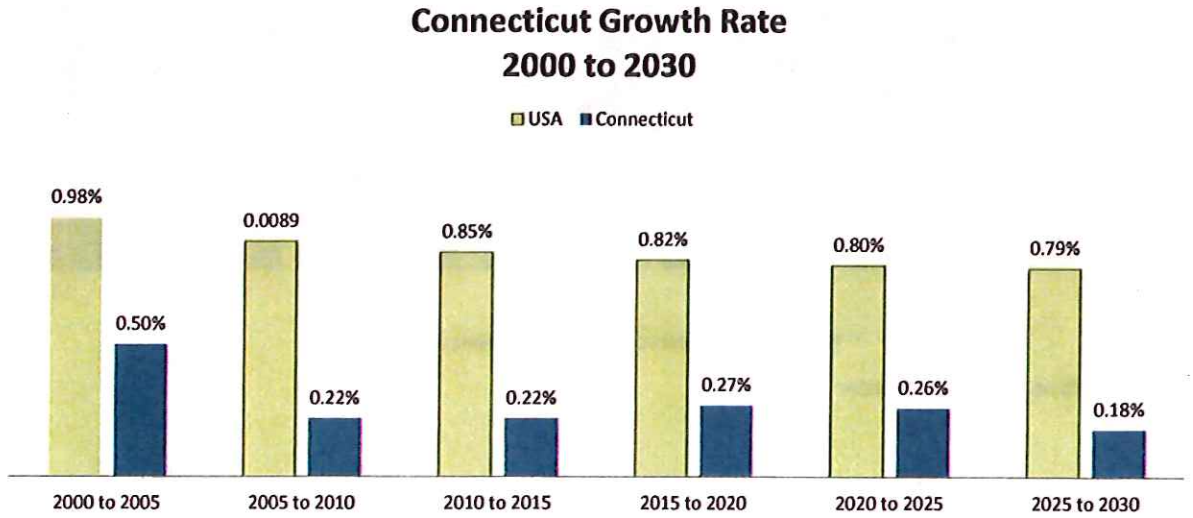
2010 Census Data

Population projections are based on 2010 Census data. In summary, the state grew increasingly more diverse since the 2000 Census, with double-digit gains among the Asian, Hispanic and Black populations. When categorized by race, the largest percentage gain was in the Asian population, which grew 63.9 percent between 2000 and 2010. Next was the Hispanic or Latino population, which rose 49.6 percent, followed by the Black or African American population, up 14.8 percent since 2000. The non-Hispanic White population fell 3.1 percent, from 2.68 million to 2.60 million, according to Census.

Overall, the state population grew 4.9 percent, from 3.41 million 3.57 million people with Eastern Connecticut having the greatest percentage gains in population.

Exhibit 2.8: Connecticut Population Growth Rate Comparisons

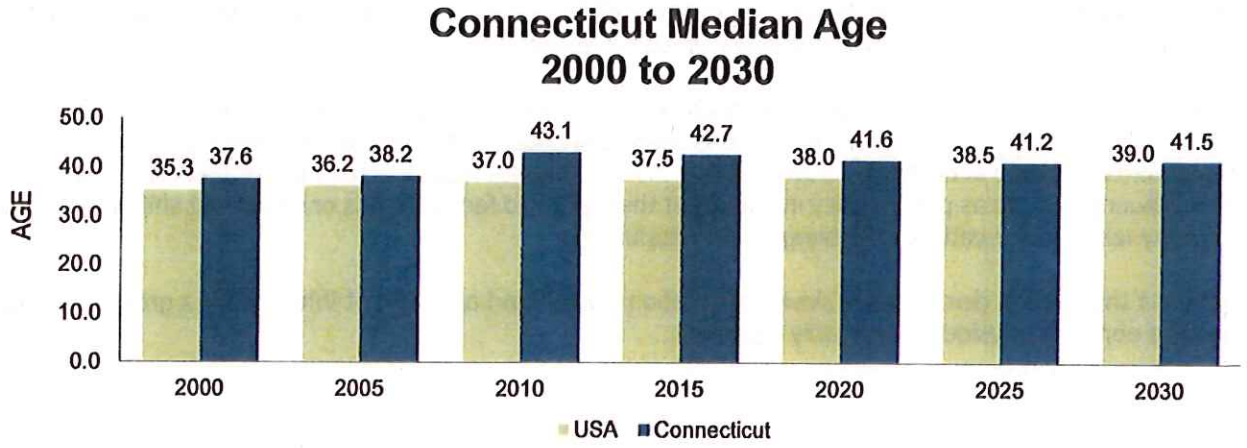
This table shows population growth from 2000 to 2030 in five-year intervals; the state population growth rate is projected to be lower than the overall U.S. growth rate.



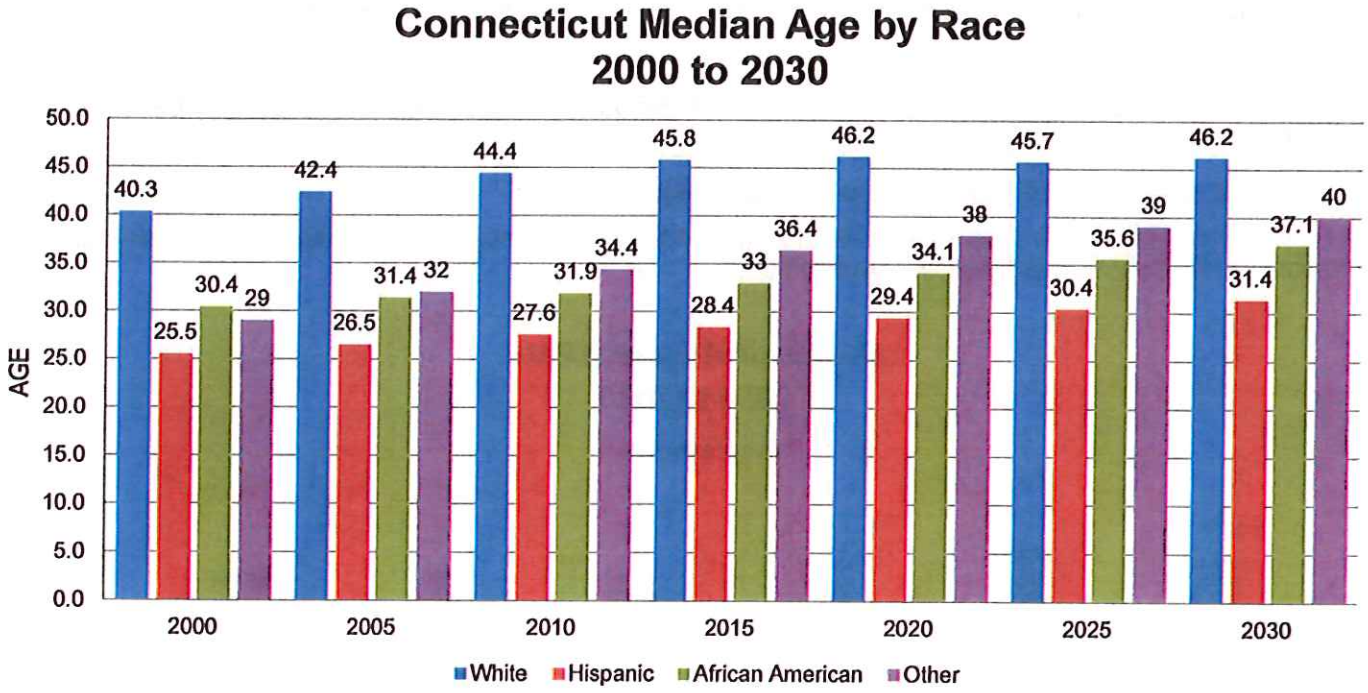
Source: Connecticut State Data Center

Exhibit 2.9: Connecticut Median Age Comparisons

In 2000, the states median age was 37.6 years. By 2030, the median age of Connecticut residents is expected to increase to 41.5 years of age, or 3.6 years higher than the US median population. Median age varies by race. Overall, African American and Hispanic race categories are much younger than Whites.



Source: Connecticut State Data Center

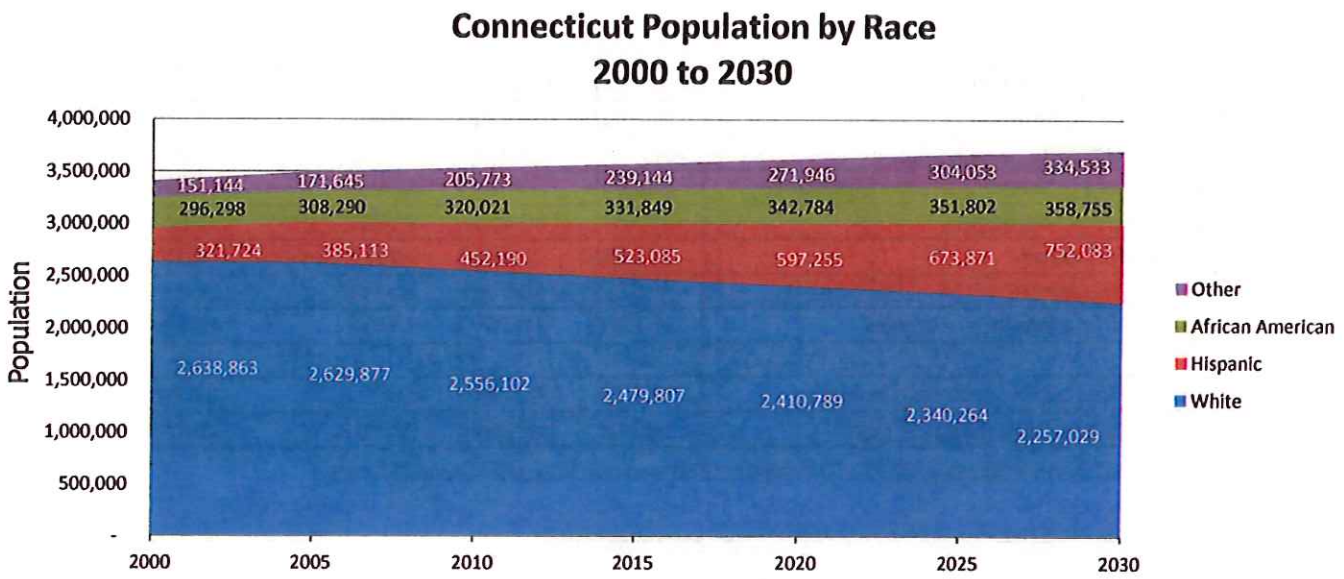


Source: Connecticut State Data Center

Exhibit 2.10: Connecticut Population by Race

The chart notes current and projected population by race categories. Racial Categories are mutually exclusive. African American, Other, and White do NOT include Hispanics. In CT, Other is mostly Mainland Chinese and South Asian Indian.

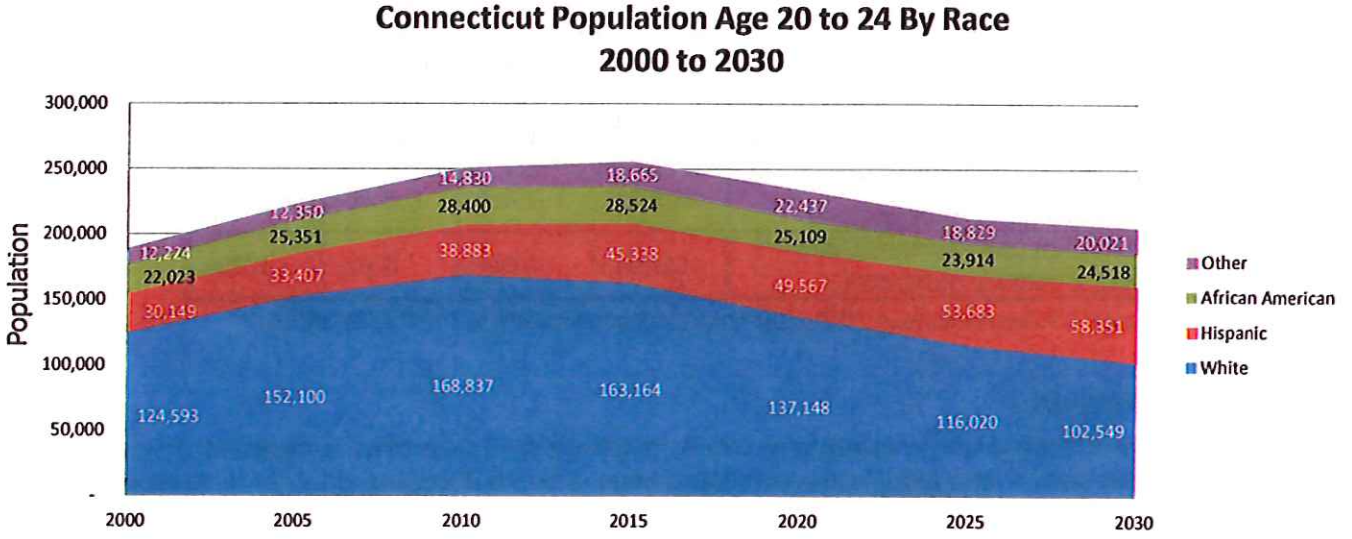
Following the overall pattern of increased diversity in the United States, growth is expected in the Hispanic, African American and Other race categories as the State continues to diversify.



Source: Connecticut State Data Center

Exhibit 2.11: Connecticut Population – Age 20 to 24

Overall, a decline is expected in Connecticut residents in the 20-24 years of age group, starting in 2015. This trend is more pronounced for Whites and African Americans. The number of Hispanics and Other race categories will grow, but not enough to offset decreases.



Source: Connecticut State Data Center

State and County Comparisons

Exhibit 2.12: Educational Attainment by State and County

This table lists the highest level of educational attainment for the population 25 years or younger. Middlesex County residents have a slightly higher level of educational attainment compared to the state as a whole.

Only 6.4 percent of the Middlesex County population had less than a 12th grade education, while 18.6 percent had some college education, but no degree or certificate.

	Connecticut		Middlesex County	
Population 25 years and over	**2,446,413**	**100.00%**	**118,112**	**100%**
Less than 9th grade	107,642	4.40%	2,126	1.80%
9th to 12th grade, no diploma	156,570	6.40%	5,433	4.60%
High school graduate (includes equivalency)	682,549	27.90%	33,426	28.30%
Some college, no degree	435,462	17.80%	21,969	18.60%
Associate's degree	178,588	7.30%	9,567	8.10%
Bachelor's degree	496,622	20.30%	25,748	21.80%
Graduate or professional degree	388,980	15.90%	19,843	16.80%
Percent high school graduate or higher	2,182,200	89.20%	110,671	93.70%
Percent bachelor's degree or higher	888,048	36.30%	45,591	38.60%

Source: US Census Bureau, 2010-2012 American Community Survey 3-Year Estimates

Exhibit 2.13: Occupational Employment by State and County

The table reviews the types of occupations held by residents 16 years of age and older by state and county. Middlesex County occupational employment figures are very similar to state figures, with the bulk of employment in management, professional, and related occupations.

	Connecticut		Middlesex County	
Civilian Employed Population 16 Years And Over	**1,478,262**	**100.00%**	**86,789**	**100.00%**
Management, business, science, and arts occupations	606,087	41.00%	38,795	44.70%
Service occupations	264,609	17.90%	12,932	14.90%
Sales and office occupations	356,261	24.10%	20,569	23.70%
Natural resources, construction, and maintenance occupations	109,391	7.40%	6,856	7.90%
Production, transportation, and material moving occupations	141,913	9.60%	7,637	8.80%

Source: US Census Bureau, 2010-2012 American Community Survey 3-Year Estimates

Middlesex Service Area

Middlesex Community College tracks enrollments within its service area. This area is represented by townships as noted in the table below. Also listed is the population change between 2000 and 2010, as developed by the Connecticut State Data Center, University of Connecticut.

Exhibit 2.14: Historical and Projected Population Summary

Middlesex Community College Service Area

Town	2000 Group	County	Census 2000 Population	Census 2010 Population	Percent Change 2000-2010	2015 Projected Household Population
Chester	Suburban	Middlesex	3,587	3,994	11%	3,995
Clinton	Suburban	Middlesex	13,093	13,260	1%	13,127
Cromwell	Suburban	Middlesex	12,258	14,005	14%	14,471
Deep River	Rural	Middlesex	4,492	4,629	3%	5,484
Durham	Suburban	Middlesex	6,480	7,388	14%	7,620
East Haddam	Rural	Middlesex	8,194	9,126	11%	9,343
East Hampton	Rural	Middlesex	10,856	12,959	19%	12,737
Essex	Suburban	Middlesex	6,374	6,683	5%	6,645
Haddam	Suburban	Middlesex	7,142	8,346	17%	8,783
Killingworth	Suburban	Middlesex	6,018	6,525	8%	6,606
Middlefield	Rural	Middlesex	4,203	4,425	5%	4,477
Middletown	Urban Periphery	Middlesex	41,293	47,648	15%	44,651
Old Saybrook	Suburban	Middlesex	10,094	10,242	1%	9,994
Portland	Rural	Middlesex	8,523	9,508	12%	9,813
Westbrook	Rural	Middlesex	6,237	6,938	11%	7,186
Rocky Hill	Urban Periphery	Hartford	17,099	19,709	15%	20,558
Meriden	Urban Periphery	New Haven	57,103	60,868	7%	62,068
Wallingford	Suburban	New Haven	42,153	45,135	7%	46,036
Town Totals			**265,199**	**291,388**	**10%**	**293,594**

Source: Connecticut State Data Center

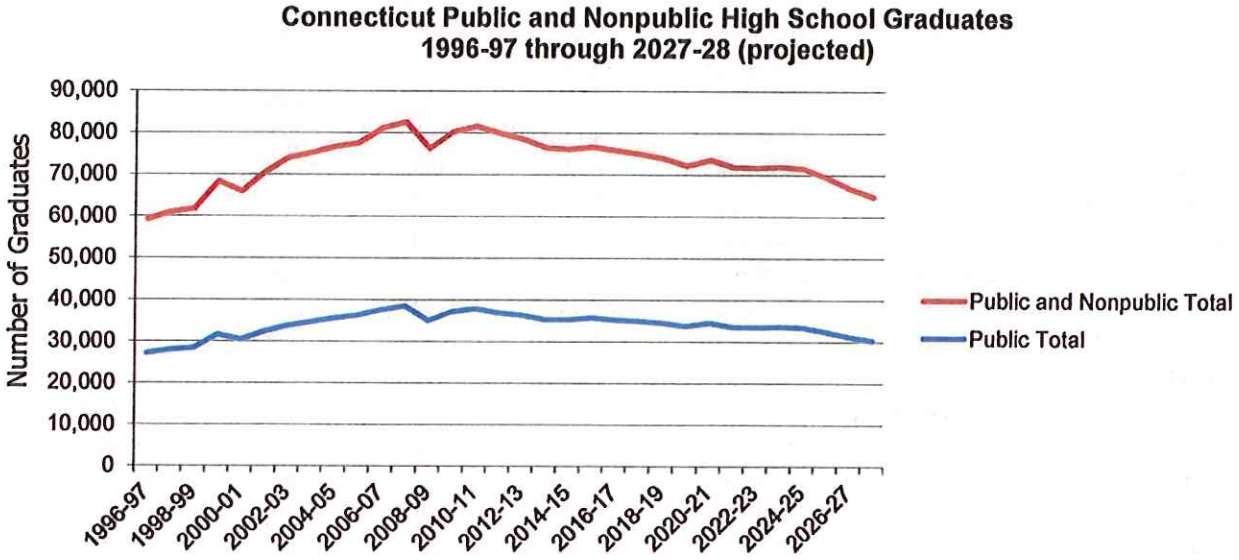
Overall, the Meriden Township has the greatest number of residents, followed by Middletown. Wallingford, a suburb of New Haven, also has a sizable resident population. The population is expected to increase slightly between 2010 and 2015.

High School Graduation Projections

While student pipeline, transition, and participation in higher education by high school graduates are important measures, the number of future high school graduates is also a significant factor in the prediction of upcoming community college enrollments and student services needs. The best source of information on high school graduates is produced by the Western Interstate Commission for Higher Education (WICHE).

Exhibit 2.15: Connecticut High School Graduates

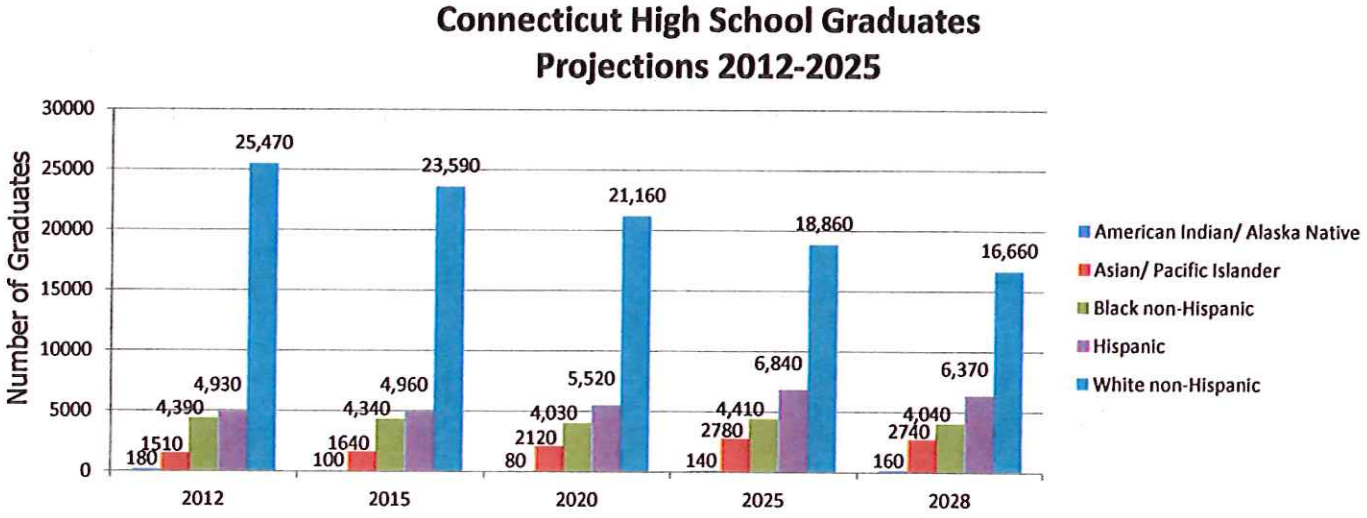
This graph highlights actual and projected student high school graduates. Projections indicate the state will experience a gradual decrease in its production of high school graduates, assuming existing patterns of high school completion and migration continue.



Source: WICHE

Exhibit 2.16: High School Graduates by Race/Ethnicity

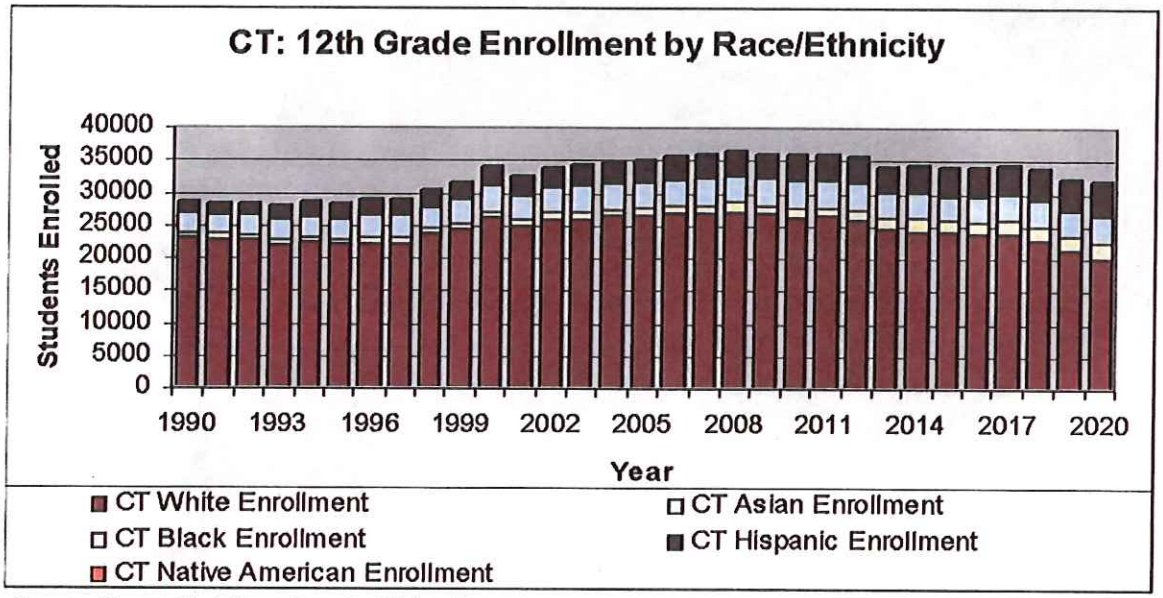
Exhibit 2.16 portrays Connecticut public high school graduates by race/ethnicity. In 2012, non-White students accounted for just over 30 percent of high school graduates. That proportion is projected to gradually increase, reaching almost 39 percent in 2025. Asian/Pacific Islanders and Hispanics will see the most growth, and this trend will continue through 2025. Black graduates will show very little change, and White graduates will decrease. This increased diversity will require additional student success resources, as many non-White students are the first generation to attend college.



Source: WICHE, Knocking at the College Door October 2013

Exhibit 2.17: Twelfth Grade Enrollments

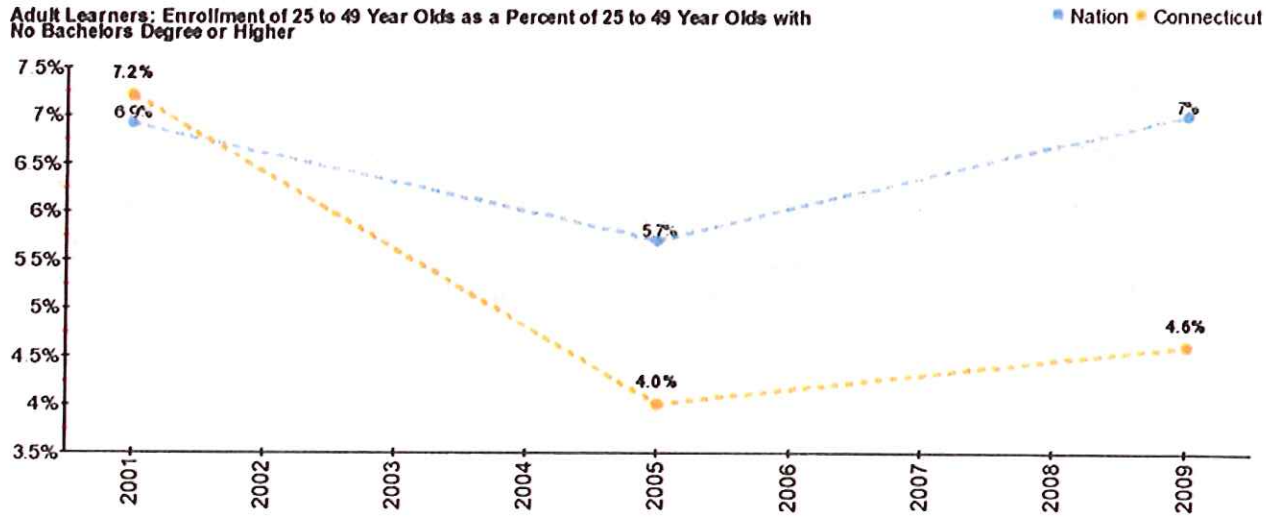
This graph shows historic and projected 12th grade enrollments. The results are very similar to the data provided from WICHE. However, the projections note a less severe drop in the number of students while the WICHE data suggests a more erratic period of ups and downs.



Source: Connecticut Department of Education

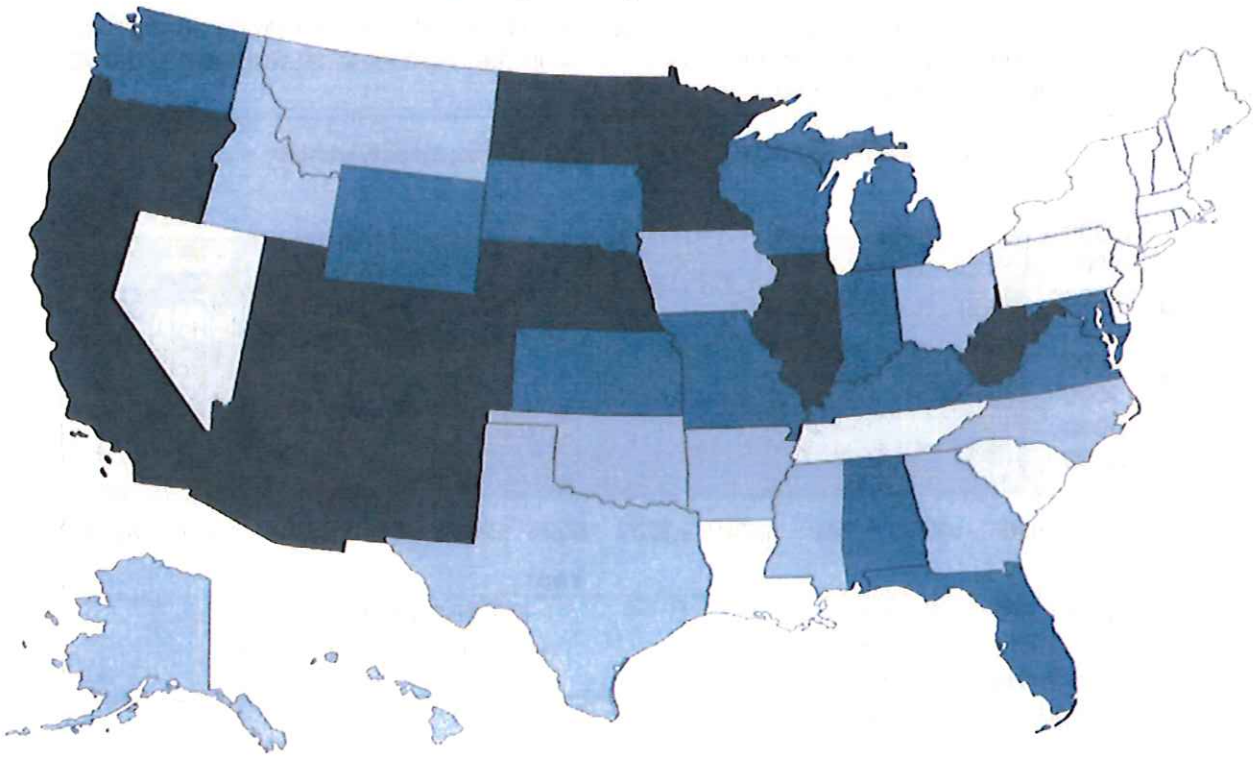
Exhibit 2.18: Postsecondary Enrollment of Non-Traditional Age Adults

While high school graduates are a critical market for community colleges, adult students are equally important. Exhibit 2.18 shows that while this population is increasing, Connecticut has captured only 4.6 percent of that population, below the US average of 7.5, indicating additional market opportunity for this population.



Source: NCES, IPEDS Enrollment Survey; U.S. Census Bureau Population Estimates

Adult Learners - Percent with No Bachelors Degree of Higher



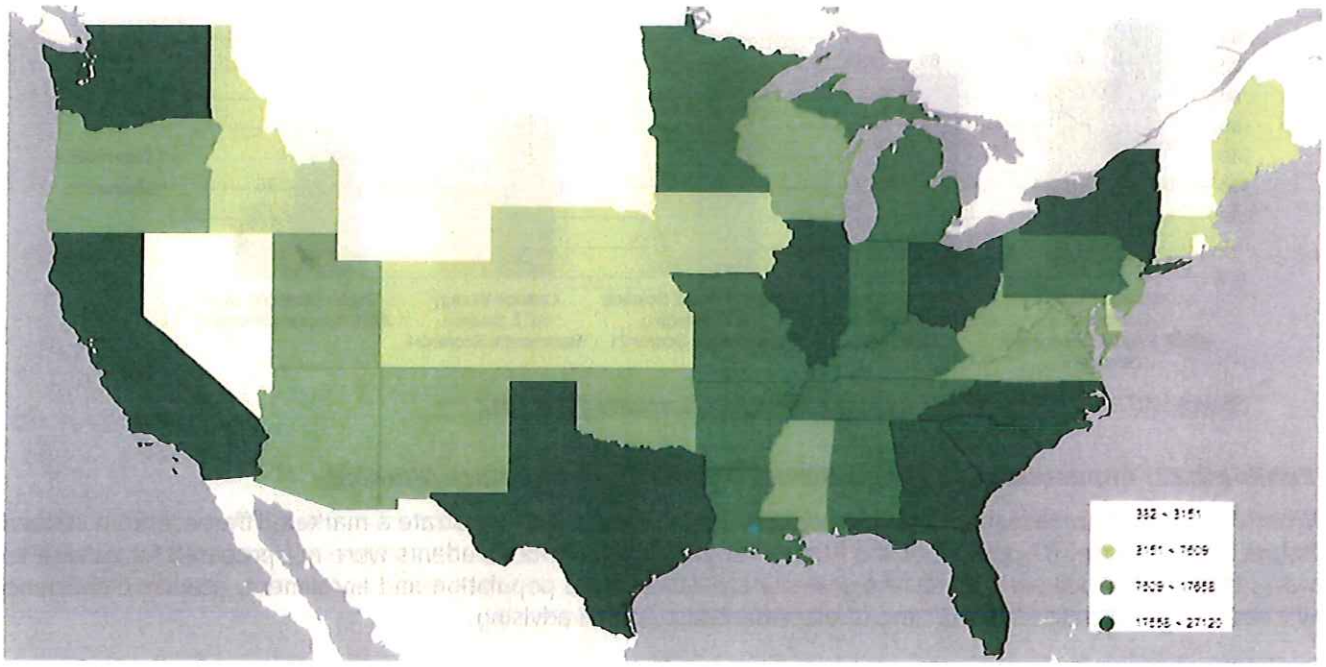
Source: NCES, IPEDS Enrollment Survey; U.S. Census Bureau Population Estimates

College Preparation

A unique and undervalued mission of the community college is preparing students for college-level courses who do not have the prerequisite academic and study skills to succeed in college. These students typically take developmental coursework in combination with assistance from tutors and other advisors. Writing, math and reading are often resources provided by the community college to assist students in there learning outcomes.

Exhibit 2.19: Adult Basic Education

In 2009, the national average of adults participating in adult basic education was 0.3 percent of the population; Connecticut was just below that with 0.2 percent of the population. However, this is an increase from 2005, when 0.15 percent of the Connecticut adult population was participating in adult basic education. If this number continues to increase, it could mean a greater future demand for such programs.



Source: US Department of Education, Office of Vocational and Adult Education

Exhibit 2.20: Enrollment in Remedial and Developmental Education

The table below provides a measure of college readiness of Connecticut public high school students entering public higher education. The numbers represent placement into a remedial course based on Accuplacer scores.
The data is from the 2011 report *Higher Education Counts: Achieving Results.* The report notes that "[t]he Community College System enrolled 6% fewer students in remedial courses in 2009 compared to 2008. Lowest rates of enrollment in community college remedial courses in 2009 were reported at Ashnuntuck (50.3%), Northwestern Connecticut (62.5%), and Manchester (66.3%)." The report also indicates that a state priority is to reduce the number of students in need of remedial or developmental courses; this will improve student progress toward a degree.

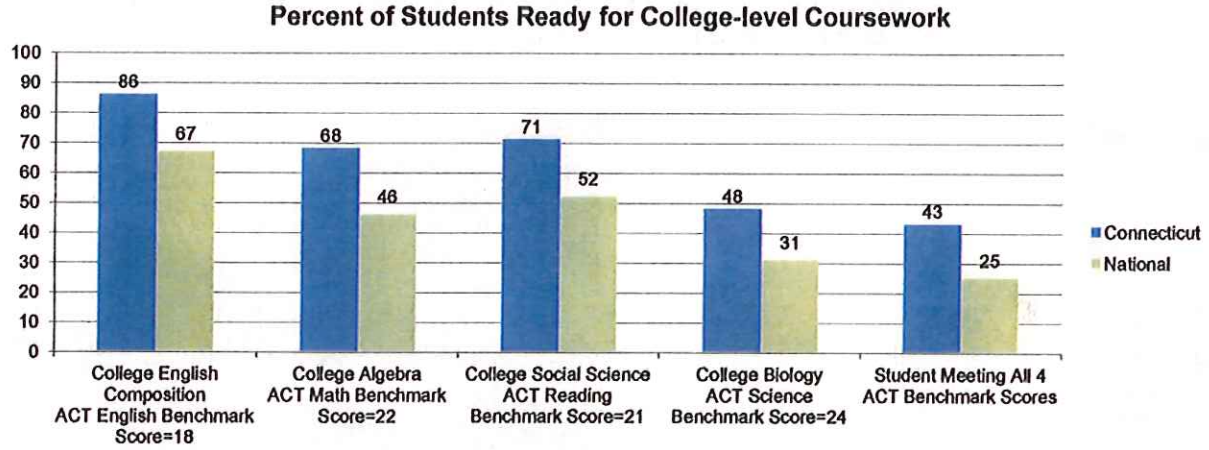
		Fall 2007		Fall 2008		Fall 2009		% Change 2008-09	% Change 2007-09
		# Students	% of total	# Students	% of total	# Students	% of total		
CCCS	Remedial	4,774	79.5%	5,313	80.8%	4,988	72.2%	-6.1%	4.5%

Source: Connecticut Department of Higher Education

Exhibit 2.21: Connecticut ACT High School Profile Report

The ACT test assesses high school students' general educational development and their ability to complete college-level work. For the graduating class of 2012, a total of 11,192 Connecticut high school students took the ACT.

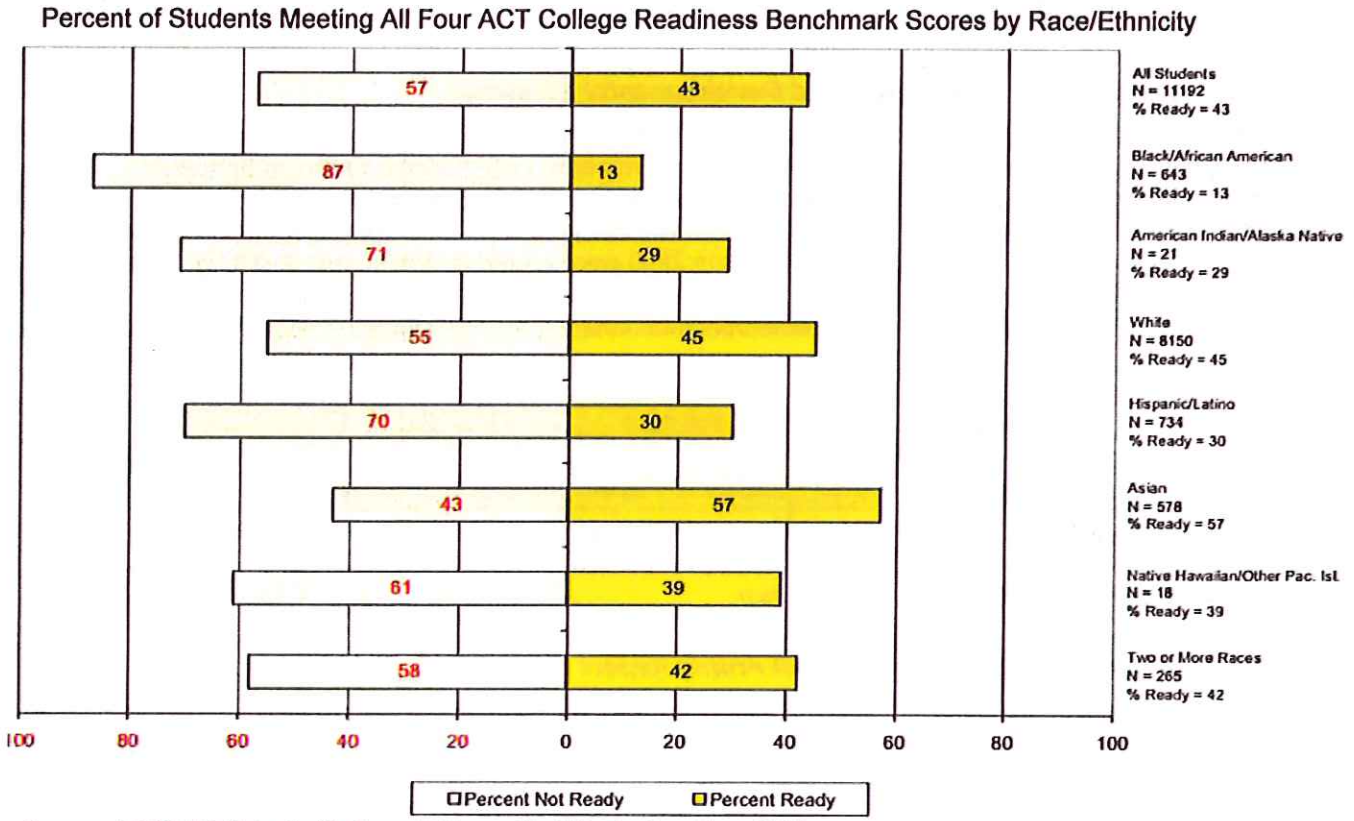
Although Middlesex Community College has its own placement test, the ACT provides statewide measures of college readiness. As seen below, Connecticut students as a whole score above the national average, compared to benchmark scores in each subject area.



Source: ACT 2012 State Profile Report: Connecticut Graduating Class 2012

Exhibit 2.22: Connecticut ACT High School Profile Report by Race/Ethnicity

When ACT results are disaggregated by race/ethnicity, the results demonstrate a marked difference from statewide figures. For instance, 87 percent of the African-American high school students were not prepared for college-level work, based on benchmark scores. As diversity increases in the population and enrollment, academic deficiencies will need to be addressed at the time of placement testing and advising.



Source: ACT 2012 State Profile Report: Connecticut Graduating Class 2012

Alternative Delivery – Learning on Demand

Using a search engine to find Web sites and publications containing information about technology, distance education, and the Internet with key identifiers of "colleges and universities" reveals more than 12,770,000 listings. In 2010, more than 15,700 reports and papers were published regarding similar topics in higher education with 28 national associations and organizations devoted to the cause.

The application of technology to deliver course content and provide essential student support functions, including online registration, student orientations, and digital libraries, are now critical for the success of a community college. There is no way to comprehensively review all the thousands of papers, reports, manuscripts and studies that are published each month on the issue of higher education technology and distance education. The purpose of this section is to review some of the more critical findings and condense some of the information "clutter" to a concise set of results. Due to the nature of federal government data collection methods, some national studies are dated but provide a benchmark of progress.

In the national report Learning on Demand, Online Education in the United States 2009, more than 4.6 million student took at least one online course during the fall 2008 term., and 74 percent of public institutions believe that online learning is critical for their long-term strategy success.

Exhibit 2.23: Alternative Delivery Definitions

Learning can be delivered in a variety of ways. While there is diversity among course delivery methods, a simple taxonomy has been developed. Online courses are those where at least 80% of the course content is delivered online, as noted below.

Proportion of Content Delivered Online	Type of Course	Typical Description
0%	Traditional	Course with no online technology used — content is delivered in writing or orally.
1 to 29%	Web Facilitated	Course that uses web-based technology to facilitate what is essentially a face-to-face course. May use a course management system (CMS) or web pages to post the syllabus and assignments.
30 to 79%	Blended/Hybrid	Course that blends online and face-to-face delivery. Substantial proportion of the content is delivered online, typically uses online discussions, and typically has a reduced number of face-to-face meetings.
80+%	Online	A course where most or all of the content is delivered online. Typically have no face-to-face meetings.

Source: Sloan Consortium, Learning on Demand, Online Education in the United States 2009

Exhibit 2.24: Total and Online Enrollment History

The table reviews total and online enrollment in degree-granting programs from Fall 2002 to Fall 2008 for all degree-granting postsecondary institutions. During Fall 2008, online enrollments accounted for 25.3% of total enrollments. At MxCC, 10% of students were enrolled in an online course.

	Total Enrollment	Annual Growth Rate Total Enrollment	Students Taking at Least One Online Course	Annual Growth Rate Online Enrollment	Online Enrollment as a Percent of Total Enrollment
Fall 2002	16,611,710	NA	1,602,970	NA	9.6%
Fall 2003	16,911,481	1.8%	1,971,397	23.0%	11.7%
Fall 2004	17,272,043	2.1%	2,329,783	18.2%	13.5%
Fall 2005	17,487,481	1.2%	3,180,050	36.5%	18.2%
Fall 2006	17,758,872	1.6%	3,488,381	9.7%	19.6%
Fall 2007	17,975,830	1.2%	3,938,111	12.9%	21.9%
Fall 2008	18,199,920	1.2%	4,606,353	16.9%	25.3%

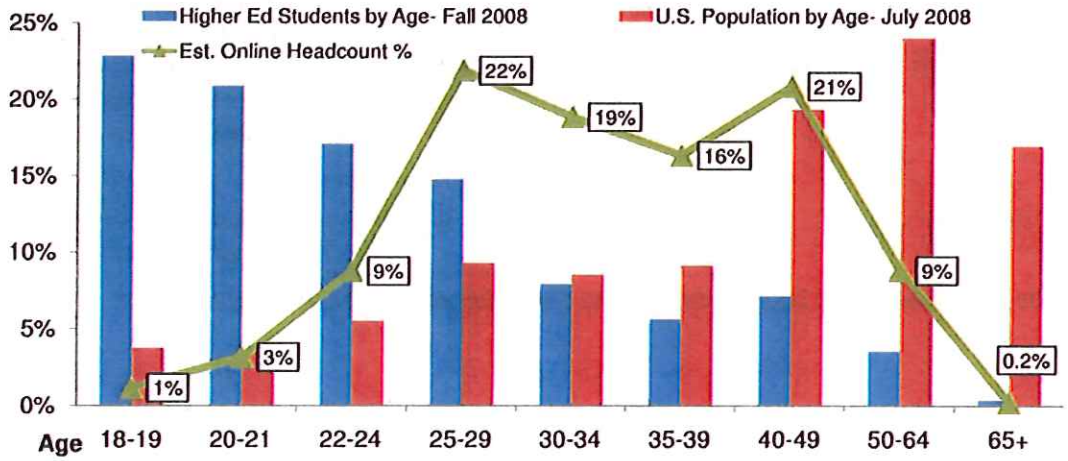
Source: Sloan Consortium, Learning on Demand, Online Education in the United States 2009

Exhibit 2.25: Rates and Patterns of Online Enrollments

According to Eduventures, a firm that studies trends in education, online enrollment is most prevalent among 25-29 year olds, comprising 22% of all enrollments during Fall 2008. Approximately 1% of traditional college age students are engaged in this delivery method. Eduventures indicates that there is tremendous opportunity for online learning at the associate level with non-traditional adult students.

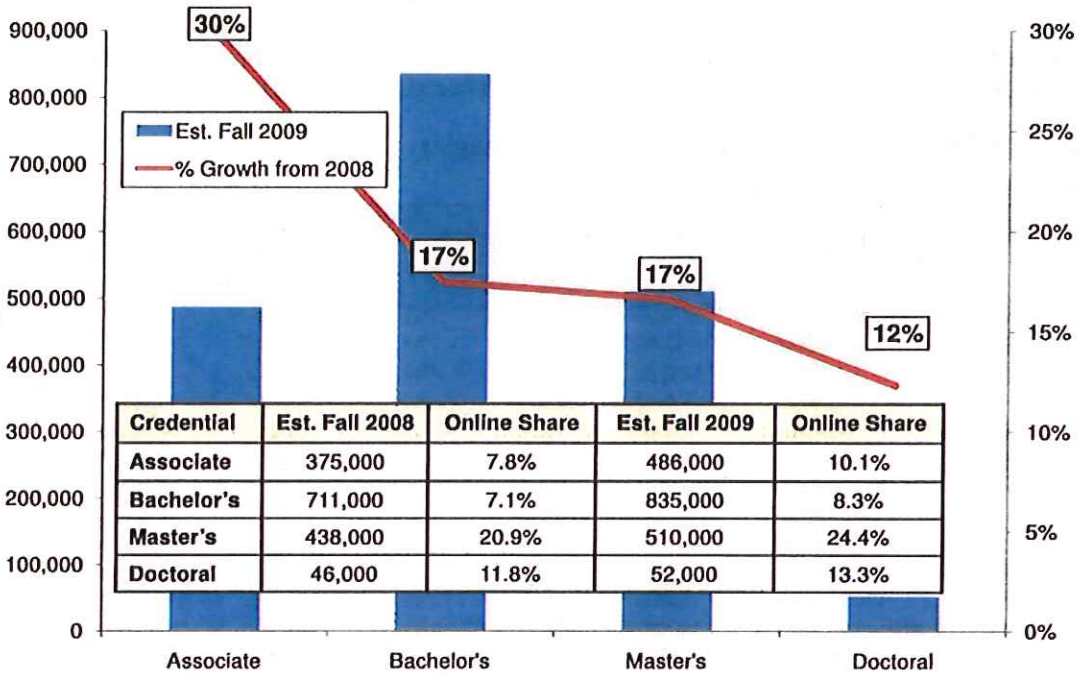
For Middlesex Community College, online enrollment growth should be targeted to older students with previous college experience, and to those taking workforce development courses.

Participation Rates, Population Patterns Signal Online Opportunity



Source: Eduventures Inc. (used by permission)

Online share up for all major credentials; strong associate growth; unrivaled master's online penetration



Credential	Est. Fall 2008	Online Share	Est. Fall 2009	Online Share
Associate	375,000	7.8%	486,000	10.1%
Bachelor's	711,000	7.1%	835,000	8.3%
Master's	438,000	20.9%	510,000	24.4%
Doctoral	46,000	11.8%	52,000	13.3%

Source: Eduventures Inc. (used by permission)

Criticisms of e-learning are still making headlines. Stories range from concerns that students learning from a computer are not providing enough intellectual exchange, to comments about young learners who have not developed the study skills or discipline necessary for success. Testing and quality assessment of distance education, as well as student plagiarism, seem to be ongoing topics of debate. The average online student is between the ages of 25 and 50, which may indicate that online learning is best for students that have had previous higher education experience in the classroom. Other e-learning issues revolve around faculty responsibilities and training, expense, and student support systems. Colleges in many states are providing 24-hour library and technical support to alternative delivery students.

Despite the naysayers, the demand for face-to-face leaning will not become obsolete anytime soon. Technology has had a profound effect on higher education and will continue to provide students with additional opportunities and avenues to complete their education.

What is the future role of technology in community colleges and its effect on teaching and learning? Unfortunately, the book is still being written and debate continues. The ongoing colloquy to understand technology's role in higher education, whether positive or negative, includes efforts such as higher education leadership forums devoted to examining technology in higher education. Most acknowledge that technology has altered almost every aspect of higher education, from libraries to teaching to student life, but all agree that we have only seen the beginning of technology-driven changes in pedagogy, delivery, and operation.

Community colleges should reconsider the mission of their institutions and how technology fits into it. Technology has a home in higher education, but only if it is used with care and planning; it is not a panacea for everything that ails higher education. As in any aspect of planning, community colleges need to think strategically.

For instance, campus planners often hear that faculty want more technology on campuses, including more wireless access, more virus protection, and more technical support. Recent high school graduates also expect a lot, especially if they come from school districts with newer schools or the latest computer equipment. These factors need to be balanced with the needs of distance education, and considered in light of other issues in higher education, such as demographics, mounting costs, increased competition, and overcrowding.

Population Projections

Population estimates and projections for this section use data from the Connecticut State Data Center (CtSCD), the state's lead agency in the US Census Bureau's State Data Center Program. Population estimates and projections were used to analyze the correlation between Middlesex Community College's enrollments and population trends. Population projections were also used in the development of enrollment projections.

Exhibit 2.26: Historical and Projected Population Summary

Middlesex Community College Service Area

Town	2000 Group	County	Census 2000 Population	Census 2010 Population	Percent Change 2000-2010	2015 Projected Household Population	2020 Projected Household Population	2025 Projected Household Population	Percent Change 2010-2025
Chester	Suburban	Middlesex	3,587	3,994	11%	3,995	3,976	3,948	-1%
Clinton	Suburban	Middlesex	13,093	13,260	1%	13,127	12,840	12,419	-6%
Cromwell	Suburban	Middlesex	12,258	14,005	14%	14,471	14,854	15,169	8%
Deep River	Rural	Middlesex	4,492	4,629	3%	5,484	4,489	4,347	-6%
Durham	Suburban	Middlesex	6,480	7,388	14%	7,620	7,803	7,966	8%
East Haddam	Rural	Middlesex	8,194	9,126	11%	9,343	9,467	9,531	4%
East Hampton	Rural	Middlesex	10,856	12,959	19%	12,737	12,695	12,394	-4%
Essex	Suburban	Middlesex	6,374	6,683	5%	6,645	6,565	6,440	-4%
Haddam	Suburban	Middlesex	7,142	8,346	17%	8,783	9,129	9,428	13%
Killingworth	Suburban	Middlesex	6,018	6,525	8%	6,606	6,614	6,581	1%
Middlefield	Rural	Middlesex	4,203	4,425	5%	4,477	4,483	4,476	1%
Middletown	Urban Periphery	Middlesex	41,293	47,648	15%	44,651	45,806	46,885	-2%
Old Saybrook	Suburban	Middlesex	10,094	10,242	1%	9,994	9,643	9,226	-10%
Portland	Rural	Middlesex	8,523	9,508	12%	9,813	10,018	10,160	7%
Westbrook	Rural	Middlesex	6,237	6,938	11%	7,186	7,362	7,495	8%
Rocky Hill	Urban Periphery	Hartford	17,099	19,709	15%	20,558	21,341	21,980	12%
Meriden	Urban Periphery	New Haven	57,103	60,868	7%	62,068	63,141	63,929	5%
Wallingford	Suburban	New Haven	42,153	45,135	7%	46,036	46,701	47,103	4%
Town Totals			**265,199**	**291,388**	**10%**	**293,594**	**296,927**	**299,477**	**3%**

Sources: U. S. Census Bureau and CT State Data Center

Population growth in Middlesex Community college's service area increased by 10 percent between 2000 and 2010. The greatest areas of population growth included Haddam, East Hampton, and Rocky Hill townships.

Projections for 2025 show that growth is expected to slow, with an overall growth rate of 3%. The areas contained within Middlesex Community College's service area population are projected to increase by just over 8,000 residents. In reviewing projections for the current ten-year time period (2010 to 2020), growth is projected to increase, with an overall growth rate of 1.9 percent.

Exhibit 2.27: Historical Population and Enrollment Analysis

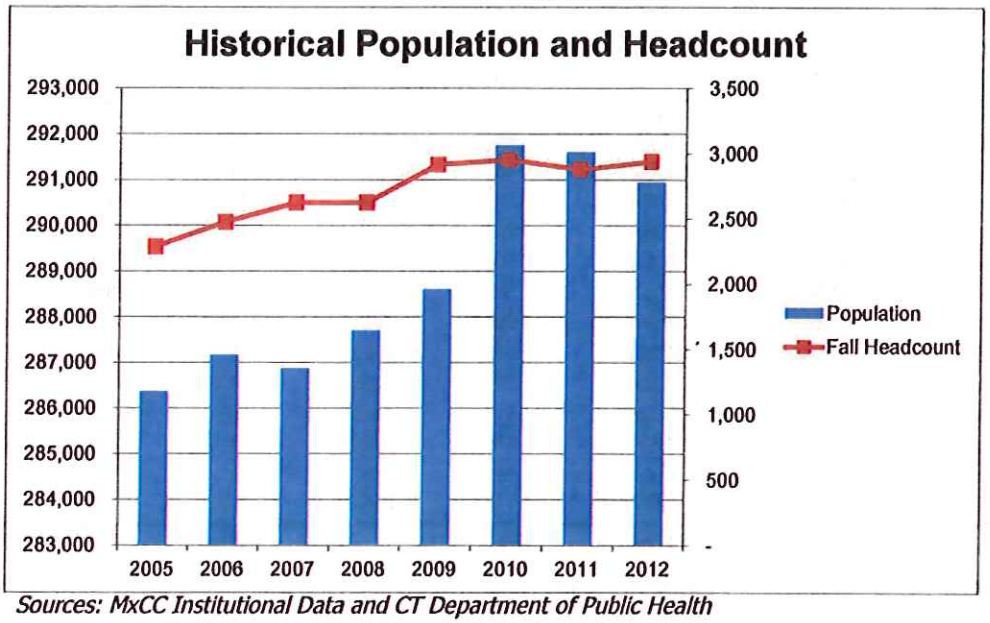
The exhibit reviews Middlesex Community College enrollment trends and population data between 2005 and 2012. In this period, the population in primary service area increased by 1.5 percent, while headcount enrollment increased by 28.5 percent. Over the same time period, the FTE to headcount ratio increased from 0.56 to 0.58, indicating a larger number of full-time students.

Correlation analysis determines the strength of relationship between two or more variables or how dependably the variables change together. A correlation coefficient, the output of the analysis, ranges from +1 to -1, with +1 being a perfect positive correlation between the variables and -1 being a perfect negative correlation between the variables. A "zero" denotes the absence of any relationship between the variables. The correlation coefficient between headcount enrollment and the population total from 2005 to 20012 was calculated at 0.856, indicating a significant positive relationship between the two variables. This finding suggests that population growth plays a significant role in enrollment growth.

Historical Population and Enrollment Analysis

Unit	2005	2006	2007	2008	2009	2010	2011
Middlesex County	163,214	163,946	164,150	164,794	165,702	165,867	166,043
Rocky Hill, Hartford	18,760	18,835	18,808	18,852	18,827	19,754	19,723
Meriden, New Haven	59,653	59,552	59,225	59,186	59,186	60,936	60,770
Wallingford, New Haven	44,736	44,825	44,679	44,859	44,881	45,182	45,062
Service Area Population	**286,363**	**287,158**	**286,862**	**287,691**	**288,596**	**291,739**	**291,598**
Participation Rate	**0.80%**	**0.86%**	**0.91%**	**0.91%**	**1.01%**	**1.01%**	**0.99%**
MCC Fall Headcount	2,286	2,474	2,623	2,624	2,914	2,952	2,876
MCCFall FTE	1,287	1,368	1,484	1,495	1,706	1,713	1,670
FTE/HC Ratio	0.56	0.55	0.57	0.57	0.59	0.58	0.58

Sources: MxCC Institutional Data and CT Department of Public Health



Sources: MxCC Institutional Data and CT Department of Public Health

Participation Rates

Participation rate can be defined as the percent of the total population that are enrolled, or participating, in higher education in a given area. In this case, participation is enrollment in credit courses and programs related to Middlesex Community College. For this analysis, only students residing in a given township or geographic area were considered in the analysis. For example, in order to be included in the participation rate for Chester, a student would have had to live in the township to be included in the analysis. The analysis includes students enrolled in distance education classes. The participation rate is usually expressed as a percentage as noted in the formula:

$$\text{Participation Rates} = \frac{\text{(Headcount)}}{\text{(Population)}} \times 100$$

Participation rates were calculated at the township level for MxCC's service area. For greater accuracy, 2011 population data was compared with fall 2012 student headcount data to develop the participation rates for the College. It must be stressed that 2011 population data is estimated based on 2010 Census data and may not represent an actual counts of the population.

The national average participation rate for community colleges is 2.08%. For the Middlesex Community College service area, an estimate of the entire community college participation rate for the service area was developed by using the formula of enrollment divided by population. For the entire service area, the average participation rate was 1.25 percent, while the Middlesex Community College participation rate was 0.76 percent. For the state of Connecticut, using the Board of Regents Fall 2013 total enrollment figure of 56,976 and the US Census 2012 estimated state population of 3,590,347, the statewide participation rate is 1.6%.
The analysis suggests that Middlesex Community College is below the average participation rate for both the service area and the state and may wish to pursue focused marketing and recruitment strategies in order to increase participation rates.

Exhibit 2.28: Participation Rates in the Middlesex Service Area

Town	County	2011 Population Estimate	2012 MxCC Headcount Enrollment	MxCC Participation Rate	Fall 2011 CT Community Colleges Headcount	CT CC Participation Rates	Headcount Enrollment Difference
Chester	Middlesex	4,003	36	0.9%	33	0.8%	-3
Clinton	Middlesex	13,290	79	0.6%	144	1.1%	65
Cromwell	Middlesex	14,037	119	0.8%	210	1.5%	91
Deep River	Middlesex	4,639	46	1.0%	63	1.4%	17
Durham	Middlesex	7,403	69	0.9%	100	1.4%	31
East Haddam	Middlesex	9,146	48	0.5%	102	1.1%	54
East Hampton	Middlesex	12,989	58	0.4%	159	1.2%	101
Essex	Middlesex	6,698	32	0.5%	46	0.7%	14
Haddam	Middlesex	8,364	123	1.5%	148	1.8%	25
Killingworth	Middlesex	6,540	50	0.8%	71	1.1%	21
Middlefield	Middlesex	4,436	36	0.8%	58	1.3%	22
Middletown	Middlesex	47,749	585	1.2%	757	1.6%	172
Old Saybrook	Middlesex	10,265	55	0.5%	79	0.8%	24
Portland	Middlesex	9,530	74	0.8%	137	1.4%	63
Westbrook	Middlesex	6,954	51	0.7%	69	1.0%	18
Rocky Hill	Hartford	19,723	57	0.3%	277	1.4%	220
Meriden	New Haven	60,770	632	1.0%	1,014	1.7%	382
Wallingford	New Haven	45,062	167	0.4%	577	1.3%	410
Total		**291,598**	**2,317**		**4,044**		**1,727**

Sources: MxCC Institutional Data and CT Department of Public Health

External Influences on Participation Rates

Participation rates are broad-based parameters of the ability of a college to successfully recruit residents from a given geographic area. These rates are also used by marketing and development offices and are often used as an indication of market penetration. Their use is almost exclusive to community colleges where students attend while living at home and/or working in the surrounding community. Based on this study, Middlesex Community College's participation rates are below the state average of 1.6% percent. The consultant is not aware of any national studies or research that notes specific influences on the measure. Based on personal experience and work with other community colleges, the consultant notes that rates can be influenced by a host of factors including ethnicity and age characteristics of the surrounding service area, higher education competition from the private sector, and breadth of program offerings to more difficult to measure concepts of image and reputation of the college in the community.

Enrollment Projections

Enrollment projections were developed using participation rates derived from Fall 2012 enrollment data and 2011 population estimates from the Connecticut State Data Center. Participation rates for the Fall 2023 academic year were developed using a propriety software model developed by Paulien & Associates, Inc.

The base methodology used to develop these projections was created by the Demographic Research Unit (State of California) for use by the California Postsecondary Education Commission for projecting enrollments of new and existing campuses. The consultant has used this methodology on a number of projects with positive results. Given the recent enrollment surge on the campus and the number of independent variables under investigation, the consultant decided against using straight-line regression techniques to drive future enrollment projections. The base model's independent variables are based on the internal and external factors.

Internal Factors Affecting Enrollment Growth

The projections take into account initiatives in the following six areas:

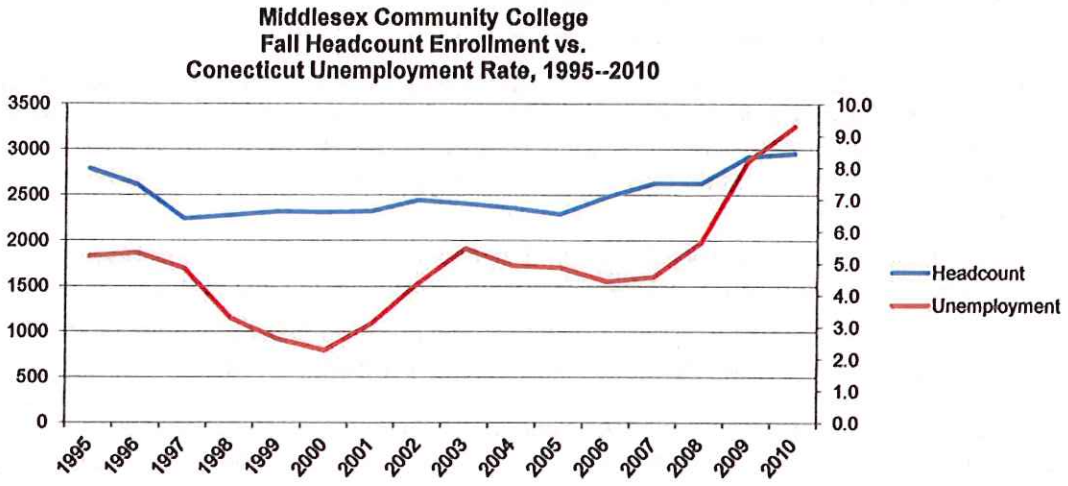
- Middlesex Community College will focus on developing online degrees and a greater number of alternative delivery course offerings. The increase in the number of online and hybrid courses is expected to attract a larger number of alternative delivery students, especially outside of the service area. As noted in the environmental scan, online students tend to be older in age (25-29). This factor is projected to increase participation rates.
- The College is continuing to expand offerings in downtown Meriden. This center is tailored to the specific needs of the community in which it resides. This factor is expected to increase participation rates.
- Strategies are being formulated to appeal to an older, more diverse adult student market. Exhibit 2.11 notes that the 20-24 age group in the service area will decline over the next ten years, while groups of 25-29 and 30-34 are expected to increase. The ability to capitalize on these growing markets can help offset the slight decline of traditional age students. Exhibit 2.18 notes that Connecticut is well below the national average in the number of non-traditional adults attending postsecondary education. The factor is expected to maintain current participation rates.
- Job creation is a high priority for the State of Connecticut, with a focus on worker training. The College has started placing more emphasis on developing additional workforce programs and expanding existing programs. Traditionally, a wider selection of programs draws more students to a campus. Middlesex Community College is expected to expand workforce and technical programs. Given current unemployment rates and the need for worker retraining, new programs could increase overall participation rates as residents seek out educational opportunities not available in the past. This factor is expected to increase participation rates.
- Minority population projections indicate an increase primarily in the Hispanic population, which also require greater skill preparation for college. There is a concerted effort on the part of the College to develop strategies to increase retention and persistence of under-prepared and/or underrepresented students as well as recruit more aggressively in these areas. By lowering attrition, enrollment levels will continue to grow in proportion to changes in the population.
- Exhibit 2.11 demonstrates that the Hispanic population is expected to increase over the master plan period. The median age of minority residents in much younger than their White counterparts and could represent a growing market for Middlesex Community College. This factor is expected to slightly increase participation rates.

External Factors Affecting Enrollment Growth

- The population is expected to increase by 3 percent in the service area. While the population is becoming older, Middlesex Community College will develop strategies to attract older students to offset declines in the traditional age markets (15 to 19) and (20-24), which will experience slight declines in population. This factor is expected to maintain current participation rates.
- As noted in the Winter 2011 article in *The Connecticut Economy – Community Colleges: Can An Old Elixir Help Heal Today's Economic Ills?*, community college enrollments are cyclical. As noted in the article: "College enrollment in Connecticut, particularly at community colleges, track economic conditions closely, swelling when economic conditions erode, ebbing as they improve. Since 1984, a one percentage point increase in the state's unemployment rate has been associated with a 3.0% increase in enrollment in Connecticut community colleges, and conversely for a decrease in that rate" (p.9).

This relationship is evident when Middlesex Community College's headcount enrollment is tracked with the unemployment rate, as noted in Exhibit 2.29. During November 2010, Connecticut's unemployment rate was 8.8% and was used in the development of the projections. Unfortunately, unemployment rates cannot be predicted over the long-term. However, the cyclical nature of this indicator suggests that unemployment rates could track lower in the long-term. The factor is expected to slightly reduce current participation rates.

Exhibit 2.29: Fall Headcount Enrollment and Connecticut Unemployment Rate



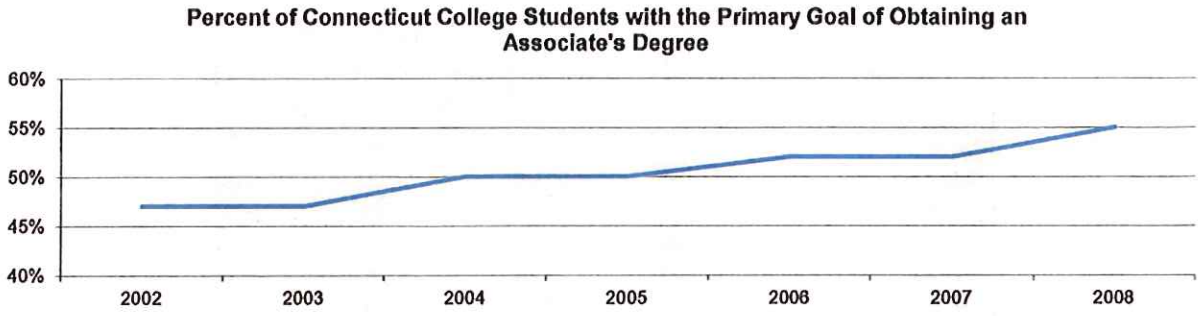
The population will continue to become more diverse with higher college participation rates by Hispanic and other minority students. As noted in Exhibit 2.11, Hispanic and other minority populations in the College's service area are growing faster than the White population and are younger. This factor is expected to slightly increase participation rates.

Based on the Connecticut Community College Entering Student Survey, the percentage of Connecticut college students with the primary goal of obtaining an associate degree has increased from 47% in 2002 to 55% in 2008. This trend is expected to increase slightly over the next ten years. This factor is expected to maintain current participation rates.

The number of public and non-public high school graduates will decline over the planning horizon as noted in Exhibits 2.15 and 2.16. The largest decline will take place among White Students (Exhibit 2.17). While this will impact the pool of traditional-age students, Middlesex Community College's ability to focus on graduates of non-White races could offset the overall decline. This factor is expected to maintain current participation rates.

Of the 29,258 Connecticut high school graduates attending college in 2008, approximately 41 percent were attending out-of-state colleges and universities. The Connecticut State Department of Education is aware of this trend. Given current recessionary pressures on family incomes and the escalating cost of out-of-state tuition, this trend may subside in the future. This factor is expected to maintain current participation rates.

Exhibit 2.30: Connecticut College Students with Goal of Associate's Degree



Source: 2008 Connecticut Community College Entering Student Survey

As evidenced in the next section (*Occupational Analysis*), Connecticut is expected to increase employment between 2010 and 2020 (Exhibit 2.40). Many of these jobs will require less than a Bachelor's degree (Exhibit 2.34) and are typically know as middle skill level jobs (Exhibit 2.36). With the development of new workforce and technical programs, Middlesex Community College is uniquely positioned to capitalize on this growing trend by attracting residents interested in retraining or new career directions, especially if some of the course content can be delivered online. This factor is expected to increase participation rates.

Middlesex Community College Enrollment Scenarios

Participation rate scenarios were calculated for middle and high levels for the service area. Scenarios were developed based on favorable and unfavorable external factors, as economic conditions cannot be predicted with any degree of accuracy. Fall 2023 headcount enrollment projections were derived by multiplying the derived participation rate by the projected populations in each township. The growth rate for the "Outside of Service Area" group was calculated based on percentage change in the headcount for the service area.

Exhibit 2.31: Middlesex Community College Mid-Level Enrollment Projections

Town	2012 MxCC Headcount Enrollment	Actual MxCC Participation Rate	Revised MxCC Participation Rate	2023 Enrollment Projections
Chester	36	0.90%	1.1%	46
Clinton	79	0.59%	0.8%	106
Cromwell	119	0.85%	1.1%	165
Deep River	46	0.99%	1.2%	55
Durham	69	0.93%	1.2%	93
East Haddam	48	0.52%	0.8%	74
East Hampton	58	0.45%	0.7%	87
Essex	32	0.48%	0.7%	47
Haddam	123	1.47%	1.7%	160
Killingworth	50	0.76%	1.0%	67
Middlefield	36	0.81%	1.1%	48
Middletown	585	1.23%	1.5%	685
Old Saybrook	55	0.54%	0.8%	74
Portland	74	0.78%	1.0%	104
Westbrook	51	0.73%	1.0%	73
Rocky Hill	57	0.29%	0.5%	117
Meriden	632	1.04%	1.3%	821
Wallingford	167	0.37%	0.6%	291
In Service Area	2,317	0.76%	1.0%	3,113
Out of Service Area	620			833
Total Enrollment	**2,937**			**3,946**

Sources: CT State Data Center and Paulien Analysis

Exhibit 2.32: Middlesex Community College High-Level Enrollment Projections

Town	2012 MxCC Headcount Enrollment	Actual MxCC Participation Rate	Revised MxCC Participation Rate	2023 Enrollment Projections
Chester	36	0.90%	1.4%	55
Clinton	79	0.59%	1.1%	138
Cromwell	119	0.85%	1.3%	203
Deep River	46	0.99%	1.5%	66
Durham	69	0.93%	1.4%	113
East Haddam	48	0.52%	1.0%	97
East Hampton	58	0.45%	0.9%	118
Essex	32	0.48%	1.0%	63
Haddam	123	1.47%	2.0%	183
Killingworth	50	0.76%	1.3%	83
Middlefield	36	0.81%	1.3%	59
Middletown	585	1.23%	1.7%	801
Old Saybrook	55	0.54%	1.0%	97
Portland	74	0.78%	1.3%	129
Westbrook	51	0.73%	1.2%	92
Rocky Hill	57	0.29%	0.8%	171
Meriden	632	1.04%	1.5%	980
Wallingford	167	0.37%	0.9%	409
In Service Area	2,317	0.76%	1.3%	3,859
Out of Service Area	620			1,033
Total Enrollment	**2,937**			**4,891**

Sources: CT State Data Center and Paulien Analysis

Continuing with the initial projections, the consultant reviewed historical FTE/Headcounts for Middlesex Community College.

Exhibit 2.33: Enrollment Projection Scenario Summary

Educational Master Plan Enrollment Summary - Mid-Level Projection

Site	Fall 2012 Duplicated Headcount	Fall 2012 FTE	Current FTE/HC Ratio	Projected Duplicated Headcount Fall 2023	Projected FTE Fall 2023	Projected FTE/HC Ratio
Middletown Campus	2577	1447	0.56	3461	2000	0.58
Meriden Center	615	250	0.41	825	371	0.45

For the Fall semester, 2290 students attended only the Middleton Campus while 328 attended only the Meriden Center. A total of 287 students attended both sites. For planning purposes, these 287 student were added to each site, creating duplicated enrollments for the institution.

Source: Paulien Analysis

Exhibits 2.31 and 2.32 indicate that according to proposed projections, the campus could experience an increase in headcount enrollment of up to 1,542 students. Since projections at the campus level are estimates based on planning assumptions and external factors, the results are influenced by the ability to develop new programs; changing external factors; the construction of new facilities; and other key areas as defined in the educational plan and strategic planning initiatives. The College decided that mid-level enrollment projections were more in line with current strategic goal outcomes.

Environmental Scan Implications

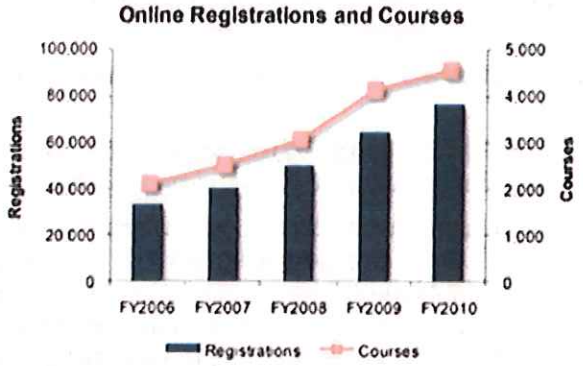
Based on the findings from the environmental scan, there are several implications for Middlesex Community College. These implications will be used in the development of academic planning initiatives.

Demographic Implications

- Connecticut is considered to have one of the oldest populations in the country. Overall, African Americans and Hispanics residing in Connecticut are younger than their White counterparts.
- The state can expect a slower population growth rate at state and county levels, as compared to US averages.
- The population will continue to diversify. Connecticut had positive population growth in the 1990s only because of the strong growth of its minority population. The increase in minority populations may suggest a modified student services model for Middlesex community College.
- Through 2020, Connecticut will find a decreasing percentage of their young population holding a bachelor's or higher level degree.
- The number of high school graduates is expected to decline over the planning period. As a result, there will be a smaller number of traditional students (16-24 years of age) entering college.
- The higher population growth in the nontraditional age markets of 25-34, combined with the fact that nontraditional students (25-64) are an underserved market in Connecticut, suggests that Middlesex Community College will need to shift its marketing focus to attract more nontraditional students, especially in the continuing educational and workforce development areas. Additionally, nontraditional students have higher expectations in terms of facilities and service, due to past college experiences.
- Approximately 40% of high school graduates leave the state to attend college. The state could focus on initiatives to reduce the "brain drain" in the state.
- Connecticut is predicted to have declines in the working age population. Jobs will be filled through in-migration. In 2020, it is predicted that 28% of Connecticut's working-age population will be composed of minority populations.
- Student Preparation Implications:
- The percentage of students taking developmental courses is steady. ACT and the Connecticut Department of Education data suggests this trend will continue. This is partly due to an increase in the college participation rate of minority students and partly due to residents returning to higher education many years after high school graduation. Middlesex Community College may need to look at a student services model that emphasizes enhanced recruitment and outreach to these groups.
- The continued need for developmental education courses and programs is discipline-specific with the greatest need in math and English. One report suggests study skill courses are also needed.
- Developmental studies and college readiness is receiving national focus, as it was a major topic at the White House Summit for Community Colleges. While entry testing is critical to assess academic skills and placement, attention is on college readiness strategies. The outcomes suggest that college retention is related to enhanced student support services (mentoring, tutoring, writing/math labs and other interventions).
- Three models of developmental education are national examples and could be explored for Middlesex Community College:
    - Accelerated Learning Programs: Students enroll in college-level and developmental course simultaneously with the same instructor (Community College of Baltimore County)
    - Integrated Basic Education and Skills Training (I-BEST): Model from Washington State Community and Technical Colleges)
    - Learning Communities: Small cohorts of student learn together (common courses) and work as a group to master skills (Hillsborough Community College, FL)

Distance Education Implications

- The latest study on national distance education trends was completed by the National Center for Education Statistics and entitled Distance Education at Degree-Granting Postsecondary Institutions: 2010-11. The report notes that 98% of public two-year colleges offered online or other forms of distance education. On average, 55% of degree and certificate programs had an online component. On average, 25.3% of the total enrollments were generated from online programs.
- According to the State of Connecticut Department of Education's report, Higher Education Counts: Achieving Results, 2011, the online course offerings for all Connecticut Distance Learning Consortium members have increased by 117% between 2006 and 2010. Since 2003, offerings have growth by 309%. Registration in online courses has also grown as noted in the table below.



- There is ample opportunity for additional growth in distance education (online and hybrid), especially for nontraditional students.
- As the economy improves, work hours increase, and the price of gas escalates, students attending Middlesex Community College from outside of the service area will try to limit the number of trips to campus. The availability of alternative delivery formats will directly drive retention.
- Course development studios and interactive classrooms for faculty teaching alternative delivery formats are crucial to ongoing success.

Population Projections

- Between 2010 and 2025, the service area population is expected to increase by 3 percent.
- Participation rates for the service area are below the state average of 1.6 percent, suggesting additional opportunities to increase enrollment among existing residents.

Occupational Overview and Analysis

A plethora of information has been published concerning labor market and economic conditions in the State of Connecticut. The state is divided into five Workforce Investment Areas (WIA's) as identified by the Connecticut Department of Labor. In relationship to Middlesex Community College, The South Central WIA (noted in light blue on the state map) is the closest in terms of geographical boundaries.

Workforce/technical programs are a crucial part of the community college mission. Successful workforce programs are highly dependent on occupational demand, college recruitment strategies, and available space. Unlike population projections which are forecast through the year 2030, occupational projections are shorter-term, with most predictions extending through 2020. A variety of circumstances, including national and state policies, local economic development initiatives, and international economic factors make these predictions less reliable over time.

The purpose of this section of the report is to review projected occupational data in an effort to determine the gaps of supply and demand of skilled workers in a wide range of occupations. Gaps were studied between occupational demand and the number of graduates produced by the Connecticut Community College System and Middlesex Community College. A second goal was to review additional workforce programs that could be feasible for MxCC through the planning horizon and beyond. To be successful, future workforce programs must be in line with the workforce needs and the demographic composition of the community/ region.

The remainder of this section will look in greater detail at both future occupations and the trends that are predicted. Since the State's economic development and occupational needs are different in each Workforce Investment Area, the consultant's review will consider both statewide and the South Central Area. In some cases, due to the population size of the College's service area, detailed projection data were not available for each and every occupation.

Occupational Employment Projections

Occupational estimates are calculated by the U.S. Department of Labor and the Connecticut Department of Labor. While these organizations analyze a variety of in-depth data and statistics, the most valuable information from this analysis is the projected total job openings for each occupational category. The time frame of this analysis includes the number of employees in the workforce by occupation in 2010 and the total number of employees needed or in demand for a given occupation for 2020 at the state level.

Each of the College's workforce education programs was placed into categories based on MxCC's program inventory. For each MxCC technical degree or certificate, the Classification of Instruction Program (CIP) code was aligned with the North American Industry Classification Systems (NAICS) code for each occupation. The crosswalk table between these two federal government classification systems was obtained from the U.S. Department of Labor. In some cases, a specific degree or technical certificate corresponded to a single specific occupational title. These occurrences were most prevalent in the health sciences, with a good example being physical therapist assistant. In other cases, a single degree corresponded to several occupational titles. A good example in this area includes the degree of office management, where graduates could enter the workforce with positions as secretaries, file clerks, administrative assistants, office support workers, and other related fields.

As noted in the tables, the Bureau of Labor Statistics listed education requirements for each job. It must be noted that occupations requiring education above the associate degree were removed from the analysis. The focus of this study involves education and workforce requirements that include postsecondary vocational training and/or the associate degree. Since some positions require credentialing, positions requiring moderate- and long-term training were also reviewed.

The information in this report should be considered an overview or indication of possible future programs. Any programmatic decisions based on this report should undergo further investigation as employment and economic conditions can change over the short term. Furthermore, the number of two-year degrees and certificates being awarded by proprietary institutions, independent colleges and universities, other two-year public colleges outside of the College's service area and four-year colleges and universities could influence the overall demand analysis.

Statewide Occupational Review

Exhibit 2.34: 2020 State Employment Demand by Educational Level

By 2020, the largest demand in Connecticut will be for Short-Term on-the-Job Training. Most of these jobs require no formal higher education. Overall, 10 percent of the jobs will require an Associate's Degree or Postsecondary Vocational Training.

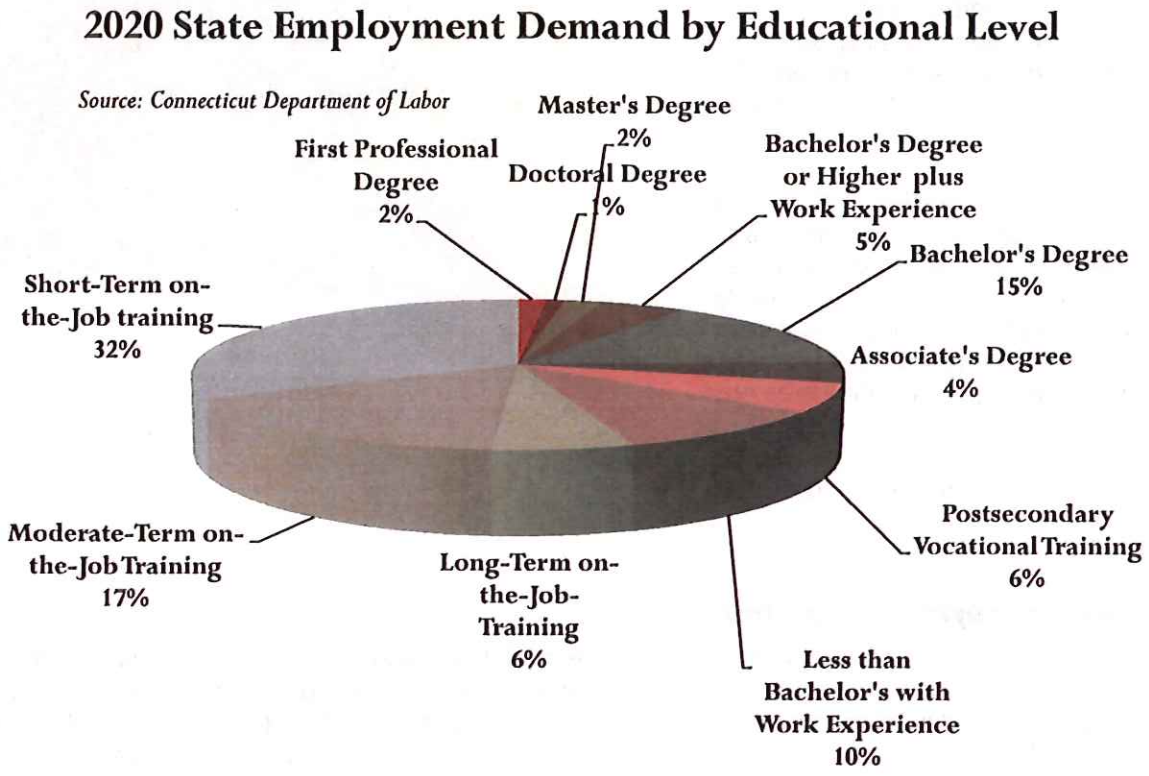


Exhibit 2.35: Minority Percentage of New England's Working Age Population as sources in New England 2020 – Forecast of Educational Attainment

The workforce is becoming more diversified as 27.7% of the Connecticut workforce will be from minority populations.

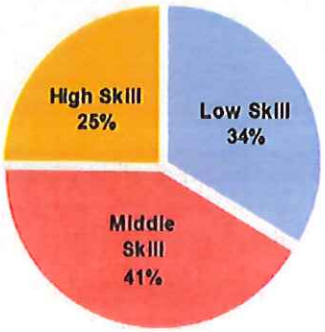
Minority Percentage of New England's Working-Age Population, 1990-2020

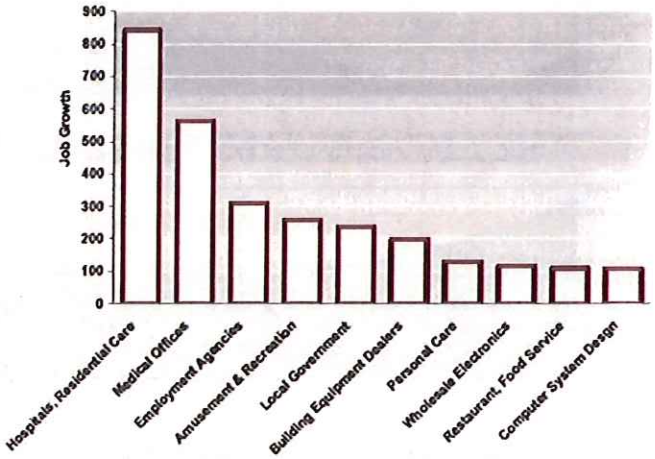
	1990	2000	2010	2020
Connecticut	17.0	19.9	24.1	27.7
Maine	2.2	2.6	3.2	4.0
Massachusetts	12.5	15.2	19.1	27.7
New Hampshire	2.9	4.0	5.9	7.9
Rhode Island	10.8	14.2	19.8	25.1
Vermont	2.0	2.8	4.5	7.5

Source: New England 2020 – Forecast of Educational Attainment

Exhibit 2.36: Industries with Largest Employment Growth In Middle-Skills Jobs

The Connecticut Department of Labor notes that middle skill jobs represent the largest need in the State. Industries with the greatest need for middle skill jobs are noted in the bar chart. Community colleges provide the majority of training for these jobs.

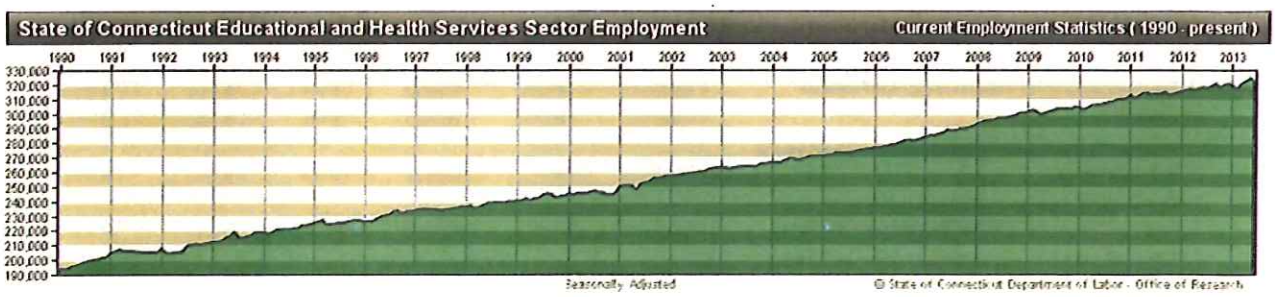




Industries with Largest Employment Growth In Middle-Skills Jobs

Exhibit 2.37: State of Connecticut Nonfarm Employment

The chart, based on CT Department of Labor data, notes a gradual increase in employment since the recession. Overall, the outlook calls for continued employment growth. The Connecticut Education and Health Services sector has seen steady job growth despite recessionary pressures. The Leisure and Hospitality Sector has also bounced back from the current lows in 2010. On the other hand, the Manufacturing Sectors has steadily declined since 1990 while the Information Sector employment has not recovered from 2008 economic decline.



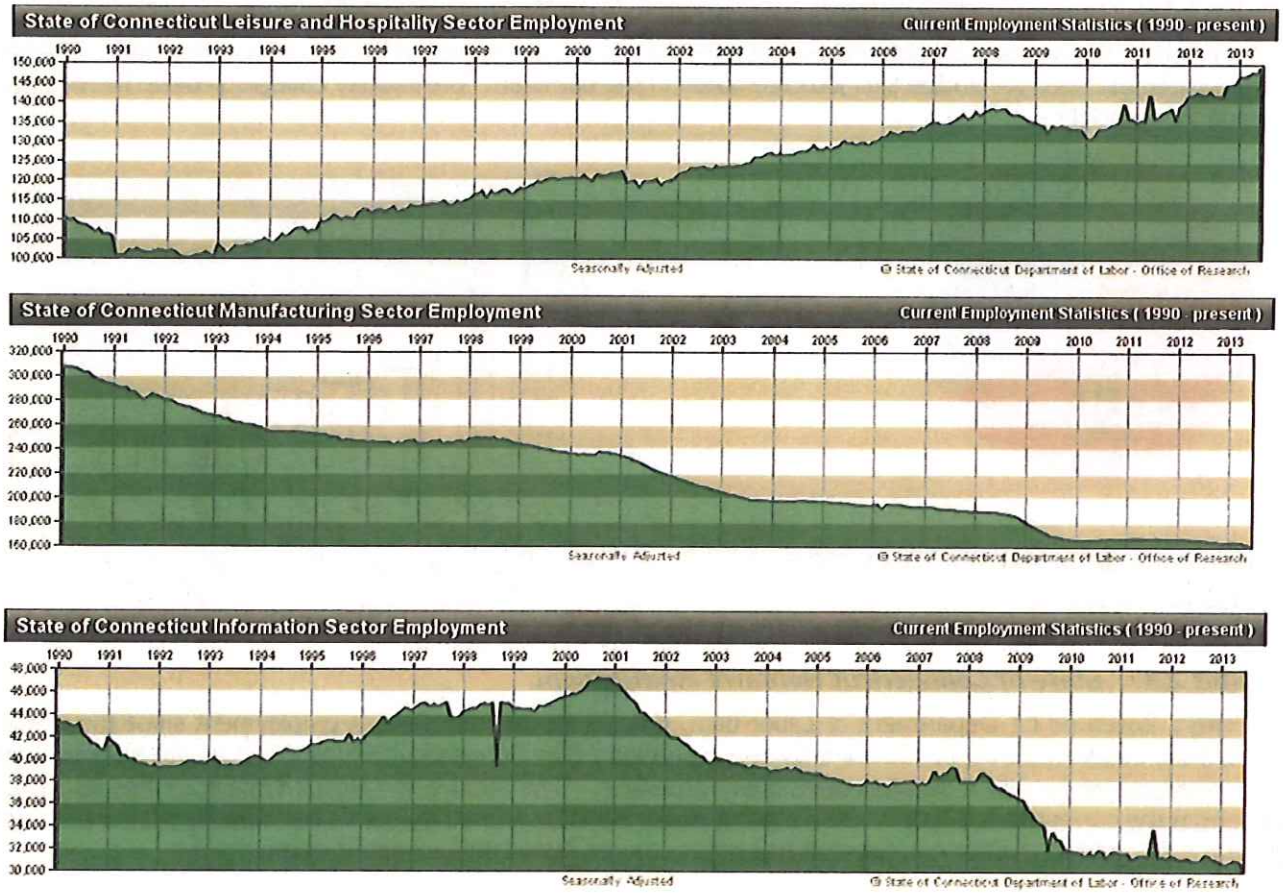


Exhibit 2.38: 2010 Industry of Employment

The table lists industry of employment for the State, Hartford and Middlesex Counties. Middlesex County has a higher percentage of civilian employment in Construction, Manufacturing, Information, Educational Services, and Public Administration industries.

	Connecticut		Hartford County		Middlesex County	
Civilian employed population 16 years and over	**1,765,755**	**100%**	**437,182**	**100%**	**86,647**	**100%**
Agriculture, forestry, fishing and hunting, and mining	6,490	0.4%	1,080	0.2%	266	0.3%
Construction	107,614	6.1%	21,868	5.4%	5,500	6.3%
Manufacturing	201,999	11.4%	49,386	12.2%	11,124	12.8%
Wholesale trade	45,358	2.6%	11,034	2.9%	2,313	2.7%
Retail trade	193,940	11.0%	46,851	11.0%	9,232	10.7%
Transportation and warehousing, and utilities	67,041	3.8%	17,832	3.9%	3,289	3.8%
Information	44,581	2.5%	10,542	2.4%	2,263	2.6%
Finance and insurance, and real estate and rental and leasing	166,839	9.4%	52,524	12.5%	8,310	9.6%
Professional, scientific, and management, and administrative and waste management services	190,314	10.8%	43,289	9.7%	9,246	10.7%
Educational services, and health care and social assistance	451,766	25.6%	110,460	23.5%	22,150	25.6%
Arts, entertainment, and recreation, and accommodation, and food services	142,250	8.1%	33,574	7.2%	5,594	6.5%
Other services, except public administration	79,787	4.5%	19,244	4.4%	3,421	3.9%
Public administration	66,776	3.8%	19,498	4.5%	3,939	4.5%

Source: U.S. Census Bureau, 2011 American Community Survey

Exhibit 2.39: Middlesex County Top 25 Employers

The table lists current the top 25 employers in Middlesex County with ranges for the number of employees. The largest category is in health care and public service sector.

Company Name	Town	Business	Size
Pilgrim Manor Care Ctr	CROMWELL	Nursing & Convalescent Homes	100 - 249 employees
Pineview At Covenant Village	CROMWELL	Residential Care Homes	100 - 249 employees
Riverview Children's Hospital	MIDDLETOWN	Psychiatric Hospitals	250 - 499 employees
Apria Healthcare	CROMWELL	Home Health & Health Care Equipment	100 - 249 employees
Connecticut Valley Hospital	MIDDLETOWN	Psychiatric Hospitals	1,000 - 4,999 employees
Middlesex Hospital	MIDDLETOWN	Hospitals	1,000 - 4,999 employees
Whiting Forensic Institute	MIDDLETOWN	State Government-Public Health Programs	1,000 - 4,999 employees
Unilever Home & Personal Care	CLINTON	Pharmaceutical Preparation (Mfrs)	500 - 999 employees
State Police	MIDDLETOWN	State Government-Police	1,000 - 4,999 employees
Connecticut Juvenile Trng Schl	MIDDLETOWN	Schools	250 - 499 employees
Middlesex Community College	MIDDLETOWN	Schools-Universities & Colleges Academic	100 - 249 employees
Wesleyan University	MIDDLETOWN	Schools	500 - 999 employees
American Legion	MIDDLETOWN	Veterans' & Military Organizations	250 - 499 employees
Saybrook Point Inn & Spa	OLD SAYBROOK	Hotels & Motels	100 - 249 employees
Stop & Shop Florist	CLINTON	Florists-Retail	100 - 249 employees
Super Stop & Shop	CROMWELL	Grocers-Retail	250 - 499 employees
Walmart	CROMWELL	Department Stores	100 - 249 employees
Walmart	OLD SAYBROOK	Department Stores	100 - 249 employees
Water's Edge Resort & Spa	WESTBROOK	Resorts	250 - 499 employees
Norma Terris Theatre	CHESTER	Theatres-Live	250 - 499 employees
Whelen Engineering Co Inc	CHESTER	Lighting Equipment NEC (Mfrs)	500 - 999 employees
Zygo Advanced Metrology Systs	MIDDLEFIELD	Industrial Measuring/Controlling Instr (Mf	250 - 499 employees
Zygo Corp	MIDDLEFIELD	Optical Instruments & Lenses (Mfrs)	500 - 999 employees
Kaman Aerospace Corp	MIDDLETOWN	Explosives-Manufacturers	100 - 249 employees
Lee Co USA	WESTBROOK	Hydraulic Equipment-Manufacturers	500 - 999 employees

Exhibit 2.40: State of Connecticut Occupational Projections by Major Groups – 2010-2020

Based on Connecticut Department of Labor data, the table lists annual job openings (growth and total) for all occupations. The table is sorted by clusters with the largest total annual openings. Overall, Office & Administrative Support Occupations are projected to have the greatest number of total openings.

Occupational Group	Employment Projections				2010-2020 Annual Openings	
	2010	2020	Change	%	Growth	Total
Total, All Occupations	**1,755,707**	**1,924,496**	**168,789**	**9.60%**	**17,294**	**54,029**
Office and Administrative Support	272,400	284,261	11,861	4.3	1,742	7,659
Sales and Related	179,770	191,229	11,459	6.4	1,182	6,678
Food Preparation and Serving Related	123,618	133,595	9,977	8.1	1,016	5,594
Education, Training, and Library	135,030	153,535	18,505	13.7	1,850	4,737
Healthcare Practitioners and Technical	101,924	120,610	18,686	18.3	1,869	3,900
Personal Care and Service	79,733	97,305	17,572	22	1,766	3,616
Management	129,922	137,166	7,244	5.6	779	3,579
Transportation and Material Moving	89,332	98,207	8,875	9.9	902	3,101
Business and Financial Operations	88,149	98,695	10,546	12	1,071	2,882
Production	99,450	99,890	440	0.4	271	2,196
Building and Grounds Cleaning and Maintenance	72,801	80,215	7,414	10.2	745	2,043
Construction and Extraction	54,736	62,124	7,388	13.5	740	1,941
Healthcare Support	55,926	65,879	9,953	17.8	995	1,793
Installation, Maintenance, and Repair	57,077	61,247	4,170	7.3	438	1,744
Computer and Mathematical	43,446	51,096	7,650	17.6	766	1,632
Community and Social Service	40,113	47,517	7,404	18.5	740	1,612
Arts, Design, Entertainment, Sports, and Media	34,025	38,005	3,980	11.7	420	1,322
Protective Service	33,676	35,480	1,804	5.4	183	1,059
Architecture and Engineering	32,940	33,526	586	1.8	118	879
Life, Physical, and Social Science	13,639	15,918	2,279	16.7	228	601
Legal	14,738	15,332	594	4	61	318
Farming, Fishing, and Forestry	3,262	3,664	402	12.3	40	138

Source: Connecticut Department of Labor

Exhibit 2.41: 2010-2020 State of Connecticut Occupations Requiring Associate's Degree or Vocational Training

Based on Connecticut Department of Labor data, the table lists annual job openings that require an Associate's Degree or Vocational Training. Occupations with greater levels of demand include Registered Nurses (1,392 annual jog openings), followed by Licensed Practical Nurses and Cosmetologists. The large number of health-related positions in the table should also be noted.

Occupational Title	Employment Projections		Annual Job
	2010	2020	Openings*
Registered Nurses	37,404	44,550	1,392
Licensed Practical and Licensed Vocational Nurses	8,806	9,931	347
Hairdressers, Hairstylists, and Cosmetologists	10,467	11,505	304
Automotive Service Technicians and Mechanics	9,845	10,278	297
Medical Secretaries	3,894	5,126	175
Emergency Medical Technicians and Paramedics	3,293	4,265	163
Fitness Trainers and Aerobics Instructors	4,060	4,889	148
Dental Hygienists	3,269	3,847	124
Paralegals and Legal Assistants	4,266	4,628	97
Aircraft Mechanics and Service Technicians	2,932	2,926	88
Welders, Cutters, Solderers, and Brazers	2,851	2,882	79
Veterinary Technologists and Technicians	1,100	1,645	73
Massage Therapists	2,506	2,813	72
Manicurists and Pedicurists	2,227	2,473	65
Bus and Truck Mechanics and Diesel Engine Specialists	2,107	2,293	65
Real Estate Sales Agents	2,255	2,383	64
Respiratory Therapists	1,360	1,678	58
Medical and Clinical Laboratory Technicians	1,826	2,045	58
Telecommunications Equipment Installers and Repairers, Except Line Installers	1,832	2,102	56
Biological Technicians	1,058	1,228	53
Medical Records and Health Information Technicians	1,420	1,641	50

Source: Connecticut Department of Labor

Exhibit 2.42: 2010-2020 Occupational Demand – South Central Workforce Investment Area

The South Central Workforce Investment Area closely mirrors MxCC's service area. Overall, the WIA is projected to have 12,091 annual openings due to replacement or job growth. The occupational clusters with the largest number of openings is projected to be in Office and Administrative Support Occupations, Sales and Related Occupations, Food Preparation, Education, and Healthcare Practitioners and Technical Occupations. Many of the jobs in office support and food preparation occupations do not require college credentials.

2010-2020 Occupational Demand - South Central Workforce Investment Area

Occupational Category	2010 Employment	2020 Projected Employment	Annual Growth Openings	Annual Openings Total
Total, All Occupations	359,316	395,136	3,781	12,091
Office and Administrative Support Occupations	55,109	57,901	395	1,572
Sales and Related Occupations	36,377	38,454	211	1,311
Food Preparation and Serving Related Occupations	25,789	27,984	223	1,163
Education, Training, and Library Occupations	33,692	38,172	448	1,147
Healthcare Practitioners and Technical Occupations	25,738	30,114	438	947
Personal Care and Service Occupations	15,177	18,836	368	707
Management Occupations	23,571	24,997	157	676
Transportation and Material Moving Occupations	18,090	19,774	169	612
Production Occupations	22,878	22,988	62	502
Business and Financial Operations Occupations	12,236	14,194	190	446
Construction and Extraction Occupations	12,104	13,757	165	426
Healthcare Support Occupations	12,608	14,889	228	405
Community and Social Service Occupations	9,967	11,802	183	398
Building and Grounds Cleaning and Maintenance Occupations	14,511	15,869	136	396
Installation, Maintenance, and Repair Occupations	12,159	12,996	86	361
Computer and Mathematical Occupations	5,983	7,174	119	237
Arts, Design, Entertainment, Sports, and Media Occupations	5,832	6,484	66	222
Protective Service Occupations	6,224	6,560	35	204
Life, Physical, and Social Science Occupations	3,044	3,691	64	143
Architecture and Engineering Occupations	4,990	5,080	18	132
Legal Occupations	2,598	2,673	7	53
Farming, Fishing, and Forestry Occupations	644	726	8	27

Source: CT Department of Labor

Exhibit 2.43: Degree and Certificate Completions for Connecticut State Colleges and Universities

The table lists 2011-2012 degree and certificate completions for Connecticut Public Colleges and Universities. Total public community college and MxCC completions are also listed. At the two year level, MxCC had the majority share of Communication Technologies and Biological Sciences awards. Precision Production awards at MxCC represents less than 1% of total awards by all Connecticut community colleges.

The large number of community college degrees in Engineering Technologies and Family and Consumer Science should be noted. Overall, MxCC's degrees have been awarded in the Liberal Arts and Sciences.

	2011-2012 Academic Year			
Discipline	Total CT State Colleges & Universities	Total CC Completions	MxCC Completions	% of CC Completions
Liberal Arts & Sciences/General Studies & Humanities	2983	2090	134	6.4%
Health Professions and Related Programs	1927	1338	60	4.5%
Business, Management, Marketing, and Related Services	2441	1169	56	4.8%
Homeland Security, Law Enforcement, Firefighting, and Protective Services	479	379	28	7.4%
Education	1768	248	15	6.0%
Visual & Performing Arts	471	196	12	6.1%
Communication, Journalism and Related Programs	465	66	11	16.7%
Communications Technologies/Technicians	7	7	5	71.4%
Biological and Biomedical Sciences	198	2	2	100.0%
Computer and Information Sciences	268	159	2	1.3%
Natural Resources & Conservation	12	12	1	8.3%
Precision Production	134	134	1	0.7%
Agriculture and Related Sciences	15	15	0	
Engineering	104	69	0	
Engineering Technologies and Related Fields	526	398	0	
English Language and Literature/Letters	346	2	0	
Family and Consumer Sciences/Human Sciences	193	112	0	
Foreign Languages, Literatures, and Linguistics	68	2	0	
Legal Professions & Studies	84	83	0	
Library Sciences	100	4	0	
Mechanic & Repair Technologies/Technicians	43	43	0	
Multi/Interdisciplinary Studies	52	24	0	
Parks, Recreation, Leisure and Fitness	124	37	0	
Personal and Culinary Services	69	69	0	
Physical Sciences	91	4	0	
Public Administration & Social Service Professions	295	69	0	
Science Technologies/Technicians	9	9	0	
Social Sciences	590	1	0	
Total		6742	327	

Source: Board of Regents of Higher Education

Using Statewide Connecticut Department of Labor (2010 to 2020) and Degree/Certificate completion data (SURDS, 2011-12), the following 14 tables provide detailed occupational data by cluster. The goal of these tables was to identify future programs for MxCC. In each table, Annual Growth is the projected growth due to the creation of new jobs while Total Growth is the sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.44: Detailed Occupational Projections – Health Professions and Related Programs.

The largest number of openings will be in the field of nursing. Medical Assistants and Secretaries will also be in strong demand. As some fields require credentialing, health jobs with high school requirements were also listed. Overall, demand at the state level far exceeds the supply of graduates.

Health Professions and Related Programs

Degree and Certificate Completions AY 2011-12			Total CC Completions	MxCC Completions			
			1338	60			
Soc Code	Occupational Title	Demand 2010	Demand 2020	% Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
29-1111	Registered Nurses	37,404	44,550	19.1	715	1,392	Associate's degree
31-1012	Nursing Aides, Orderlies, and Attendants	23,304	25,848	10.9	254	555	Postsecondary non-degree award
29-2061	Licensed Practical and Licensed Vocational Nurses	8,806	9,931	12.8	112	347	Postsecondary non-degree award
31-9092	Medical Assistants	6,642	8,267	24.5	162	264	High school diploma or equivalent
43-6013	Medical Secretaries	3,894	5,126	31.6	123	175	High school diploma or equivalent
29-2041	Emergency Medical Technicians and Paramedics	3,293	4,265	29.5	97	163	Postsecondary non-degree award
31-9091	Dental Assistants	4,149	4,667	12.5	52	139	Postsecondary non-degree award
29-2021	Dental Hygienists	3,269	3,847	17.7	58	124	Associate's degree
29-2052	Pharmacy Technicians	3,407	3,974	16.6	57	116	High school diploma or equivalent
29-2037	Radiologic Technologists and Technicians	2,409	2,985	23.9	58	95	Associate's degree
31-9799	Healthcare Support Workers, All Other	2,961	3,259	10.1	30	75	High school diploma or equivalent
29-2056	Veterinary Technologists and Technicians	1,100	1,645	49.5	54	73	Associate's degree
31-9011	Massage Therapists	2,506	2,813	12.3	31	72	Postsecondary non-degree award
29-1126	Respiratory Therapists	1,360	1,678	23.4	32	58	Associate's degree
29-2012	Medical and Clinical Laboratory Technicians	1,826	2,045	12.0	22	58	Associate's degree
29-2799	Health Technologists and Technicians, All Other	1,351	1,638	21.2	29	56	Postsecondary non-degree award
29-2071	Medical Records and Health Information Technicians	1,420	1,641	15.6	22	50	Postsecondary non-degree award
29-2032	Diagnostic Medical Sonographers	826	1,164	40.9	34	47	Associate's degree
29-2053	Psychiatric Technicians	1,284	1,434	11.7	15	37	Postsecondary non-degree award
31-1013	Psychiatric Aides	1,554	1,692	8.9	14	34	High school diploma or equivalent
29-2055	Surgical Technologists	1,007	1,140	13.2	13	31	Postsecondary non-degree award
31-2011	Occupational Therapy Assistants	616	813	32.0	20	30	Associate's degree
31-2022	Physical Therapist Aides	555	703	26.7	15	24	High school diploma or equivalent
31-9096	Veterinary Assistants and Laboratory Animal Caretakers	878	980	11.6	10	24	High school diploma or equivalent
31-2021	Physical Therapist Assistants	436	562	28.9	13	20	Associate's degree
29-2081	Opticians, Dispensing	714	767	7.4	5	19	High school diploma or equivalent
29-2031	Cardiovascular Technologists and Technicians	411	528	28.5	12	18	Associate's degree
31-9093	Medical Equipment Preparers	549	624	13.7	8	16	High school diploma or equivalent
29-2051	Dietetic Technicians	560	608	8.6	5	15	High school diploma or equivalent
29-2033	Nuclear Medicine Technologists	410	484	18.0	7	13	Associate's degree
31-9094	Medical Transcriptionists	802	811	1.1	1	13	Postsecondary non-degree award
39-4831	Funeral service managers, directors, morticians, undertakers	306	365	19.3	6	12	Associate's degree
51-9081	Dental Laboratory Technicians	388	383	-1.3	0	12	High school diploma or equivalent
31-9095	Pharmacy Aides	381	427	12.1	5	11	High school diploma or equivalent
51-9083	Ophthalmic Laboratory Technicians	309	315	1.9	1	11	High school diploma or equivalent
29-1124	Radiation Therapists	272	309	13.6	4	9	Associate's degree
29-9012	Occupational Health and Safety Technicians	158	174	10.1	2	8	High school diploma or equivalent
51-9082	Medical Appliance Technicians	245	244	-0.4	0	8	High school diploma or equivalent
39-4011	Embalmers	103	110	6.8	1	6	Postsecondary non-degree award
29-2054	Respiratory Therapy Technicians	107	108	0.9	0	2	Associate's degree
31-2012	Occupational Therapy Aides	60	70	16.7	1	2	High school diploma or equivalent
	Total in Category	**122,032**	**142,994**	**17.2%**	**2,100**	**4,234**	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.45: Detailed Occupational Projections – Business, Management, Marketing, and Related Services.

The largest number of opening will be in business supervisory and management positions. Administrative Assistants and office related workers will also be in demand. Again, demand exceeds supply of graduates.

Business, Management, Marketing, and Related Services

		Total CC Completions	MxCC Completions				
		1169	56				
Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
43-1011	First-Line Supervisors of Office and Administrative Support Workers	23,975	26,060	8.7	208	849	High school diploma or equivalent
11-1021	General and Operations Managers	29,624	29,713	0.3	9	560	Associate's degree
41-1011	First-Line Supervisors of Retail Sales Workers	22,041	22,343	1.4	30	544	High school diploma or equivalent
41-4012	Sales Representatives, Wholesale & Manufacturing, except Technical & Scientific	15,609	16,973	8.7	136	503	High school diploma or equivalent
43-6014	Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	32,506	32,926	1.3	42	478	High school diploma or equivalent
43-3031	Bookkeeping, Accounting, and Auditing Clerks	21,418	23,142	8.1	172	408	High school diploma or equivalent
43-6011	Executive Secretaries and Executive Administrative Assistants	13,294	14,156	6.5	86	264	High school diploma or equivalent
11-9199	Managers, All Other	9,642	10,086	4.6	44	258	High school diploma or equivalent
43-3071	Tellers	6,067	5,460	-10.0	0	249	High school diploma or equivalent
41-3021	Insurance Sales Agents	5,829	6,681	14.6	85	219	High school diploma or equivalent
41-3099	Sales Representatives, Services, All Other	5,189	5,506	6.1	32	184	High school diploma or equivalent
13-1199	Business Operations Specialists, All Other	7,497	7,780	3.8	28	172	High school diploma or equivalent
41-1012	First-Line Supervisors of Non-Retail Sales Workers	5,067	5,117	1.0	5	133	High school diploma or equivalent
13-1031	Claims Adjusters, Examiners, and Investigators	4,848	4,749	-2.0	0	124	High school diploma or equivalent
11-9141	Property, Real Estate, and Community Association Managers	5,334	5,458	2.3	12	124	High school diploma or equivalent
11-9021	Construction Managers	5,772	6,379	10.5	61	98	Associate's degree
13-2072	Loan Officers	2,106	2,274	8.0	17	71	High school diploma or equivalent
43-4071	File Clerks	2,579	2,387	-7.4	0	68	High school diploma or equivalent
41-9022	Real Estate Sales Agents	2,255	2,383	5.7	13	64	High school diploma or equivalent
41-3011	Advertising Sales Agents	1,700	1,770	4.1	7	59	High school diploma or equivalent
43-4161	Human Resources Assistants, Except Payroll and Timekeeping	1,645	1,734	5.4	9	55	High school diploma or equivalent
11-3011	Administrative Services Managers	4,074	4,473	399	9.8	40	High school diploma or equivalent
13-2082	Tax Preparers	591	630	6.6	4	17	High school diploma or equivalent
41-9021	Real Estate Brokers	654	672	2.8	2	17	High school diploma or equivalent
13-2021	Appraisers and Assessors of Real Estate	608	625	2.8	2	15	High school diploma or equivalent
41-3041	Travel Agents	1,104	1,059	-4.1	0	12	High school diploma or equivalent
13-1032	Insurance Appraisers, Auto Damage	180	155	-13.9	0	5	Postsecondary non-degree award
43-9022	Word Processors and Typists	929	815	-12.3	0	5	High school diploma or equivalent
	Total	232,137	241,506	4.0%	1,014	5,595	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.46: Detailed Occupational Projections – Education/Library Services

Childcare Workers and Teacher Assistants comprise the largest demand in the education cluster. Community Colleges typically offer some type of certification in these areas.

Education/Library Services

	Total CC Completions	MxCC Completions
	252	15

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
39-9011	Childcare Workers	15,534	18,984	22.2	345	834	High school diploma or equivalent
25-9041	Teacher Assistants	22,587	25,519	13.0	293	802	High school diploma or equivalent
25-2011	Preschool Teachers, Except Special Education	7,550	9,392	24.4	184	380	Associate's degree
25-3021	Self-Enrichment Education Teachers	2,408	2,853	18.5	44	81	High school diploma or equivalent
43-4121	Library Assistants, Clerical	1,361	1,464	7.6	10	71	High school diploma or equivalent
	Total	49,440	58,212	17.7%	876	2,168	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.47: Detailed Occupational Projections – Engineering Related

The engineering cluster contains a large number of jobs that require an Associate's degree. Total community college completions in 2011-12 exceeded demand in the cluster as annual growth is minimal through 2020. MxCC, with two completions, is not a significant producer of graduates in this occupational cluster.

Engineering
Engineering Technologies and Related Fields
Physical Sciences
Science Technologies/Technicians
Biological and Biomedical Sciences

Degree and Certificate Completions AY 2011-12	Total CC Completions	MxCC Completions
	482	2

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
17-3013	Mechanical Drafters	2,147	2,185	1.8	4	46	Associate's degree
19-4099	Life, Physical, and Social Science Technicians, All Other	499	616	23.5	12	33	Associate's degree
17-3023	Electrical and Electronics Engineering Technicians	1,620	1,536	-5.2	0	31	Associate's degree
17-3026	Industrial Engineering Technicians	1,108	1,172	5.8	6	27	Associate's degree
19-4091	Environmental Science and Protection Technicians, Including Health	516	557	7.9	4	26	Associate's degree
17-3027	Mechanical Engineering Technicians	1,042	1,008	-3.3	0	20	Associate's degree
19-4031	Chemical Technicians	620	675	8.9	6	15	Associate's degree
17-3011	Architectural and Civil Drafters	706	629	-10.9	0	14	Associate's degree
17-3029	Engineering Technicians, Except Drafters, All Other	483	501	3.7	2	11	Associate's degree
17-3012	Electrical and Electronics Drafters	498	486	-2.4	0	10	Associate's degree
17-3022	Civil Engineering Technicians	402	409	1.7	1	9	Associate's degree
17-3025	Environmental Engineering Technicians	215	249	15.8	3	7	Associate's degree
17-3031	Surveying and Mapping Technicians	295	309	4.8	1	7	High school diploma or equivalent
17-3024	Electro-Mechanical Technicians	238	220	-7.6	0	5	Associate's degree
17-3021	Aerospace Engineering and Operations Technicians	142	122	-14.1	0	3	Associate's degree
19-4093	Forest and Conservation Technicians	67	71	6.0	0	3	Associate's degree
17-3019	Drafters, All Other	128	111	-13.3	0	2	Associate's degree
	Total	10,726	10,856	1.2%	39	269	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.48: Detailed Occupational Projections – Visual Arts

The visual arts cluster contains a variety of jobs that are in line with MxCC's new Digital Media program. Total community college completions in 2011-12 exceed demand in the cluster, but many of these students go on to pursue a Bachelor's degree.

Visual & Performing Arts
Communication, Journalism and Related Programs
Communications Technologies/Technicians

		Total CC Completions	MxCC Completions
		648	56

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
27-2042	Musicians and Singers	3,296	3,539	7.4	24	104	High school diploma or equivalent
27-4011	Audio and Video Equipment Technicians	927	1,102	18.9	18	44	Postsecondary non-degree award
27-2032	Choreographers	442	547	23.8	10	27	High school diploma or equivalent
27-1023	Floral Designers	847	838	-1.1	0	26	High school diploma or equivalent
27-4021	Photographers	1,199	1,289	7.5	9	21	High school diploma or equivalent
27-4012	Broadcast Technicians	478	541	13.2	6	20	Associate's degree
27-2011	Actors	468	526	12.4	6	18	Some college, no degree
27-4014	Sound Engineering Technicians	262	323	23.3	6	14	Postsecondary non-degree award
27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	480	499	4.0	2	14	High school diploma or equivalent
27-3099	Media and Communication Workers, All Other	240	267	11.3	3	9	High school diploma or equivalent
27-4099	Media and Communication Equipment Workers, All Other	137	160	16.8	2	4	High school diploma or equivalent
27-1012	Craft Artists	84	91	8.3	1	3	High school diploma or equivalent
27-1019	Artists and Related Workers, All Other	118	122	3.4	0	3	High school diploma or equivalent
27-1022	Fashion Designers	58	65	12.1	1	3	High school diploma or equivalent
27-2031	Dancers	60	70	16.7	1	3	High school diploma or equivalent
43-9031	Desktop Publishers	134	103	-23.1	0	2	Associate's degree
27-2099	Entertainers and Performers, Sports and Related Workers, All Other	55	60	9.1	0	2	High school diploma or equivalent
	Total	9,285	10,142	9.2%	89	317	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized

Exhibit 2.49: Detailed Occupational Projections – Computer and Information Sciences

The overwhelming position in this category is in Computer Support Specialist. Statewide demand is greater than the number of completions. MxCC, with two completions in 2011-12, is looking more closely at this category.

Computer and Information Sciences

		Total CC Completions	MxCC Completions
		159	2

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required	Work Experience
15-1150	Computer Support Specialists	8,759	10,137	15.7	138	368	Some college, no degree	None
43-9011	Computer Operators	889	792	-10.9	0	8	High school diploma or equivalent	None
	Total	9,648	10,929		138	376		

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.50: Detailed Occupational Projections – Family and Consumer Sciences/Human Sciences/ Social Services

The overwhelming need in this category is for Social and Human Services Assistants. Most community colleges offer a certificate degree in this program area. Jobs that require an Associate's degree do not have a large employment demand through 2020.

Family and Consumer Sciences/Human Sciences
Public Administration & Social Service Professions
Social Sciences

		Total CC Completions	MxCC Completions				
		182	27				
Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
21-1093	Social and Human Service Assistants	8,706	10,401	19.5	170	358	Postsecondary non-degree award
21-1011	Substance Abuse and Behavioral Disorder Counselors	2,389	2,813	17.8	42	93	High school diploma or equivalent
43-4061	Eligibility Interviewers, Government Programs	739	756	2.3	2	22	Associate's degree
19-4061	Social Science Research Assistants	60	79	31.7	2	4	Associate's degree
	Total	**11,894**	**14,049**	**18.1%**	**216**	**477**	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.51: Detailed Occupational Projections – Precision Production

The overwhelming need in this category is for Machinists and HVAC mechanics and installers. Several Connecticut community colleges have started programs to address this need. MxCC, with a precision machining laboratory, could see additional demand. Many of the jobs that require a Postsecondary non-degree award are offered outside of the community college credit system and are offered through Continuing Education.

Precision Production
Mechanic & Repair Technologies/Technicians

		Total CC Completions	MxCC Completions				
		177	1				
Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
51-4041	Machinists	8,323	8,844	6.3	52	205	High school diploma or equivalent
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	3,879	4,574	17.9	70	139	Postsecondary non-degree award
51-1011	First-Line Supervisors of Production and Operating Workers	8,408	8,234	-2.1	0	110	Postsecondary non-degree award
49-3011	Aircraft Mechanics and Service Technicians	2,932	2,926	-0.2	0	88	Postsecondary non-degree award
51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	2,101	2,344	11.6	24	64	High school diploma or equivalent
49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	1,832	2,102	14.7	27	56	Postsecondary non-degree award
49-2011	Computer, Automated Teller, and Office Machine Repairers	1,591	1,617	1.6	3	42	Postsecondary non-degree award
51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	1,144	940	-17.8	0	42	High school diploma or equivalent
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	1,252	1,394	11.3	14	38	High school diploma or equivalent
47-4011	Construction and Building Inspectors	797	864	8.4	7	31	High school diploma or equivalent
49-2091	Avionics Technicians	821	815	-0.7	0	20	Postsecondary non-degree award
49-9062	Medical Equipment Repairers	348	430	23.6	8	18	Associate's degree
49-2097	Electronic Home Entertainment Equipment Installers and Repairers	358	414	15.6	6	15	Postsecondary non-degree award
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	578	579	0.2	0	14	Postsecondary non-degree award
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	550	497	-9.6	0	10	High school diploma or equivalent
51-5111	Prepress Technicians and Workers	381	283	-25.7	0	9	Postsecondary non-degree award
49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles	309	277	-10.4	0	8	Postsecondary non-degree award
51-4012	Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic	355	363	2.3	1	8	High school diploma or equivalent
49-9061	Camera and Photographic Equipment Repairers	197	197	0.0	0	5	Associate's degree
49-9069	Precision Instrument and Equipment Repairers, All Other	154	166	7.8	1	5	Associate's degree
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	177	163	-7.9	0	4	Postsecondary non-degree award
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	128	129	0.8	0	3	Postsecondary non-degree award
49-2092	Electric Motor, Power Tool, and Related Repairers	106	115	8.5	1	2	Postsecondary non-degree award
49-9063	Musical Instrument Repairers and Tuners	57	57	0.0	0	2	Postsecondary non-degree award
	Total	**16,168**	**16,672**	**3.1%**	**92**	**484**	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.52: Detailed Occupational Projections – Law Enforcement/Protective Services

The largest demand will be for Security Guards, Police and Sheriff's Patrol Officers, and Firefighters. Connecticut community colleges are awarding multiple certifications in this area, including MxCC.

Homeland Security, Law Enforcement, Firefighting, and Protective Services

		Total CC Completions	MxCC Completions
		379	28

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
33-9032	Security Guards	11,349	12,006	5.8	66	246	High school diploma or equivalent
33-3051	Police and Sheriff's Patrol Officers	6,499	6,865	5.6	37	228	High school diploma or equivalent
33-2011	Firefighters	3,351	3,536	5.5	18	111	Postsecondary non-degree award
33-3012	Correctional Officers and Jailers	3,207	3,347	4.4	14	70	High school diploma or equivalent
33-9099	Protective Service Workers, All Other	696	750	7.8	5	50	High school diploma or equivalent
33-1012	First-Line Supervisors of Police and Detectives	1,225	1,238	1.1	1	43	High school diploma or equivalent
33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	776	815	5.0	4	40	Postsecondary non-degree award
33-3021	Detectives and Criminal Investigators	915	933	2.0	2	22	High school diploma or equivalent
33-9021	Private Detectives and Investigators	555	621	11.9	7	19	Some college, no degree
33-1099	First-Line Supervisors of Protective Service Workers, All Other	549	552	0.6	0	19	High school diploma or equivalent
33-1011	First-Line Supervisors of Correctional Officers	395	412	4.3	2	16	High school diploma or equivalent
33-2021	Fire Inspectors and Investigators	379	400	5.5	2	12	High school diploma or equivalent
33-9093	Transportation Security Screeners (Federal Only)	304	291	-4.3	0	4	High school diploma or equivalent
33-3031	Fish and Game Wardens	83	86	3.6	0	2	High school diploma or equivalent
33-9031	Gaming Surveillance Officers and Gaming Investigators	51	52	2.0	0	1	High school diploma or equivalent
	Total	30,334	31,904	5.2%	158	883	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.53: Detailed Occupational Projections – Personal and Culinary Services

The largest demand will be for cosmetologists and supervisors/managers of service related businesses. Community colleges often offer non-credit or continuing educational courses in management to service professionals. The need for culinary trained chefs and cooks is minimal through 2020.

Personal and Culinary Services

		Total CC Completions	MxCC Completions
		69	0

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
39-5012	Hairdressers, Hairstylists, and Cosmetologists	10,467	11,505	9.9	104	304	Postsecondary non-degree award
35-1012	First-Line Supervisors of Food Preparation and Serving Workers	7,677	8,308	8.2	63	226	High school diploma or equivalent
39-1021	First-Line Supervisors of Personal Service Workers	4,321	4,663	7.9	34	139	High school diploma or equivalent
11-9051	Food Service Managers	3,693	3,524	-4.6	0	68	High school diploma or equivalent
39-5092	Manicurists and Pedicurists	2,227	2,473	11.1	25	65	Postsecondary non-degree award
35-1011	Chefs and Head Cooks	2,285	2,235	-2.2	0	41	High school diploma or equivalent
39-5094	Skincare Specialists	1,035	1,225	18.4	19	38	Postsecondary non-degree award
39-9099	Personal Care and Service Workers, All Other	944	1,029	9.0	8	28	High school diploma or equivalent
39-5011	Barbers	989	1,015	2.6	3	21	Postsecondary non-degree award
11-9081	Lodging Managers	505	542	7.3	4	18	High school diploma or equivalent
35-2013	Cooks, Private Household	220	253	15.0	3	8	Postsecondary non-degree award
	Total	34,363	36,772	7.0%	263	956	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.54: Detailed Occupational Projections – Legal Professions and Studies

The largest demand will be for Paralegals and Legal Assistants, which typically requires an Associate's degree. Community Colleges are meeting the majority of demand in this area.

Legal Professions & Studies

Total CC Completions	MxCC Completions
83	0

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
23-2011	Paralegals and Legal Assistants	4,266	4,628	8.5	36	97	Associate's degree
43-6012	Legal Secretaries	2,302	2,179	-5.3	0	31	High school diploma or equivalent
23-2091	Court Reporters	217	244	12.4	3	6	Postsecondary non-degree award
23-2099	Legal Support Workers, All Other	351	364	3.7	1	6	High school diploma or equivalent
23-2093	Title Examiners, Abstractors, and Searchers	84	75	-10.7	0	1	High school diploma or equivalent
	Total	**7,220**	**7,490**	**-4%**	**40**	**141**	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Exhibit 2.55: Detailed Occupational Projections – Transportation & Materials Moving

An often ignored occupational cluster for community colleges. The greatest educational demand is for supervisors and managers, which can be offered through non-credit programs and online courses.

Transportation & Materials Moving

Total CC Completions	MxCC Completions
1	0

Soc Code	Occupational Title	Demand 2010	Demand 2020	%Change in Employment	Annual Growth	Total Annual Growth	Minimum Education Required
53-1021	First-Line Supervisors of Helpers, Laborers, and Material Movers, Hand	2,264	2,720	20.1	46	93	High school diploma or equivalent
53-1031	First-Line Supervisors of Transportation and Material-Moving Machine and Vehicle Operators	2,001	2,151	7.5	15	56	High school diploma or equivalent
11-3071	Transportation, Storage, and Distribution Managers	1,440	1,539	6.9	10	45	High school diploma or equivalent
43-5011	Cargo and Freight Agents	317	392	23.7	8	16	High school diploma or equivalent
53-2012	Commercial Pilots	317	338	6.6	2	14	Postsecondary non-degree award
53-6051	Transportation Inspectors	185	195	5.4	1	5	Some college, no degree
53-2021	Air Traffic Controllers	87	84	-3.5	0	3	Associate's degree
	Total	**5,705**	**6,410**	**12.4%**	**71**	**194**	

Source: Connecticut Department of Labor, Office of Research

Legend

Annual Growth: Annual Projected Growth of Employment

Total Growth: The sum of growth and the expected number of replacement workers needed due to retirement, family reasons, health or who may switch careers, annualized.

Occupational Summary

In reviewing the various tables, several trends can be observed for MxCC. Growth clusters include:

- **Health Occupations** – Continued demand for health care workers. Pharmacy Technicians, EMT's, Radiologic Technicians, Medical Lab Technicians, Surgical Technicians, Health Information Technologists, Mortuary Science, Vet Tech's, Gerontology
- **Office Support** – Increases in job demand as businesses grow
- **Manufacturing** – Growth for trained workers based on state initiatives
- **Chemistry and Biology** – Area of national focus and connections to health care and emerging technologies
- **Hospitality** – Lifestyle trends combined with sustained growth in job demand
- **Mid-Level Managers** – Knowledgeable in business sector with liberal arts background and soft skills to communicate effectively

Other trends include:

- Energy and Sustainability – Green Jobs
- Technology – Biotechnology, Green Technology
- Global Competency – Business Practices, Cultural Competencies, Global Awareness
- Possible niche specialization in several key areas:
    - Criminal Justice – Forensics, Intelligence Analysis, Computer Crime
    - Business – Salesmanship, Supervision, Middle Management, Small Business, Quality Processes, Customer Service, Leadership, Retail, Insurance Specialist
- "Recognition Awards" – Recognition award upon completing a group of specialized courses in a given area.

CLASSROOM & TEACHING LABORATORY ANALYSIS

The utilization of classrooms and teaching laboratories was examined using the MxCC Fall 2013 course file and facility data. The utilization analysis includes scheduled classroom use by day and time of day, as well as classroom and teaching laboratory utilization analyzing average weekly room hour use and student station occupancy percentage. This information was used to guide the space needs analysis component in the master planning process. The analysis also demonstrates the efficiency and effectiveness of which MxCC is using its academic resources.

The utilization of a room is determined by calculating the average enrollment of the courses taught in a room along with total weekly student contact hours, weekly room hours, and student station occupancy percentage. Weekly student contact hours are calculated by multiplying the enrollment of a course by the weekly contact, or room hours, during which the course is held. Weekly room/contact hours are determined by calculating the number of hours a course meets (start and end times) and multiplying the result by the number of days the course meets each week. Both of these factors are totaled on a room-by-room basis. If a course does not meet for a full term, the number of hours for a room is prorated by the number of weeks in a semester.

The student station occupancy for a room is determined by dividing the rooms weekly student contact hours by the room's weekly student contact hour capacity (a course's weekly contact hours times the room's number of student stations). This study did not include an analysis of space quality, sight lines, acoustics, or equipment in the rooms.

WEEKLY ROOM/CONTACT HOURS (WRH OR WCH) = No. of Days X ((End Time - Start Time)/60)
WEEKLY STUDENT CONTACT HOURS (WSCH) = Students X Weekly Room/Contact Hours
WEEKLY STUDENT CONTACT HOUR CAPACITY = Student Stations X Weekly Room/Contact Hours
STUDENT STATION OCCUPANCY % = WSCH / WSCH Capacity
HOURS PER SEAT = WSCH / No. of Student Stations

CLASSROOM UTILIZATION

Scheduled Classroom Use by Day/Hour

The analysis included scheduled credit related courses. Non-credit utilization is noted at the end of this section.

At MxCC, classrooms used for credit and credit-free instruction are more heavily utilized on Tuesday and Wednesday, as noted by the darker shaded areas of the Exhibit CU-1. The table notes both the number and Percentage (%) of classrooms in use each day of the week in half hour increments. Scheduled use is heaviest during mid-morning, mid-afternoon and early evening. Both Friday and Saturday show limited use compared to Monday–Thursday

The table also notes the average scheduled classroom use by day and hour. The average percent of classrooms in use is based on Monday through Friday, and excludes Saturday. If Saturday were included, the average would be distorted because many courses are scheduled Monday/Wednesday/Friday and Tuesday/Thursday blocks.

EXHIBIT CU-1

Scheduled Classroom Use by Day and Time

(Darker colors indicate a large percentage of rooms are scheduled.)

Time of Day	Monday		Tuesday		Wednesday		Thursday		Friday		Saturday		Sunday		Average	
	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use	Rooms in Use	% In Use
8:00 AM	11	69%	10	63%	11	69%	7	44%	1	6%	1	6%	0	0%	8	50%
9:00 AM	16	100%	14	88%	15	94%	11	69%	12	75%	3	19%	0	0%	14	85%
10:00 AM	14	88%	14	88%	13	81%	11	69%	12	75%	3	19%	0	0%	13	80%
11:00 AM	14	88%	13	81%	13	81%	11	69%	12	75%	3	19%	0	0%	13	79%
12:00 PM	14	88%	16	100%	13	81%	15	94%	4	25%	1	6%	0	0%	12	78%
1:00 PM	14	88%	14	88%	15	94%	12	75%	3	19%	1	6%	0	0%	12	73%
2:00 PM	14	88%	13	81%	15	94%	11	69%	3	19%	1	6%	0	0%	11	70%
3:00 PM	7	44%	13	81%	7	44%	12	75%	1	6%	0	0%	0	0%	8	50%
4:00 PM	3	19%	5	31%	4	25%	5	31%	0	0%	0	0%	0	0%	3	21%
5:00 PM	8	50%	6	38%	8	50%	4	25%	0	0%	0	0%	0	0%	5	33%
6:00 PM	10	63%	7	44%	8	50%	5	31%	0	0%	0	0%	0	0%	6	38%
7:00 PM	8	50%	9	56%	6	38%	8	50%	0	0%	0	0%	0	0%	6	39%
8:00 PM	6	38%	8	50%	6	38%	8	50%	0	0%	0	0%	0	0%	6	35%
9:00 PM	3	19%	4	25%	4	25%	5	31%	0	0%	0	0%	0	0%	3	20%
10:00 PM	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%

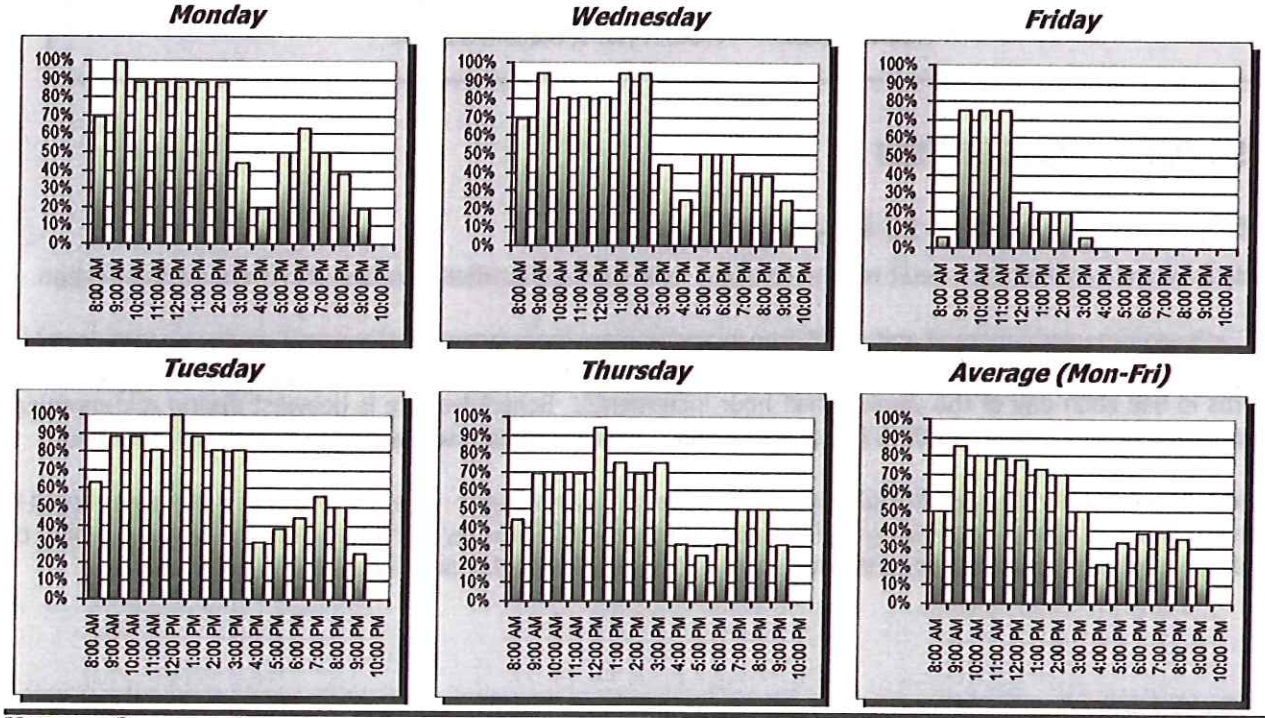
Total classrooms = 16

For the Fall 2013 semester, the heaviest classroom use occurred at 9:00 AM on Mondays and Noon on Tuesdays with 100% of the 16 classrooms in use.

On average, classroom use was heaviest between 8:00 AM and 2:00 PM on Mondays and Wednesdays. Use drops between 3:00 PM and 4:00 PM, but increase for evening classes. Tuesdays and Thursdays had a similar use patterns with high classroom demand until 3:00 PM. Similarly, the average drops during the late afternoon hour (4:00 PM) but increases again by 6:00 PM as the college transitions to evening students. On average, evening use was about 50% of day use. Exhibit CU-2 illustrates the scheduled classroom use by hour for each day of the week for credit courses.

EXHIBIT CU-2

Percent of Classrooms In Use



Classroom Utilization by Building

During Fall 2013, the 16 active classrooms on the MxCC Campus averaged 33 hours of scheduled use per week, at 64% student station occupancy, with an average of 19 ASF per station (see Exhibit CU-3 below). Student station occupancy is defined as the number of seats occupied when the classroom is in use. The average scheduled use per week ranges from 38 weekly room hours in Snow Hall to 29 weekly room hours in Wheaton and Chapman Halls. During the Fall 2013 semester, several classrooms in Chapman Hall were under renovation as part of the Center for New Media program relocation and were not part of the utilization analysis.

EXHIBIT CU-3

Classroom Utilization Analysis by Building

Room Id	Room Use Code	Assignable Sq. Ft.	No. of Stations	Assignable Sq. Ft. Per Station	Average Enrollment	Weekly Student Contact Hours	Weekly Seat Hours	Weekly Room Hours	Hours in Use Student Station Occupancy %
Chapman Hall									*No. of Rooms = 3*
CHAP 605	110	1,076	60	18	22	586	9.8	26	37%
CHAP 606	110	512	30	17	22	635	21.2	29	73%
CHAP 613	110	628	25	25	15	542	21.7	32	68%
Average		*738*	*38*	*20*	*20*		*15.3*	*29*	*60%*
Total		*2,215*	*115*			*1,763*		*88*	
Snow Hall									*No. of Rooms = 7*
SNOW 415	110	744	35	21	22	898	25.7	41	62%
SNOW 504	110	576	36	16	18	581	16.1	31	53%
SNOW 505	110	744	42	18	22	917	21.8	41	54%
SNOW 506	110	593	36	16	21	852	23.7	40	59%
SNOW 507	110	579	36	16	21	739	20.5	35	59%
SNOW 509	110	669	42	16	29	1,196	28.5	42	68%
SNOW 521	110	667	42	16	30	1,057	25.2	35	72%
Average		*653*	*38*	*17*	*23*		*23.2*	*38*	*61%*
Total		*4,573*	*269*			*6,240*		*264*	
Wheaton Hall									*No. of Rooms = 6*
WHEAT 204	110	799	32	25	23	619	19.4	27	72%
WHEAT 205	110	510	28	18	19	404	14.4	21	70%
WHEAT 210A	110	500	24	21	18	530	22.1	29	76%
WHEAT 309	110	582	30	19	18	669	22.3	37	61%
WHEAT 311	110	676	32	21	23	909	28.4	40	71%
WHEAT 312	110	590	34	17	25	571	16.8	23	73%
Average		*610*	*30*	*20*	*21*		*20.6*	*29*	*70%*
Total		*3,657*	*180*			*3,702*		*176*	
AVERAGE		**653**	**35**	**19**	**22**		**20.8**	**33**	**64%**
TOTAL		**10,445**	**564**			**11,705**		**528**	
NO. OF ROOMS		**16**							

The average student station occupancy numbers are less consistent and range from 37% to 73%. The average ASF per station ranges from 16 to 25 ASF with an overall average of 19 ASF. The 19 ASF/student station average for the campus is lower than typically found in community colleges. This is due to the number of classrooms that contain tablet arm chairs.

Classroom Utilization Analysis by Room Capacity

Reviewing Exhibit CU-4: Classroom Utilization Analysis by Capacity Summary, the rooms are distributed in various groupings based on the number of seats or stations in each room

There were four classrooms with 31-35 stations. These rooms averaged 33 weekly rooms hours at 69% student station occupancy. There is only one classroom with capacity greaer than 51 stations. This room generated the lowest use with an average of 26 weekly room hours and 37% student station occupancy. Given a course section size of 22, this room was about half filled during schedule instruction.

EXHIBIT CU-4

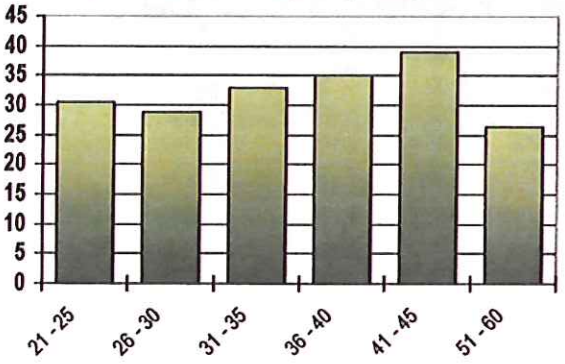
Classroom Utilization Analysis by Capacity Summary

Classroom Capacity Grouping	No. of Rooms	No. of Seats	Average Room Size	Average ASF per Station	Average Section Size	Weekly Seat Hours	Average Weekly Room Hours	Hours in Use Student Station Occupancy %
21 - 25	2	49	564	23	16	21.9	31	72%
26 - 30	3	88	534	18	20	19.4	29	67%
31 - 35	4	133	702	21	23	22.5	33	69%
36 - 40	3	108	583	16	20	20.1	35	57%
41 - 45	3	126	694	17	27	25.2	39	64%
51 - 60	1	60	1,076	18	22	9.8	26	37%
Total No. of Rooms = 16	**AVERAGE**		**653**	**19**	**22**	**20.8**	**33**	**64%**

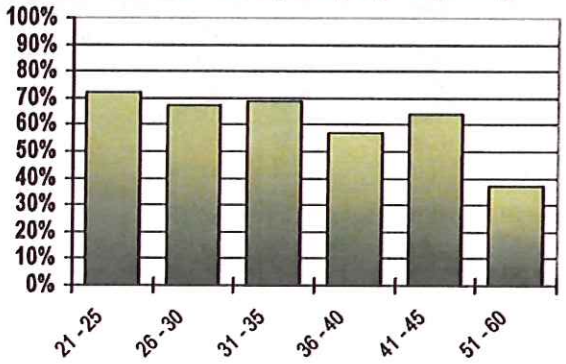
Typically, past studies of community college utilization by capacity have shown that smaller classrooms are not scheduled as much as the larger classrooms, so as the capacity of the classrooms increase, so do the weekly room hours (see Exhibit CU-5 below). Overall, this pattern is mostly supported at MxCC. Conversely, smaller classrooms tend to have a greater student station occupancy ratio while the larger rooms have a lower student station occupancy ratio. This pattern generally holds true for the MxCC Campus, as noted in the right graph in Exhibit CU-5.

EXHIBIT CU-5

Weekly Room Hours by Capacity:



Student Station Occupancy by Capacity:



National Perspective on Classroom Utilization

Approximately half the United States either has a statewide utilization expectation, or there are specific expectations in one or more of their public higher education systems. The lowest classroom utilization guideline currently in use is approximately 30 hours per week. This figure used to be a widely accepted standard and remains one of the most commonly used figures today. In many jurisdictions it was based on day usage only with evening and weekend usage being excluded from the expectation. More recently, common practice has been using this guideline as a full day expectation.

In a few states (Arizona and Colorado) much higher utilization targets have been adopted. The average of those systems which have classroom utilization guidelines is now 42 weekly room hours as states monitor the efficiently of physical resources.

The consultant has performed utilization studies for more the 150 campuses. The most common findings are between 30 and 50 average weekly room hours with a median of 32 hours per week, specifically for scheduled use of credit instruction.

The second utilization factor which is normally part of the utilization expectation in jurisdictions that have adopted guidelines, is the percentage of seats filled when the rooms are in use. The most widely used guideline remains at 60%. There has recently been a strong push to increase the utilization factor above 65%. One jurisdiction, the Colorado Community College System has recently adopted a guideline of 68% student station occupancy.

In the many studies the consultant has conducted, the actual occupancy use tends to be lower. Because institutions do not ultimately control the final enrollment in a specific course, there will always be a degree of disparity between estimated course size and the actual size of the course.

MxCC Classroom Utilization Analysis Summary

Compared to national classroom guidelines, the utilization of classrooms at the MxCC campus (33 weekly room hours at 64% Student Station Occupancy) is in line with most published utilization guidelines. While the findings indicate that there are times of the day where classrooms have no capacity for additional use, the results also show that there is some room for additional capacity, especially during evenings, and on Fridays and Saturdays. Unfortunately, these are difficult time slots to fill due to work and family characteristics of the community college student population.

The low student station occupancy of the one larger classroom signals that this room is not being used to capacity. Overall, MxCC may not have the correct mix of classrooms to serve its needs, and therefore has to use the classrooms that are not the appropriate size for a course section.

There are a variety of reasons why some classrooms are used heavily and others are not. Classroom utilization needs to be considered within the context of the existing classrooms educational adequacy and functionality, available technology, and overall qualitative assessment, which were not components of this analytical utilization study.

TEACHING LABORATORY UTILIZATION

During the Fall 2013 semester there were 13 rooms classified as teaching laboratories within the MxCC facilities inventory on the Middletown campus. Similar to classrooms, several laboratories were under renovation for part of the semester to create a new home for the Center for New Media. As Exhibit LU-1 indicates, the teaching laboratories averaged 19 weekly room hours at 81% student station occupancy.

EXHIBIT LU-1

Teaching Laboratory Utilization Analysis by Building

Room Id	Room Use Code	Assignable Sq. Ft.	No. of Stations	Assignable Sq. Ft. Per Station	Average Enroll-ment	Weekly Student Contact Hours	Weekly Seat Hours	Weekly Room Hours	Hours in Use Student Station Occupancy %
Snow Hall									*No. of Rooms = 6*
SNOW 406	210	393	20	20	19	470	23.5	25	96%
SNOW 408	210	763	18	42	13	102	5.7	8	73%
SNOW 409	210	976	24	41	16	243	10.1	15	70%
SNOW 410	210	682	24	28	18	264	11.0	15	73%
SNOW 413A	210	584	22	27	16	508	23.1	32	73%
SNOW 413B	210	417	20	21	17	400	20.0	23	87%
Average		*636*	*21*	*30*	*16*		*15.5*	*19*	*80%*
Total		*3,816*	*128*			*1,988*		*116*	
Wheaton Hall									*No. of Rooms = 7*
WHEAT 206	210	656	16	41	12	144	9.0	12	75%
WHEAT 210B	210	993	24	41	23	210	8.8	9	97%
WHEAT 213A	210	1,352	24	56	21	567	23.6	27	88%
WHEAT 221	210	1,353	24	56	23	138	5.8	6	96%
WHEAT 305A	210	678	24	28	16	231	9.6	15	64%
WHEAT 306	210	746	28	27	24	727	26.0	30	85%
WHEAT 308	210	915	31	30	24	816	26.3	35	76%
Average		*956*	*24*	*40*	*20*		*16.6*	*19*	*81%*
Total		*6,694*	*171*			*2,833*		*134*	
AVERAGE		**808**	**23**	**35**	**19**		**16.1**	**19**	**81%**
TOTAL		**10,510**	**299**			**4,821**		**250**	
NO. OF ROOMS		**13**							

On average, weekly hour lab hour usage in Snow and Wheaton Halls was identical at 19 hours per week. The average student station occupancy ranged from 64% to 96% with an average of 81% across all disciplines and programs.

The ASF per station was somewhat low (35 ASF/station) indicating that laboratories require additional program and preparation space. This is evident in physical science laboratories based on visual observation.

National Perspective on Teaching Laboratory Utilization

As with classroom utilization, guideline targets are usually implemented by states, systems, or institutions within the public higher education sector. These targets tend to oversimplify the use of teaching laboratories. Some guideline targets are based on a discipline while others are based on the intensity in which a discipline relies on laboratories for instructional delivery.

The most-used guideline targets have expectations of 20 hours per week with an 80% student station occupancy rate. In an effort to increase the use of its laboratories, one community college system has raised laboratory utilization goals to 28 hours per week at 80% student station occupancy.

While 80% student station occupancy is the most used rate in guideline targets, most community colleges have difficulty achieving it. In reality, occupancy averages that the consultants' have studied typically range between 68% and 76%.

Teaching laboratory usage has as much to do with course level, instructional methods, and outside student activities and capstone experiences, as it does discipline type. It is not unusual to find lower scheduled use (ten hours and under) in some specialized program laboratories. On the other hand, entry level laboratories can have much higher levels of scheduled use – 30 hours or more.

Laboratory utilization can be more difficult to measure through standardized course data. Many laboratories are also used for student research activities or homework or group projects and have very low regularly scheduled use. Laboratories have additional time demands that classrooms typically do not have. For example, there is setup and preparation time required, sometimes for a class, sometimes for the day. Other laboratories require an experiment to stay set up for multiple lab sessions or the entire semester which excludes the room from other types of scheduled activity.

Teaching Laboratory Summary

Dedicated teaching laboratories at MxCC averaged 19 weekly room hours at 81% student station occupancy, suggesting that laboratories are being utilized at or lower than most state guidelines. The student station occupancy of most science laboratories appeared to be higher than established guidelines of 80%, indicating that most labs were at or approaching capacity.

It must be noted that many of the computer laboratories were being used more than 28 hours per week.

Given the consultant's experience, a range of 20 to 28 hours per week is adequate depending on the discipline. For certain disciplines in which a variety of laboratories are needed, it is very difficult to achieve more than 28 hours of weekly use. These disciplines include but are not limited to Art, certain Sciences, and engineering-type programs. These lower utilization expectations account for the time needed by students to perform lab-based assignments with equipment or software not available in other locations on the campus.

CONTINUING EDUCATION PROGRAMS

Continuing Education (CE) is a core mission of the community college. Non-credit courses are offered to "lifelong learners" who enjoy exploring different topics and interests. Many enroll to improve job skills or even find a new career. MxCC's Continuing Education's non-credit programs offer numerous opportunities for year-round personal and professional development. Continuing Education offers the depth of programming, flexibility of delivery, and customized content for area residents.

Day and Evening Use with CE/CS Hours

Short Duration Courses							
CRN	Building	Room	Days	Start Time	End Time	CE Weekly Hours	CE Normalized Weekly Hours
1718	Chapman	606	MW	8:00 AM	11:30 AM	7	2.6
1724	Chapman	606	MW	5:00 PM	7:40 PM	6	2.6
3703	Chapman	606	MW	6:00 PM	9:00 PM	6	4.1
1741	Chapman	606	TR	7:00 PM	10:00 PM	6	3.8
1751	Chapman	606	S	9:00 AM	2:00 PM	5	2.5
						30	15.6
1709	Snow	406	TRF	1:00 PM	4:00 PM	9	0.9
1708	Snow	419	MTWRF	1:00 PM	4:00 PM	15	1.7
1706	Snow	419	MTWRF	9:30 AM	12:30 PM	15	1.4
1707	Snow	419	TR	1:00 PM	4:00 PM	6	0.5
1707	Snow	509	MWF	1:00 PM	4:00 PM	9	0.7
1721	Snow	521	MW	5:00 PM	7:40 PM	6	2.6
1709	Snow	413B	MW	1:00 PM	4:00 PM	6	0.6
						66	8.3
1731	Wheaton	306	MTWRF	9:00 AM	10:20 AM	7.5	0.9
1743	Wheaton	309	MW	7:00 PM	9:00 PM	4	2.1
1747	Wheaton	311	MW	7:00 PM	9:00 PM	4	2.3
1752	Wheaton	305A	R	5:30 PM	8:20 PM	3	2.8
						18.5	8.1

One-Day Classes							
CRN	Building	Room	Days	Start	End	CE Weekly Hours	CE Weekly Hours
1737	Chapman	808D	W	9:30 AM	12:00 PM	2.5	N/A
1738	Chapman	808D	M	5:30 PM	8:00 PM	2.5	N/A
1739	Chapman	808D	W	9:30 AM	2:00 PM	4.5	N/A
						9.5	0

CE also offers a wide range of professional development and workforce training programs. These include brief courses in improving a specific skill, state certifications in healthcare, and longer-term technical certificates. In addition, over 500 online courses are offered every month. However, many of these customized training programs are conducted at the employer's site or online, requiring no on-campus physical resources.

Continuing Education has courses that are offered at the Middletown Campus and the Meriden Center, and as such, require appropriate space. Courses are often scheduled after credit-producing classes are scheduled. Since classes have different start and stop dates, they typically fill academic space as it is available. With the exception of larger community colleges in highly urbanized areas, classrooms and laboratories are not typically dedicated to continuing or community education.

Middlesex Community College provided non-credit course data for the most recent term. The information was compiled noting location, time and days scheduled. This information was contrasted with credit scheduled courses to develop a true understanding of space use and guideline recommendation.

Continuing Education Findings

The table denotes a review of CE weekly hours by room. CE courses were scheduled into eleven different rooms. Of these, five were general purpose classrooms. Courses ranged from one day to several weeks. While total weekly hours were calculated for each room, it does not represent an accurate picture of utilization. As CE courses are not taught for a full semester, the weekly room hours must be normalized to allow a one-to-one comparison with credit-bearing instruction. Overall, CE courses generated a total of 32 weekly room hours after normalization. This is equivalent to the amount of credit hours instruction at 33 average weekly rooms hours.

Continuing Education is expected to grow in the future, to include:

- More customized training programs with companies and organizations
- A new electrical/electronics and electro-mechanical training lab to support local manufacturing interests and a new film & television industry training programs
- Expanded healthcare programs to provide state credentialing in the growing healthcare industry
- More collaborative opportunities with workforce agencies to provide training to move people into new jobs
- More personal enrichment opportunities in the arts, culture, history, culinary, health & wellness, outdoor skills, and special topics
- More collaborations with MxCC academic programs to provide career ladders from entry-level skills to degrees
- More basic skills education to build college readiness for entry-level students
- More accessibility and opportunities to attain education and training, including online programs

Classroom and laboratory guidelines take this growth into consideration. Section 5 of this report addresses the space needs analysis and the need for additional classrooms and laboratories to accommodate both credit and non-credit enrollment growth.

MERIDEN CENTER

MxCC leases an instructional center in Downtown Meriden, approximately 20 minutes from the Middletown Campus. Meriden is a city in New Haven County, Connecticut. As of the 2010 census, the population of the city was 60,868. The Meriden Center (MC) is a fully accredited instructional site for Middlesex Community College, offering a high level of student services and activities, a wide selection of credit and non-credit courses in a recently expanded facility. In addition, the College offers an array of student services, including access to faculty, tutors, academic counselors, career counselors, disability counselors, and our retention specialist who help student with academic and professional goals.

The college occupies the first, forth, and fifth floors of a multi-story downtown building at 55 West Main Street. The location features:

Floor 1: Community Room, Learning Center (Library), Welcome Center, Offices, conference rooms, and a 22 station computer lab

Floor 4: Three classrooms, health and computer laboratories, and an Open Laboratory

Floor 5: Four classrooms, art laboratory, and a small student lounge

The facility also has an outdoor courtyard with ample free parking. The center is located on a major bus line and is within walking distance to the train station.

While no room-by-room facility inventory for the center was provided by the College, the consultant completed a high level utilization analysis based on courses taught for the fall 2013 semester. The Utilization Analysis table notes results of weekly room hours for the ten instructional spaces at the center. Only one room (502) was scheduled more than 30 weekly room hours. Overall, classrooms and laboratories were being used 18 hours per week for credit instruction. When in use, student station occupancy averaged 75%, a result this is higher than most classroom guideline recommendations.

Meriden Center
Utilization Analysis

Room #	Weekly Room Hours	Average Enrolment	# Student Stations	Student Station Occupancy
105ME	3	17	22	77%
404ME	6	15	18	83%
405ME	3	8	24	33%
406ME	30	24	30	80%
407ME	24	22	23	96%
501ME	27	22	30	73%
502ME	33	22	28	79%
503ME	10	18	24	75%
505ME	16	21	28	75%
507ME	23	16	21	76%
Average	**18**	**19**	**25**	**75%**

Class distribution by time of day noted that 35 courses were offered during the week between the hours of 8:00 AM and Noon, five courses between 1:00 PM and 4:30 PM, and 27 courses between the hours of 5:00 PM and 7:00 PM. Based on the results of the utilization analysis, most classrooms and laboratories have the ability to accommodate additional course sections before additional instructional space is needed.

SCANNING SUMMARY AND ACADEMIC PLAN OVERVIEW

INTRODUCTION

This section contains a summary of the environmental scan and its potential impact on the overall academic programs, student and academic support services and facilities at the MxCC. Typically, an academic plan provides an action plan for the future and keeps the College in line with trends within the labor market. The plan also serves as a vehicle for program growth in order to provide the best teaching and learning experiences for both faculty and students. More importantly, the academic plan provides perspective on the educational initiatives that are part of the overarching MxCC Educational Master Plan.

ENVIRONMENTAL SCANNING SUMMARY

a. Middlesex Community Colleges service area population increased by 1.6% between 2005 and 2012. During the same time period MxCC's headcount enrollment increased 28.5%. The population is expected to increase by 3% through 2025.

b. The population of MxCC's service area is older, less diverse, more affluent and educated than the state average.

c. The percent of Connecticut college students with the primary goal of obtaining an associate degree has increase from 47% in 2002 to 55% in 2008. However, Connecticut's statewide 3-year graduation rate for associate's degree students was 16.1% compared to 27.9% at the national level.

d. The postsecondary enrollment of non-traditional age adults (25-64) in Connecticut is 129 per 1000 residents, well below the national average of 190.8 per 1000 residents.

e. The number of Connecticut high school graduates has been decreasing since the 2005-2006 school year. The production of high school graduates in Connecticut is expected to decline through 2027-2028. In the future, students will be more diverse with a greater percentage of African American and Hispanic graduates.

f. Of the 37,904 high school graduates in 2010, 32.5% are attending an out-of-state college or university.

g. A total of 73% of the students attending a community college in Connecticut need some type of remedial assistance. Public Act 12-40 was implemented in July 2012 and addresses college readiness and completion.

h. Online registration and courses offered by the Connecticut Distance Learning Consortium member institutions increased by 117% between 2006 and 2010. While online courses are reaching saturation, courses with a hybrid component will continue to grow.

i. The largest employment sectors in Middlesex County include educational services, healthcare, and social assistance as well as manufacturing.

j. The largest number of employment openings in the South Center Workforce Investment Area between 2010 and 2020 include office and administrative support, sales, food preparation, education, and healthcare practitioners.

k. Of Middlesex County's top 25 employers, nine are in the health and social service industry while five are in manufacturing, five in retail and four in schools and colleges.

l. Nationally, there is an emphasis on STEM and science related programs. Demand has increased for biology, chemistry, math and physical science courses at most colleges and universities.

m. More community colleges are offering recognition awards. This is an award upon completing a group of specialized courses in a given area.

n. Public Act 11-1 promotes economic growth and job creation in the state with tactics on how colleges can assist in developing the state's workforce.

ACADEMIC PLAN OVERVIEW

1) Recruitment and Retention

As the number of high school graduates decline, it will be imperative for MxCC to attract and retain more traditional-age students:

i. Improve 3-year persistence and retention rates. Programs like the Honors College and the Transitional Year Program could attract a greater number of full time students in the future.

ii. Continue to grow STEM and science related disciplines and programs

iii. Develop supplemental programs that increase the transition rate for students from developmental education into college-level courses.

iv. Expand on-line and other alternative delivery courses and programs. Continue to develop hybrid courses that allow students flexibility in scheduling.

v. Develop strategies to increase the FTE to headcount ratio. Provide student programming and facilities to keep students on the campus longer.

vi. The Center for New Media degree and certificate programs will create a secondary demand for more traditional fine art courses. A synergy could be developed between digital arts, fine arts (drawing, painting, sculpture, photography), music (production/live) and theatre/stagecraft to attract traditional students to the College.

vii. Occupational data notes demand for more than 400 openings in preschool, primary, secondary, and special education teachers. A pre-education transfer degree is available in many community colleges.

viii. International studies or global studies, combined with a semester abroad, is a popular program in many community colleges located in more affluent and educated population areas.

2) Workforce and Technical Programs

During Fall 2012, 1,162 students were working toward a technical degree or certificate. Another 1,173 declared a general studies or liberal arts and science degree as their major. MxCC must continue to develop new technical programs and continue to enhance existing programs to keep pace with the changing needs of businesses and industries in the College's service area.

i. Education, healthcare, and social assistance comprise the largest and one of the fastest growing sectors of the economy in Middlesex County. There is strong demand for Emergency Medical Technicians and Paramedics, Pharmacy Technicians, Medical and Clinical Laboratory Technicians, and Diagnostic Medical Sonographers and massage therapists.

ii. While registered nurses and dental hygienists are in high demand, startup and operating costs are often prohibitive.

iii. Community colleges are expanding programs for health workers with a focus on business and management. Employment titles include Health Services Management, Health Unit Coordinator, and Hospital Central Service.

iv. Criminal Justice programs are growing. Certificates in Computer Forensics and Crime Scene Investigation and Fraud Examination are growing as well.

v. Manufacturing employment is expected to expand by 13%. Degree and certificate programs in Manufacturing Machine Technology could continue to grow with equipment and physical expansion. Closely aligned programs include machine inspector, and a specialty in Computer Numerical Control (CNC) and occupational safety.

vi. Demand is returning for Computer Support specialists and programmers. Certificates are being offered with concentrations in computer security and mobile applications.

vii. Post-recession growth will fuel the demand for occupations in management and business and financial operations. The greatest number of jobs are in business support functions of office and administrative support, retailing management, financial specialists and human resources. A non-profit administration certificate for health and human services providers is also viable. Recognition awards for basic business and advanced business skills should be investigated as well as a small business development center on campus.

3) Adult and Continuing Education

i. Consider mini-mesters, accelerated course offerings, more hybrid courses, weekend, evening, and other options to better meet the needs of non-traditional populations

ii. Explore offering support modules for those courses with low persistence rates, and offering a credit first-year experience course for at risk and some non-traditional populations

iii. Offer and market recognition awards in key career and skill areas.

4) Pedagogy and Technology

a. One of the most profound pedagogical changes in higher education is the recognition that traditional, passive teaching methods often garner lower retention rates than participatory methods such as group discussion, practice and teaching others. This transition from teaching as a passive event to learning as an active, student-centered experience has prompted dramatic changes in the physical spaces on a campus.

b. Facilities have become an integral part of the curriculum and learning experience. Research shows that learning best occurs in exploratory settings with active learning modalities and peer-to-peer academic and social engagement.

c. There has been a strong movement toward more learner-centered instruction where students are required to be more active during class time and are often expected to engage in collaborative group projects as part of their overall class experience. The impact of these trends on academic program and instruction is most visible in classrooms and laboratories.

   i. Classrooms - The classroom of today offers flexibility in furnishings, allowing for lecture, seminar, team-based activity, seminars and interest-driven individual learning. Lecture is still an essential method of introducing an academic topic and disseminating information, but can take on a variety of delivery methods and should be supported by various technologies for content display. Seminar is often a modified form of group discussion, embracing a full class for dialog and face-to-face discussion. Team-based activity requires a non-didactic configuration with movable tables and chairs that can be formed into groups for discussion. An interactive, digital display for sharing content within the group lends itself to peer-to-peer knowledge transfer and consensus building. Interest-driven individual learning in a classroom harkens back to grade school rooms with multi-modal discovery zones, and exhibits some of the traits of the popular flipped model.

   ii. Teaching Laboratories - While innovation in classroom spaces has primarily increased the size of the rooms and enhanced mobility of furnishings, the response in laboratory design to pedagogical advancements is the dispersion of utilities. Traditional laboratories often contain rows of wet benches with fixed utilities and storage at counter height. Lecture took place in a separate room and conversation in the laboratory was limited to reintroducing subject matter and experimentation notes. Today's teaching laboratory hosts utilities along the perimeter, freeing up the central area and allowing for the flexible seating found in newer classroom spaces. By placing movable tables and chairs, often at bench height, in a laboratory, students can position seating facing forward for lecture, in groups for discussion, and adjacent to utility fixtures for experimentation.

d. Knowledge Centers

   i. Advancements in technology have impacted academics and the proliferation of study/learning spaces with innovative solutions for content storage, access, display and sharing. With the advent of technology

as a resource provider and sharing enabler, the role of the classroom as the primary learning space has transitioned from a single venue to a more porous environment with ancillary study/learning spaces as valuable settings for supplemental work. Advances in technology have also affected libraries, and shifted their role from providing print materials to providing digital materials along with spaces to retrieve and share this content. Having almost all professional journals available in digital formats has substantially changed the patterns of faculty and student activity as it relates to a library setting. The growth of e-books has also resulted in changes in the way monographs are accessed. The need for sophisticated access to materials in high quality viewing formats results in additional study space requirements within the library and at other locations on campus. A closer synergy has developed between the role of the library as a repository and a place for active learning in peer settings.

ii. More library space is now devoted to study and group learning activities than was the case before. Coupled with the ability to access digital content ubiquitously, study/learning spaces are being created in and around libraries, close to classrooms, near food services and recreational areas. The notion of the traditional classroom as the single source for dissemination has dissolved to become a more porous, active environment for learning that includes various locations for academic interaction and support.

iii. Student and academic support spaces may include:

- Small and Large Group Study Rooms/Spaces
- Presentation Support Centers with Practice Rooms
- Multi-media Pods/Rooms
- Computer Workstation Clusters
- Independent Study Rooms/Spaces
- Digital Media Studios
- Advanced Technology Laboratories
- Science Resource Centers & IT Emporiums
- Media Editing Centers
- Mobile App Prototyping
- Gaming Research
- Sandbox/Digital Exploration
- Production Studios
- Wireless IT / Ubiquitous Internet
- Comfortable Seating
- Movable White Boards
- Power Supply

Often they are located near social and gathering spaces that may include:

- Food and Drink Service
- Retail Services
- Copy/Print/Fax/Mail Services

iv. Technology has provided the tools to better engage students and enhance their learning experience. It has also complicated the process to some degree as students are required to understand learning management systems, on-line classes, web-based support services and digital social media. As a result, a proliferation of technical support spaces or centers has emerged. Some focus on students and others on faculty, though they have some overlapping function. Students arrive to campus with, on average, three digital devices. Installing new applications, getting security to function properly on devices, connecting with cloud-based application can all take time and energy away from learning. A recent addition to higher education is the 'tech bar' giving students an informal place for peer-to-

peer technology support. These are manned by students and provide free assistance and application knowledge in an informal setting.

v. As learning modalities flourish and technology offers more methods of creating and presenting content, faculty development becomes a critical part of the success of a college.

vi. Faculty development spaces often have recording areas for podcasts, video capture and other forms of digital recordings. This adds to the repository of on-line content for student viewing. Faculty development is also important to advance the newer modalities and give instructors a place to test new theories of instruction. This proving ground is often a model classroom with small group seating for team-based activity and can be used for scheduled coursework when not allocated to developmental events.

EDUCATIONAL INITIATIVES

INTRODUCTION

This section contains 14 preliminary initiatives centered on three dominate themes. The initiatives were developed based on the results of the environmental scan and academic plan overview, a review the Middlesex Community College's (MxCC) current strategic plan, consultant interviews with college representatives, and an evaluation of existing internal documentation. The initiatives incorporate information from interviews with the campus president, deans, division chairs, directors, faculty and staff during the week of August 26th, 2013.

Each initiative is listed within the following pages of this document. No consideration has been given to ranking or prioritization. Each initiative includes an analysis of existing conditions and description.

1) Existing Conditions – This section describes justification or purpose for the initiative. Justification is based on existing constraints or future goals as translated by the strategic plan.
2) Description – The description provides the reader with an overarching vision for the initiative. The description also notes the types of academic programs impacted by the initiative. While no date has been provided for implementation, initiatives are expected to be implemented over the 10 year master planning period.

The initiatives are:

Campus Connections

1. Student Collaborative & Study Areas
2. Recreation/Fitness Center
3. Enhanced Student Center
4. Student Activities/Community Event Space

Academic Programs and Instruction

5. Appropriate Classrooms and Technologies for Newer Pedagogies
6. Specialty Laboratories for New and Existing Programs
7. Fine and Digital Arts
8. Relocation of Machine Technology Program
9. Full Time Faculty Offices and Adjunct Faculty Suites
10. Auditorium/Performance Venue

Student and Academic Support

11. Faculty Development/Technology Center
12. Realignment of Student Services – One Stop Center
13. From Library to Learning Commons
14. College Readiness and Completion

After review and comment, the final initiatives will drive the space needs analyses and the need for renovation or new space. Each of the initiatives is presented in more detail in the following pages of this section.

CAMPUS CONNECTIONS

During campus work sessions, an overarching theme was the lack of activities and amenities to keep students on campus a greater percent of the time. Faculty described the "car to classroom " phenomenon where students arrive at campus a few minutes before class time and leave immediately following class. Many students also leave the campus if there is extended time between classes.

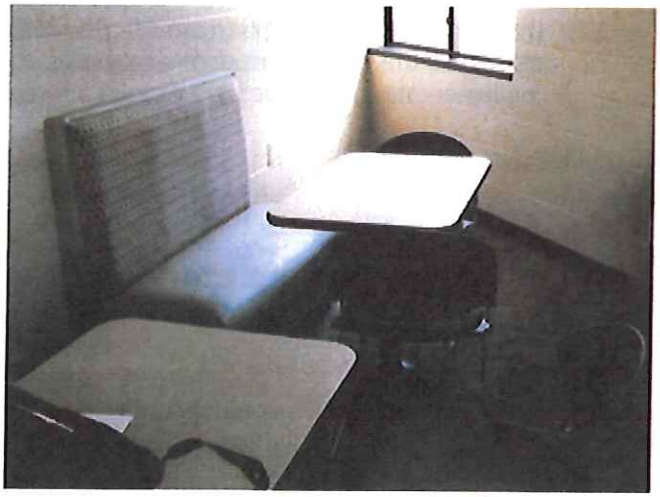
A goal of the College is to have "more people on the campus more of the time" with the attempt to develop an emotional connection to the campus. This is especially important for full time students who are looking for a vibrant college experience. National research also indicates that students who spend more time on campus interacting with faculty and other students have higher retention and persistence rates.

Several initiatives were developed to augment campus connections. These include the creation of student collaborative and gathering areas, a recreation/fitness facility, enhanced student center, and an event space to host student activities.

1. Student Collaborative & Study Areas

Existing Conditions

Thirteen of the sixteen classrooms on campus are located in Snow Hall and Wheaton Hall. These are identical buildings in terms of floor plan with long-double loaded corridors. During class changes, the halls are cramped and noisy. Faculty and students congregate in the halls as faculty offices are confined and lack space for private conversations. The second floor of each building has a small student lounge of approximately 215 assignable square feet (ASF). The area includes vending machines and small tables for dining or studying.



Founders Hall has a student lounge of 1,154 ASF with various table and chair configurations. Students find it difficult to study or gather as this space is the only venue for student activities. There are no whiteboards , and lighting and seating is generally poor.

Description

Collaborative learning areas are best located near classrooms, laboratories and faculty offices where students can gather before class or a faulty member can easily continue a discussion with students after a class in an active setting. Collaborative learning areas are usually open to a corridor and usually have a white board with movable furniture where the flow of ideas and discussion can easily be communicated. It is recommended that these area be incorporated into a new facility and be retrofitted in Snow and Wheaton Halls.

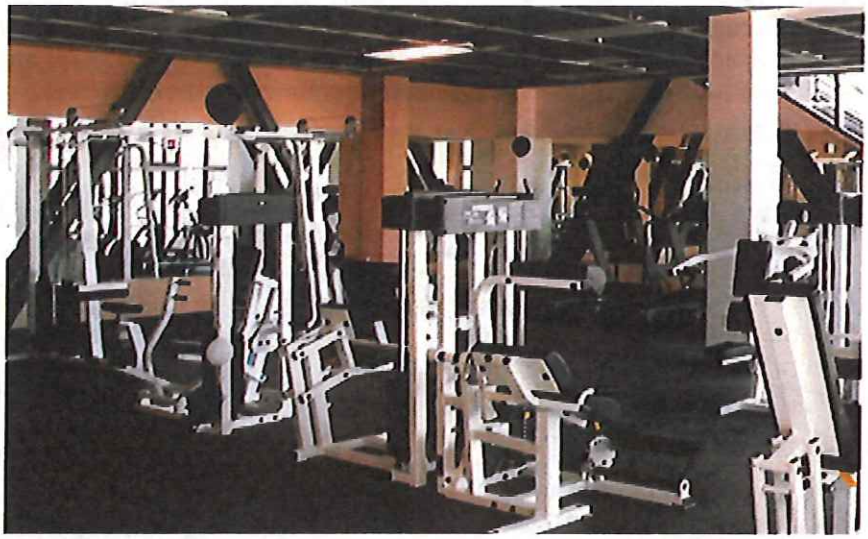
2. Recreation/Fitness Center

Existing Conditions

Men's and Women's locker rooms and showers are located on the first floor of Snow Hall. These facilities are open to students, faculty and staff, but current use is marginal. No other indoor fitness or recreation areas are located on the campus. At the current time, no wellness or fitness classes are offered due to lack of facilities.

Description

A Recreation/Fitness Center could help support programs and education regarding wellness, health and general fitness for faculty, staff, students and the community.



It is envisioned that the facility would consist of an area for cardiovascular equipment (stationary bikes, treadmills, stair climbers, cross-trainers), a small weight room and a large multi-purpose room for aerobics, yoga, dance and other related activities. Support facilities would include a small locker room facility for changing and showering, and dedicated storage space for exercise equipment.

The multipurpose area could also host wellness clinics for blood pressure, body fat and cholesterol screening as well as scheduled sessions for weight management or smoking cessation, providing a valuable resource to students and the community. The room could also be organized in multiple settings, and could function as a classroom, demonstration space, or for CPR training.

3. Enhanced Student Center

Existing Conditions

MxCC's Student Center is located in Founder's Hall. The area includes a bookstore (877 ASF), Café and Kitchen (3,226 ASF), student lounge (1,924 ASF), and game room (766 ASF) for a total of 6,815 ASF. A 4,400 ASF addition to the dining area is planned for the near future. Founder's Hall also includes space for all student and administrative service functions for the College.

Description

Many MxCC students are on-and-off the campus throughout the day and spend a considerable amount of time in classes, studying and a nominal amount of time socializing. Facilities to help support the needs of these students while on campus are currently inadequate given the institutional goal of expanding the number of full-time students on the campus.

Student lounge areas, meeting/activity spaces for the College's clubs and organizations as well offices for student government are needed to help support a more cohesive campus experience. The current food service operation is antiquated. Long lines form during lunch as a single cashier takes orders and completes transactions. Consistent with dining options at many community colleges, a grab-&-go format with longer hours is desired.

4. Student Activities/Community Event Space

Existing Conditions

The current student lounge is housed in the same building as admissions and student services, the business office and the president's office. The student lounge is also a thorough-fare to the game room, bookstore, café and to numerous administrative offices. Thus, seating is limited to maintain corridor space. The location and design is not conducive to concerts, comedy, movies, guest lectures, and other events that require amplification of music or voice. The situation limits the type and frequency of student programming events on the campus.

Description

There is a need for a flexible, large multipurpose event space with a small stage to host student related events such as dances, bands, movies, and other student life programming events. While many community colleges have large theatre or auditorium facilities, this initiative is more practical in its approach in terms of functionality and size. Initiative 10 fully describes this space.

One way to ensure success in this area is to bring community and business organizations to the campus for seminars, conferences, lectures, and other organized events. This space would also support educational avenues for faculty, students and staff such as health and job fairs.

ACADEMIC PROGRAMS AND INSTRUCTION

Like many community colleges, Middlesex Community College offers a range of courses and degrees in General Studies and Liberal Arts and Sciences. Typically, the focus is on preparing students for transfer to a baccalaureate institution. During Fall 2008, 950 students declared interest in general studies or the liberal arts. By Fall 2012, this had increased to 1,173 students or 40% of the student population. Middlesex Community College also has more than 45 technical degree and certificate programs. The goal of these programs is to provide training and skill building in selected occupations in preparation for employment upon graduation. Both of these missions are vital to the future of MxCC.

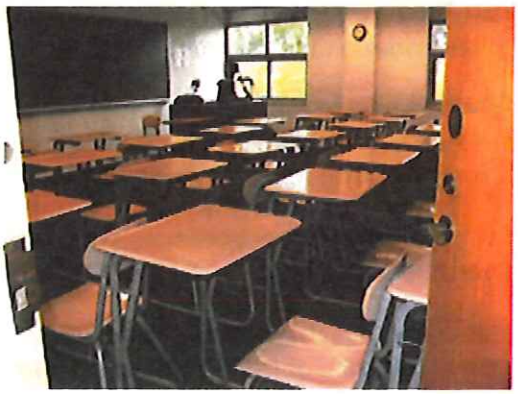
With the passing of Connecticut Public Act 11-1, entitled "An Act Promoting Economic Growth and Job Creation in the State", the connection of community colleges to economic development cannot be overemphasized with progressively more demands for technical programs, career certificates, apprenticeships, and workforce development. This will necessitate stronger collaborative efforts between MxCC, the business sector and the community. The business community must continue to view MxCC as a resource in both training employees and the assistance with business and industry solutions.

The following initiatives address areas related to academic programs and instruction.

5. Appropriate Classrooms and Technologies for Newer Pedagogies

Existing Conditions

During on-campus work sessions, faculty noted several concerns with existing classrooms. The current classroom utilization analysis lists 16 classrooms on the Middletown Campus ranging from a high of 1,076 assignable square feet (ASF) to a low of 500 ASF. Overall, the 16 classrooms average 610 ASF. Classrooms average 30 stations per room for a total of 653 total stations with an average of 19 ASF/station. Eight of the 16 classrooms provide less than 18 ASF per station. During a recent campus tour, the number of seats in the classroom prevented the door from fully opening.



Faculty expressed concerns regarding crowded classrooms and lack of flexibility in freely moving furniture for active learning pedagogies. Many of the rooms have traditional tablet arm chairs that are uncomfortable for larger adults. Faculty also expressed a need for more integrated technologies and larger projection screens, additional white boards and overall larger classrooms to accommodate increases in class sizes in selected programs.

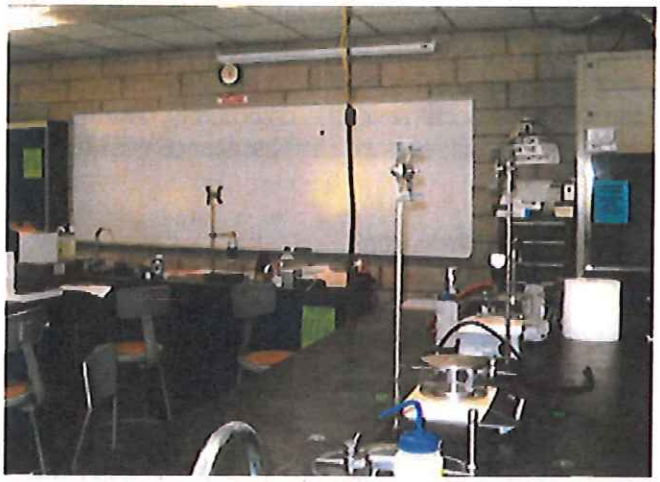
Description

Current MxCC classrooms are not conducive in size and design for most active learning formats. As pedagogy focuses on more collaborative student learning and distance education, there is a need for new types of learning spaces. The classrooms of the future should be designed with the greatest level of flexibility with an embedded level of instructional technology that is consistent throughout the campus. Some classrooms should include interactive video technologies so instruction can be delivered to the Meriden Campus and other sites. Flexibility in furnishings with multiple fronts of room is also essential to the future of student learning. In addition, classrooms will need to be strategically located to optimize student and faculty interaction. Given projected enrollment levels and the number of potential new programs, additional classrooms will be needed on the campus to accommodate growth.

6. Specialty Laboratories for New and Existing Programs

Existing Conditions

The College has growing Engineering Science and Environmental Science programs. Given the types and quantity of jobs needed during the planning horizon, combined with the national emphasis on STEM programs, these areas will continue to grow in the future. The majority of science laboratories are located in Wheaton Hall. Current science labs include a chemistry laboratory of 1,353 ASF, a physics laboratory of 1,352 ASF, a general biology lab of 993 ASF and a microbiology lab of 656 ASF. The 878 ASF in laboratory preparation space is inadequate.



The chemistry laboratory has not been remodeled since the construction of Wheaton Hall. Given the rectangular shape of the room, students in the periphery have poor sight lines to the faculty station. The biology and physics laboratories were remodeled several years ago, but are still lacking in storage and flexibility. There is no space on campus for students to work on independent projects or develop their own experiments.

The seven computer laboratories on campus are equipped with MAC- and PC- based systems with an average of 24 computers in each laboratory. Several of these labs have new projection and computer equipment as part of the Center for New Media Program. Overall, these labs serve the needs of faculty and students.

With the exception of an Ophthalmic Design and Dispensing program laboratory, there are no specialty program laboratories on the campus.

Description

At MxCC, courses tend to be more theoretical than applied due to the lack of specialty labs in many disciplines. These labs are critical to developing new degrees and providing capstone courses for students. Science faculty are also interested in mediated teaching pedagogies as they continue to experiment with newer teaching methodologies. The current science laboratories do not offer flexibility regarding teaching and the use of technology. A small greenhouse is also desired for biology, but could also be used for non-credit ornamental horticulture classes.

Student research space is needed for science students to set up experiments and conduct independent research under the supervision of faculty. Typically several work stations are provided for students in a wet-bench environment.

Division chairs and faculty noted the need for several specialized labs for selected programs. These laboratories are not represented in the aforementioned initiatives. The areas include:

- Criminal Justice Program – Need for a Forensics Laboratory and Static Crime Scene.
- Student Technology Sandbox for the Computer Engineering Technology Program.
- A small laboratory for social sciences with an observation room
- A environmental science laboratory with ample storage space to storage materials
- A small photography laboratory
- A language laboratory for instruction and student practice.

7. Fine and Digital Arts

Existing Conditions

The College recently received a multi-million dollar grant to develop the Center for New Media. The Center offers innovative associate degrees in broadcasting, cinema, communication, graphic design, and multimedia as well as job-based certificate programs. After full implementation of the grant, student enrollments are expected to double as new certificate programs are implemented.

Several classrooms on the lower floor of Chapman Hall are being repurposed for the program. The construction of a production studio in the near future will require the repurposing of additional instructional spaces.

MxCC has three art laboratories for courses in two and three dimensional art. Together they comprising at total of 3,184 ASF in the first floor of Snow Hall. Laboratories are outdated, crowded with equipment, and lack storage and preparation spaces. Little time and space is available for students to work on projects after class hours in an open lab environment.

Description

The lower level of Chapman Hall is well suited for the New Media Program. The expansion of art labs with appropriate storage and a small studio space for students is needed to continue growth in this area. Relocation and expansion of the Pegasus Art Gallery with storage space was also identified as an area of need to showcase student and visiting artist works. Having appropriate high visibility space to continue this effort helps maintain the vibrant atmosphere that is critical at MxCC in future building spaces.

8. Relocation of Machine Technology Program

Existing Conditions

The Machine Technology Certificate program trains students for a career in the machine technology profession. The program provides a 29 semester hour course sequence in manufacturing machine technology by providing hands-on equipment that prepares students for the modern shop floor by working with manual and computerized machinery. The program is currently housed in a 3,900 gross square feet stand-alone leased steel building two miles from the Meriden Campus. Parking is limited. Faculty noted concerns with the lack of integration with other programs and the distance from the Middletown Campus.

Description

There is a desire to relocate the Machine Technology Program onto the Middletown Campus. This facility could house new and existing manufacturing, engineering, and technology related programs as well as provide spaces were business and industry partners and other community groups could meet to demonstrate new technologies. Having a high bay warehouse space that would accommodate various types of machinery to help teach/train technical specialists on various equipment pieces and current repair methods would also be beneficial. It is desirable to have a classroom and meeting space directly adjacent to the laboratory.

9. Full Time Faculty Offices and Adjunct Faculty Suites

Existing Conditions

Full time faculty members have offices primarily in Snow Hall and Wheaton Hall. Four to five faculty share a common open area with mid-height partitions delineating their office environments as noted in the photograph. Office cubicles typically range from 70 to 80 ASF.

Faculty members expressed concern regarding the lack of confidentiality during conversations with students and the overall lack of privacy and security. Many of the faculty offices areas do not have conference rooms in close proximity making private meetings difficult.

At MxCC, it is estimated that 50% to 80% of courses are taught by adjunct faculty. Adjunct faculty members on campus currently have minimal space from which to operate. This causes some difficulty in meeting with students and having a secure place to store possessions during class time.

Description

As the student population shifts, full-time faculty will need to work with students on a variety of academic and personal issues. Single private offices or two faculty per office is commonplace in community colleges. Division faculty also need appropriate conference rooms and work rooms.

Several adjunct faculty suites are needed on the campus. These suites would consist of shared cubicles for adjuncts, a small dedicated conference or meeting room space for confidential discussions with students and a storage area for personal items.

Faculty expressed a desire to have these suites in close proximity to full time faculty offices. Since adjunct faculty are often on campus in the evenings after normal working hours, accessibility to regular faculty and staff is critical. The location of full-time faculty offices and suites in central areas of campus that are activity hubs would be helpful and could help foster greater interaction between regular faculty, administration, and staff.

10. Auditorium/Performance Venue

Existing Conditions

The College has a multipurpose room in Chapman Hall of 4,825 ASF that can be divided into four sections. While the space is used for college and community events and meetings, the high ceilings and poor acoustics prohibit effective music recitals, concerts, or theatre productions. Other than a small kitchen and furniture storage areas, there is no support space. The multipurpose room is directly above the Jean Burr Smith Library.

Description

The arts are a vital part of the Middletown community and the College. While MxCC offers selected courses in the visual arts, there is no formal program or space to hold music recitals or create student theatre productions and perform to a live audience.

Work session participants described the need for a flexible, acoustically controlled space with stage lighting for music recitals, plays, screenings, lecturers, and community events. Student enrollments and physical size of the campus do not permit a full proscenium theater. A black box type theatre space could be designed for maximum flexibility and usability that seats from 80 to 150, depending on riser arrangement.

A typical blackbox theatre includes:

- Public Spaces – Lobby, box office, coat room, storage,
- Theatre – main stage, riser storage, lighting/projection control and general storage,
- Backstage Support – Green room, dressing room, prop storage, stage storage,
- Shops – Scene / lighting shop and storage.

STUDENT AND ACADEMIC SUPPORT

The Middlesex Community College *"Envisioning Our Future"* Strategic Plan notes student success as the foremost priority. Key action steps for this priority include delivering support services that are conducive to student success. Goals of growing enrollment and maintaining a vibrant collegiate environment link to action steps of creating a culture of one-stop service and providing access to support services that meet the needs of students. The following four initiatives address the core student and academic support areas of the campus.

11. Faculty Development/Technology Center

Existing Conditions

Approximately 1,200 to 1,300 students are enrolled in alternative delivery courses with 90% of faculty using the Blackboard/Learn Course Management System. The library computer lab is often used for faculty training sessions. Currently, faculty members develop course content at home or in their office areas. There are no dedicated facilities for training or for faculty to develop video and audio content or practice newer teaching methodologies.

Description

In supporting instructional technologies, the commonly used technologies are MyCommNet, Faculty/student self-service, digital audio, digital video, E-Portfolio, and mobile devices/applications. Staff provides training and assistance to faculty and students who use these technologies.

As the use of alternative delivery and technology increases, spaces are needed to accommodate additional support staff, technology training, faculty media production, and call in or walk-in users. Two small recording spaces would allow faculty to record lectures as well as edit and upload to the Internet. A technology training classroom is needed to offer year round training for faculty, staff, and students. This area can also serve as an open laboratory for students taking online/hybrid courses and Blackboard enhanced courses. Student workers will be seated in the open lab to assist students using Blackboard and other instructional technologies supported at MxCC. The ideal location for Faculty Development/Technology Center would be close to the college library, providing an efficient and friendly one-support place for students needing help in a wide range of technologies and research endeavors.

12. Realignment of Student Services – One-Stop Center

Existing Conditions

Existing student services functions are located in Founders Hall and include a large open office area of 989 ASF for Admissions and Records and the Registrar. Financial Aid has several offices located in the southeast corner of the building while Career Development and Counseling are located in the Northeast corner of the building. Many of these areas lack space for confidential discussions with student services staff. The Bursar and payment window is located near the business office on the west side of the building. An information center is co-located with the mailroom with an immediate adjacency to Admissions and Records.

Student services functions are constrained, somewhat disjointed and hard to find for students visiting the campus for the first time. During periods of open registration, lines form at key student service areas. Given the close proximity to the student center and café, the halls are noisy and crowded.

Description

A true one-stop student services model with information/ welcome center is desired. This model would bring together all departments of enrollment services (Admissions, Registrar, Financial Aid, Counseling and the Bursar) into one area with appropriate waiting functions and student self-serve kiosks. The one-stop area would also include small conference rooms and an intake area for students who bring children and their family members to the campus.

13. From Library to Learning Commons

Existing Conditions

The Jean Burr Smith Library is located on the Ground Floor of Chapman Hall. The library includes a circulation desk, technical services area, periodical and reference areas, book stacks, computer lab, and several study rooms for a total of approximately 11,530 ASF. The library also includes the Pegasus Gallery, Office of the Institute for Lifelong Learning, Student Newspaper offices, Veterans Center, and the Learning Center and Placement Testing. While these functions are located in or near the Library, they are excluded from the library square foot numbers. The current library has a capacity between 180 to 200 students in various accommodations. However, the existing flow and efficiency of the space is tight and organized differently from current learning common types of spaces.

Description

Transforming the library into a Learning Commons would be desirable and would allow more functional use of the space for students. Incorporating more group meeting rooms along with five or six rooms for team learning/team projects where students are able to easily access the personal assistance of the library staff is an advantage to the learning process. In addition, space is needed for personal quiet study areas as well as more open areas that utilize computers and programs that are easily accessible for students.

Bringing together technology, content and services in a common space creates an environment that will address the needs of today's students. It was mentioned that many forms of technology are utilized by students. Having spaces that accommodate the various forms of computer, laptop, handheld devices, and other technology media where students can interact to develop learning interactions is driving the success of the Learning Commons space at other institutions.

The current open computer laboratories are heavily utilized by students. The development of a Learning Commons could help in this capacity as well as serve the computer needs of the students while on campus.

14. College Readiness and Completion

Existing Conditions

The State of Connecticut recently passed Public Act 12-40, an act concerning college readiness and completion. Not later than fall semester 2014, public institutions of higher education will be required to offer students remedial support that is embedded with the entry level course in a college level program. The act further states that colleges must provide remedial students the opportunity to participate in an intensive college readiness program before the start of the next semester. As discussions are taking place regarding the implementation of the act, there is a need to look at how this will impact the need for facilities at MxCC.

The College currently has a Learning Center located adjacent to the Library on the ground floor of Chapman Hall. The College Learning Center provides academic support for placement testing, individualized and group tutoring, and also serves as the testing center for the Basic Skills Assessment.

Description

The current Academic Support Center serves the student population. Both legislation and information contained in the environmental scan indicates that this center will need to serve a larger percentage of the student population in the future. During work sessions, faculty expressed an interest in having a math lab and a writing center close to classrooms and offices. In many community colleges, developmental math courses are transforming into a self-paced format called math emporiums which contain open computer labs with break-out spaces.

ACADEMIC SPACE NEEDS ANALYSIS

OVERVIEW

During the Fall Semester 2013, the consultant completed a macro level space needs analysis. The analysis was driven by the Academic Initiatives, current strategic plan as well as future enrollment and staffing assumptions.

The consultant was provided with enrollment, course, and staffing data. The facilities inventory provided building, square footage, and space use classification on a room-by-room basis. The course data contained the course number and description, student enrollments, start and stop times, and meeting locations. The staffing data contained headcount by major employee category on a departmental basis. The data provided a snapshot of instructional activities for the Fall 2013 semester, which was used as the master planning base year.

INVENTORY OF EXISTING SPACE

The facility inventory was pulled from the August 2006 Master Plan Utilization Study and had not been updated since that report. As part of the overall planning services provided by the consultant, a significant portion of the facilities inventory for the Middletown Campus was field verified for accuracy. The inventory reflects changes as of November, 2013. As the Meriden Campus is housed in leased facility, no space inventory was provided or developed for this facility.

A list of buildings and the calculated ASF for the Middleton Campus is noted in the table. In total, 84,923 ASF was contained within the five buildings on the campus.

Existing Assignable Square Feet by Building

Location	Existing ASF
Chapman Hall	31,200
Founders Hall	16,631
Snow Hall	17,070
Wheaton Hall	17,422
Maintenance Building	2,600
Middletown Campus Total	**84,923**

ASF= Assignable Square Feet

At the time of this analysis, two capital projects were underway and were included in the space needs analysis at the 2023 Plan Horizon:

- A 4,400 ASF addition to Founders Hall for expansion of the cafeteria.
- Renovation on the lower level of Chapman Hall for the creation of a new digital production studio. At the time of this analysis, the final design of the production studio was incomplete.

The Meriden Center and the Manufacturing facility are leased facilities and equal approximately 19,000 ASF.

SPACE CLASSIFICATIONS

Facility space is calculated according to major space classifications as outlined in the *National Center for Education Statistics, Postsecondary Education Facilities Inventory and Classification Manual, 2006 Edition.* Some additional points of clarification are:

- Classrooms are those rooms that are regularly scheduled.
- Teaching laboratories are laboratories that are regularly scheduled.
- Open laboratories are laboratories that are irregularly scheduled. This category includes open computer laboratories. They may be laboratories used as combination teaching laboratories and open access laboratories. The Open Laboratory category includes music practice rooms, art studios, and laboratories built for one individual or a small group. It also includes senior capstone space and collaborative learning areas.
- The Office category includes offices, office supply and storage areas, workrooms, reception areas, conference rooms, and conference room service space.
- Library space is defined as space dedicated to the main and branch libraries, and not departmental study rooms that serve as an unofficial library.
- Assembly/Exhibit Space is space that accommodates many persons for events such as dramatic and musical activities or space that is used for exhibitions of materials or art such as a museum or an art gallery. It includes planetariums and herbariums.
- Other Academic/Administrative Department Space includes: departmental libraries, building or departmental student lounges, armories, media production rooms, clinics, demonstration rooms, meeting rooms, and central computer or telecommunications space. It also includes field buildings, animal quarters, and greenhouses that support instructions. Field buildings and greenhouses in support of physical plant and campus grounds are included as Physical Plant Space.
- The Student Center is space that is used for college life and student activities functions and includes bookstores, cafés, student lounges, student organization and government spaces, and ballroom space, if applicable.
- Physical Plant includes shops, warehousing, and grounds facilities that provide centralized space for support systems and services to a campus.
- Non-assignable areas include restrooms, corridors, stairways, elevators, mechanical rooms and central utility plants that primarily house central utility production and/or distribution to more than one facility on campus.

EXISTING SPACE ALLOCATIONS BY CAMPUS

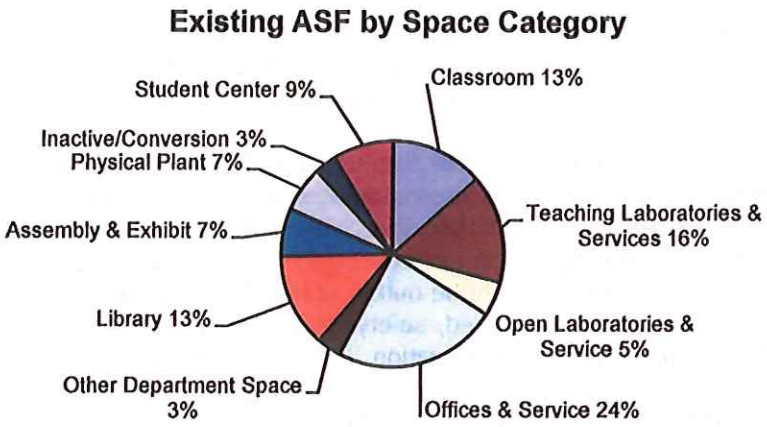
The following table and graph illustrates the Middletown Campus ASF by space type and category for buildings used in this analysis. Classroom and teaching laboratory space is often considered the most significant allocation of space on campuses of higher education. For MxCC these two space categories comprise 29% of the total ASF on the Middletown campus.

Academic and administrative offices and service space comprise the second largest space category in the analysis, representing 24% of all space on the campus. The Library comprises 13% of the space on campus and the Student Center 9%.

Existing ASF by Space Category

Space Category	ASF
Classroom	11,416
Teaching Laboratories & Services	13,197
Open Laboratories & Service	4,176
Offices & Service	20,203
Other Department Space	2,961
Library	11,454
Assembly & Exhibit	5,792
Physical Plant	5,556
Inactive/Conversion	2,758
Student Center	7,410
Campus Total	**84,923**

ASF = Assignable Square Feet



SPACE NEEDS PROCESS AND GUIDELINE APPLICATION

Guideline Assumptions and Application

This section summarizes the macro level space needs by functional space category. The different methods include national and state guideline recommendations, benchmarking, and review of design and/or program plans completed for prior projects. Paulien & Associates has also completed space need analyses for several other institutions of higher learning in Connecticut. In an effort to maintain consistency of analysis, many of the same guideline application parameters were used in this study.

Classroom Guideline Application

Classrooms are defined as any room generally used for scheduled instruction requiring no special equipment and referred to as a "general purpose" classroom, seminar room, or lecture hall. Classroom service space directly supports one or more classrooms as an extension of the classroom activities, providing media space, preparation areas, or storage. The classroom station size is considered as including the classroom service area space. However, additional service space can be justified on a program or classroom basis.

Prior to 2000, many guidelines for classroom space were developed at a time when tablet armchair classrooms were the predominant seating preference. These guidelines called for approximately 15 ASF per student station, which is significantly lower than what today's active learning classrooms require.

Classrooms with good sight lines that are required by technology and flexible seating arrangements usually average between 22 and 28 ASF per student station. For master planning purposes, the consultant used 25 ASF per student station. This provides MxCC with enough space for a variety of seating arrangements and greater flexibility.

As MxCC does not have a standardized set of classroom utilization expectations nor does it have a set of space standards to which it is required to adhere, the consultants determined a set of classroom utilization targets and that are typical of community colleges similar to MxCC. These state that each classroom should be scheduled 32 hours per week with a student station occupancy (student station fill) of 67% when the room is in use for credit and non-credit instruction.

Classroom Guideline

	Weekly Room Hours	Student Station Occupancy Percentage
Median of 28 states	32	65%
MxCC Campus	**32**	**67%**

Teaching Laboratories Guideline Application

Teaching laboratories are defined as rooms used primarily by regularly scheduled classes that require special purpose equipment to serve the needs of particular disciplines for group instruction, participation, observation, experimentation, or practice. Station sizes in teaching laboratories vary by discipline.

The scheduled weekly room hour average for teaching laboratories is generally found to be less than scheduled use of classrooms due to the need for preparation time of specialized equipment prior to class. Conversely, the student station occupancy is normally higher in teaching laboratories as the number enrolled in a laboratory exercise is more closely monitored, safety being a key issue as well as the limitations of faculty observation. The utilization goals of 20 weekly room hours and 80% student station occupancy were used for all teaching laboratory disciplines for MxCC.

Teaching Laboratory Guideline

	Weekly Room Hours	Student Station Occupancy Percentage
Median of 28 states	22	80%
MxCC Campus	**20**	**80%**

Interpretation of Space Needs Analysis Outcomes

For each space category, four columns illustrate the findings at the base year (Fall 2013) and the plan horizon (Fall 2023). The Existing ASF at the base year and plan horizon includes all current academic facilities. Only assignable square feet (ASF) were included, which is the usable area of a building and does not include circulation areas such as corridors, stairways, elevators, mechanical/electrical areas, wall structural space, custodial closets, or restrooms.

Interpreting the table, there was 11,416 ASF of existing Classrooms & Service space in Fall 2013 (see table on next page). For the ten year horizon (Fall 2023), the existing ASF includes any additional space that might be added due to renovation, acquisition, and new construction. For the MxCC, there were no changes in the amount of existing classroom space.

Reviewing the second column, the Guideline ASF is a calculation of how much space is needed in each space category at the Base Year and Plan Horizon, given future enrollment, program, and staffing assumptions. The consultant applied appropriate guidelines relative to an institution of MCC's enrollment, program mix, and mission. Referring to the table, the guideline calculation produced a need for 13,553 ASF of Classroom & Service space for Fall 2013.

The Surplus/(Deficit) column is the difference between the Existing ASF and Guideline ASF totals, while the Percent Surplus/(Deficit) column is the magnitude of the difference expressed as a percent. For each column, deficits are in parentheses and indicate a space need in that category. Referring to the table, the MxCC campus has a 2,137 ASF or 19% deficit of Classroom & Service space during the fall 2013 semester. It should be noted that the space needs analysis is quantitative only and does not take into account the quality of space.

SPACE NEEDS ANALYSIS BY SPACE CATEGORY – MIDDLETOWN CAMPUS

The Space Needs Analysis by space category is noted in the *Campuswide Space Needs Analysis* table. At the Fall 2013 Base Year, there was an overall deficit of 20,922 ASF of space or a 25% deficit when compared to existing space. Space deficits were noted in several categories as listed with the parenthesis in the table. The largest deficits were noted in the Assembly & Exhibit, and Student Center categories.

As the MxCC campus grows to an institution of approximately 3,500 headcount and develops new program offerings, the additional need for academic space is again illustrated in the table. In the next 10 years, deficits exist in every space category, with an additional need of 49,258 ASF. Again, the largest deficits are in Assembly & Exhibit and Teaching Laboratories & Service categories.

Each space category will be described in greater detail after the table.

Campuswide Space Needs Analysis
Middlesex Community College

Space Category	Fall 2013 Student Headcount = 2,577 Staff Headcount = 130 Existing ASF	Guideline ASF	Surplus/ (Deficit)	Percent Surplus/ (Deficit)	Fall 2023 Student Headcount = 3,461 Staff Headcount = 155 Existing ASF	Guideline ASF	Surplus/ (Deficit)	Percent Surplus/ (Deficit)
Academic Space								
Classroom & Service	11,416	13,553	(2,137)	(19%)	11,416	17,908	(6,492)	(57%)
Teaching Laboratories & Service	13,197	15,484	(2,287)	(17%)	13,120	23,165	(10,045)	(77%)
Open Laboratories & Service	4,176	5,789	(1,613)	(39%)	4,176	8,000	(3,824)	(92%)
Academic Offices & Service	9,032	11,235	(2,203)	(24%)	9,032	13,530	(4,498)	(50%)
Other Academic Department Space	1,565	2,170	(605)	(39%)	1,565	3,601	(2,036)	(130%)
Academic Space Subtotal	*39,386*	*48,231*	*(8,845)*	*(22%)*	*39,309*	*66,204*	*(26,895)*	*(68%)*
Academic Support Space								
Administrative Offices & Service	11,171	10,899	272	2%	11,171	12,439	(1,268)	(11%)
Library	11,454	11,873	(419)	(4%)	11,454	14,305	(2,851)	(25%)
Physical Education & Recreation	0	0	0	n/a	0	3,990	(3,990)	n/a
Assembly & Exhibit	5,792	16,000	(10,208)	(176%)	5,792	16,000	(10,208)	(176%)
Physical Plant	5,556	3,968	1,588	29%	5,556	6,464	(908)	(16%)
Other Administrative Department Space	1,396	1,808	(412)	(30%)	1,396	2,500	(1,104)	(79%)
Academic Support Space Subtotal	*35,369*	*44,548*	*(9,179)*	*(26%)*	*35,369*	*55,698*	*(20,329)*	*(57%)*
Auxiliary Space								
Student Center	7,410	10,308	(2,898)	(39%)	11,810	13,844	(2,034)	(17%)
Auxiliary Space Subtotal	*7,410*	*10,308*	*(2,898)*	*(39%)*	*11,810*	*13,844*	*(2,034)*	*(17%)*
CAMPUS TOTAL	**82,165**	**103,087**	**(20,922)**	**(25%)**	**86,488**	**135,746**	**(49,258)**	**(57%)**
Inactive/Conversion Space	*2,758*				*2,758*			

ASF = Assignable Square Feet

Academic Space

Overall, an additional 26,895 ASF was generated in the Academic Space Category. Over the next 10 years space deficits are evident in each of the five categories that make up the Academic Space portion of the analysis.

Classrooms

The guideline analysis generated an additional need for 6,492 ASF of Classroom & Service space for credit, continuing education or community education courses and programs. The additional need includes enrollment growth for new programs as well as additional space to ease crowded conditions of existing classrooms.

Teaching Laboratories

Existing teaching laboratories at the MxCC campus include computer, art, and science laboratories for a total of 13,120 ASF. The guideline generated a total need for 23,165 ASF of teaching laboratory space for Fall 2023 or a 10,045 ASF deficit when compared to existing space. The College is deficient in new laboratories for Criminal Justice

(forensics lab), Computer Engineering (Tech Sandbox Lab) Social Sciences (Observation Lab) and Photography. In total, 2,800 ASF was allocated for the development of these laboratories and service spaces in the future.

The manufacturing lab, currently located in leased facilities at Meriden, is best suited for relocation to the Middletown campus. An allocation of 2,500 ASF was appropriated for the laboratory portion of this program.

The remaining 4,745 ASF includes expansion of undersized laboratories and support spaces to accommodate new enrollment growth. Specifically, science laboratories and especially lab preparation and storage areas are smaller than the consultants would typically see for related enrollments. While art laboratories are appropriate sized, they lack adequate support space as well.

Open Laboratories

The space classified as open laboratories includes rooms that are open for student use and are not used on a regularly scheduled basis. At the Plan Horizon, the need for an additional 3,824 ASF of Open Laboratory space was generated. Examples of Open Laboratory space needs included the Testing Center and specialized laboratories such as the tutoring areas and the academic learning center (Math and Writing Centers). Open computer laboratories for student research projects in the sciences are also included in this category as well as some collaborative or team rooms with computer resources.

Academic Offices

The Academic Offices & Service category includes office space for full- and part-time faculty and any staff that are working under academic divisions or Academic Affairs. The Office category also includes conference rooms and service areas such as workrooms where faculty and staff may make copies, scan documents, use the fax machine, or gather office related materials. Space for faculty and staff mailboxes also is considered part of the office service category.

For Fall 2023, the campus will require approximately 13,530 ASF of Academic Office & Service space or 4,357 ASF more than what is currently available. The factor driving the deficit is related to providing each full-time faculty with a 100 ASF private office for a total of slightly less than 4,500 ASF in office space. A slight growth of full-time faculty to accommodate increased enrollments as well as the need for additional conference rooms for faculty meetings results in another 1,700 ASF.

The guideline also included adequate space for adjunct faculty. Areas for adjunct faculty are typically spread throughout the campus, but located within proximity to full-time faculty and the division office to foster collaboration and unity as well as to avoid duplication of resources. At the Plan Horizon, it is anticipated that two adjunct faculty suites for a total of 800 ASF will be required to help address the current space deficit in this area.

The balance of the academic office space need is in offices for academic unit staff and service areas such as workrooms, copy rooms, file rooms, and small break rooms for faculty and academic units.

Other Academic Department Space

Facilities classified as Other Academic Department space include all other areas assigned to an academic department that were not included in the classifications of Classrooms, Teaching Laboratories, Open Laboratories, or Office. Other Academic Department space at the MxCC campus included lounges, meeting rooms, clinical spaces (Eye Clinic) and resource areas. A deficit of slightly more than 2,000 ASF of space was generated at the Fall 2023 Plan Horizon. The majority of this deficit is dedicated to the proposed small greenhouse for the sciences and expanded clinical space for health programs and development of a Faculty Development Center (meeting and training rooms).

Academic Support Space

Academic Support Space includes all spaces that directly or indirectly support the academic mission of the College. Overall, an additional 20,329 ASF of space is needed in the six categories noted in the table.

Administrative Offices

Similar to the Academic Offices & Service category, the Administrative Offices & Service category includes space for administrators and staff who are working outside of the academic divisions. This includes the President, Student Services, and Finance and Administration. The Plan Horizon indicates a deficit of 1,268 ASF, mostly in the area of Student Services as the College develops an integrated One-Stop Center, and the President's office as new positions support overall enrollment growth.

Library/Learning Commons

The Library consists of stacks area, casual seating, on-line resource area, staff offices, group study rooms, and a room containing computers that is dedicated to the Library. The Pegasus Gallery, Veteran's Oasis Center, and the Learning & Testing Center were not included in the library guideline.

Library Services

Library Collections

	Current Items	Conversion Factor	Fall 2013 Volumes	Volume Growth	Fall 2023 Volumes
Books/Serials (Volume	43,800	1.00	43,800	-10.00%	39,420
Manuscripts & Archive	0	1.00	0	0.00%	0
Gov't Documents (Vol	0	1.00	0	0.00%	0
Unbound Serials (Disp	225	0.40	563	1.00%	568
Microforms	0	80.00	0	0.00%	0
Audio/Visual Materials	2,300	5.00	460	10.00%	506
Total Volume Equivalents			**44,823**		**40,494**

Library Guideline Application and Analysis

Collection Space	*No. of Volume Equivalents* 0 - 150,000	150,001 - 300,000	300,001 - 600,000	600,001 - 2,000,000	2,000,001 and above	FALL 2013 Guideline ASF	FALL 2023 Guideline ASF
ASF per Volume	*0.09*	*0.08*	*0.08*	*0.07*	*0.02*		
Fall 2013 Collection Space	4,034	0	0	0	0		
Fall 2023 Collection Space	3,644	0	0	0	0		
					Total Collection Space	4,034	3,644

Study Space	Percent of FTE	Fall 2013 FTE	Fall 2013 Stations	Fall 2023 FTE	Fall 2023 Stations
Undergraduate Students	18%	1,447	260	2,000	360
Graduate Students	0%	0	0	0	0
Faculty (FTE)	0%	40	0	50	0
	Total Study Stations		260		360
Regular Study Stations	*80% @ 25 ASF/Station*		5,200		7,200
Multimedia Study Stations	*20% @ 30 ASF/Station*		1,560		2,160

Total Study Space	6,760	9,360
TOTAL COLLECTION & STUDY SPACE	**10,794**	**13,004**
Service Space *(10.0% of Total Collection and Study Space)*	1,079	1,300
TOTAL LIBRARY GUIDELINE SPACE	**11,873**	**14,305**
Existing Space	*11,454*	*11,454*
SURPLUS / (DEFICIT)	**(419)**	**(2,851)**

The guideline application, as illustrated in the table, generated a deficit just over 2,800 ASF in this type of space at the Plan Horizon.

As MxCC moves toward a learning commons model, the consultant generated guidelines that reduce the amount of stack space for printed volumes while increasing space for group and collaborative study. Quiet study areas are also being incorporated into newer learning commons.

Recreation & Fitness

At the MxCC Middletown campus, there are no dedicated facilities for physical education and recreation. Typically the Physical Education/Recreation space category includes gymnasia, basketball courts, weight or exercise rooms, indoor swimming pools, and similar. Recreation space includes exercise, dance and general fitness rooms and weight rooms.

For MxCC, the 3,990 ASF need at the Plan Horizon includes a Fitness/Wellness Center with a 1,200 ASF multipurpose room for aerobics, yoga or Pilates; 670 ASF in men's and women's locker rooms and support areas; and a 1,820 ASF recreation area for cardio equipment and free and fixed weight machines. A small reception desk and storage area was also included in the facility.

Assembly & Exhibit

Assembly & Exhibit Space is defined as any room or area designed and equipped for the assembly of large numbers of students or community members. This includes theaters, auditoriums, concert halls, and arenas. Exhibit spaces are used for exhibition of materials, works of art, or artifacts intended for general use by students and the public. At MxCC, the multipurpose rooms on the upper floor of Chapman Hall were classified as assembly & exhibit space.

In recent years Paulien & Associates has been using a guideline originally promulgated by the Council of Educational Facility Planners International. This guideline has a core allowance of 16,000 ASF for smaller institutions. When the guideline was applied, a total need of 10,208 ASF of assembly and exhibit space was generated. This guideline includes space for an auditorium or black box performance venue as well as an expanded art gallery and adjacent support space of 850 ASF.

Physical Plant

Physical Plant space includes carpenter, plumbing, HVAC, electrical, and painting, printing shops and tool rooms as well as any centralized storage space. MXCC has a maintenance building that is predominately used for grounds equipment and some materials storage. Additional central storage is located in Chapman Hall. In the future, additional shop and central storage space will be needed as the campus continues to increase enrollments and physical size. The guideline generated a need for an additional 908 ASF at the Plan Horizon.

Other Administrative Department Space

Similar to the Other Academic Department Space requirements, Other Administrative Department Space consists of the same types of spaces with the exception that the areas are allocated to administrative units. These spaces include non-office related work and processing rooms, telecommunication/server rooms, phone rooms, lounge areas, computer storage and repair rooms and general meeting rooms. The consultant shows a minimal need of 1,104 ASF in this space category at the Plan Horizon, primarily for Information Technology and meeting rooms.

Auxiliary Space - Student Center

The Student Center is located within Founders Hall and includes food services and dining, bookstore, student game room, and student lounge area. Despite a planned 4,400 ASF addition to the student Center adjacent to the cafeteria, the Plan Horizon generated a 2,034 ASF deficit to accommodate the anticipated growth in Student Headcount. The majority of this space deficit is allocated to the space needs for additional lounge space, student clubs and student activities.

LIMITATIONS OF ANALYSIS

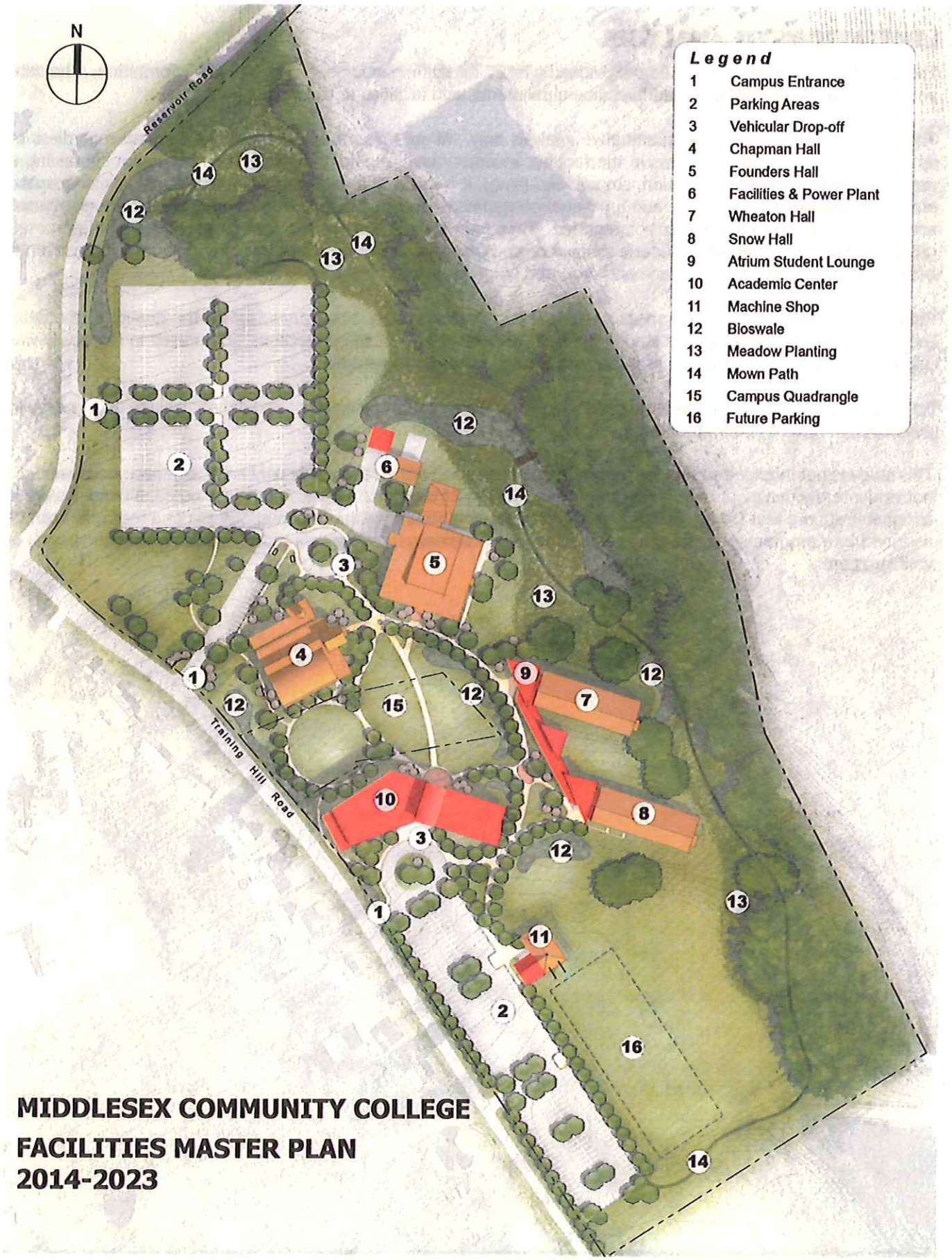
The consultant analyzed campus data provided by MxCC for staffing, course, and enrollment information. The data provides a "snapshot in time" of staff, course enrollments, and facilities at the institution.

The Space Needs Analysis is a quantitative analysis only. All permanent existing space is counted regardless of its quality. Because several rooms in the facilities inventory have multiple functions (i.e., one room containing a reception space, clerical workstation, storage and filing), it is impossible to accurately distribute the existing space among the appropriate room use and functional categories whereas the proposed area calculations are distributed among the room use and functional categories. Therefore, the relationship between existing space and proposed guideline space for individual categories should be considered as rough comparisons. The only true comparison is between a unit's total existing space and proposed guideline space.

Reliability of the findings of any space needs study depends on several factors including the quality of the data, the appropriateness of the space standards used, and the validity of the projections. Data used in this study was updated and refined to as high a level of accuracy and currency as possible.

The scope of this study did not identify every individual department requirement and did not include detail normally developed in room-by-room program planning of specific facilities.

This study is not intended to replace program level analysis. Further, this study only analyzed space needs and did not evaluate the quality of existing space or the suitability of the space. Unless otherwise noted, all findings are in assignable square feet (ASF). ASF is defined as the area measured within the interior walls of a room that can be assigned to a program. It does not include circulation, stairways, mechanical rooms, building service spaces, or wall structure.



MIDDLESEX COMMUNITY COLLEGE
FACILITIES MASTER PLAN
2014-2023

GOALS AND OBJECTIVES

Middlesex Community College campus is an integrated network of environmental and human-built systems that defined the parameters encouraging or restricting future land use and development. The major systems include existing land use, open space, pedestrian circulation, vehicular circulation, buildings/architecture, parking, utilities and existing development patterns.

Goals and Objectives of the Facilities Master Plan

The objectives of the Facilities Master Plan outlined for Middlesex Community College as outlined by the planning team and Goals and Objectives for Facilities and Campus Development are:

- To provide a blueprint for utilizing existing resources, building on existing strengths and reinforcing the positive image of the college, community and State of Connecticut.
- To provide a development strategy that establishes need, priority, schedule and cost- effective solutions.
- To identify functions that should be relocated in existing or new facilities.
- To provide phased renovation, upgrading, replacement and expansion of existing facilities.
- To outline a guide for unification and consolidation of the campus.
- Evaluate the current use of space and functionality identifying relocation strategies, and incorporate these strategies in the renovation of existing buildings including identifying new facilities as required.
- Provide a renovation and sequencing plan as required to allow prioritized upgrading for existing facilities.
- Develop a physical plan that will unify and consolidate the campus through a comprehensive open space and landscaping plan.
- Provide a course-of-action "Master Plan" over the next ten years for the College to follow that will build on existing strengths and reinforce its image.
- Integrate a capital outlay plan for facilities to fulfill need.

Focus and Emphasis

The Middlesex Community College Facilities Master Plan will have focus areas that will be included within the overall master plan. Our work plan will emphasize these focus areas within the structure of the planning process. The focus areas are:

1. Increased use of buildings during peak and off-peak academic periods for conferences and events;
2. Changes in building use resulting from online classes;
3. Parking on campus for both students and employees;
4. High community-demand spaces to be served by parking;
5. Improve faculty office locations;
6. Provide additional student activity space;
7. Centralized support services.

Themes

The Facility Master Plan reflects the planning team's understanding of MxCC's intent for a Master Plan process and was based on the following five themes:

A Sound Approach to Project Management

Policies, procedures and schedules were clarified at project inception. Effective coordination with MxCC representatives and consultants throughout the planning process slowed the numerous planning tasks to be conducted efficiently, contributing to the development of a cohesive plan.

An Understanding of Middlesex Community College's Goals

Workshops and presentations, schedule during the planning process, provided an opportunity to explore and test with MxCC's representatives the mission of the School, its continued evolution as an institution and as a community. The adequacy of the physical plant to support this mission, as well as specific facilities changes necessary to accommodate the curriculum, was discussed to enhance evaluations of planning materials and interviews.

A Dynamic Planning Process in Which Middlesex Community College Was A Partner

Opportunities for informal "brainstorming" with MxCC representatives generated creative concepts that were provided at key points in the planning process. Planning criteria provided direction for subsequent planning tasks. A workshop with MxCC provided an opportunity for discussion and refinement of these criteria. A second workshop presented for discussion the alternative plans and selected the preferred alternative.

An Integrated Approach to Sustainable Planning

The work plan integrated the campus with the surrounding environment through unified planning standards and stormwater management design concepts. These stormwater management concepts are built on MxCC's strengths and unique qualities. Sustainability objectives and goals are incorporated in the energy management priorities of the Facilities Master Plan.

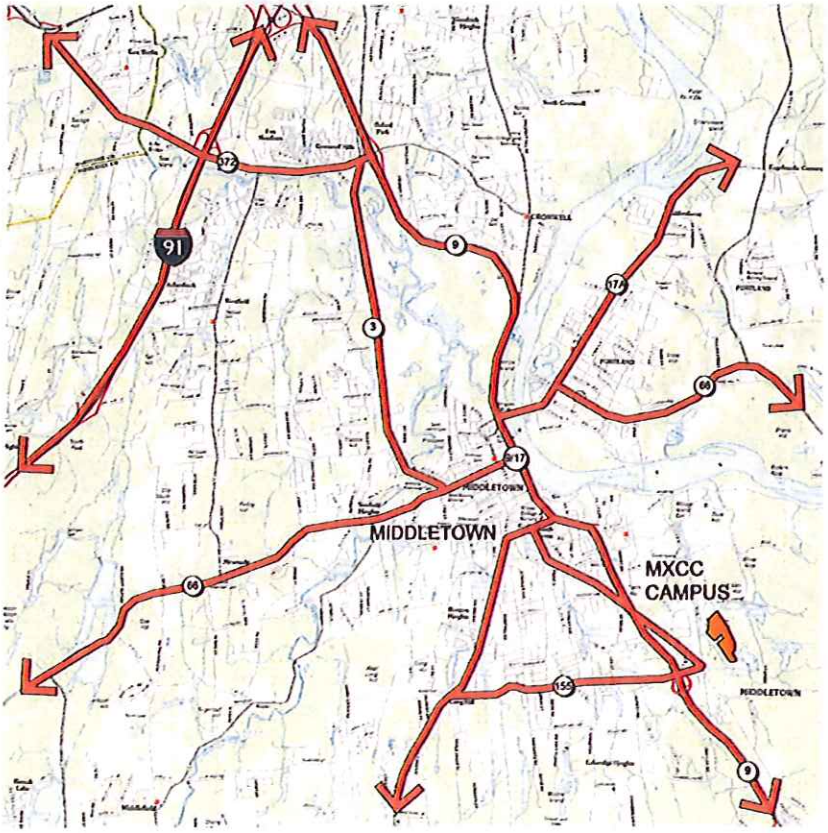
A Practical Strategy for Implementation

The Master Plan responded to MxCC's needs and available resources providing clear documentation phasing, and sources for implementation.

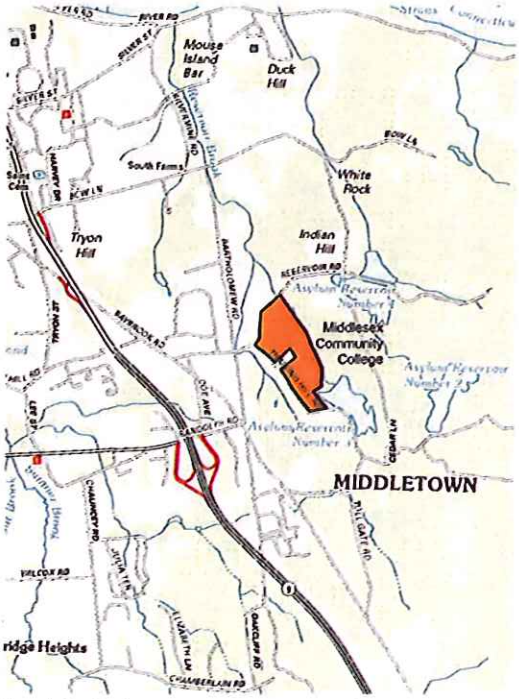
SITE ANALYSIS AND INVESTIGATION

Regional and Urban Context

Middlesex Community College is located on the outskirts of Middleton, Connecticut approximately 20 miles south of Hartford. The campus is accessible from Connecticut Route 9 that connects I-91 and I-95. The campus is adjacent to residential neighborhoods across Reservoir Road and Training Hill Road. The campus is contained along the eastern border by forested wetlands.



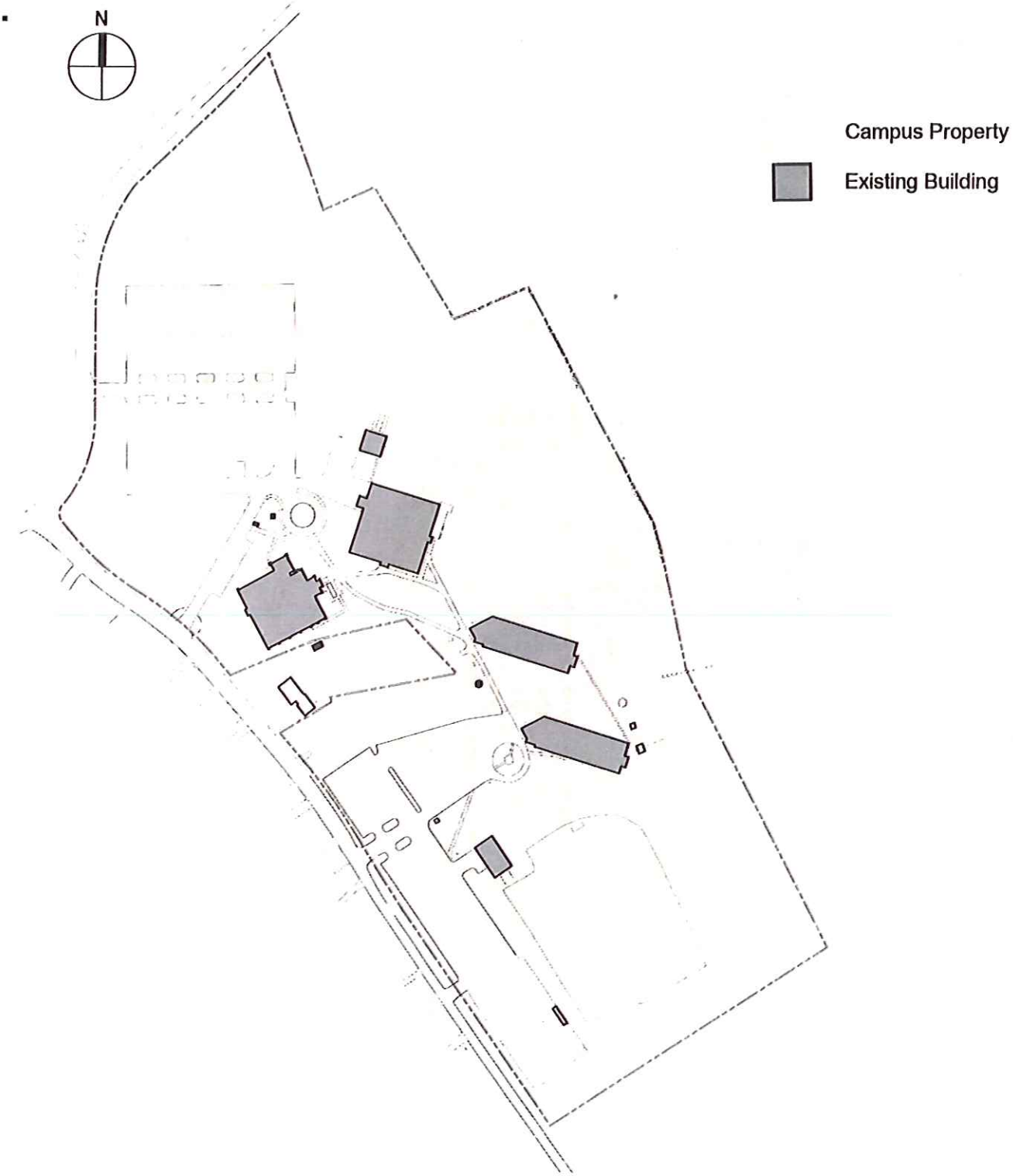
Regional Context



Local Context

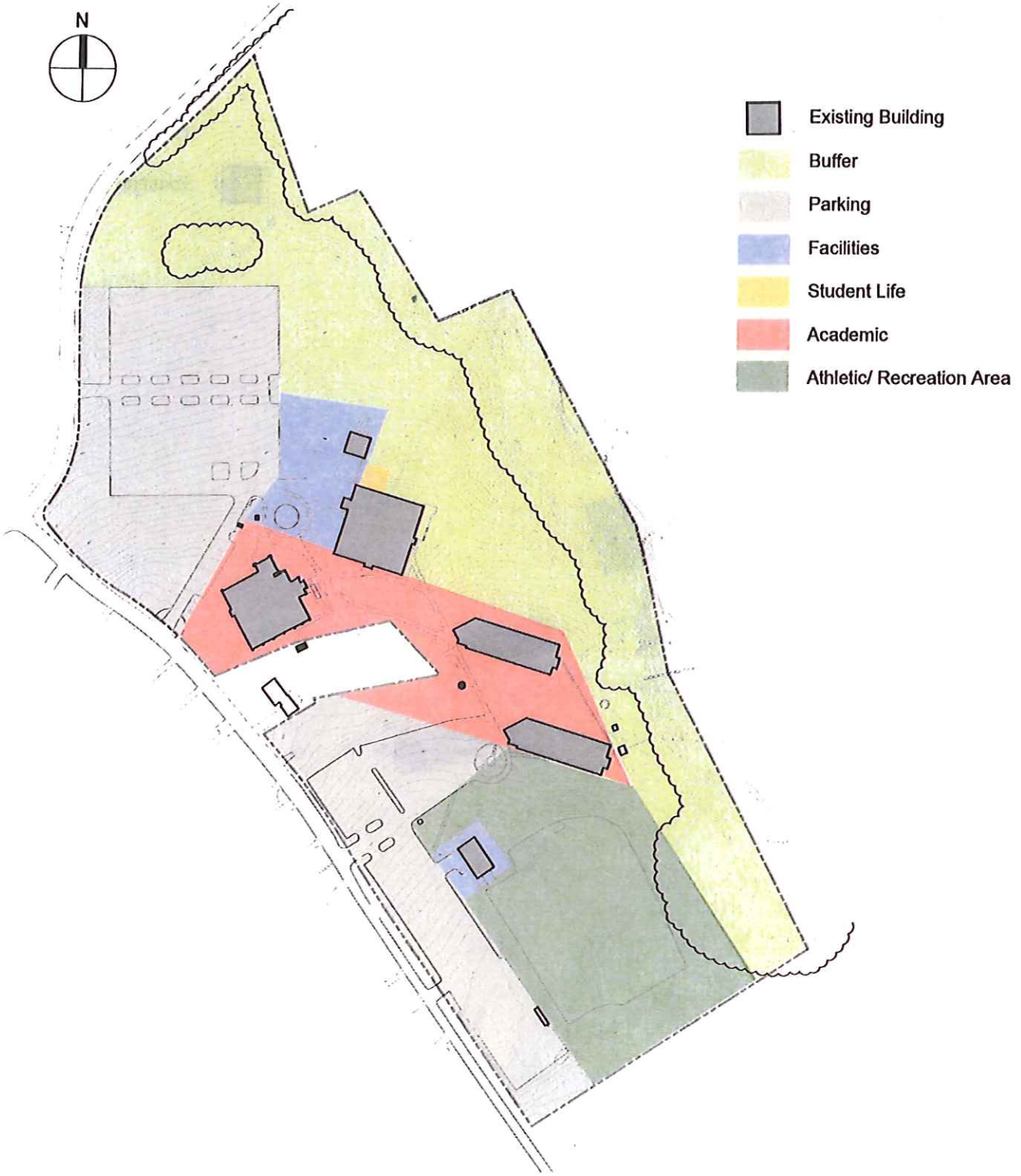
Figure Ground

The Figure Ground diagram represents the size of building footprints and locations on campus property. The main campus buildings are centrally located on approximately 35 acres of campus property. A one acre residential parcel carves an area out of the center of campus effectively dividing it in half. Parking is illustrated to the north and south ends of campus.



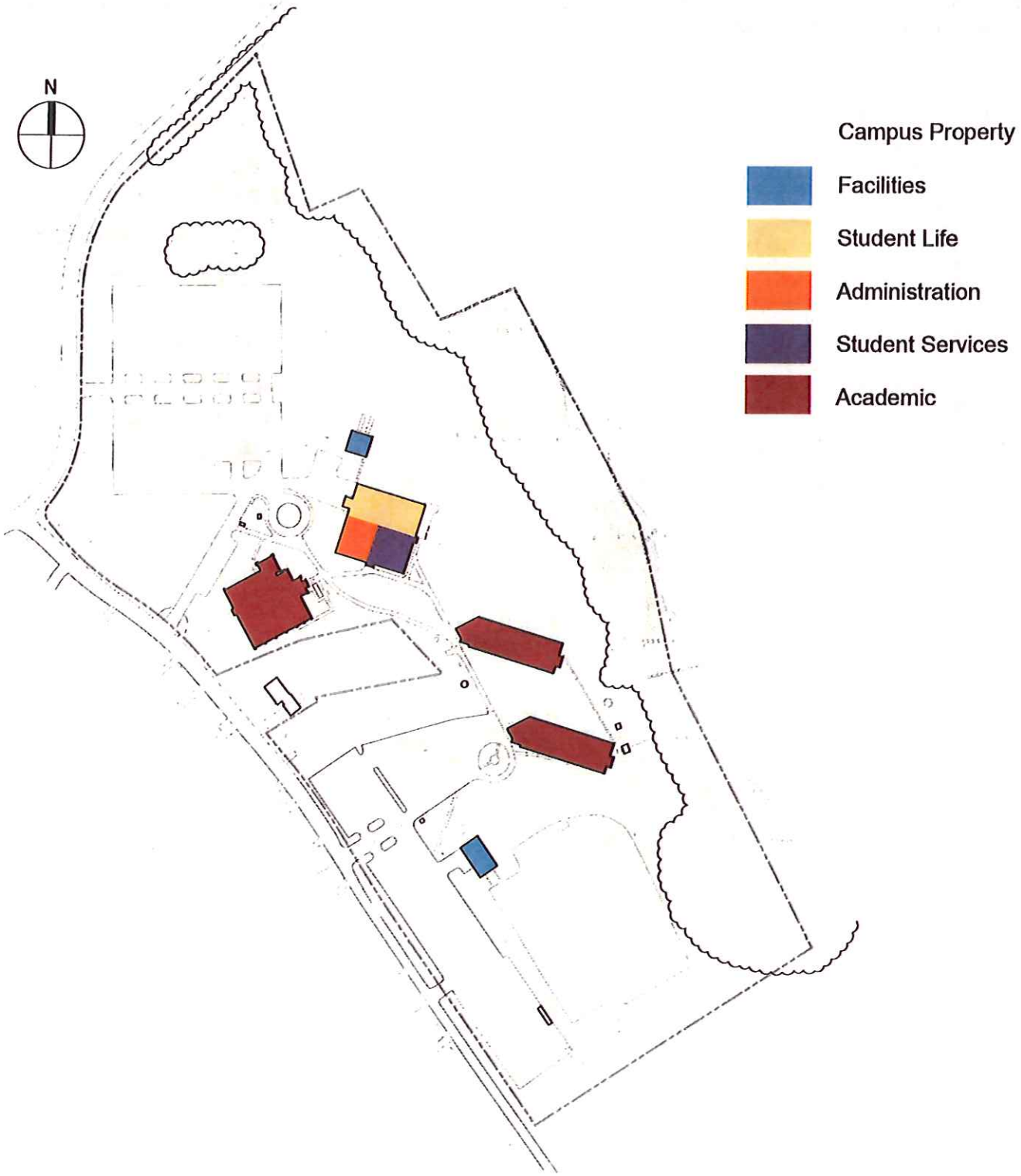
Land Use

Middlesex Community College has several land uses. Academic and Student Life uses are centrally located flanked by facility uses. Parking use dominates the edge of campus along the roadways. An area for athletics and recreation is located on the southern end of campus. An open space buffer runs the length of the eastern campus border.



Building Use

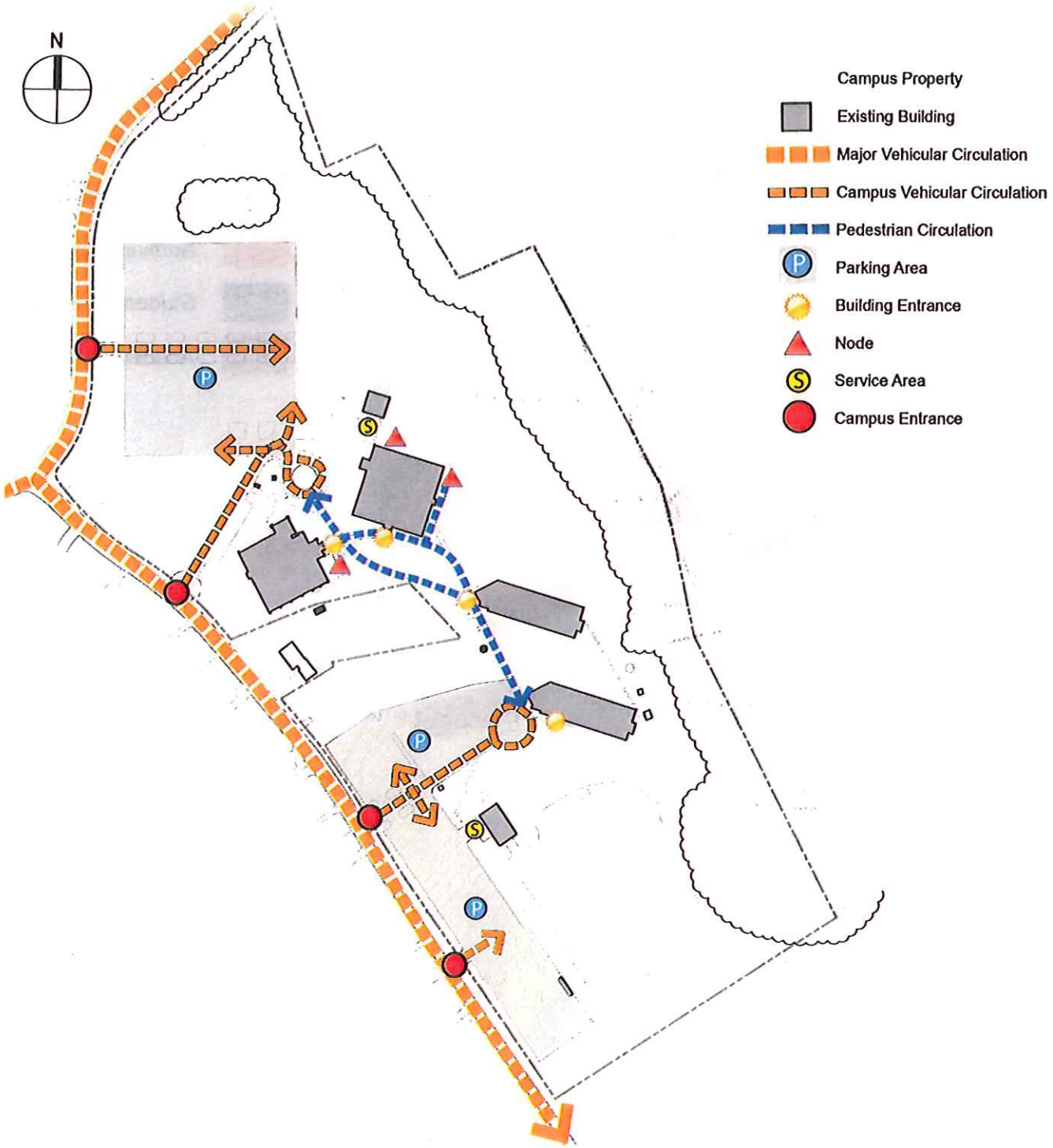
Middlesex Community College is comprised of four main buildings and two support buildings. Chapman Hall, Wheaton Hall and Snow Hall are all academic buildings. Founders Hall houses administration, student services, and student life functions. The Central Plant and Maintenance Building provide facilities support to the campus.



Circulation

Middlesex Community College is accessible by vehicle on the western edge of campus by Reservoir Road and Training Hill Road. The formal entrance to campus is located on Training Hill Road closest to the intersection with Reservoir Road. There are two additional vehicular entrances from Training Hill Road directly into parking areas and a third from Reservoir Road into a parking area. General traffic does not circulate through campus.

Pedestrian circulation extends across the center of campus from one parking area to the other making connections to the main campus building entrances.

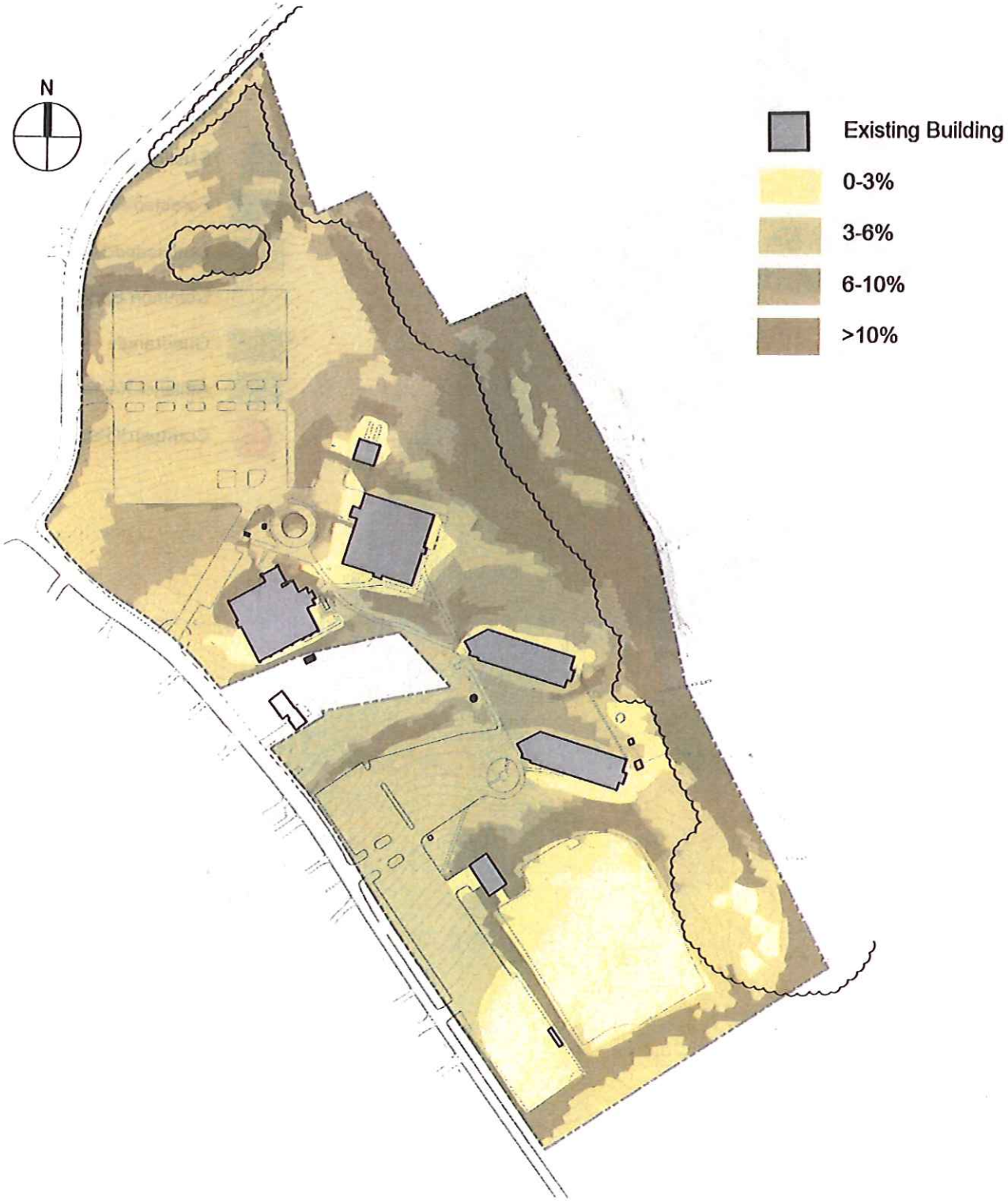


Open Space

The Middlesex Community College campus is characterized by several different types of open space. In the center of campus, a loosely defined quadrangle knits together three of the main campus buildings with the formal drop-off area in a linear organization. Common open space provides a foreground from the roadways looking to Chapman Hall. A seldom used athletic/recreation area is located at the southern end of campus. A zone of mowed lawn defined as landscaped area separates the campus proper from the eastern forested edge.

Topography

The overall topography of the Middlesex Community College campus falls from a high point at the southern end of campus to the northern end in a terracing fashion. Most of the site is characterized by slopes of 3-6%. Slopes between the buildings, parking areas and fields are 6-10%, and sometimes sloping to over 10%. The eastern edge of campus is dominated by steep slopes of over 10% where water is directed toward the reservoirs just off campus property.

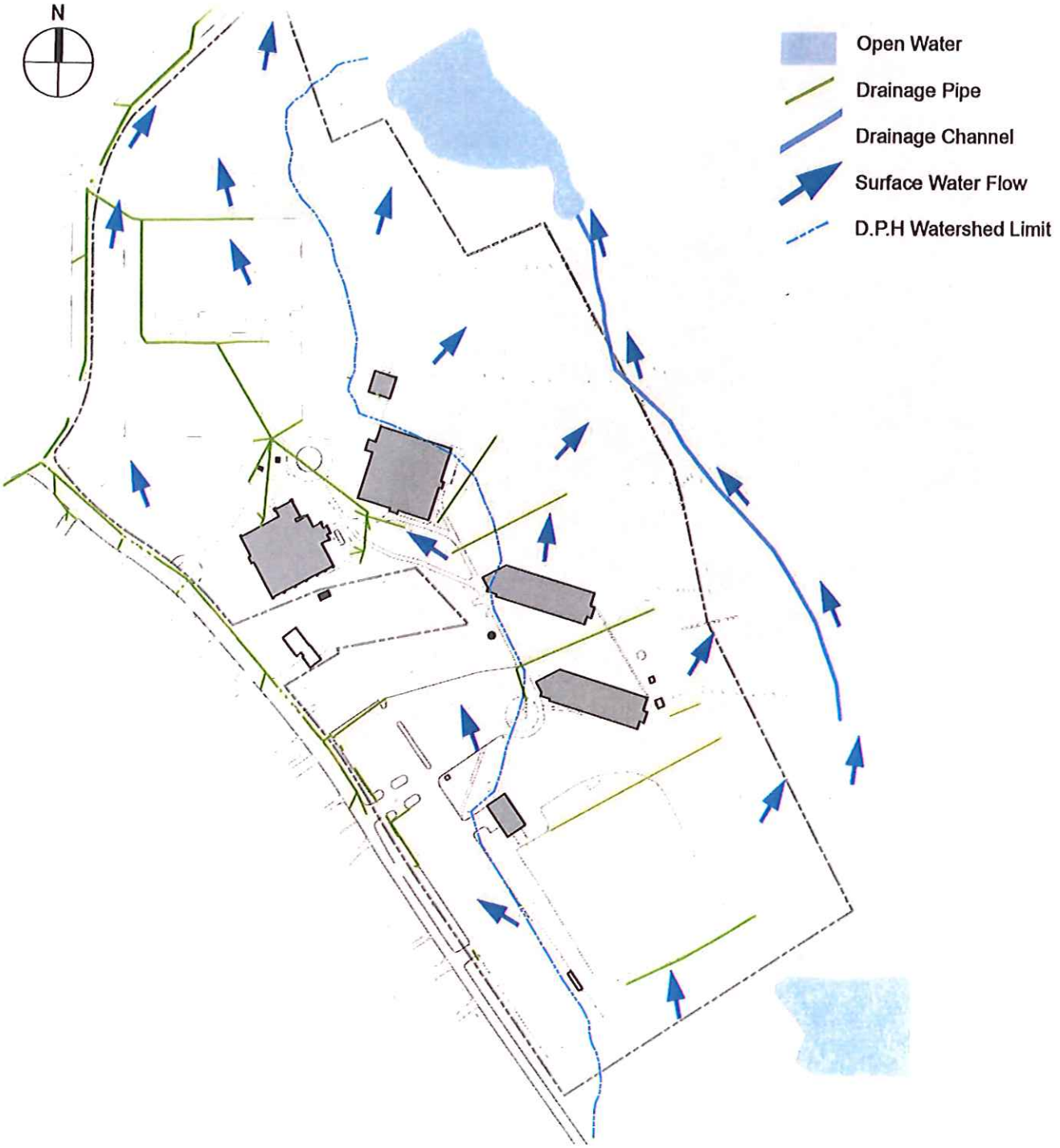


Soils

Most of the soils on the Middlesex Community College campus are characterized by soils suitable for building with some precaution for high water tables and frost protection. These areas are labeled 30B, 45B, 84B, and 307. Areas labeled 73E and 86D have characteristics challenging to development such as steep slopes, erosion, and bedrock. The areas along the southern edge of the campus often have very high water tables and exhibit soggy conditions due to the proximity of the nearby reservoir.

Hydrology

The overall topography of the site consists of a high point near the southern end of the campus that slopes downhill toward the northern end. Along the eastern property line the campus drains into a channel that flows northward into an existing water body. Existing drainage systems on the southern half of the campus are collected in catch basins and piped northeastward where the pipes daylight and runoff continues via overland flow to the drainage channel just beyond the eastern property line. Drainage from the northern half of the site is collected in catch basins and piped to a system that runs northward along Reservoir Road. A Department of Public Health (D.P.H.) watershed line runs though the campus directing some overland flow to domestic water supply reservoirs. There are no detention or filtration areas on the campus.



Utilities

Middlesex Community College has a Central Plant that provides chilled water and hot water services and returns to three of the main buildings. A utility "corridor" runs through the center of campus around to the Maintenance Building. Gas service is available from the street, but does not currently exist on campus.

FACILITY ASSESSMENTS

Overview

The objective of the Building Evaluation reports was to perform a cursory visual inspection of the physical condition of the exterior, interior and building systems and to evaluate and summarize upgrades required and recommended as a result of the assessment. Recommendations are summarized as code compliance, accessibility and energy management issues. Generally, the buildings appear to be in good condition and well maintained but due to the age of the structures it is difficult to achieve modern standards without major renovation to improve the quality of the spaces for their intended academic use.

Building Evaluation reports for each building shown below, as well as for the Maintenance and Power Plant buildings, are provided in Appendix C.

Snow Hall

Wheaton Hall

Founders Hall

Chapman Hall

EDUCATIONAL INITIATIVES	
Campus Conneotions	
1. **Student Study Areas**	Located near classrooms **(2) 3,000 ASF areas**
2. **Recreation/Fitness Center**	Multi-purpose room/small locker/changing/ exercise equipment **Maintenance Building 2,600 ASF + 1,400 = 3K**
3. **Enhanced Student Center**	Around cafeteria in Founder's Hall **(1) 3,000 ASF**
4. **Community Event Space**	Maybe "Black Box Theater" **? size – see item 10**
Aoademio Programs and Instruotion	
5. **Classroom & Tech for New Pedagogies**	New classrooms needed **(10) classrooms @ 800 ASF (old labs renovation)**
6. **Specialty Laboratories**	Chemistry, Physics, Biology, Microbiology Lab preparation space; need independent work space **(4) new labs and shared prep. – 12,000 ASF; storage and prep 1,600 ASF**
Other Labs	• Criminal Justice • Computer Engineering Technology program • Social Sciences and Observation Room • Environmental Science • Photography • Language Lab and Student Practice **(6) new labs – 18,000 ASF**
7. **Fine and Digital Arts**	Center for new Media **Existing space**
8. **Machine Technology Program**	10,000 SF state standard **Locate near Central Facilities** **1-story**
9. **Faculty Offices**	60 ft. faculty offices @ 120 ASF Adjunct faculty suites **8,000 ASF + 2,400 ASF – (2) suites**
10. **Auditorium/Performance** **Black Box**	**3,000 ASF** Lobby, Box Office/Coat Room **2,000 ASF** Theater, stage, lighting, storage **1,000 ASF** Backstage support: green room, dressing **1,500 ASF** Shops: scenery, lighting, storage **7,500 ASF**
Student Aoademio Support	
11. **Development/ Technology Center**	For delivery and supporting online courses **1,200 ASF**
12. **One-Stop Student Services** **Re-plan Founders**	Realignment of Administration and Registrar, Admissions, Financial Aid and Records, Career, Counseling, etc.
13. **Learning Commons**	Transform Library into Learning Commons **Addition to Library**
14. **Readiness and Completion**	Math Labs, Writing Centers close to classrooms and offices **(2) @ 1,200 ASF**

ALTERNATIVES

Educational Initiatives

The Campus-wide Space Needs Analysis for Middlesex Community College (MxCC) is summarized by space category on Page 89 of this report and was used to determine the Educational Initiatives that would require physical space, either new or renovated on campus to fulfill academic program need. The summary indicates a shortfall in the target year 2023 of 26,895 ASF academic space; 20,329 ASF of support space and 2,034 ASF auxiliary space for a total of 49,258 ASF.

The Table of Educational Initiatives was compiled based on critical issues expressed in leadership, faculty and staff workshop discussion sessions conducted on campus. This list of educational initiatives forms the basis for the physical planning.

Space Summary

Student Study Areas	4,000 ASF	New
Recreation/Fitness Center	4,000 ASF	Renovation and Addition
Student Center Expansion	3,000 ASF	Addition
150 Seat Black Box	5,000 ASF	New
Classrooms	8,000 ASF	Renovate Old Labs
New Science Labs	10,000 ASF	New
Other New Labs	12,000 ASF	New
Fine and Digital Arts	ND ASF	Additional adjacent spaces
Machine Technology Program	10,000 ASF	New 1-story building
Faculty Offices	7,200 ASF	New
Development/Technology Center	1,900 ASF	New and Faculty Offices
One-Stop Student Services	16,000 ASF	Renovation and Realignment of Founder's Hall
Learning Commons	10,000 ASF	Addition to Library
Readiness and Completion	1,900 ASF	New and Faculty Offices

ND=Not Determined

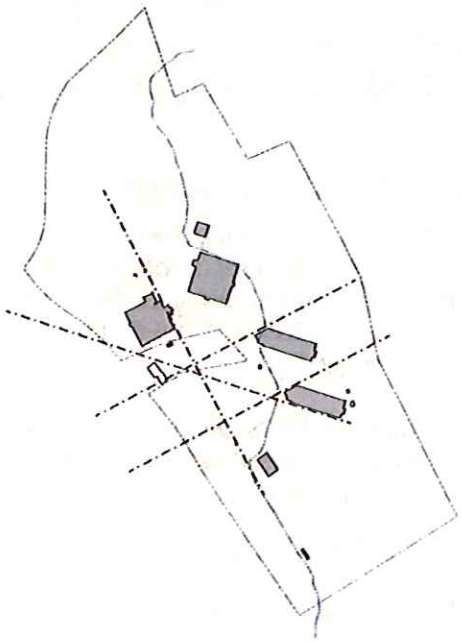
Massing Concepts

Four massing concepts were created to determine the best location and mix of renovations to existing buildings with comparisons to new building space requirements.

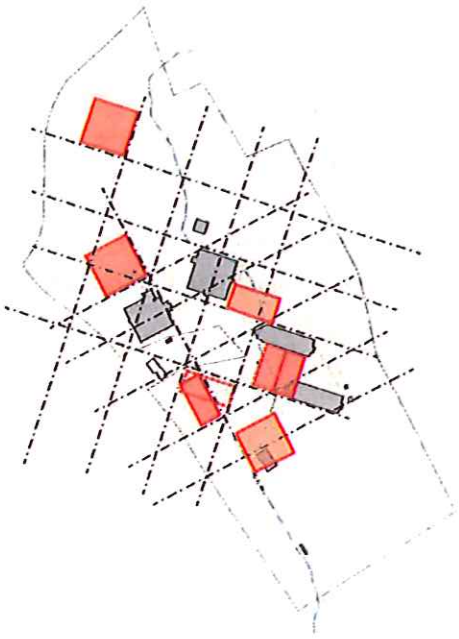
The concepts focused on balancing environmental issues, program requirements and design parameters to create and reinforce the existing visual quality of the campus with new development.

Planning Framework

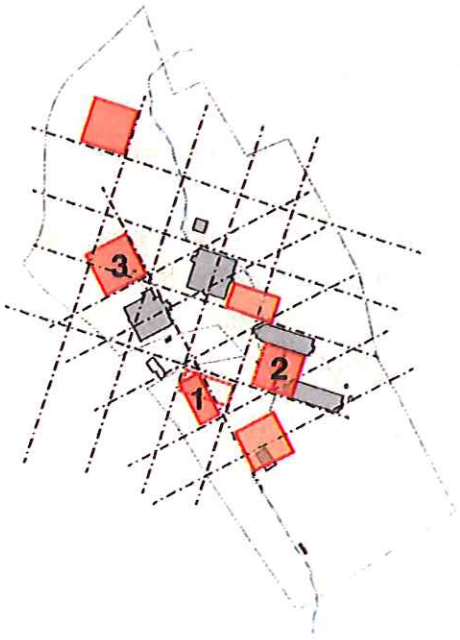
Potential building areas were suggested based on the existing campus buildings and orientation extracted from established axes that create the visual character of the campus. The following diagrams tested potential building locations.



Existing Axes



Extrapolated Grid

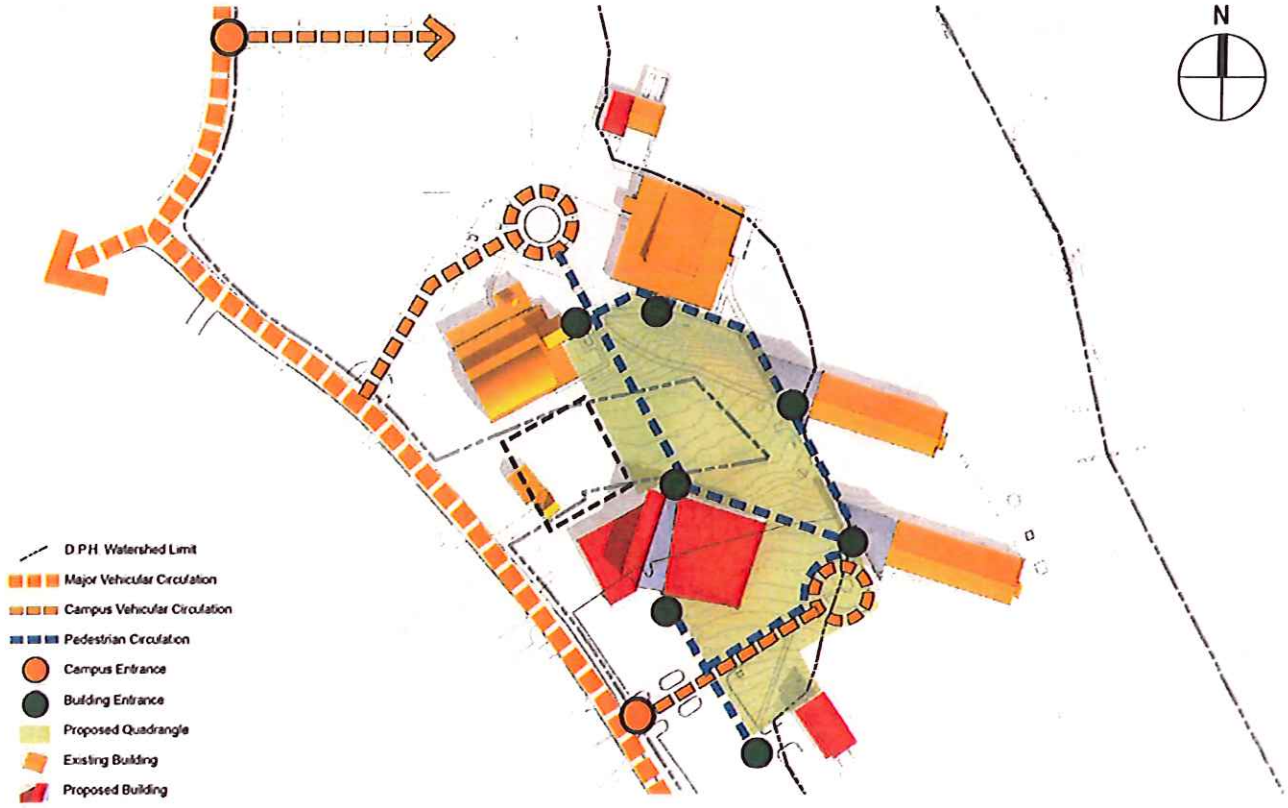


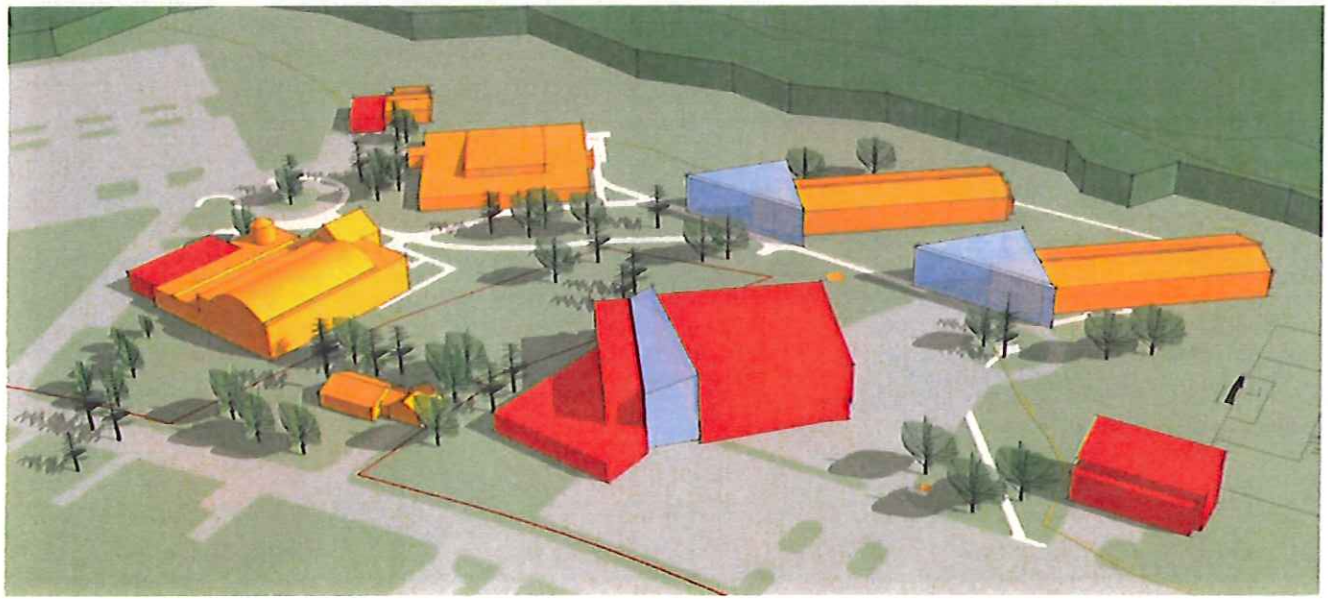
Potential Building Location

Massing Concept 1

Consolidate campus maintenance and facilities at Central Utilities Plant with new garage.

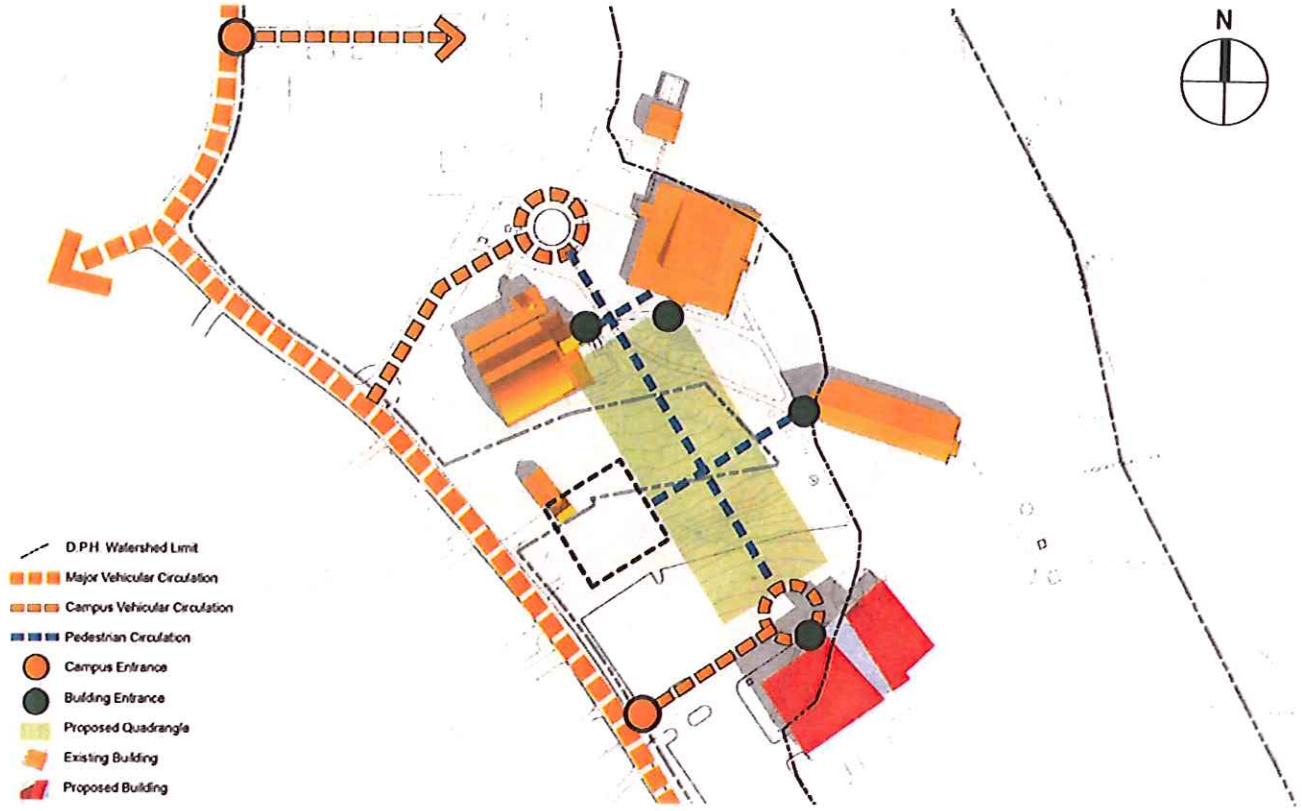
- Re-purpose and expand maintenance building for student/ academic use.
- Construct a new building with central atrium to accommodate proposed space requirements
- Construct a new building/atrium to connect Snow and Wheaton Halls and to provide an updated entrance, lounge and study space.
- Define new quadrangle with proposed buildings, plantings and paths.
- Introduce new south campus entrance and drop off on street side of proposed building.
- Create new formal campus quadrangle at the center of the campus.

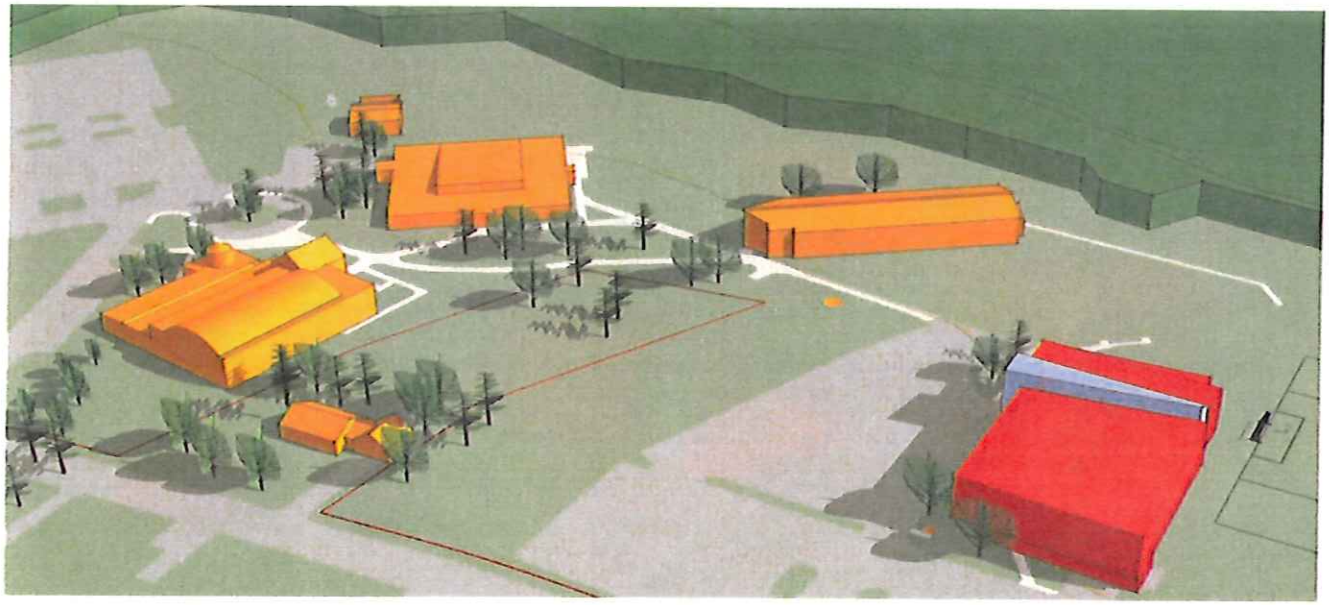




Massing Concept 1A

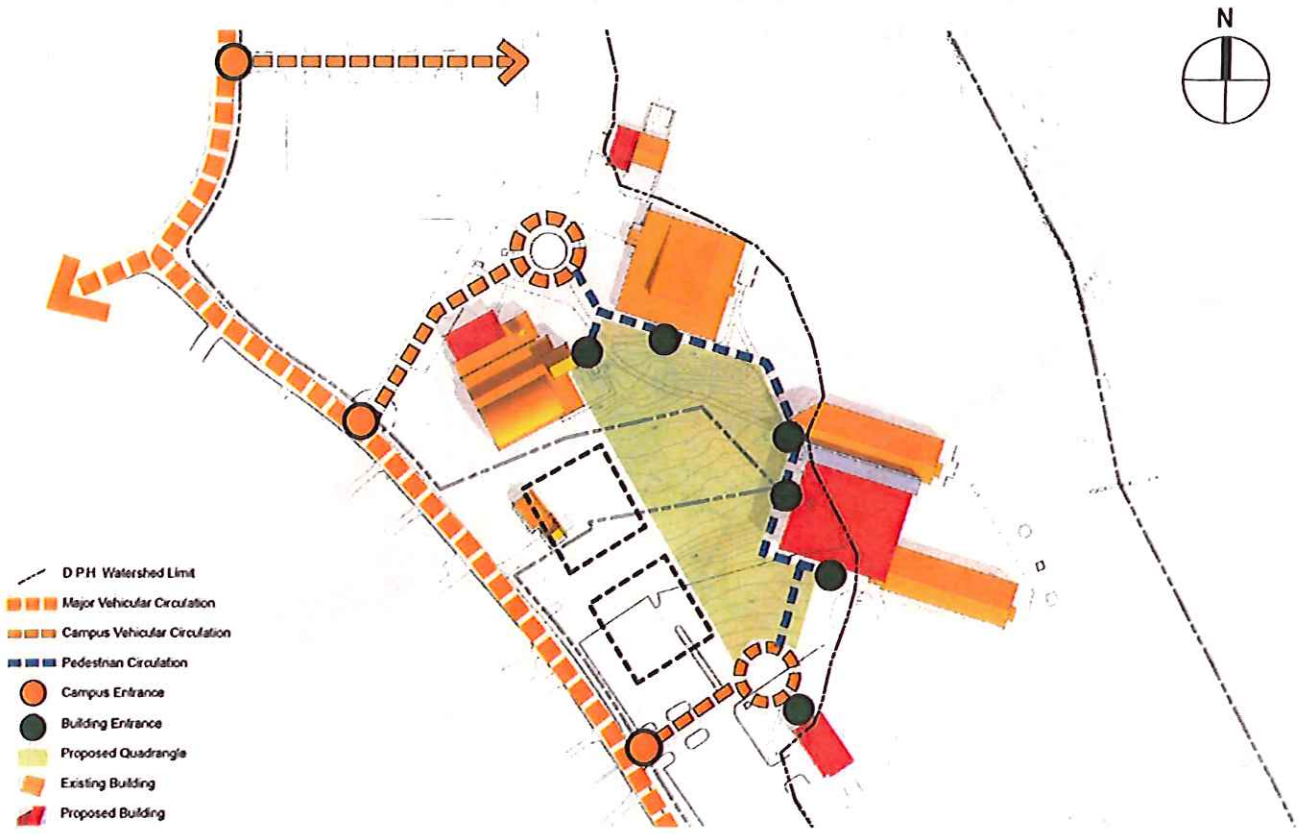
- Consolidate campus maintenance and facilities of Central Utilities Plant with new garage.
- Demolish maintenance building for building location.
- Construct a new building with atrium to accommodate proposed space allocation at high point of campus.
- Construct new atriums at Snow and Wheaton Hall to enhance entrance experience, student lounge and study spaces.
- Define new quadrangle using geometric framework and define future building site.
- Introduce new south campus entrance and drop off in front of new Academic Center.

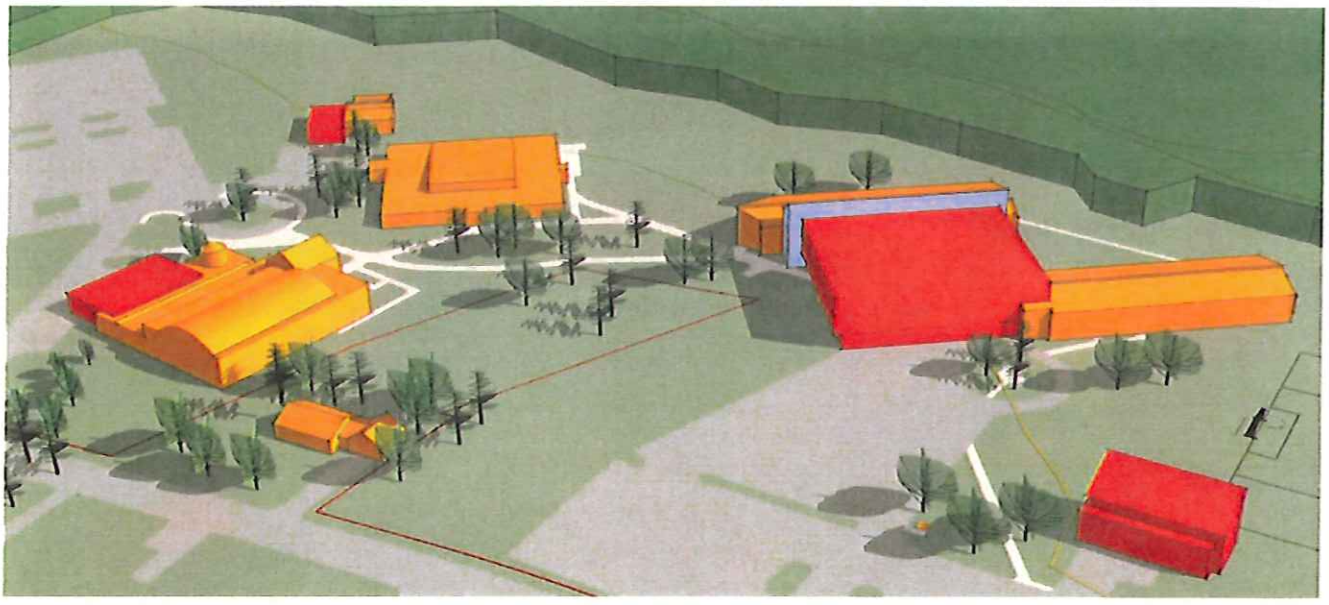




Massing Concept 2

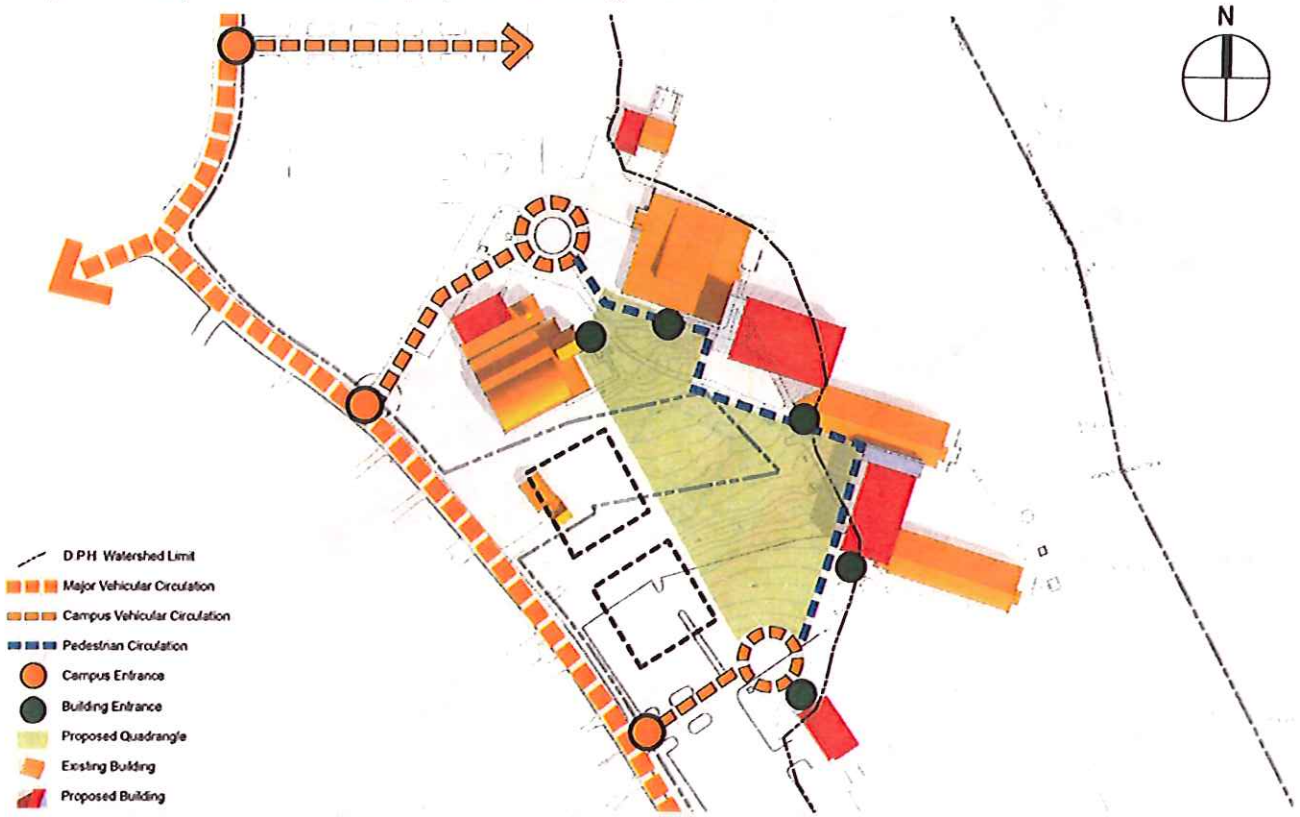
- Consolidate campus maintenance and facilities at Central Utilities Plant with new garage.
- Re-purpose and expand maintenance building for student/academic use.
- Construct a new building to connect Snow and Wheaton Halls and to provide an updated program space.
- Define new quadrangle central with proposed buildings, plantings and paths.
- Introduce new south campus drop off with addition to Library as Learning Center.
- Create new formal campus quadrangle at the center of campus.





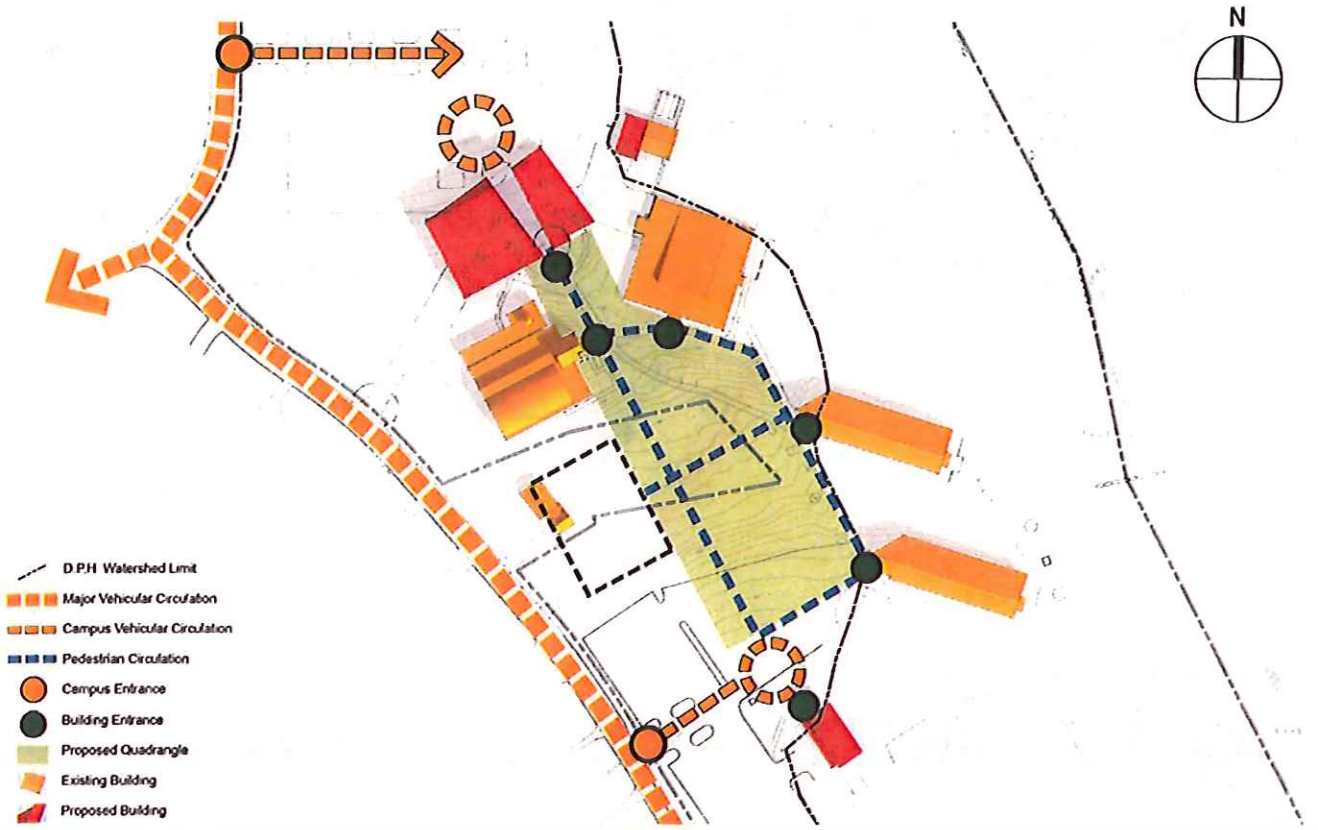
Massing Concept 2A

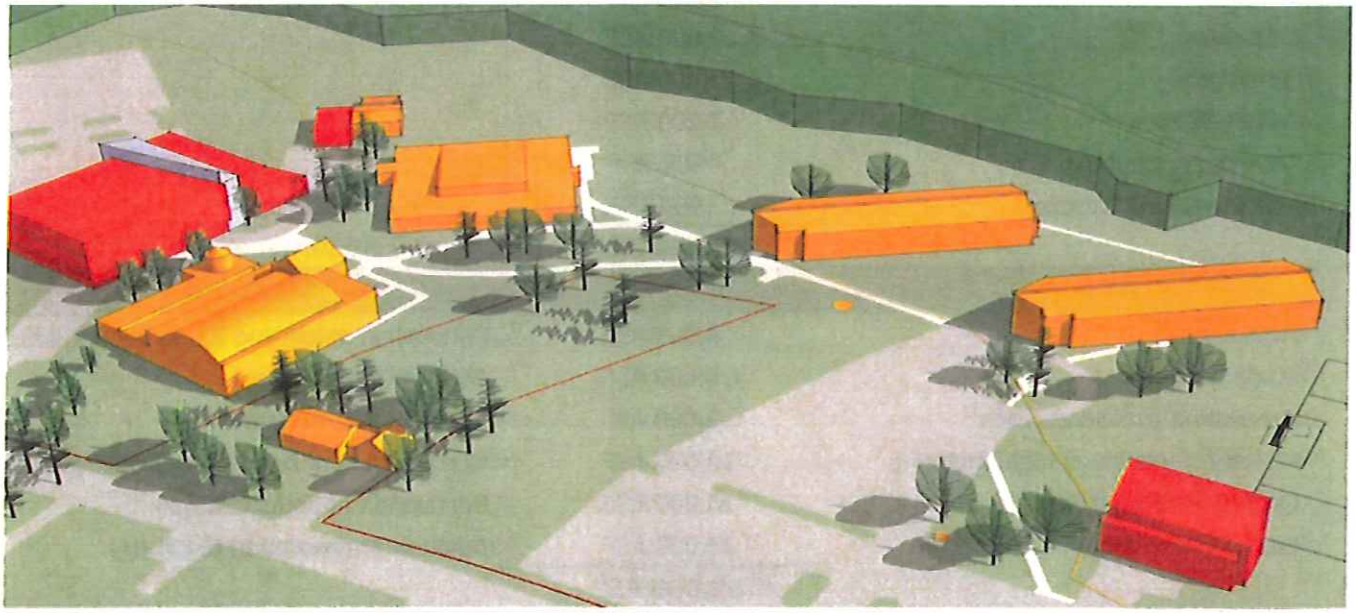
- Consolidate campus maintenance and facilities at Central Utilities Plant with new garage.
- Re-purpose maintenance building for student/academic use.
- Construct a new building with atrium connecting Snow and Wheaton Halls to accommodate proposed space program allocation.
- Define new quadrangle at center of campus.
- Introduce new south campus entrance and drop off in front of new student center in re-purposed maintenance building.
- Provide space for two additional new buildings along Training Hill Road.
- Expand Library to accommodate proposed Learning Center.



Massing Concept 3

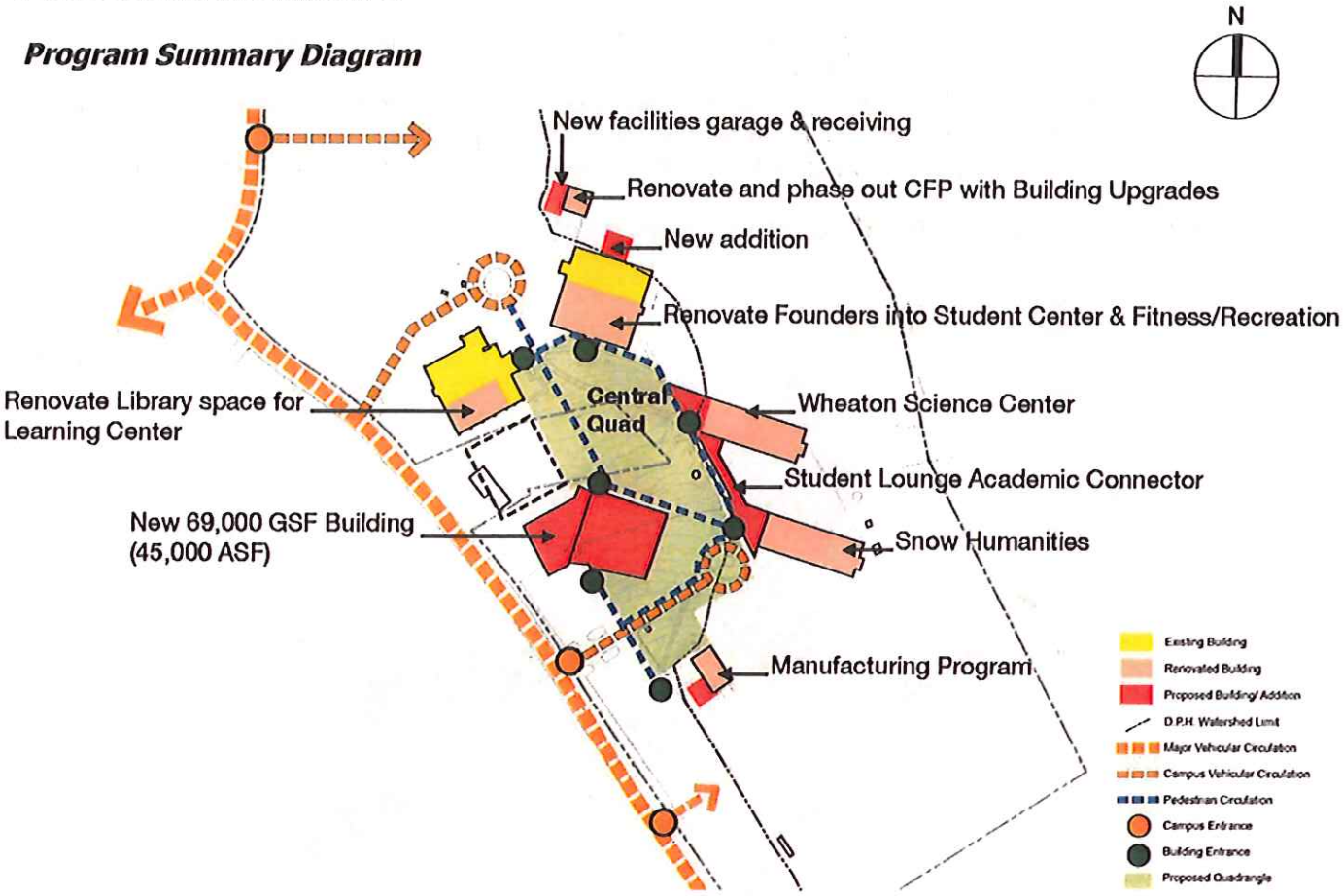
- Consolidate campus maintenance and facilities at Central Utilities Plant with new garage.
- Re-purpose and expand maintenance building for student/academic use.
- Construct a new building with central atrium to accommodate proposed programs at north end of campus.
- Define new central quadrangle with proposed buildings, plantings and paths.
- Introduce new south campus entrance and drop off in front of the proposed student center in renovated maintenance garage.
- Provide for an additional new building on site of current out parcel.





Preferred Alternative

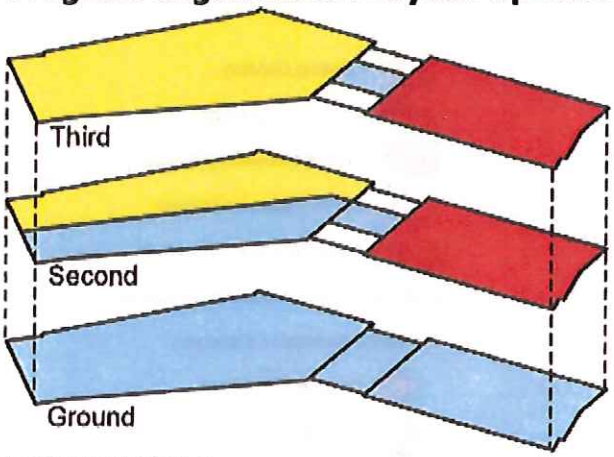
Program Summary Diagram



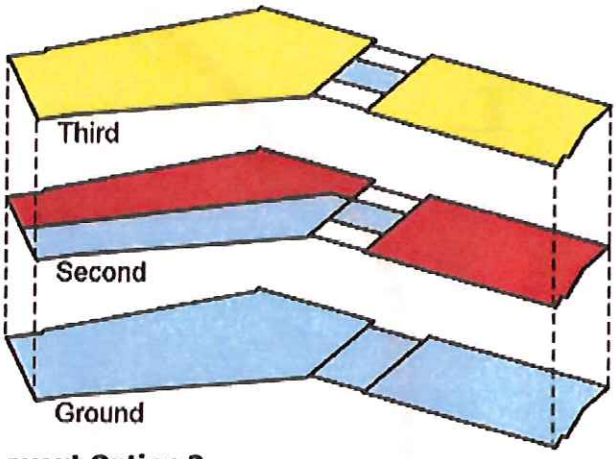
Building Program Space Summary

New Building Program		
Study Areas	4,000 ASF	
Theatre	8,000 ASF	
Classrooms	12,000 ASF	
Other Labs	12,000 ASF	
Faculty Offices	7,200 ASF	
Technology Center	900 ASF	
Readiness and Completion	900 ASF	
	45,000 ASF	=(x1.53)69,000 = GSF
Renovation and Additions		
Fitness Center	4,000 ASF	Renovation to existing 2,600 SF + 1,400 SF
Student Center	3,000 ASF	Addition to Founders
Renovation to Science Labs	8,000 ASF	Renovation to Wheaton Hall
Machine Technology Manufacturing	10,000 ASF	New Building next to Central Utilities Plant
One-Stop Student Services	16,000 ASF	Renovation of Founder's Hall
Learning Commons	10,000 ASF	Addition or renovation to Library
	51,000 ASF	

Program Organization Layout Options



Layout Option 1



Layout Option 2

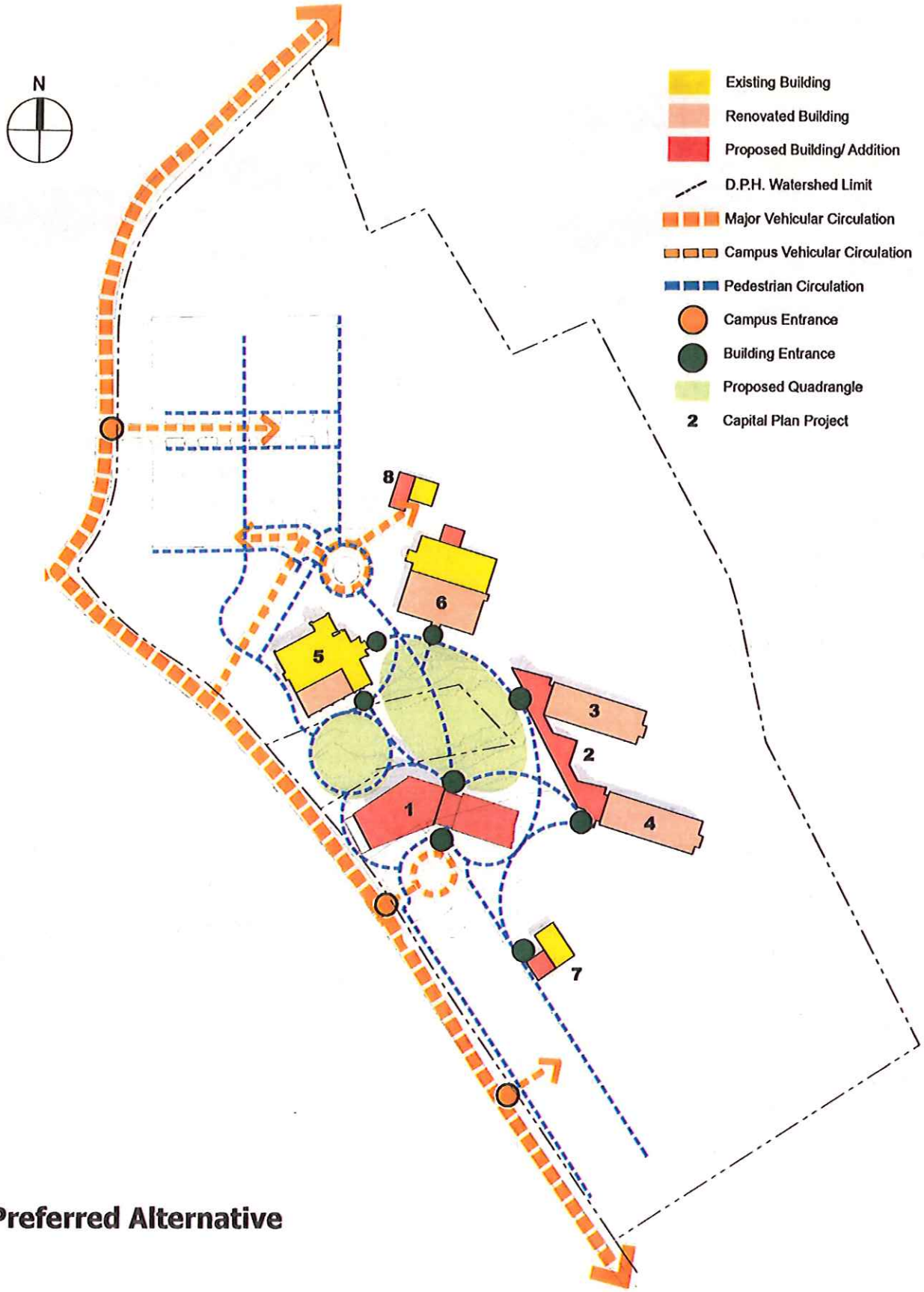
Program Spaces

- Black Box
- Gallery
- Arts Center
- Student Services
- Applied Science Labs
- Classrooms
- Administration and Faculty Offices

36,800 Student Services and Black Box
17,000 Labs and Classrooms
16,000 Faculty and Offices
69,000 GSF

Building Organization

Move	Current Space ASF	New Building Space ASF	Building Floors	Migration
Move Student One Stop Admissions in FOUNDER'S to New Building	5,300	6,300	1	Backfill with Expanded Student Center and Recreation Center in Founder's
Student Collaborative Areas (3 areas at 200 ASF)	0	600	1	NEW
New Full-Time Faculty Offices (58 faculty at 100 ASF each)	0	5,800	3	Backfill existing offices with Classrooms in Snow and Wheaton
Full-Time Faculty Conference Rooms (2 - 12 stations @ 25 Each)	0	600	3	New
Faculty Break Room (1 @ 250 ASF)	0	250	3	New
Faculty Office Service (File rooms, Copy Rooms (3 @ 150 ASF)	0	450	3	Backfill existing offices with Classrooms/ Science Labs in Snow and Wheaton
Academic Division Office Assistants (4 stations at 120 ASF each)	0	480	3	Backfill existing offices with Classrooms/ Science Labs in Snow and Wheaton
Adjunct Faculty Suites (2 @ 600 ASF each) Total of 200 Adjuncts	0	1,200	3	Backfill existing offices with Classrooms/ Science Labs in Snow and Wheaton
Specialty Labs				
Criminal Justice/Forensics Lab (16 stations @45 ASF)	0	720	2	New
Computer Engineering Tech Sandbox Lab (20 @ 30 ASF)	0	600	2	New
Social Science Observation Lab (12 @ 25 ASF)	0	300	2	New
Photography Lab (6 stations at 50 ASF)	0	300	2	New
Language Practice Computer Lab (16 @30 ASF)	0	480	2	New
Environmental Science Lab (In remodeled space in SNOW with other sciences)	0	-	2	
Move Art Labs from SNOW to New BUILDING	2811			Backfill with New Classrooms and Computer Labs
Painting (24 stations at 40 ASF plus storage)		1,200	2	
Drawing/Photo/Graphics Lab (24 @40 plus storage)		1,200	2	
Ceramics/Sculpture Lab (18@60 ASF plus storage)		1,400	2	
Move Art Gallery from CHAPMAN LIBRARY to NEW BUILDING	460	650	1	Backfill with Learning Commons
Art Gallery Storage	0	200	1	Backfill with Learning Commons
Move Veterans Center from CHAPMAN LIBRARY to NEW BUILDING	402	400	1	Backfill with Learning Commons
Move Learning Center and Testing from CHAPMAN to NEW BUILDING	742	900	1	Backfill with Learning Commons
ADD Math Tutoring Center (12 stations @25 ASF)	0	300	1	New
ADD Writing/Reading Center (12 stations @ 25ASF)	0	300	1	New
Move MyMath Open Lab from SNOW to NEW BUILDING	393	500	1	New
Black Box Theatre w / Support Space	0	8,500	1	New
Faculty Development Center	0	1,400	3	New
College Administration Offices in Founder's (President, Deans, Marketing, Foundation, HR)	3750	3,950	3	Backfill with Expanded Student Center and Recreation Center in Founder's
Optometry Program (Lab and Dispensing Clinic)	942	1,020	2	Backfill Chapman with Expanded Digital Arts
Total ASF		**40,000**		



Preferred Alternative

FACILITIES CAPITAL PLAN

The Capital Plan for Middlesex Community College (MxCC) includes the following new and renovated space needs.

	Space Category	Program (ASF)	Gross Square Footage (GSF)	Construction SF Cost ($)	Construction Cost ($)	Project Cost ($)	Funding Source
1	**New Academic Building**	45,000	69,000	N/A	30,392,768	45,829,045**	General Fund
2	**Wheaton/ Snow Connector**	-	12,000	225	2,700,000	4,100,000	General Fund
3	**Wheaton Hall Renovation**	-	25,005	325	8,000,000	12,500,000	General Fund
4	**Snow Hall Renovation**	-	25,005	325	8,000,000	12,500,000	General Fund
5	**Chapman Hall Learning Center Renovation**	-	10,000	325	3,250,000	5,000,000	General Fund
6	**Founders Hall Renovation**	16,000	-	225	3,600,000	5,500,000	Auxiliary Fund
7	**New Machine Technology Center**	10,000	15,000	225	3,375,000	5,100,000	General Fund
8	**New Maintenance Garage and Central Receiving**	3,000	4,500	225	1,100,000	1,500,000	General Fund
	TOTAL					**46,200,000**	

NOTES

** New Academic Building funding already in place for $45,829,045.

- Budget totals do not include site utility upgrades or cost of upgrading or extending utilities for building renovations.
- Site development cost for stormwater management mitigation or landscape or open space improvements not included.
- Costs associated with only projected program space for new buildings and renovations are included.

OPEN SPACE DIAGRAM

LANDSCAPE/OPEN SPACE AND VISUAL CHARACTER

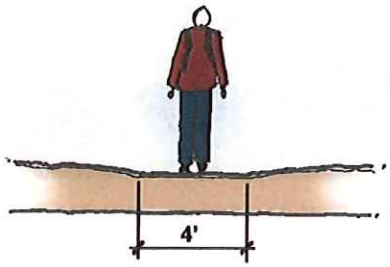
Open Space

The proposed master plan contains several different types of open space. A new quadrangle has been proposed in the center of campus bound by existing and proposed buildings and walks. Common open space composed of mown lawn and trees will continue to provide a foreground from the adjacent roadways. Around the existing and proposed buildings is a more intensely landscaped area composed of mown lawn, trees, shrubs, groundcover and perennials. The proposed plan calls for the addition of several bioswales that will be planted with a variety of native and adapted species. A proposed meadow area will provide a further buffer to the existing woodland edge.

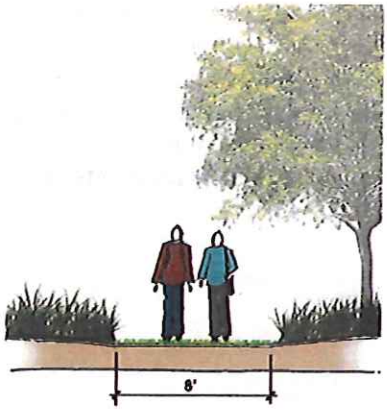
Maintaining the visual character of the campus

Pedestrian Circulation

A network of pedestrian paths of varying widths and types should be established on the campus. The campus spine is proposed to be the main route, traversing the entire campus and connecting all buildings and both parking lots. This walk should generally be 12' to 15' in width and paved with an accessible paving surface, such as bituminous concrete or concrete. Additional accent paving could be added to this walk in places. The campus spine can also serve as emergency vehicle access.

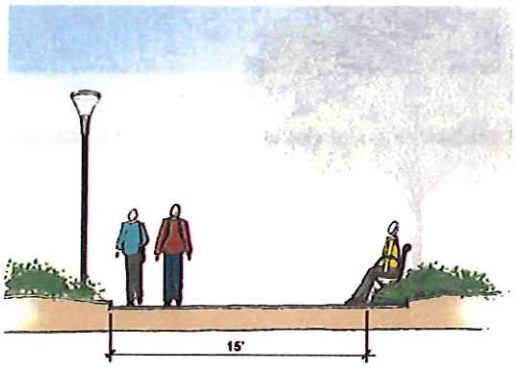


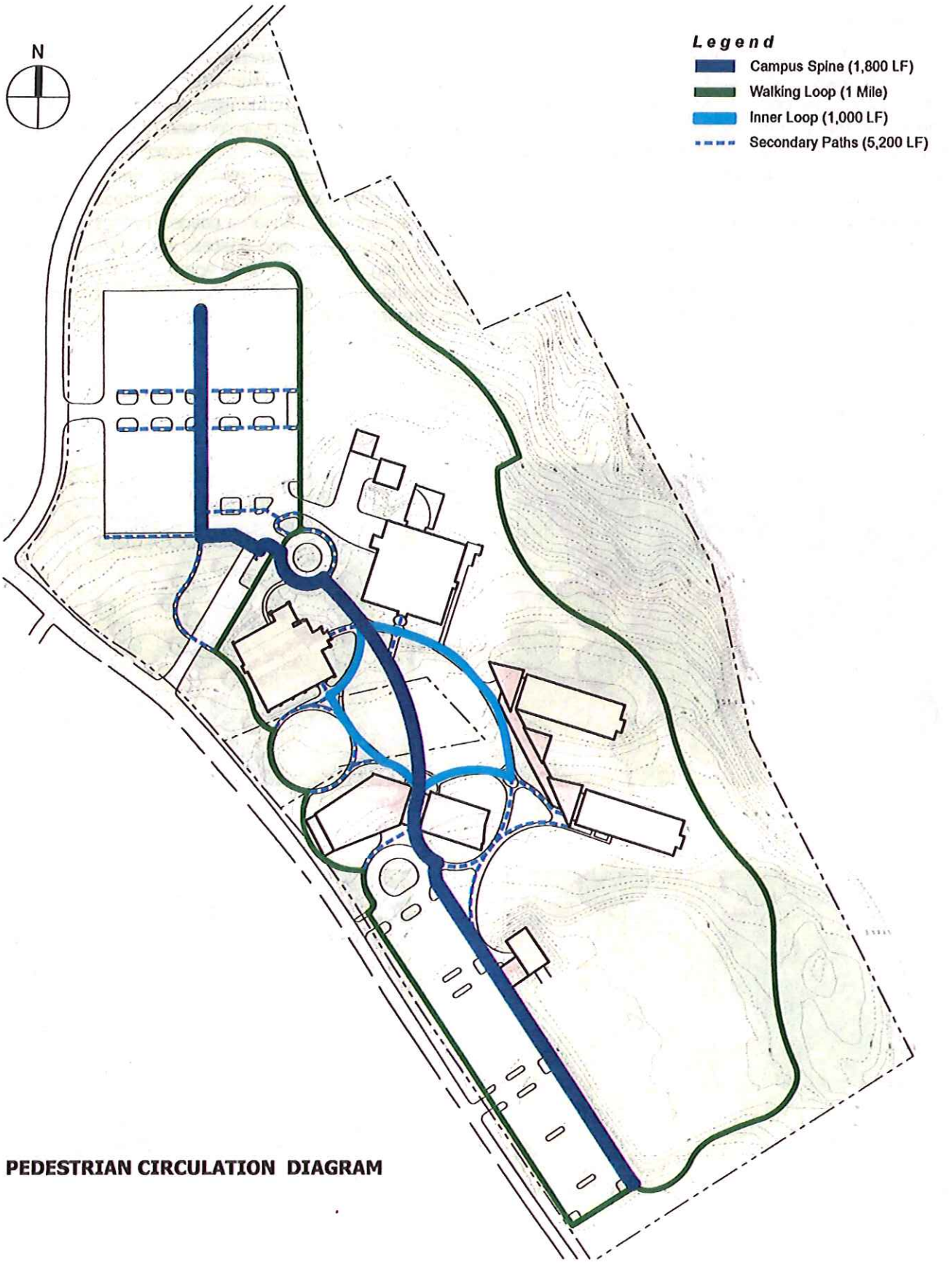
The inner loop defines the central quadrangle and provides access between the buildings in the inner campus. This walk should generally be 8'-12' in width and paved with accessible paving surface.



The secondary paths provide additional routes for convenience to other building entrances and different areas of the parking lots. These walks should generally be 4'-8' in width and paved with accessible paving surface.

The walking loop is a proposed path that will provide the College community an opportunity to enjoy the natural amenities of the campus. Over one mile in length, the walking loop can also serve as a fitness amenity. The path would be composed of a few different types of walking surfaces. When cutting through meadow areas, the path could simply be a mown path. When going through wooded areas, the path can be paved with bark mulch or crushed stone. In other areas, the loop simply follows sidewalks used as secondary paths and would be paved with concrete or bituminous concrete. When in natural areas, the path should generally be 8' in width. Signage will help inform users of the path entrances and route.





PEDESTRIAN CIRCULATION DIAGRAM

Landscape Plan

In addition to the preservation of good quality existing plant materials, the proposed plan calls for the addition of several types of plants. Canopy trees will create shade, define spaces, provide visual cues for circulation and create a cohesive look to the campus. Accent and understory trees are used to highlight and enhance smaller scale and important campus spaces. These spaces include: patios and courtyards, building and campus entrances and circulation nodes. Groundcover and shrubs are used where they will have the most impact: directly adjacent to the most frequently traveled pedestrian paths, steeply sloped areas, patios and courtyards, building and campus entrances and at circulation nodes. Additional planting types proposed include bioswale and meadow areas. The bioswales will be planted with native and adapted plant species and will provide a space to process storm water from the campus. The meadow area will be planted with a mix of native and adapted grasses and wildflowers. The meadows will require far fewer mows throughout the growing season than traditional lawn and the bioswales will require minimal maintenance. Both the bioswales and the meadow areas will increase biodiversity and improve campus runoff water quality. Landscape and stormwater management should be intertwined in a blue/green sustainable design philosophy.

Planting Palette

Accent

Screen

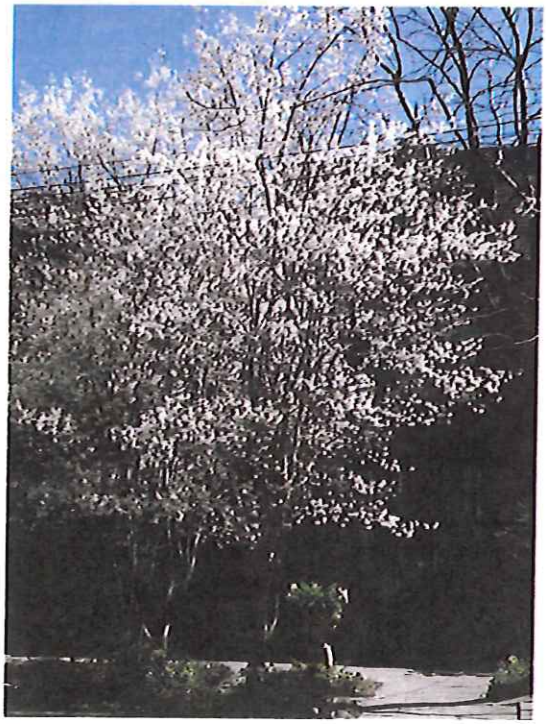
Groundcover

Shrub

LANDSCAPE PLAN

Plant Category- Canopy			Location Type						Notes
Scientific Name	Common Name	Native	Common Space	Quads	Plaza/Bldg. Entrance	Pedestrian Circ.	Vehicular Circ./Entr.	Parking Areas	
Acer rubrum	Red Maple	x					x	x	salt tolerant
Acer saccharum	Sugar Maple	x	x	x					
Betula alleghaniensis	Yellow Birch	x		x					
Betula lenta	Sweet Birch	x		x					
Betula nigra	River Birch	x		x	x				
Betula papyrifera	Paper Birch	x		x	x				
Carya glabra	Pignut Hickory	x	x						
Carya ovata	Shagbark Hickory	x	x						salt tolerant
Celtis occidentalis	Common Hackberry	x					x		
Cladrastis lutea	American Yellowwood	x	x	x					
Fagus grandifolia	American Beech	x	x			x			
Fraxinus americana	White Ash	x				x	x	x	
Fraxinus pensylvanica	Green Ash	x				x	x	x	
Ginkgo biloba	Ginkgo			x			x		male specimens only
Gleditsia triacanthos	Honeylocust			x			x		
Gymnocladus dioica	Kentucky-coffee Tree	x	x	x					
Koelruteria paniculata	Golden RainTree						x		
Liquidambar styraciflua	Sweet Gum	x	x						
Liriodendron tulipifera	Tulip Poplar	x	x						
Nyssa sylvatica	Black Gum	x				x			salt tolerant
Platanus occidentalis	Sycamore	x	x						also *P. x acerifolia*
Populus tremuloides	Quaking Aspen	x	x						
Quercus alba	White Oak	x	x						salt tolerant
Quercus coccinea	Scarlet Oak	x	x	x					
Quercus macrocarpa	Bur Oak	x		x					salt tolerant
Quercus palustris	Pin Oak	x					x	x	
Quercus prinus	Chestnut Oak	x	x	x					
Quercus rubra	Red Oak	x		x					salt tolerant
Sassafras	Sassafras	x	x						
Sophora japonica	Japanese Pagoda Tree						x		
Taxodium distichum	Bald Cyprus		x						
Tilia americana	American Linden	x					x	x	
Ulmus parvifolia	Chinese Elm						x	x	
Zelkova serrata	Japanese Zelkova					x	x		

Canopy Tree



Understory Tree

Plant Category - Understory			Location Type						Notes
Scientific Name	Common Name	Native	Common Space	Quads	Plaza/Bldg. Entrance	Pedestrian Circ.	Vehicular Circ./Entr.	Parking Areas	
Acer buergeranum	Trident Maple				x		x	x	
Acer ginnala	Amur Maple							x	salt tolerant
Acer griseum	Paperbark Maple				x				
Amelanchier arborea	Downy Serviceberry	x		x					
Amelanchier canadensis	Shadblow Serviceberry	x		x					salt tolerant
Amelanchier laevis	Allegheny Serviceberry	x		x					
Aronia arbutifolia	Red Chokeberry	x			x				salt tolerant
Aronia melanocarpa	Black Chokeberry	x			x				
Betula populifera	Gray Birch	x		x	x		x		
Carpinus caroliniana	American Hornbeam	x	x			x			
Cercidiphyllum japonicum	Katsura Tree		x	x					
Cercis canadensis	Eastern Redbud	x			x	x			
Chionanthus virginicus	White Fringe Tree	x			x				
Cornus alternifolia	Pagoda Dogwood	x			x	x			
Cornus florida	Flowering Dogwood	x			x	x			
Cornus kousa	Kousa Dogwood				x	x			
Cornus mas	Cornelian Cherry			x					
Cornus sericea	Red-oiser Dogwood	x						x	
Crataegus crusgalli	Cockspur Hawthorn	x		x	x			x	
Crataegus viridis	Green Hawthorn	x		x	x			x	
Forsythia x intermedia	Showy Border Forsythia		x						
Hamamelis virginiana	Common Witchhazel	x	x						
Kalmia latifolia	Mountain Laurel	x	x		x				
Magnolia stellata	Star Magnolia		x	x	x				
Magnolia x soulangiana	Saucer Magnolia		x	x	x				
Malus spp.	Crabapple Tree		x	x	x	x		x	
Myrica pensylvanica	Bayberry	x						x	salt tolerant, semi-EVGR
Populus grandidentata	Bigtooth Aspen	x	x				x		
Populus tremuloides	Quaking Aspen	x	x				x		
Prunus sargentii	Sargent Cherry			x	x	x		x	
Prunus serrulata	Japanese Flowering Cherry			x	x	x		x	
Prunus subhirtella	Higan Cherry			x	x	x		x	
Prunus x incam 'Okame'	Okame Cherry			x	x	x		x	
Prunus yedoensis	Yoshino Cherry			x	x	x		x	
Pyrus calleryana	Callery Pear						x	x	
Rhododendron maximum	Rosebay Rhododendron	x	x						
Rhododendron prinophyllum	Roseshell Azalea	x			x	x			
Rhododendron viscosum	Swamp Azalea	x			x	x			
Rosa rugosa	Rugosa Rose	x			x			x	salt tolerant
Rosa virginiana	Virginia Rose	x			x			x	salt tolerant
Sorbus americana	American Mountain Ash	x	x			x			
Symphoricarpos albus	Common Snowberry	x		x	x	x			
Vaccinium corymbosum	Highbush Blueberry	x			x				salt tolerant
Viburnum carlesii	Korean Spice Viburnum			x	x		x		
Viburnum dentatum	Arrowwood	x		x	x		x		salt tolerant
Viburnum dilatatum	Linden Viburnum			x	x		x		
Viburnum lantana	Wayfaring Tree			x	x		x		
Viburnum lentago	Nannyberry			x	x		x		
Viburnum opulus	European Cranberrybush			x	x		x		
Viburnum plicatum	Doublefile Viburnum			x	x		x		
Viburnum prunifolium	Blackhaw	x		x	x		x		
Viburnum sieboldii	Siebold Viburnum			x	x		x		
Viburnum trilobum	American Cranberrybush	x		x	x		x		salt tolerant
Viburnum x burkwoodii	Burkwood Viburnum			x	x		x		

Plant Category- Accent		Location Type							Notes
Scientific Name	Common Name	Native	Common Space	Quads	Plaza/Bldg. Entrance	Pedestrian Circ.	Vehicular Circ./Entr.	Parking Areas	
Acer griseum	Paperbark Maple		x		x				
Acer palmatum	Japanese Maple				x				
Amelanchier arborea	Downy Serviceberry	x	x	x					
Amelanchier canadensis	Shadblow Serviceberry	x	x	x					salt tolerant
Amelanchier laevis	Allegheny Serviceberry	x	x	x					
Andromeda polifolia	Bog Rosemary	x			x				EVGR
Arctostaphylos uva-ursi	Bearberry	x			x				EVGR
Aronia arbutifolia	Red Chokeberry	x			x		x	x	
Aronia melanocarpa	Black Chokeberry	x			x		x	x	
Bergenia cordifolia	Heartleag Bergenia	x			x				EVGR
Betula papyrifera	Paper Birch	x		x	x		x		
Betula populifera	Gray Birch	x		x	x		x		
Bouteloua gracilis	Misquito Grass	x		x	x				
Cercis canadensis	Eastern Redbud	x	x	x	x	x		x	
Clematis spp.	Clematis			x	x				with support
Cornus florida	Flowering Dogwood	x	x	x	x	x		x	
Cornus kousa	Kousa Dogwood		x	x	x	x		x	
Cornus sericea	Red-oiser Dogwood	x		x	x			x	salt tolerant
Crataegus viridis	Green Hawthorn	x		x			x	x	salt tolerant
Deschampsia caespitosa	Tufted Hair Grass	x			x				salt tolerant, EVGR
Festuca amethystina	Large Blue Fescue	x			x				
Gaultheria procumbens	Checkerberry	x			x				EVGR
Geranium sanguineum	Blood-red Cranesbill	x			x		x		
Hamamelis virginiana	Common Witchhazel	x			x		x		semi-EVGR
Helictotrichon sempervirens	Blue Oat Grass	x			x				salt tolerant
Hemerocallis spp.	Daylilies		x		x	x		x	salt tolerant
Hydrangea spp.	Hydrangeas		x	x	x			x	salt tolerant
Ilex verticillata	Winterberry	x	x		x			x	
Juniperus spp.	Juniper (various culitvars)				x				salt tolerant
Kalmia latifolia	Mountainlaurel	x			x		x	x	EVGR
Koeleria glauca	Blue Hair Grass	x			x				
Liriope spicata	Creeping Lily Turf				x	x			salt tolerant
Magnolia stellata	Star Magnolia		x	x	x	x			
Magnolia x soulangiana	Saucer Magnolia		x	x					
Malus spp.	Crabapple Tree		x	x	x	x	x	x	
Panicum virgatum	Switch Grass	x			x			x	salt tolerant
Pennisetum alopecuroides	FountainGrass	x			x				salt tolerant
Phalaris arundinacea picta	Ribbon Grass	x			x				
Phlox subulata	Moss Pink	x			x				salt tolerant, EVGR
Potentilla fruticosa var. arbuscula	Shrubby Cinquefoil	x			x				salt tolerant
Prunus sargentii	Sargent Cherry			x	x	x	x	x	
Prunus serrulata	Japanese Flowering Cherry			x	x	x	x	x	
Prunus subhirtella	Higan Cherry			x	x	x	x	x	
Prunus x incam 'Okame'	Okame Cherry			x	x	x	x	x	
Prunus x yedoensis	Yoshino Cherry			x	x	x	x	x	
Rhododendron spp.	Azaleas/ Rhododendrons		x	x	x		x	x	some EVGR
Rhus aromatica 'Gro-Low'	Fragrant Sumac	x			x			x	salt tolerant
Rosa rugosa	Rugosa Rose	x			x			x	
Rosa virginiana	Virginia Rose	x			x				
Sorbus americana	American Mountain Ash	x	x	x		x			
Symphoricarpos albus	Common Snowberry	x		x	x				
Symphoricarpos orbiculatus	Coralberry	x		x	x				
Tsuga canadensis	Canada Hemlock	x					x	x	EVGR
Vaccinium macrocarpon	American Cranberry	x			x				

Plant Category- Screen			Location Type						Notes
Scientific Name	Common Name	Native	Common Space	Quads	Plaza/Bldg. Entrance	Pedestrian Circ.	Vehicular Circ./Entr.	Parking Areas	
Abies balsamea	Balsam Fir	x			x		x	x	EVGR
Abies concolor	White Fir				x		x	x	
Buxus sempervirens	Common Box				x	x		x	
Campsis radicans	Trumpet Creeper	x			x				with support
Casmanthium latifolium	Northern Sea Oats	x			x				salt tolerant
Chamaecyparis pisifera	Sawara False Cypress						x	x	salt tolerant, EVGR
Chamaecyparis thyoides	Atlantic Whitecedar	x					x	x	EVGR
Cotoneaster divaricatus	Spreading Cotoneaster				x	x		x	salt tolerant
Crataegus crusgalli	Cockspur Hawthorn	x		x	x		x		
Crataegus viridis	Green Hawthorn	x		x	x		x		
Ilex glabra	Inkberry	x			x	x		x	salt tolerant, EVGR
Ilex verticillata	Winterberry	x			x	x		x	
Juniperus virginiana	Eastern Red Cedar	x			x	x		x	salt tolerant, EVGR
Kalmia latifolia	Mountainlaurel	x			x	x		x	EVGR
Myrica pensylvanica	Bayberry	x			x	x		x	salt tolerant, semi-EVGR
Panicum virgatum	Switch Grass	x			x			x	salt tolerant
Parthenocissus quincefolia	Virginian Creeper	x			x				with support, salt tolerant
Picea glauca	White Spruce	x					x	x	salt tolerant, EVGR
Pinus banksiana	Jack Pine	x					x	x	salt tolerant, EVGR
Pinus resinosa	Red Pine	x					x	x	EVGR
Pinus strobus	Eastern White Pine	x					x	x	EVGR
Taxus spp.	Yew			x				x	salt tolerant, EVGR
Thuja occidentalis	American Arbor-vitae	x						x	salt tolerant, EVGR
Tsuga canadensis	Canada Hemlock	x						x	EVGR

Plant Category- Groundcover			Location Type						Notes
Scientific Name	Common Name	Native	Common Space	Quads	Plaza/Bldg. Entrance	Pedestrian Circ.	Vehicular Circ./Entr.	Parking Areas	
Andromeda polifolia	Bog Rosemary	x			x				EVGR
Arctostaphylos uva-ursi	Bearberry	x			x			x	EVGR
Asarum canadense	Wild Ginger	x			x				
Bergenia cordifolia	Heartleaf Bergenia	x			x				EVGR
Bouteloua gracilis	Misquito Grass	x			x				
Comptonia peregrina	Sweetfern	x			x				salt tolerant, EVGR
Convallaria majalis	Lily of the Valley				x	x			
Cornus canadensis	Bunchberry	x		x	x			x	salt tolerant
Cotoneaster dammeri	Bearberry Cotoneaster						x	x	salt tolerant, EVGR
Diervilla lonicera	Northern Bush Honeysuckle	x			x				salt tolerant
Elymus glaucus	Blue Lyme Grass	x			x			x	
Epigaea repens	Mayflower	x			x				EVGR
Epimedium grandiflorum	Bishop's Hat				x				
Euonymus fortunei	Wintercreeper				x	x	x	x	EVGR
Festuca amethystina orina	Large Blue Fescue	x			x			x	
Gallium odoratum	Sweet Woodruff				x	x			salt tolerant
Gaultheria procumbens	Checkerberry	x			x				EVGR
Geranium sanguineum	Blood-red Cranesbill	x			x				
Glyceria maxima	Manna Grass	x			x				
Hedera helix 'Thorndale'	English Ivy				x	x	x	x	salt tolerant, EVGR
Hemerocallis spp.	Daylilies				x	x	x	x	salt tolerant
Hosta spp.	Hosta				x	x			
Juniperus spp.	Juniper (some)				x		x	x	salt tolerant, EVGR
Koeleria glauca	Blue Hair Grass	x			x				
Ledum groelandicum	Labrador Tea	x			x				
Liriope spicata	Creeping Lily Turf				x	x	x	x	salt tolerant, EVGR
Mahonia repens	Creeping Mahonia	x			x				EVGR
Osmunda cinnamonea	Cinnamon Fern	x			x				
Pachysandra terminalis	Japanese Spurge				x	x			EVGR
Panicum virgatum	Switch Grass	x			x				
Parthenocissus quincefolia	Virginia Creeper	x			x				
Paxistima canbyi	Rat-stripper	x			x				EVGR
Phalaris arundinacea picta	Ribbon Grass	x			x				
Phlox subulata	Moss Pink	x			x			x	salt tolerant
Potentilla fruticosa var. *arbuscula*	Shrubby Cinquefoil	x			x			x	salt tolerant, EVGR
Rhus aromatica 'Gro-Low'	Fragrant Sumac	x			x			x	salt tolerant
Sedum spp.	Stonecrop				x	x			salt tolerant, EVGR
Symphoricarpos orbiculatus	Coralberry	x			x				
Thymus species	Thyme	x			x			x	salt tolerant
Vaccinium angustifolium	Lowbush Blueberry	x			x				
Vaccinium macrocarpon	American Cranberry	x			x			x	salt tolerant, EVGR
Vinca minor	Periwinkle, Myrtle				x	x	x	x	salt tolerant, EVGR

Plant Category- Wetland / Bioswale			Notes
Scientific Name	Common Name	Type	
Abies balsamea	Balsam Fir	Tree	EVGR
Acer rubrum	Red Maple	Tree	
Acer saccharum	Sugar Maple	Tree	
Betula alleghaniensis	Yellow Birch	Tree	
Betula nigra	River Birch	Tree	
Betula papyrifera	Paper Birch	Tree	
Carpinus caroliniana	American Hornbeam	Tree	
Fraxinus pensylvanica	Green Ash	Tree	
Liriodendron tulipifera	Tulip Tree	Tree	
Nyssa sylvatica	Black Gum	Tree	
Pinus strobus	White Pine	Tree	EVGR
Populus tremuloides	Quaking Aspen	Tree	
Prunus virginiana	Chokecherry	Tree	
Quercus bicolor	Swamp White Oak	Tree	
Quercus rubra	Red Oak	Tree	
Salix nigra	Black Willow	Tree	
Tsuga canadensis	Hemlock	Tree	EVGR
Amelanchier canadensis/arborea	Shadblow/Serviceberry	Shrub	
Arctostphylos uva-ursi	Bearberry	Shrub	EVGR
Aronia arbutifolia	Red Chokeberry	Shrub	
Clethra alnifolia	Sweet Pepperbush	Shrub	
Comptonia peregrina	Sweet Fern	Shrub	
Cornus sericea	Red-Osier Dogwood	Shrub	
Hamamelis virginiana	Witch Hazel	Shrub	
Ilex verticillata	Winterberry Holly	Shrub	
Myrica pensylvanica	Bayberry	Shrub	
Prunus depressa	Sand Cherry	Shrub	
Prunus maritima	Beach Plum	Shrub	
Rhododendron viscosum	Swamp Azalea	Shrub	
Rhus typhina	Staghorn Sumac	Shrub	
Rosa virginiana	Virginia Rose	Shrub	
Salix discolor	Pussy Willow	Shrub	
Spirea latifolia	Meadowsweet	Shrub	
Vaccinium angustifolium	Low Bush Blueberry	Shrub	
Viburnum dentatum	Arrowwood	Shrub	
Dennstaedtia punctilobula	Hay Scented Fern	Fern	
Matteuccia struthiopteris	Ostrich fern	Fern	
Osmunda cinnamomea	Cinnamon Fern	Fern	
Acorus americanus	Sweetflag	Herbaceous	
Alisma plantago-aquatica	Water Plantain	Herbaceous	
Andropogon gerardii	Big Bluestem	Herbaceous	
Asclepias tuberosa	Butterfly Milkweed	Herbaceous	
Aster nova-angliae	New England Aster	Herbaceous	
Calamagrostis canadensis	Blue Joint Grass	Herbaceous	
Caltha palustris	Marsh Marigold	Herbaceous	
Carex comosa	Bearded Sedge	Herbaceous	
Carex scoparia	Broom Sedge	Herbaceous	
Chelone glabra	Turtlehead	Herbaceous	
Eupatorium maculatum/purpureum	Joe-Pye Weed	Herbaceous	
Hibiscus moschuetos	Swamp Rose Mallow	Herbaceous	
Iris versicolor	Blue Flag Iris	Herbaceous	
Juncus effusus	Soft Rush	Herbaceous	
Lobelia cardinalis	Cardinal Flower	Herbaceous	
Panicum virgatum	Switchgrass	Herbaceous	
Peltandra virginica	Arrow Arum	Herbaceous	
Pontederia cordata	Pickerelweed	Herbaceous	
Rudbeckia laciniata	Green Headed Coneflower	Herbaceous	
Schizachyrium scoparium	Little Bluestem	Herbaceous	
Schoenoplectus acutus	Hard-Stem Bulrush	Herbaceous	
Scirpus cyperinus	Woolgrass	Herbaceous	
Solidago sempervirens	Seaside Goldenrod	Herbaceous	
Typha latifolia	Common Cattail	Herbaceous	

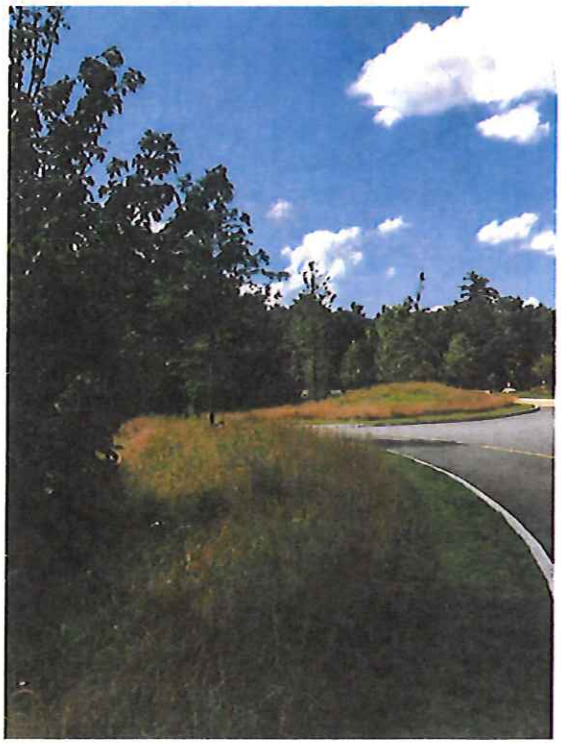
View looking from Founder's Hall to new Academic Cender and Academic connector between Snow and Wheaton Halls.

Campus pedestrian spine looking across the new central quadrangle to the new Academic Center.

Site Development Opportunities

Site Recommendations

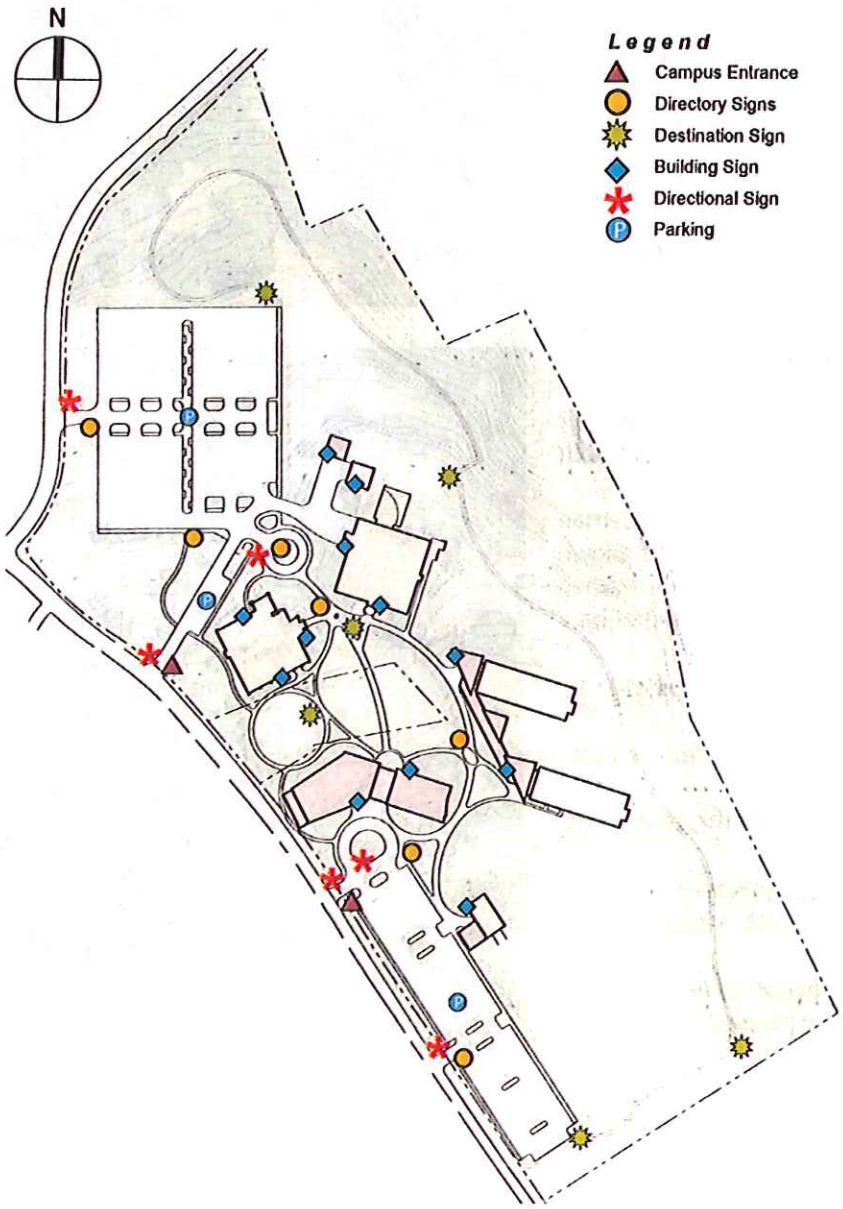
1. Introduce pedestrian walkways and crossings in and around the parking lots.
2. Install additional trees in the parking lots to soften the space, create shade, and provide visual cues for pedestrian circulation.
3. Re-organize existing parking lot lights as necessary to accommodate proposed layout.
4. Create a new, south campus entrance and drop-off adjacent to the proposed building south of Chapman Hall.
5. Enhance existing north campus entrance with additional planting and accent lighting.
6. Reconfigure existing drop-off area to separate from loading dock and campus maintenance/facilities area.
7. Define a new campus quad including the current residential parcel with paths, trees, and proposed buildings.
8. Delineate an accessible, clear pedestrian circulation network that logically connects all buildings and defines campus spaces.
9. Create nodes at critical junctions of pedestrian paths, include special pavement, signage and enhanced planting.
10. Choose a new campus standard pedestrian-scale pole light. Evenly light all pedestrian areas to increase security.
11. Consolidate campus facilities and maintenance yard. Provide screening to north campus entry.
12. Construct bioswales to reduce storm water runoff, improve water quality and provide a learning opportunity for students and faculty to teach.
13. Utilize meadow plantings on edges of the woodland to further mitigate runoff impacts, increase biodiversity and reduce both maintenance costs and carbon footprint.
14. Install a walking path that connects to the pedestrian circulation network. The great majority of the trail as shown is a mown path through the proposed meadow. When traversing through treed areas, path can be composed of bark mulch, crushed stone or a combination of the two.
15. Install a pedestrian crossing at the bioswale to provide an observation area, include interpretive signage.
16. Install an observation area at the edge of the reservoir; include interpretive signage.
17. Create pastoral views of the landscape from the new dining terrace.
18. Enhance pedestrian walks with linear tree planting.
19. Augment building entrances with accent trees, shrubs, perennials and groundcover.
20. Institute an energy efficient lighting regime to ensure safety after hours while respecting neighboring property (i.e. reduce light levels after hours).
21. Maintain existing mown field.
22. Install a new monument sign at intersection of Training Hill Road and Reservoir Road.



PARKING , WAYFINDING AND LIGHTING

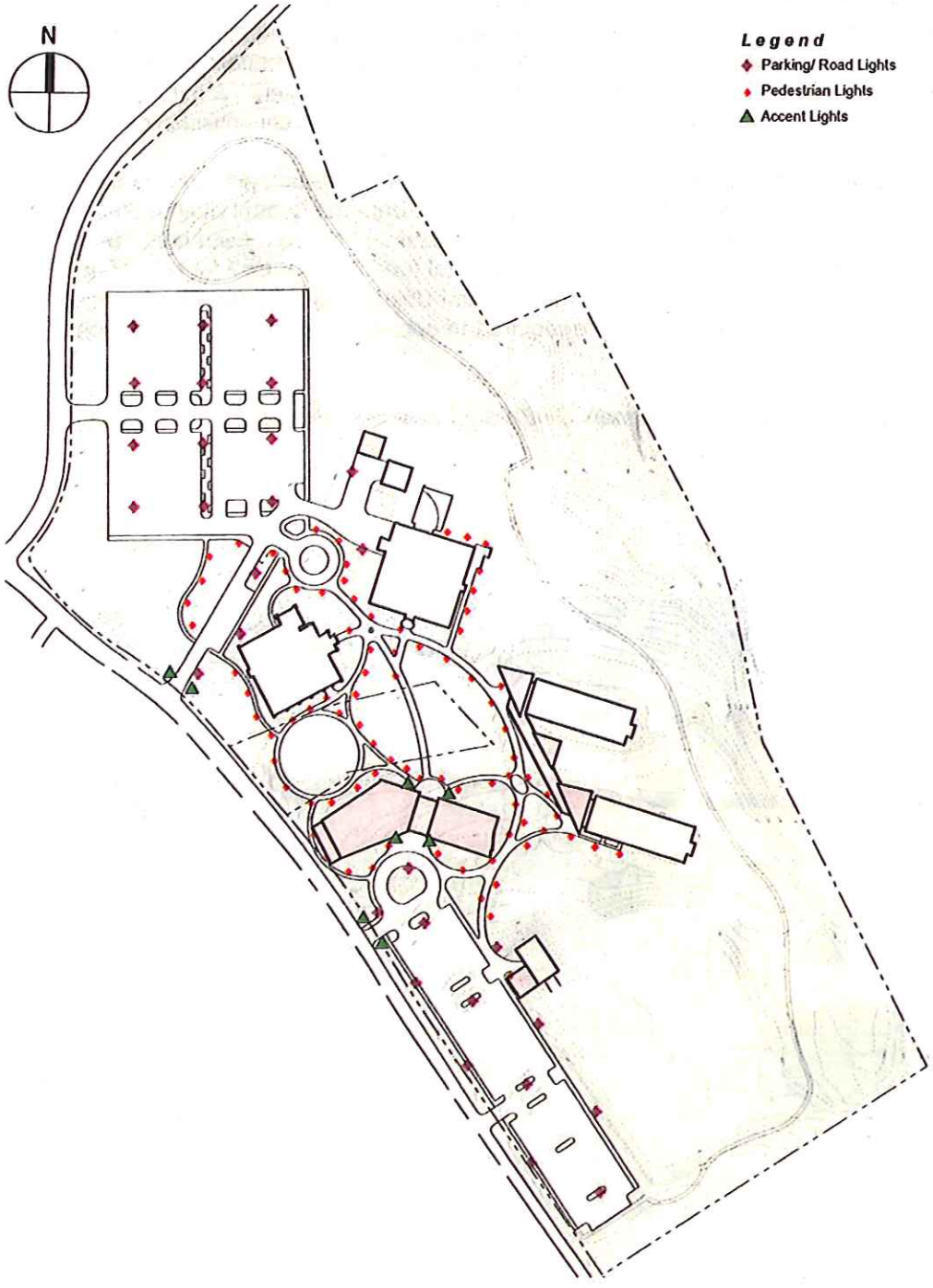
Parking and Wayfinding

A systematic overhaul of campus signage will help create a cohesive sense of place and inform and direct visitors, faculty, students and staff. The proposed plan calls for the placement of a suite of signage types throughout the campus including: entrance signage, directory signs for general directions to building and features on campus, destination signs for special places and campus information, building signs and directional signs for general information, traffic flow, and parking. Destination signs could include information about sustainability efforts and campus paths.



Lighting

Existing lighting at the parking lots appears to be fairly adequate. However, lights will need to be relocated in order to accommodate the proposed improvements to the parking lots. The College should consider replacing parking lot lights with LED fixtures for reduced energy and maintenance costs. The pedestrian lights on campus should be upgraded to energy efficient LED light fixtures. The College should select a new fixture that will help visually connect the campus, provide safety and compliment new and existing buildings. A new lighting regime could then be instituted to provide campus lighting after hours at reduced levels to enhance security and minimize disturbance to neighbors. Accent lights can be installed to enhance campus entrances and highlight the architecture at proposed and existing buildings.

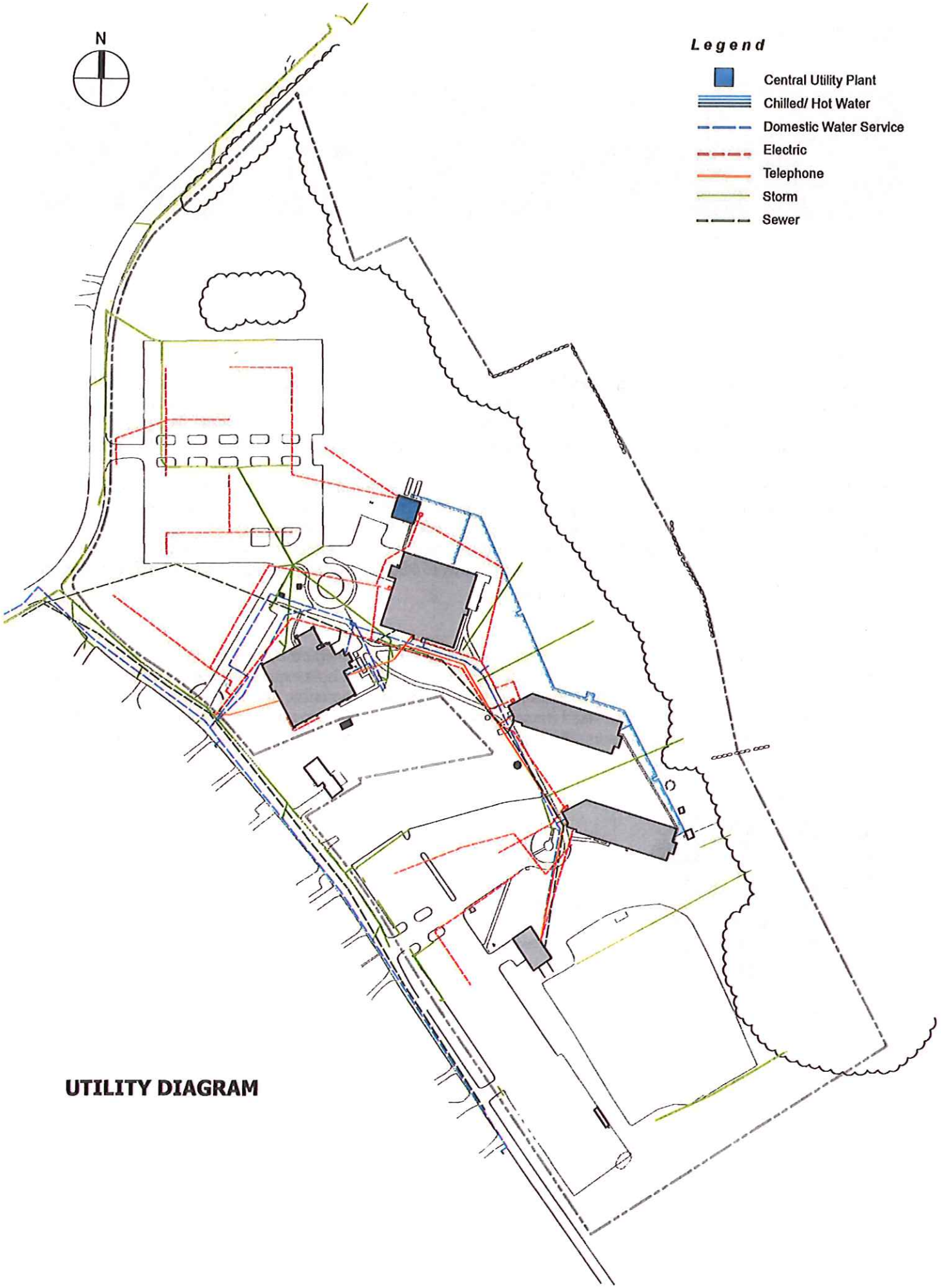


UTILITY ASSESSMENT

Generally, the equipment and systems are in fair condition and are well maintained. Consideration should be given to elimination of the Central Utilities Plant and installing cooling and heating plants in each of the facilities it presently serves. Consider changing from oil to natural gas when gas is brought into the campus. If plant will continue in use consider replacing existing boiler plant with Hybrid type boilers. A hybrid plant would consist of a mix of both high efficiency condensing type boilers and high efficiency non-condensing boilers.

The Central Utilities Plant houses the boilers and chillers that provide heating and cooling to Founders Hall, Snow Hall and Wheaton Hall. Hot water and chilled water are pumped from the Central Utilities Plant underground to the other buildings. Heating hot water is generated by three Burnham oil boilers. Each boiler has an output rating of 3580 MBH, and are approximately 15 years old. Boilers are oil fired and burn #2 fuel oil. There is a 15,000 gallon underground fuel oil storage tank just outside of the Central Utilities Plant. Chillers have remote condensers and are approximately 15 years old. Both chillers are required to operate, to maintain space conditions, on or close to a design day.

Additional information can be found in *Appendix C - Building Evaluation Reports.*



UTILITY DIAGRAM

ENERGY MANAGEMENT AND SUSTAINABLE DESIGN PRIORITIES

Energy

Overall Energy Picture

The study was initiated by gathering available information regarding the condition of the existing buildings on campus. SMMA architects and engineers toured the existing facilities to observe the condition of the building enclosure, lighting, plumbing fixtures, mechanical systems and to speak with facilities staff. Existing conditions reports summarizing the findings of the site visits are included in *Appendix C - Building Evaluation Reports.*

The College also provided campus level water and energy use data dating back to the beginning of FY2013. The data included monthly water and electricity consumption, No. 2 fuel oil deliveries and propane deliveries. Costs associated with water, sewer and energy use were also provided. SMMA organized the data in a spreadsheet to examine trends in usage over time and to estimate annual usage. The associated carbon dioxide (CO2) emissions and unit cost were also calculated. Emissions rates used were 780 lb CO2/MWh for electricity[1], 22.4 lb CO2/gallon for No. 2 fuel oil[2] and 12.7 lb CO2/gallon for propane[3].

Current Energy Use

The total FY2013 energy usage by fuel source is shown in Figure 1. The figure demonstrates that the largest fuel use is No. 2 fuel oil followed by electricity and propane. This consumption is as expected for these types of buildings since the oil and propane use is primarily associated with building heating energy. The New England climate tends to be heating dominated. Electricity is used for cooling and lighting in buildings, and to a lesser degree, plug loads such as computers, printers, and copiers. Electricity is also used to provide site lighting on the MxCC campus.

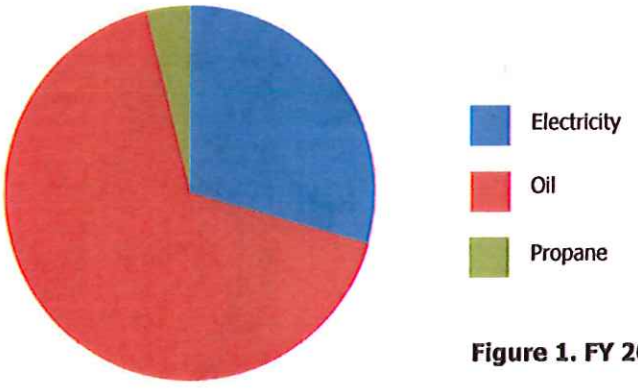


Figure 1. FY 2013 Energy Use by Fuel Source (kBtu)

Electricity

Based on the data provided, annual electricity use for FY 2013 was 694 Mega-Watt hours (MWh) which generated 271 short tons (2,000 lb) of CO2. The total cost of electricity in 2012 was $270,000 and unit costs varied from $0.17/kWh ($0.050/kBtu) to $0.57/kWh ($0.167/kBtu).

1 2011 ISO New England Electric Generator Air Emissions Report
2 Table 5.12, Energy for Sustainability, Randolph and Masters, 2008.
3 Table 5.12, Energy for Sustainability, Randolph and Masters, 2008.

No. 2 Fuel Oil

While fuel oil use is not metered, annual usage for FY2013 was estimated at 38,000 gallons based on delivery records. This usage generated 428 short tons of CO2. The total cost of fuel oil was $119,000 and unit costs varied from $2.64/gallon ($0.018/kBtu) to $3.14/gallon ($0.022/kBtu). It should be noted that the winter of FY2013 was particularly cold in New England and so fuel oil use may be somewhat higher than typical annual fuel oil use.

Propane

Propane use is similar to fuel oil in that it is not metered but usage was estimated based on delivery records. Total usage for FY2012 was estimated at 3,500 gallons, which generated 22 short tons of CO2. The total cost of propane was $4,900 and the unit cost varied from $1.36/gallon ($0.015/kBtu) to $1.48/gallon ($0.016/kBtu). It should be noted that the winter of FY2013 was particularly cold in New England and so propane use may be somewhat higher than typical annual propane use.

Total FY2013 Energy Usage

The total annual energy use for the MxCC campus was estimated at 8,000 MBtu/year based on the electricity, propane and fuel oil use for FY2013. With an overall existing gross square footage of 122,000 square feet, this equates to an approximate Energy Use Intensity (EUI) of 66 kBtu/sf. EUI is a typical metric used to compare energy performance in buildings. Based on data from the US EPA, the national average EUI for college and university buildings is 104 kBtu/sf. While the MxCC campus average EUI is relatively low compared to the national average, typically college and university campuses have more high energy use square footage such as labs.

State Energy Reduction Goals

In 2011 the Connecticut legislature enacted Public Act No. 11-80 which established goals for reducing the state's energy consumption[4]. This includes reducing energy consumption in state facilities by 10% by 2013 and by another 10% by 2018. Based on the FY 2013 energy use of 8,000 MBtu/year, achieving the state energy savings goals would mean reducing overall campus energy use by 20% by 2018 to 6,400 MBtu/year[5]. This value should be considered an "energy budget" for future planning and campus expansion. Since the full build out of this Master Plan will likely extend beyond 2018, MxCC may also consider setting another target, such as a 40% reduction in energy use for the existing buildings (4,800 MBtu/year) by 2023. Reducing energy use beyond the 20% target for the existing buildings on campus would allow some space in the energy budget to be dedicated to the construction of a new building, and while still allowing the campus to meet the 20% energy consumption goal with the addition of this new facility.

Table 1. Energy Savings and Target EUIs

YEAR	TARGET SAVINGS (FROM FY2013)	ANNUAL ENERGY USE	TOTAL GSF	EUI
2013	0%	8,000 MBtu	122,000 sf	66 kBtu/sf
2018	20%	6,400 MBtu	122,000 sf	52 kBtu/sf
2023	40%	4,800 MBtu	122,000 sf	39 kBtu/sf
2023+	20%	6,400 MBtu	192,000 sf*	33 kBtu/sf

* Accounts for construction of the proposed 69,000 sf building

20% Energy Savings Target

Options for achieving 20% Energy Savings by 2018 are discussed in the following text. The recommendations have been categorized into those actions which should be immediately implemented in the existing buildings to reduce energy consumption and costs and those which should be considered as the campus Master Plan is implemented and each of the buildings is renovated.

4 Source: Database of State Incentives for Renewables & Efficiency (www.dsireusa.org)
5 It is assumed that the 10% goal for 2013 was not met on the MxCC campus.

Immediate Actions to Reduce Energy Use and Costs

Based on the facility walk through, several issues affecting the energy performance of the existing buildings were observed. For additional detail on the condition of the existing buildings refer to the assessments of the Architectural and MEP systems in *Section 9*.

- **Additional Metering**
  Current energy use data provided by MxCC is for the campus level only – there is no building level energy use data. Additional data is needed to understand which buildings and systems are using the most energy on campus to make meaningful recommendations about the best approach to reducing energy usage in the most cost effective manner. Therefore, we recommend installing metering for the following buildings and systems. Meter data should be collected and recorded on a continuous basis for a period of 1 year by connecting it to a building management system. Data should be reviewed quarterly to make sure that it makes sense and is being recorded accurately.

  Central Utility Plant
  Install BTU meters on the hot and chilled water mains to monitor campus consumption

  Academic and Administration Buildings
  Building level electric metering
  Install BTU meters on the hot and chilled water systems
  Submetering for lighting and HVAC systems, if possible

  Maintenance Building
  Building level electric metering
  Building level water metering
  Submetering for lighting and HVAC systems, if feasible

- **Other Short Term Measures**
  Academic and Administration buildings
  Recaulk windows as recommended in the facilities assessment discussed in *Section 9*
  Upgrade roof insulation to R-30 minimum with roof replacement (Chapman)
  Repair damaged hot water and chilled water piping insulation in exposed areas such as the mechanical room
  Provide or expand unoccupied setback temperatures
  Install insulation on domestic water piping
  Install water meters on the cooling tower makeup and blowdown (Chapman)

Longer Term Options to Consider

- **Central Plant and Chapman Hall Boiler Upgrade**
  The existing boilers at the central plant and Chapman Hall have an efficiency of 80%. By upgrading to new condensing boilers, or a hybrid boiler plant, up to 10% savings in fuel oil consumption could be achieved. (A hybrid boiler plant consists of a mix of both high efficiency condensing type boilers and high efficiency non-condensing boilers.) This would reduce overall campus energy use and emissions from the FY2012 baseline by 6% and would save approximately $12,000 per year in operating costs.

  A similar upgrade to the Central Plant chillers should also be considered. It is more difficult to estimate the potential energy and cost savings for the chiller plant upgrade because only campus level electricity data is available. (Electricity meter data includes multiple buildings and end uses - chilled water, lighting, equipment and appliances, etc. - where as fuel oil is used for heating only.)

- **Site Lighting**
  The build out of this Master Plan will increase the overall amount of site lighting, both to light additional walkways and the exterior of a new building. In general additional lighting would increase the overall energy use associated with the campus. In order to offset this increase in lighting use, we recommend upgrading the existing poles and building mounted lighting with LED fixtures, and installing LED fixtures for any new lighting. LED lighting generally provides better quality and even illumination than alternative lighting sources. While it can have a somewhat higher first cost, the savings in energy usage and potential utility incentives usually make the payback for this investment relatively short. Upgrading the site lighting will be an important strategy for achieving the overall energy goals discussed previously.

Existing Buildings

In general, the approach to reducing energy use in the existing buildings on campus should be:

- Meter existing building energy uses and collect data for one year.
- Conduct an ASHRAE Level II or III Energy Audit to better understand issues with existing buildings and opportunities for improvement.
- Use the results of the Audit to inform the redesign of the existing buildings. For example, the audit may inform whether the existing HVAC systems can be reused or should be replaced, or whether building envelope upgrades are cost effective.
- Design to the target energy budget.

Achieving a low energy use building renovation requires careful planning. While the renovation of each building will be different based on its unique characteristics and planned use, the general approach to design to achieve the target EUIs above is outlined below.

Optimize the Building Enclosure
Based on Figure 1, the greatest potential energy savings are associated with reducing heating energy use. Heating loads are determined by the ability of the building enclosure to prevent heat transfer. Creating a well insulated, well sealed enclosure is a key component of minimizing both heating and cooling energy use.

Integrate Day Lighting
Upgrading the enclosure may include installing better windows that let in more daylight but limit heat transfer. In addition, day lighting controls should be integrated where appropriate to automatically turn off lights when they are not needed.

Upgrade Existing Lighting
While the lighting on campus was upgraded in 2008, it may still be economically feasible to further upgrade lighting to achieve energy savings. In addition to daylight controls, there are also many opportunities for integrating occupancy sensors in the existing buildings to reduce lighting energy use. A more detailed study should be conducted to evaluate opportunities to upgrade fixtures to LED, especially down lights (this could be done as part of a level II or III Energy Audit). Significant cost savings and utility incentives may be available to facilitate this upgrade.

Optimize HVAC and Domestic Hot Water Systems
An Energy Audit can help determine how to optimize the function of existing HVAC systems or inform if they should be upgraded to meet future needs and achieve targeted energy savings. Domestic Hot Water Systems should be similarly evaluated.

Minimize Plug Loads
In very low energy use buildings, plug loads associated with equipment such as computers and copy machines represents a larger portion of the overall building energy use. Plug loads can be reduced by purchasing the best

performing (top 10%) Energy Star equipment and using controls such as occupancy sensor controlled power strips to reduce energy use.

Occupant Engagement

The way that building occupants use a building can have a significant impact on overall energy usage. Providing mechanisms to allow feedback to building occupants on energy usage is a key component of achieving a very low energy use building. For example, a monitor in the entrance lobby that displays data from the building control system can inform and educate occupants on the building's performance.

Figure 2. Building Energy Monitoring System for Academic Buildings

Renewable Energy

Renewable energy systems should be integrated only after exhausting other opportunities for energy efficiency improvements. At a minimum renovated buildings should be redesigned to be "PV Ready" including evaluating the existing roof structure for its ability to support PV or solar thermal panels, providing conduit for the installation of a future rooftop renewable energy system and providing space in mechanical or electrical rooms for equipment such as inverters.

New Buildings

The approach to designing a new, low energy use building is similar to the approach to existing buildings described above. However, there is greater opportunity to minimize heating and cooling loads and maximize day lighting potential by optimizing the building orientation, massing and enclosure design. These strategies are critical to achieving cost effective low energy use building design because they have no or very low cost. There is an additional investment in modeling and analysis that is required to fully vet potential options and inform decision making.

After optimizing the building orientation, massing, and enclosure, efficient systems must be designed to meet the needs of the users. An efficient lighting design with integrated daylight and occupancy controls should target a lighting power density of 0.5-0.75 W/sf (depending on building type and use). Efficient HVAC systems should be selected to provide heating and cooling. Decoupling heating and cooling from ventilation (e.g. a dedicated outdoor air system with chilled beams and radiant heat) can achieve significant energy savings and improve thermal comfort for the building occupants. Similar to existing buildings, the more energy efficient the building becomes, the more significant the impact of plug loads and building occupants.
Finally, renewable energy systems should be considered. At a minimum new construction should be designed to

be solar ready, including providing additional structural capacity at the roof to support the additional weight of solar collectors, conduit to connect them into the building systems and space to accommodate the future installation of equipment such as inverters.

Emissions

Current Emissions

The total FY2013 emissions by fuel source are shown in Figure 3. The figure demonstrates that the largest portion of emissions is from No. 2 fuel oil followed by electricity and propane. The oil and propane use is primarily associated with building heating energy. Electricity is used for cooling and lighting in buildings, and to a lesser degree, plug loads such as computers, printers, and copiers. Electricity is also used to provide site lighting on the MxCC campus.

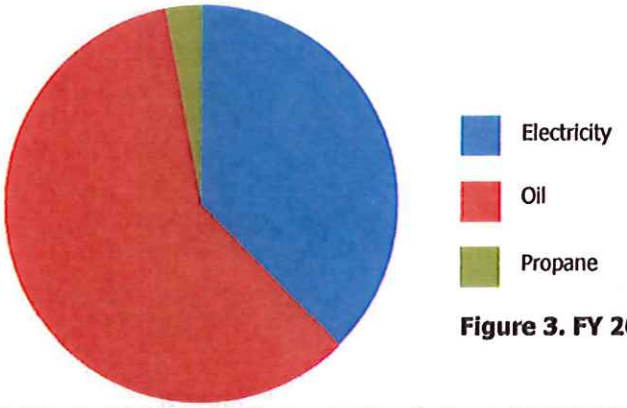


Figure 3. FY 2013 Emissions by Fuel Source (short tons CO2)

Table 2. Middlesex Community College FY 2013 Carbon Footprint

FUEL SOURCE	OIL	PROPANE	ELECTRICITY	TOTAL
EMISSIONS (Tons CO_2)	428	22	271	720
PRIMARY END USE	Heating	Heating Hot Water	Cooling Lighting Equipment	N/A

The reduction in energy use from the efficiency strategies discussed above will also result in reductions of emissions. Figure 2 illustrates that focusing on strategies to reduce heating energy use has the greatest potential to reduce emissions. These include improving building enclosures to minimize heating loads and then providing heating as efficiently as possible.

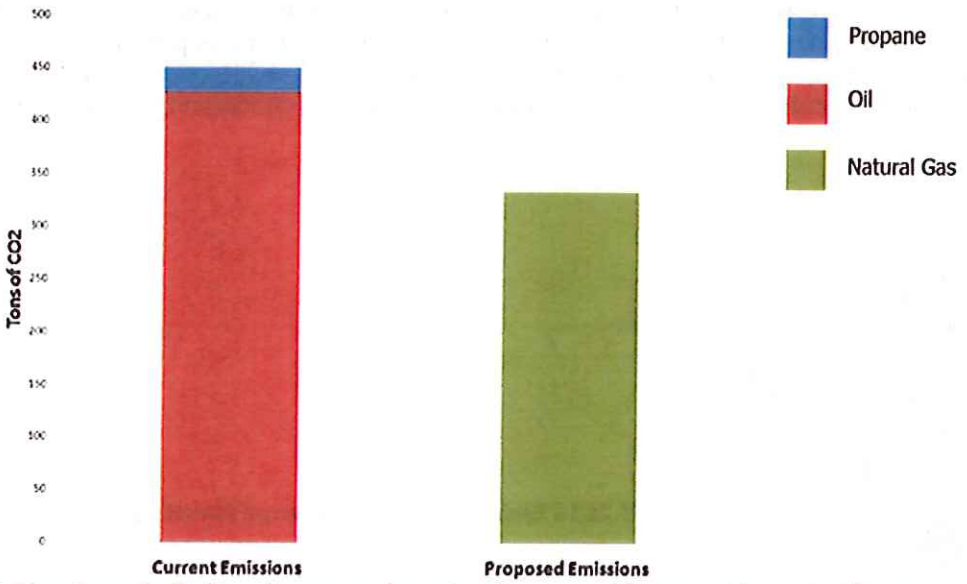
Fuel Switching

In addition to improving energy efficiency on the MxCC campus, additional emissions reductions and energy cost savings can be achieved by converting from No.2 fuel oil to natural gas. Based on conversations with facilities staff and the local gas company representatives, natural gas service is available in the vicinity of the college. In addition, the Department of Energy and Environmental Protection is currently reviewing the Governor's Comprehensive Energy Strategy, the final version of which was expected to be released in December 2013. One objective of the Comprehensive Energy Strategy is to facilitate the expansion of natural gas service in Connecticut. In addition, representatives from the local gas utility indicated that the company's approach to cost/benefit analyses of expanding to new customers was recently revised to a 25 year outlook from a 15 year outlook.

The potential emissions savings of switching from fuel oil to natural gas were determined by calculating the total

energy (in kBtu) in 38,000 gallons of fuel oil and 3,500 gallons of propane. Assuming the same amount of energy would be needed from natural gas to replace these two fuels, the equivalent amount of emissions was calculated based on an emissions rate of 117.1 lb CO2/MBtu of natural gas [6]. The total emissions of switching from No. 2 fuel oil and propane to natural gas would be reduced from approximately 450 short tons of CO2 to 333 tons of CO2. This is an estimated savings of 26%.

Figure 3. Approximate Emissions Before and After Fuel Switching



Switching from fuel oil and propane to natural gas would also achieve significant operational savings. According to data provided by MxCC , the total cost of fuel oil and propane for FY 2013 was $124,000. Switching from oil to natural gas typically reduces operating costs by around 50%. (Some additional costs would also be incurred from purchasing new equipment such as gas fired boilers that have not been accounted for here.)

Renewable Energy

Another option for offsetting emissions associated with campus energy use is to consider installing renewable energy systems. In general, roof mounted or ground mounted PV is likely most appropriate as it can easily offset electricity consumed in a building. In some cases solar thermal hot water may make sense but these systems need some additional level of consideration. Solar thermal hot water often doesn't make sense in academic settings because the most hot water is generated in the summer which does not match the time it is most needed which is typically in the winter. If the supply of hot water generated does not closely match the demand, then heat rejection systems must be integrated with the design to ensure that the system does not overheat. This adds to the initial cost of a solar thermal system and makes the overall payback less favorable.

In general, wind energy is very site specific, meaning that it is only appropriate to install in certain locations. Also it is most effective on a large scale. The power generated by a wind turbine is proportional to the cube of the wind speed, and wind speeds increase significantly with height. Therefore small scale wind installations such as roof mounted turbines are not particularly effective at generating significant quantities of energy.

Ground source heat pumps can also be considered but require the drilling of expensive wells to investigate potential feasibility.

6 Table 5.12, Energy for Sustainability, Randolph and Masters, 2008.

Water

Current Water Use

The MxCC campus receives its water from the Middletown Water Department. According to records provided by MxCC , annual water use on the MxCC campus for FY2013 was 133,000 gallons with a total cost of $8,600, including water and sewer fees. Unit costs for water were between $0.03/gallon and $0.04/gallon and unit costs for sewer were $0.03/gallon. The primary water uses on the MxCC campus are for domestic water use and cooling tower makeup for the water cooled chillers that serve Chapman Hall.

Fixture Replacement

Based on observations made during the building walk through, typical fixtures in the existing academic and administration buildings are assumed to have the following flow rates:

- Water Closet 1.6 gallons per flush (gpf)
- Urinal 1.0 gpf
- Lavatory 2.5 gallons per minute (gpm)

Older fixtures that use more water than new low-flow fixtures could be replaced at relatively low cost to achieve water savings. For the purpose of this analysis the replacement fixtures were assumed to include:

- 1.28 gpf water closets
- 0.125 gpf urinals
- 0.5 gallon per minute (gpm) lavatories

Savings were estimated based on the following assumptions:

- Occupants are assumed to be 50% male and 50% female
- Men use a water closet once per day and a urinal twice per day
- Women use a water closet three times per day
- Each person uses the lavatory 3 times per day for 20 seconds each use
- 10% of building occupants shower for 10 minutes each day
- 50% of building occupants use the kitchenette sinks for 20 seconds each day

Based on these assumptions, it is estimated that overall domestic water use could be reduced by approximately 15% by replacing the existing fixtures with new, low water use fixtures. It is difficult to estimate how much this might reduce the total water use on campus because there is currently no information on how much water is used for domestic use versus cooling tower makeup. By metering the cooling tower makeup and blowdown at Chapman Hall an estimate of the potential total water and cost savings could be determined.

Rainwater Harvesting

Rainwater harvesting was also considered as a potential strategy for reducing potable water consumption. Captured rainwater could potentially be used for flushing and for cooling tower makeup, where applicable. It was assumed that 25% of the average annual rainfall (50 inches) could feasibly be captured from the existing roof areas. Roof areas were approximated by dividing the total building square footage by the number of floors. Table 2 summarizes the rainwater harvesting potential for each building.

Table 2. Approximate Rainwater Harvesting Potential

BUILDING	APPROXIMATE ROOF AREA (SF)	RAINWATER HARVESTING POTENTIAL (GAL)
Chapman	14,670	114,280
Founders	25,000	194,830
Snow	12,500	97,400
Wheaton	12,500	97,400
TOTAL	**64,670**	**503,910**

Rainwater Harvesting for Toilet Flushing

The potential rainwater harvesting volume that could be captured is approximately four times greater than the total annual water usage for the MxCC campus. Clearly there is significant potential to offset water consumption through rainwater harvesting, however, there are also significant challenges with it. For example, plumbing all existing buildings with additional piping to allow rainwater to be used for toilet flushing could be difficult and expensive. There is also significant expense with the installation of all the components of a rainwater harvesting system associated with water storage and filtration. Installation could be somewhat easier with the construction of a new building, but there is still significant additional expense associated with double piping and the storage and filtration components of a rainwater harvesting system.

Rainwater Harvesting for Cooling Tower Makeup

Capturing rainwater for use as cooling tower makeup water may be a more practical retrofit strategy since the required plumbing is more accessible and the baseline water usage may be more substantial. If rainwater harvesting systems were installed at Chapman Hall it is possible to significantly offset water use. A more detailed analysis of the potential costs and benefits of rainwater harvesting for cooling tower make up water could be conducted if the volume of water for this purpose was metered. It is recommended that both the cooling tower makeup and blowdown are metered. The data should be collected on an continuous basis for one year.

Stormwater Management

The overall topography of the site consists of a high point near the southern end of the campus that slopes downhill toward the northern end. Along the eastern property line the campus drains into a channel that flows northward into an existing water body. Existing drainage systems on the southern half of the campus is collected in catch basins and piped northeastward where the pipes daylight and runoff continues via overland flow to the drainage channel just beyond the eastern property line. Drainage from the northern half of the site is collected in catch basins and piped to a system that runs northward along Reservoir Road. The existing drainage is illustrated in Figure 4 below.

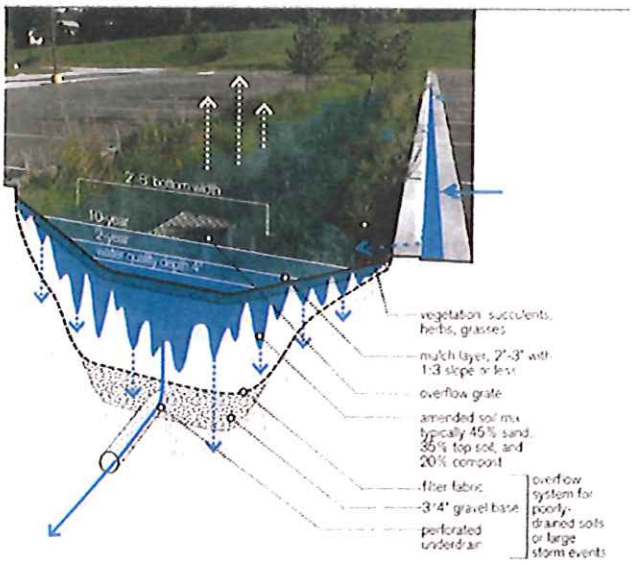
Figure 4. Existing Hydrology on the MxCC Campus

The proposed improvements to the campus landscape have four main objectives: 1) reduce stormwater runoff rate and quantity to reduce the risk of flooding, 2) promote infiltration to recharge groundwater, 3) improve overall water quality of runoff and 4) mitigate the proposed increase in impervious surfaces associated with new construction. Several strategies are recommended to achieve these objectives including disconnecting impervious surfaces from discharging directly to hard drainage infrastructure and utilizing plants and soils.

Bioswales for Existing Parking Areas

The existing parking lot and drives can be retrofitted with curb cuts to allow water to flow into the existing islands and along the edges of paving. The adjacent vegetated areas can be regraded and planted with bioswales to allow for infiltration and filtering of stormwater runoff. These measures could be implemented without significantly disrupting existing drainage patterns and with minimal changes to existing hard drainage infrastructure.

Figure 5. Parking Bioswale with Curb Inlets



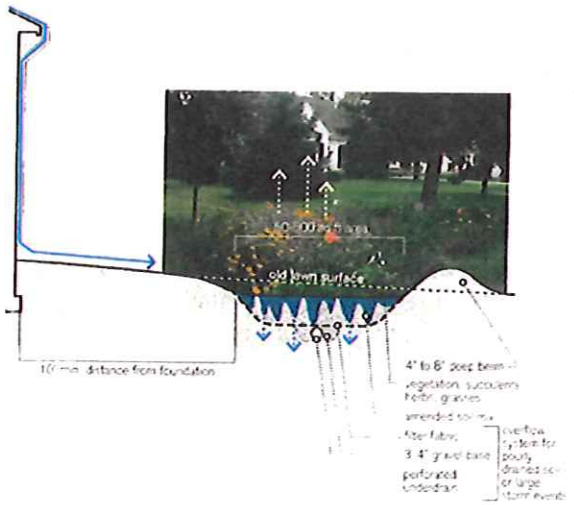
Source:
Low Impact Development; a design manual for urban areas, University of Arkansas Community Design Center, p. 183

This type of retrofit would reduce the overall volume of runoff by allowing more stormwater to infiltrate into the soil, recharging the groundwater. The rate of runoff from storm events would also be reduced, because water flows more slowly over a planted surface than it does over a smooth, paved surface. Reducing the volume and rate of stormwater runoff reduces the potential for future downstream flooding. This type of strategy is particularly important for mitigating the overall increase in impervious area that will occur as a result of future development. Introducing runoff from paved surfaces to landscaped areas will also improve overall water quality. Currently, stormwater runoff from the parking lots and drives is not being treated. By integrating bioswales into the drainage system, sediment, oils and other pollutants can be filtered out of the water by the plantings before it is discharged from the site.

Rain Gardens for Roof Runoff

The existing roof drainage could be modified to direct roof runoff to rain gardens as shown in Figure 6 below. Rain gardens work best on a small scale and can improve overall drainage on the MxCC campus by slowing the rate of runoff because stormwater will flow more slowly over larger plantings than it will over a mowed lawn. By slowing the rate of runoff additional infiltration will also be possible, thereby reducing the volume of runoff.

Figure 6. Rain Garden for Roof Runoff



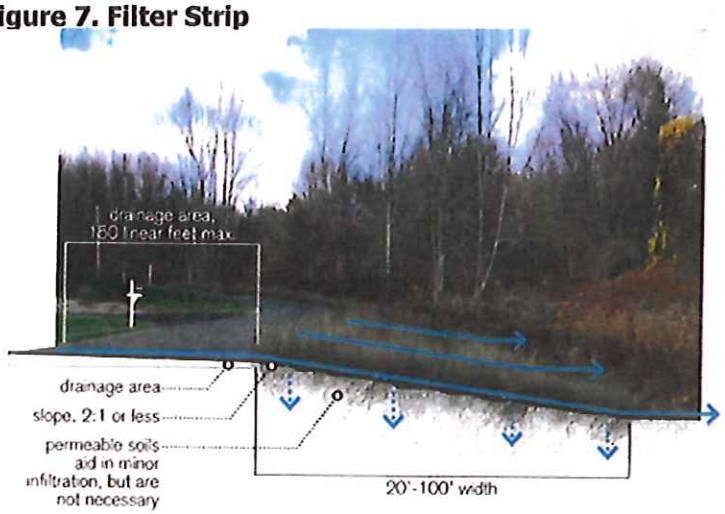
Source:
Low Impact Development; a design manual for urban areas, University of Arkansas Community Design Center, p. 179

Meadow Restoration

Another opportunity for improving stormwater runoff on the MxCC campus is to convert some of the lawn area at the edge of the woods along the eastern property line to return to meadow. This would effectively create a filter strip similar to that shown in Figure 7 below. This meadow area would improve the existing condition by slowing the rate of stormwater runoff, promoting additional infiltration, as well as creating additional wildlife habitat by establishing a more natural transition between the lawn and wooded areas.

This strategy would also reduce maintenance costs associated with mowing this area. Maintaining the meadow would only require mowing once or twice a year.

Figure 7. Filter Strip



Source:
Low Impact Development; a design manual for urban areas, University of Arkansas Community Design Center, p. 163

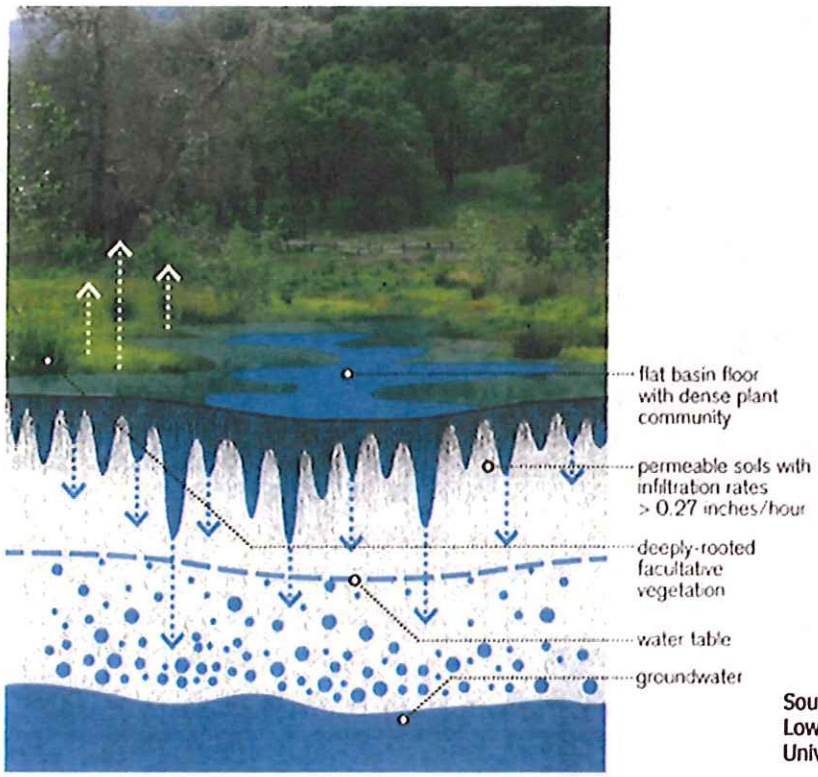
Figure 8. Meadow with a Mowed Walking Path

Source:
Low Impact Development; a design manual for urban areas, University of Arkansas Community Design Center, p. 185

Infiltration Basin

In addition to restoring the meadow along the edge of the existing treeline, another option for utilizing the landscape to improve stormwater runoff is to introduce an infiltration basin downstream of the existing outfalls that discharge runoff from the southern half of the campus. Again, the intent of the infiltration basin would be to slow the rate of stormwater runoff from the site and promote infiltration.

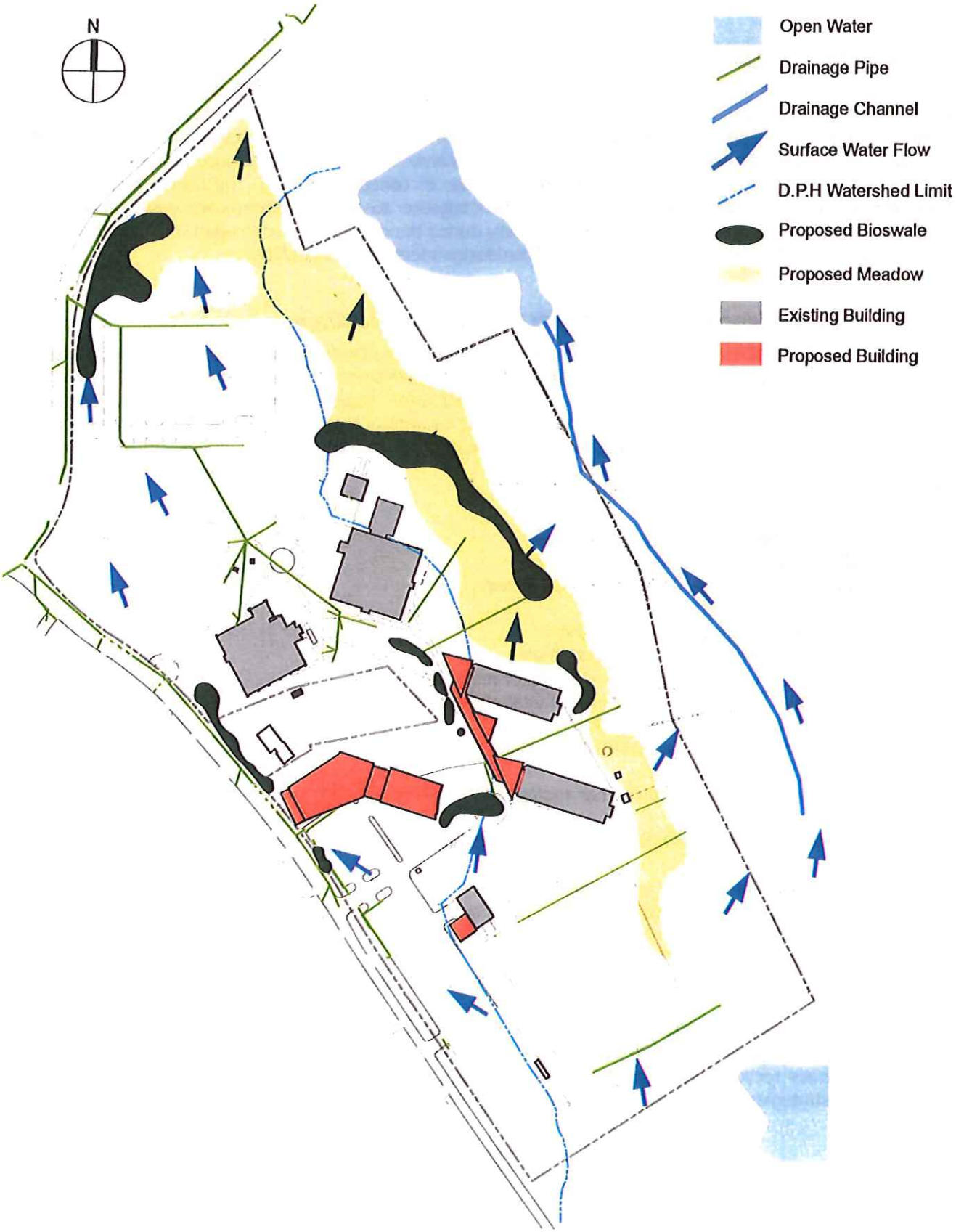
Figure 9. Infiltration Basin



Source:
Low Impact Development; a design manual for urban areas, University of Arkansas Community Design Center, p. 185

The proposed revisions to the landscape integrating the strategies discussed above are illustrated in Figure 10.

Figure 10. Proposed Hydrology on the MxCC Campus



SUSTAINABLE DESIGN

The Integrative Design Process

Achieving the aggressive energy reduction goals for Connecticut state facilities, as outlined in this report, requires a non-standard approach to renovation and design. Successful low energy and high sustainable design projects achieve this by using an Integrative Design Process (IDP). The Integrative Design Process differs from traditional design through greater emphasis on early research and analysis used to inform design. It also differs in that it engages all project stakeholders from the earliest phases of conceptual design. The design team and other stakeholders, such as the building owner and users, work together to establish performance goals and metrics at the outset of design at a series of workshops. Periodically during the design process the team will revisit these goals and guiding principles for the project to make sure the design meets the original intent.

Connecticut Compliance Manual for High Performance Buildings

The State of Connecticut has developed its own sustainable design standards for State facilities including new construction and renovation projects over $2 million. The requirements are similar to the prerequisites and credits of the LEED green building rating system. There are twelve mandatory requirements as outlined below, and projects must choose an additional 26 of 60 optional requirements to be in compliance. The standard is intended to produce buildings that perform at an equivalent level to a LEED Silver certified building.

The twelve mandatory requirements include:

- Commissioning building energy systems
- Utilizing an Integrated Design Process
- Achieving a minimum 21% energy cost savings
- Installing Energy Star products
- Implementing a construction IAQ plan
- Achieving a minimum 20% water savings
- Providing for the storage and collection of recyclables
- Implementing an Erosion and Sedimentation Control plan
- Establishing a No Smoking policy
- Implementing an Integrated Pest Management Plan
- No use of CFC refrigerants
- Providing minimum ventilation as required by ASHRAE 62.1

School facilities have several additional mandatory requirements including:

- Acoustical performance requirements
- Locating outdoor air intakes at least 25 feet away of potential sources of contaminants
- Utilizing only electric ignitions for gas-fired equipment
- Requiring certain low VOC finishes
- Conducting HEPA vacuuming of all carpeted and soft surfaces prior to substantial completion.

The optional requirements consist of several additional strategies in the areas of energy performance (minimum 1 strategy required), indoor environment (minimum of 2 strategies required), water efficiency (minimum 1 strategy required), materials recycling and reuse (minimum of 2 strategies required), site selection and development (minimum of 2 strategies required), operations and innovation (no minimum required).