

**The Community College of Baltimore County  
Environmental Science & Technology Program  
Five (Six) Year Review**

Submitted on  
April 26, 2001

To  
Dr. Donna Links, Dean  
Division of Mathematics, Science and Engineering

By  
Chris Fox, ENVS Program Coordinator

<b>TABLE OF CONTENTS</b>	<b>PAGE</b>
I. Program Review Committee	2
II. Program Review Content	3
A. INTRODUCTION TO THE PROGRAM	3
1. Program Background	3
2. Program Mission	3
3. Program Impact	4
B . RELATIONSHIP TO COLLEGE & SYSTEM MISSION	5
1. Student Learning	5
2. Learning Support	5
3. Learning College	6
4. Infusing Technology	6
5. Management Excellence	6
6. Embracing Diversity	7
7. Building Community	7
8. Enrollment Management	8
C. CURRICULUM INFORMATION	9
D. ENROLLMENT AND STUDENT PERFORMANCE DATA	10
E. GENERAL PROGRAM INFORMATION	10
1. Articulation Agreements	14
2. Faculty Information	15
3. Inventory of Instructional Resources	15
4. Delivery Strategies	16
5. Advisory Committee	16
6. Relationship To Continuing Education And Economic Development	16
7. Cooperative Education And Internship Information	18
8. Marketing Activities And Plan	19
9. Employment Opportunities For Graduates	20
10. Summary	22
a. ENVS Program Income/Revenue/FTE	22
b. ENVS Program Priorities	22
c. ENVS Resources Request	24
III. Executive Summary	25
A. APPENDICES	26
1. Environmental Science and Technology Program Reviewers	26
2. A.A.S. Degree Program Outline	28
3. Certificate Program Outline	29
4. Credit Course Descriptions	30
5. Participating Companies and Organizations, 1994-2000	33
6. Non-Credit Course Offerings	38
7. Workshops and Conferences	39

## I. Program Review Committee

The CCBC Environmental Science and Technology program would like to thank the following advisory committee members for contributing to this report.

Ms. Allison Anderson	CCBC-Catonsville	Environment Project
Dr. Dennis Helfritch	U.S. Army Research Laboratory	Aberdeen, Maryland
Mr. Thomas Russ	CCBC-Catonsville	Environmental Science & Technology
Ms. Cheryl Silver	CCBC-Catonsville	Environmental Science & Technology
Dr. Donna Links	CCBC-Catonsville	Math, Science & Engineering
Dr. Bernard Nebel	CCBC-Catonsville	MSE Division
Dr. Penelope Revelle	CCBC-Essex	Biology/Environmental Science
Dr. Steven Frysinger	James Madison University	Environmental Science Program
Dr. Suzanne Giannini-Spohn	U.S.E.P.A.	Office of International Activities
Dr. William Jones	University of Maryland	Biotechnology Institute

## **II. Program Review Content**

### **A. INTRODUCTION TO THE PROGRAM**

**1. Program Background** - The idea for the development of an environmental science program at Catonsville Community College, now the Community College of Baltimore County - Catonsville, sprouted during an after dinner conversation over a fence between two neighbors in December 1992. One of the two neighbors was an upper level manager in a large, national environmental engineering firm. The other was the Dean of Institutional Advancement and Continuing Studies at the college, Mr. Michael Carey. Mr. Carey listened intently while his neighbor suggested the creation of a two-year environmental technology program to meet the growing demand for skilled employees to work in the mushrooming environmental science and services field.

Dean Carey finished his after dinner conversation and began to check into environmental resources at the Catonsville campus. He found that environmental science courses were being taught by two Catonsville faculty, Dr. Bernard Nebel of the biology department, and Dr. George Farrant, professor of chemistry. Dean Carey then learned about the Partnership for Environmental Technology Education, or PETE, a national coalition of community colleges with environmental education and training programs. He soon became a member of the Northeast PETE advisory board and was able to acquire two U.S. Environmental Protection Agency grants, which helped fund a full-time environmental programs coordinator in June, 1994.

A proposal for the creation of an Environmental Technology A.A.S. degree program was submitted to the Maryland Higher Education Commission in the spring of 1995. The program was approved began accepting students in the fall of 1995. The name of the program was changed to Environmental Science and Technology in the spring of 1997 and a non-degree certificate program was added at that time as well. The ENVS program began to spread across all three CCBC campuses with the offering of ENVS 101, Introduction to Environmental Science, and ENVS 102, Introduction to Environmental Science Laboratory, at the Dundalk and Essex campuses in the fall of 1998.

**2. Program Mission** - The Community College of Baltimore County Environmental Science and Technology (ENVS) Program recognizes that humans are our most important natural resource. Development of this resource is critical to a sustainable future that better integrates the environmental and the economy, optimizes use of natural resources, and meets the needs of 21st century societies.

The ENVS program consists of four interconnected and integrated components. They are:

1. Credit degree program; certificate program, and courses;
2. Professional development, non-credit short courses, workshops, and seminars;
3. Grant funded programs and projects; and,
4. Outreach programs to businesses, government, institutions, and organizations.

## *CCBC Environmental Science and Technology Program Review*

The CCBC Environmental Science and Technology program integrates theory and principles of environmental science with applied, hands-on experiences. ENVS students learn to monitor and sample environmental conditions, use computer programs to solve environmental problems, and explore environmental policies and technologies. The program is designed for students looking to transfer to 4-year colleges, pursue employment upon graduation, and upgrade skills or seeking retraining. Articulation agreements for ENVS courses exist with many of the area's four-year colleges and institutions. A program highlight is the optional internship where credits are awarded for work at environmental companies, government agencies, or non-profit environmental organizations.

Target audiences for the ENVS program include:

1. Students considering environmental careers;
2. Professionals within the environmental industry;
3. Communities seeking to enhance quality of life and "economic development;
4. Representatives from companies and institutions looking to comply with environmental regulations; and,
5. Individuals from all walks of life seeking to integrate environmental concerns into their daily lives.

Students that successfully complete the CCBC ENVS program are able to:

1. Demonstrate a working knowledge and familiarity with the natural environmental systems;
2. Apply basic scientific principles to environmental systems and dynamics;
3. Delineate how individual, group, and organizational human behavior can affect and impact natural systems;
4. Describe how environmental systems are affected by, and affect, urban areas;
5. Monitor, sample, and assess environmental data in objective technical terms;
6. Design sampling plans for various media using appropriate strategies to assure significance and validity;
7. Critically evaluate information sources to develop an independent, informed perspective;
8. Engage in environmental problem solving at local, regional, national, and global scales;
9. Understand the role and specifics of environmental policy, law, and regulations;
10. Develop and objectively assess environmental and policy technical reports;
11. Complete research and solve problems that confront them on-site and in the field.

**3. Program Impact** - The next several pages contain much factual and statistical information about the CCBC Environmental Science and Technology program. While this information is useful, indeed critical, to a formal program review such as this, the program's real impact lies with the individuals whose lives have been touched by the program. These include the following:

\* A shy, intelligent, young African American woman who overcame her father's negativism to excel in a summer internship at the Maryland Department of the Environment;

\* A single mother of three small children who, having taken one environmental science class, went on to complete her four-year environmental science degree and is now enrolled in law school pursuing her vision of becoming an environmental lawyer;

\* An employee of a local environmental organization who enrolled in ENVS 101 to further her understanding of environmental issues affecting the Chesapeake Bay;

\* The environmental manager for the Maryland manufacturer that took the on-line version of ENVS 101 to better understand the dynamics and effects of pollution;

\* A middle-aged, disabled student due to graduate this spring, who was forced to change careers, is furthering his education at a four-year institution and volunteering at a local wildlife refuge;

\* A former bouncer from a Baltimore bar who, after having taken two ENVS courses, is working full-time for a local environmental consulting firm;

\* A hazardous waste manager at a large, local federal facility who is taking ENVS electives for professional development and is soon to be promoted to a management position;

\* A single mother of two young boys who, seeking reentry into workforce, completed her coursework and participated in the ENVS Directed Practicum. Her practicum took place at the Baltimore County Bureau of Solid Waste, where she facilitated the revision of the Solid Waste Management Plan for Baltimore County and has since gone onto employment at a local environmental consulting firm;

and many others. These tales are the real story of the ENVS program. Behind every registration statistic and three credit course taken, as numerated on the pages to come, is a unique individual whose life, we hope, has been enriched by her or his experience at the Community College of Baltimore County Environmental Science and Technology program.

## **B. RELATIONSHIP OF PROGRAM GOALS TO COLLEGE AND SYSTEM MISSION**

The mission, of the CCBC Environmental Science & Technology program is to optimize environmental education and career opportunities for all CCBC students. Central to the program's mission is guiding students through the learning process. From field trips to wastewater facilities to on-line courses for students throughout the state .from intensely interactive evening courses to School-to-Career programs .learning is the central focus for the efforts and activities of the ENVS program at CCBC.

**1. Student Learning** - ENVS faculty and staff are active in seeking new and innovative ways to enhance curriculum and course delivery. On such project underway is an outcomes assessment project that compares on-line and on-site versions of ENVS 101, Introduction to Environmental Sciences and ENVS 102 Introduction to Environmental Sciences Laboratory . The project is testing the relative performance of students in on-line and on-site versions of the two courses as well as comparing the results of CCBC students to those of a national environmental education survey.

A second effort to improve learning for students involves developing student portfolios. The goal of this project is to have students maintain a portfolio of assignments, research papers, and special projects completed in ENVS courses. The portfolio would then become part of the student s final program evaluation and provide CCBC students a competitive edge in the marketplace for internships and employment.

Lastly, ENVS faculty have recently completed a comprehensive assessment and revision of all ENVS courses to meet Learning First objectives and outcomes. As part of this process, ENVS 101, Introduction to Environmental Sciences and ENVS 102 Introduction to Environmental Sciences Laboratory were submitted and approved for general education science requirement status. Several changes were also made to the program s general education requirements, program requirements, and program electives, including the development and revision of a number of new and existing ENVS courses.

**2. Learning Support** - The ENVS program actively works towards improving student opportunity, assistance and learning. Several ENVS faculty regularly participate in freshman orientation programs as well as maintain open study-tutoring sessions.

Second, ENVS faculty regularly give presentations to increase information and access to environmental education and training programs. These include talks given at the 1995 Maryland. Intersegmental Educators Conference, 1997 Maryland Association for Counseling & Development Conference, the 1998 Baltimore County Schools Next Step Conference, and the 1998 CCBC-Essex Environmental Careers Forum.

The ENVS program also works closely with the Catonsville Foundation to steward and administer the Janet Rose Nebel scholarship fund. The fund was established as a means of providing support for needy, worthy ENVS students and as memorial to Janet Rose Nebel, deceased wife of Dr. Bernard Nebel, a retired biology/environmental science professor from the Catonsville campus.

**3. Learning College** - The ENVS program was one of the first academic programs selected for CCBC system-wide integration. To accomplish that goal, a CCBC ENVS Workgroup was formed. Issues tackled by the tri-campus workgroup included the program update and revision, credit articulation & transfer, strategies and mechanisms for offering elective courses, enhancing diversity participation, and increasing the number of ENVS majors.

The ENVS program has also been active in faculty and staff development programs. An ENVS faculty member currently co-chairs the Math, Sciences, and Engineering Professional Development Committee, and ENVS faculty have participated and given presentations at several CCBC workshops.

**4. Infusing Technology** - The ENVS program recognizes the importance and potential of technology for education, and have been active in infusing distance education technology into the program. Over the last 5 years, a number of distance education courses have been created. First, the ENVS program offers a compressed video section of ENVS 101 which is distributed to the Hunt Valley and Owings Mills centers as well as Baltimore City Community College, BCCC. The course originates at BCCC and is staffed by BCCC faculty every fall semester. CCBC staff coordinate and teach the course in the spring semester. A second compressed video ENVS course, ENVS 146 Introduction to Natural Resources, is also under development.

Several ENVS courses are also offered via the World Wide Web. These include ENVS 101, Introduction to Environmental Science and ENVS 102, Introduction to Environmental Sciences Laboratory. On-line versions of these courses were developed for the fall 1998 semester and are offered every semester, both at CCBC and through the Maryland Community College Teleconsortium (MCCT). In the fall of 1999, an on-line version of ENVS 142 Environmental Law and Regulation was created and development is underway for ENVS 153 Environmental Policy, Economics, & Management" to go on-line this coming fall. To examine the on-line versions of ENVS 101 and 102, go to <http://student.ccbc.cc.md.us/courses/env101/> and <http://student.ccbc.cc.md.us/courses/env102/>. Lastly, ENVS faculty regularly take advantage of distance education training programs, such as those currently offered for Web CT3.

**5. Management Excellence** - Any organization whether a church, business, government agency, non-profit - is only as good as the people that comprise it. The Environmental Science and Technology program has been fortunate in attracting and retaining qualified and dedicated staff and faculty. These individuals are the lifeblood of the program and give the program its drive, innovation, and uniqueness.

ENVS staff and faculty recognize the tremendous importance in participating in programs to enhance institutional capability and expertise. These include internal committees and special projects as well as external programs and initiatives. Within the CCBC community, ENVS faculty have participated in the Catonsville Environmental Screening and Forecasting Committee and have served on the Institutional Integrity Committee as part of the Middle States Accreditation process.

With regards to external programs, ENVS staff and faculty have successfully completed 27 sponsored projects totaling over \$1,000,000 in funding since 1994. Examples of the ENVS program's funded projects are provided throughout this report and include programs and initiatives in the following areas:

Community Development	Emerging Issues	Global Change
Curriculum Development	Energy Efficiency	Water Quality
"Eco"nomic Development	Environmental Technologies	Workforce Development

Corporations, private foundation, non-profits and government agencies are among the many types of organizations that have sponsored projects. The list of generous funders for the ENVS program includes the following:

## *CCBC Environmental Science and Technology Program Review*

The Abell Foundation	Md. Department of the Environment
AT&T	Md. Division of Business & Economic Development
Baltimore County Career Connections Office	Md. Energy Administration
The Chesapeake Bay Trust	Md. State Department of Education
EG&G Pressure Sciences - Perkin Elmer	National Environmental Education & Training Foundation.
Hazardous Materials Training & Research Institute	Parks & People Foundation
The GE Fund	Partnership for Environment Technology Education
Historic Baltimore	R.R. Donnelly & Sons, Inc.
The Hitachi Foundation	U.S.E.P.A. Office of Exploratory Research
Kimberly Clark	U.S.E.P.A. Sustainable Development Grant Program
Md. Assoc. of Environmental & Outdoor Educators	Virginia Housing & Environment Network

**6. Embracing Diversity** - At their core, environmental issues are urban issues. Not only are the vast majority of pollutant sources located in cities, but urban residents are also most adversely affected by environmental pollution. Yet, there is a disconnect nationally between the areas and populations most affected by environmental degradation and the processes and organizations seeking to improve environmental conditions. Many African Americans fight their environmental battles in civic and neighborhood groups and are generally underrepresented in environmental companies and non-profit organizations. Combatting environmental degradation, however, requires full participation by all members of the urban community.

Over the last five years, the ENVS program has been engaged in many activities to promote diversity and achieve greater minority participation in environmental education, training programs, employment, and careers. For starters, the program is in the final approval stages of a course entitled *Environment and Society* that would qualify as a General Education Diversity course. *Environment and Society* would challenge students to consider the environmental perspectives of different societies across geographic and temporal distances, including those of the Aboriginal Australians, African, Asian, and Native American cultures.

To improve minority participation in the environmental field, ENVS faculty have given presentations on environmental career opportunities for the Baltimore City Public Schools Office of Guidance Services, the Summer Teachers Institute at Morgan State University, and the Baltimore Urban League. ENVS faculty and staff have also worked closely with representatives from Morgan State University; the Baltimore Urban League, the Parks and People Foundation, and the Baltimore City Environmental Health Education Center and several Baltimore City high schools on grant related proposals and projects.

Lastly, celebrating diversity is another means of reaping the many benefits that people of all walks of life, races, religions, and ethnic origins have to offer. Towards that goal, ENVS faculty have been involved in co-sponsoring, along with the Office of Student Activities, a zydeco dance series. For the last four years, this monthly series has brought the music and dance of the African American Creole culture from Southwest Louisiana to the Barn Theatre on the Catonsville campus.

**7. Building Community** - The ENVS program believes in the power of community and works to develop linkages and partnerships with business, government, organizations, and institutions. As an example of its community building efforts, representatives from over 400 businesses, government agencies, educational institutions, and non-profit organizations have attended ENVS courses, workshops, and conferences (see Appendix 4 for listing).

ENVS staff are also active in national environmental, economic, and workforce development initiatives. These efforts include the creation of a U.S. National Environmental Industry Coalition and the Institute of Corporate Environmental Mentoring in Washington, D.C. Project staff have worked with White House staff, federal agency administrators, and CEOs and staff from some of the largest North American and multinational corporations. These include 3M, AT&T, Lockheed Martin, Lucent, Monsanto, Motorola, R.R. Donnelley, and Volvo North America.

Closer to home, the ENVS program has been on a project to improve conditions within the Gwynn Falls Watershed. The project, funded by the Abell Foundation and the Parks and People Foundation, has been working since 1998 to increase business and institution participation in environmental activities along the Gwynns Falls.

In another Baltimore based project, ENVS staff are currently working to foster sustainable economic growth in Southwest Baltimore through the development and expansion of markets for repaired and reused goods. Both repair and reuse typically yield greater environmental benefit than recycling, and can accrue significant benefits to areas with established repair businesses such as in Southwest Baltimore. One outcome of the project is to establish the Baltimore reBusiness Network, which would help connect disposers, repairers, and users of appliances, computer, electronics, furniture, and video equipment. A second outcome is the development of School-to-Work linkages involving Baltimore City high school technical education programs with local employers that repair and reuse products. Funding for the project has been provided by the U.S. Environmental Protection Agency Sustainable Development Challenge Grant Program.

**a. Maryland Environmental Business Alliance** - In addition to the outreach and community building activities described above, the ENVS program has, over the past five years, helped to create three statewide environment and energy coalitions. The first of these, the Maryland Environmental Business Alliance, or MEBA, was developed in 1996 to foster development of the Maryland's environmental technology industry. MEBA provides programs to enhance business development, international trade, education and training, effective policy, and innovative technologies for its membership, which includes environmental technology, service and manufacturing companies as well as other companies and manufacturers interested in improving environmental performance. Since its inception, the Alliance has sponsored a regular program of monthly meetings focused on topics relevant to environmental technology and industry, attended by representatives from over 500 environmental companies and organizations in Maryland and throughout the Mid-Atlantic region.

The Alliance has been involved in several international trade programs and has sponsored its events with other economic and workforce development organizations, including the Suburban Maryland High Tech Council, the Greater Baltimore Committee Technology Council, the Baltimore Development Corporation, the Maryland International Division, the Department of Business and Economic Development, the U.S. Asian Environmental Partnership and the White House Interagency Environmental Technology Office. Recently, MEBA has obtained separate 501C3 status, and has begun to offer its program at community colleges throughout the state.

**b. Maryland Energy Institute** - The ENVS program helped bring The Maryland Energy Institute to the Catonsville campus in 1997. The Institute is a statewide energy initiative begun in the early 1990's under then-governor Schafer. The Institute at Catonsville has offered several workforce-training programs. Business and institutional energy managers and chief executive officers attend these programs and courses. The Institute operated out of the ENVS program from 1997 to 2000, and has since relocated to Howard Community College.

**c. Environmental Managers of Maryland** - The third coalition that the ENVS program helped to establish is Environmental Managers of Maryland. The Environmental Managers of Maryland is a coalition of environmental managers from some of Maryland's most successful and established companies. These include Perkin Elmer, Bethlehem Steel, Black and Decker, W.R. Grace, Chesapeake Finished Metals, McCormick Paints, and Proctor and Gamble. For its work in establishing, academic business linkages and networks, the ENVS program received honorable mention in the Partnerships and Linkages Category from the National Council of Instructional Administrators in 1999.

**8. Enrollment Management** - The ENVS program has, since its inception, maintained a comprehensive spreadsheet of enrollment in all ENVS courses. This spreadsheet has allowed the program to accurately track enrollment trends and is regularly used as a course and curriculum decision-making tool. Many of the statistics and charts that appear on the following pages are part of the ENVS enrollment spreadsheet, which contains information on every ENVS course from 1989 to the present semester in its 10,000 or so cells.

### **C. CURRICULUM INFORMATION**

The ENVS credit program and courses target two distinct audiences. The first audience is composed of students looking to fulfill their general education science requirements. Both ENVS 101 Introduction to Environmental Science and ENVS 102 Introduction to Environmental Science Laboratory fulfill general education requirements.

The second audience is made up of students focused specifically on obtaining environmental education, training, and employment and includes:

1. Students transferring to 4-year institutions to further their education;
2. Individuals seeking job opportunities after completion of the two-year degree program, and;
3. Currently employed environmental professional upgrading skills and education while employed.

The ENVS Associate of Arts degree program was approved by the Maryland Higher Education Commission in the spring of 1995 and began accepting students later that year. The initial program curriculum was the result of a three-year curriculum development effort involving dozens of representatives from environmental businesses, government agencies non-profit organizations, and educational institutions. Many individuals from the Catonsville campus were involved in the development of the program and the support and enthusiasm provided to the program by the campus leadership was instrumental in the program's creation.

As a side note, several of the members of the initial program advisory committee were from environmental companies across the state. While these individuals knew of one another, they had never been provided with a forum for meeting and networking on a regular basis. Such was the enthusiasm of this initial group that the curriculum advisory committee members, with the assistance of campus staff and faculty went on to form the Maryland Environmental Business Alliance. Suffice it to say that, over the last five years, there has been a tremendous amount of interaction between environmental employers and ENVS staff and faculty which has helped the program stay abreast of emerging trends, issues and developments within the field.

In addition, results from national surveys, such as that conducted by the National Association of Environmental Professionals in 1996, provided valuable information to guide the ENVS program's development. ENVS faculty also participated in a nationwide project conducted by the Advanced Technological Education Program of the National Science Foundation. The project, the National Forum on Critical Issues in Environmental Technology Education at Two-Year Colleges was co-sponsored by the American Association of Community Colleges, and the Hazardous Materials Training and Research Institute.

The A.A.S. degree and certificate program outlines and course descriptions are attached to this review in Appendices 2 and 3, respectively. Course descriptions are provided in Appendix 4. Both the A.A.S. and certificate programs seek to optimize student's environmental education and career opportunities. In addition, though it may be difficult to tell from just the listing of courses, a tremendous amount of inquiry, feedback, and decision-making was invested into the development of each and every course. Rather than provide the rationale for each course, which would take several pages to complete, interested readers of this program review are encouraged to contact the ENVS program coordinator, Chris Fox at 410-455-4538 or [cfox@ccbc.cc.md.us](mailto:cfox@ccbc.cc.md.us), with questions or requests for additional information.

### **D. ENROLLMENT AND STUDENT PERFORMANCE DATA**

This document serves as review of the CCBC Environmental Sciences & Technology program for the five-year period from 1996 through 2001. However, since the program began in the fall of 1995 -- six years ago -- some of the statistics and analysis extend, where appropriate, to include a six-year, rather than five-year, period. Much credit and thanks is due to the CCBC Office of Institutional Advancement and the Catonsville, Dundalk, and Essex campus scheduling office staff, without whom much of the long term trend analysis would not have been possible.

Though this is a five-year review, let's begin by examining the total CCBC wide ENVS enrollment for the most recent six-year period, years 1996 - 2001, and compare it to the previous six-year period. The rationale for this comparison is that ENVS A.A.S. degree program was launched in the fall of 1995, six years ago. Comparing these two six-year periods, therefore, is meaningful and fully considers the growth in enrollment due to the creation of the ENVS program. Figure 1 depicts a number of comparative criteria for these two six-year periods.

**Figure 1**  
**Comparative Analysis**  
**Fall 1989 to Spring 1995/Fall 1995 to Spring 2001**

	F89 to S95	F95 to S01
Number of ENVS Sections	68	200
Average Sections Per Semester	6	17
Total Sections Cancelled	0	18
Percent of Sections Cancelled	0%	9%
Average Section Size	19	15
Average Adjuncts Per Semester	1	8
Total Number of Adjuncts	13	95
Percent Adjunct Sections	19%	48%

Over the most recent six-year period, the ENVS program has greatly increased the number of ENVS course offerings from 68 in the 1989 - 1995 period, to over 200 from 1995 to 2001. The average number of ENVS sections offered per semester nearly tripled over this period, from 6 to 17. Due to offering ENVS elective courses, and trying new course times and formats, the percent of courses cancelled increased as well. Lastly, roughly half of all ENVS courses are taught by adjunct instructors.

The development of the ENVS program over the last six years has resulted in a huge increase in ENVS enrollment. Figure 2 depicts total credit hours for these two six-year periods. Total ENVS credit hours for the 1996 through 2001 fiscal years are 253% greater than the previous six-year period. Over roughly the same periods, credit hours CCBC wide declined 15% and credit hour totals for the Catonsville campus decreased 8%.

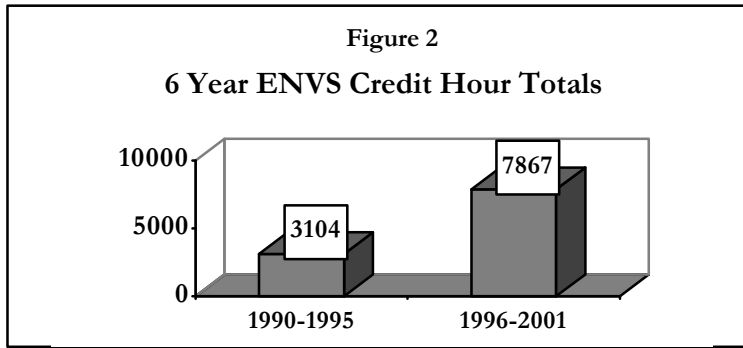
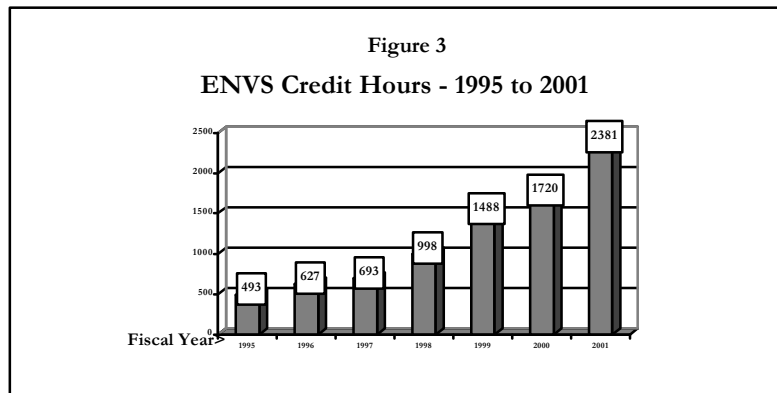


Figure 2 depicts total credit hours for these two six-year periods. Total ENVS credit hours for the 1996 through 2001 fiscal years are 253% greater than the previous six-year period. Over roughly the same periods, credit hours CCBC wide declined 15% and credit hour totals for the Catonsville campus decreased 8%.

The annual increase in ENVS credit hours from 1995 through the current semester is even more impressive (Figure 3). The fall of 1995, as noted previously, was the program's initial semester. Total ENVS credit hours for 2001 are 483% higher than in 1995, nearly a five-fold increase. As a relative comparison, CCBC and the Catonsville campus credit hours declined about 9% between the fall 1995 and fall 2000 semesters.

Perhaps an even more compelling way to examine the increase in ENVS enrollment is to look at percent increase in credit hours from one fiscal year to another. For example, total FY 2001 credit hours were 38.43% greater than 2000, which was 18.78% higher than FY 1999, and so on. The Environmental Science and Technology program has experienced double digit growth



over the last six years, with the increases in 1998 and 1999 bordering on 50% and year 2001 increase year bordering on 40% (Figure 4).

These significant increases in enrollment are due to several factors. First, student interest in environmental issues and education appears to be on an increase. This trend seems to hold true for the CCBC system, within Baltimore County, in Maryland, across the U.S. and, indeed, globally. Many new environmental education programs have been launched in the 1990s at high school, community colleges, and four-year colleges and universities. The growth of ENVS enrollment at CCBC is consistent with this trend.

**Figure 4**  
**ENVS Credit Hours**  
**Annual Percentage Increase**  
**FY 1996 FY 2001**

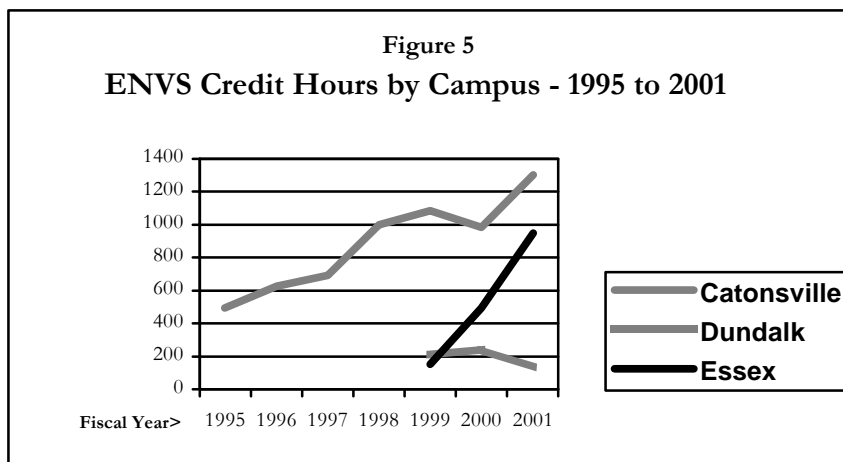
FY 2001 > FY 2000	+38.43%
FY 2000 > FY 1999	+18.78%
FY 1999 > FY 1998	+45.09%
FY 1998 > FY 1997	+44.01%
FY 1997 > FY 1996	+10.53%
FY 1996 > FY 1995	+27.18%

A second likely reason for the increases in enrollment is that more ENVS sections have been offered, particularly those that fulfill the general education science requirement, namely ENVS 101 and ENVS 102. Enrollment in these courses comprises the bulk of the ENVS credit hour increases. A third and final reason for the increases is that ENVS faculty have, for the most part, been very favorably received by students.

So far, we've looked at credit hours in ENVS courses across the CCBC system. Equally interesting are the credit hour breakdowns for each individual campus (Figure 5). What the data in Figure 5 indicate is that ENVS enrollment at the Catonsville campus has been increasing steadily since 1995, with a slight decline in FY 1999.

This decline in FY 1999 is due to an error in the printing of the final schedule of classes. ENVS course offerings for the fall of 1998 were erroneously printed in the fall 1999 schedule leading to low enrollment, as many program majors had already taken the courses offered in 1998. This mistake led not only to a one year decline in enrollment, but also in the number of program majors as some students, not being able to get the courses they needed, opted for other majors or other schools.

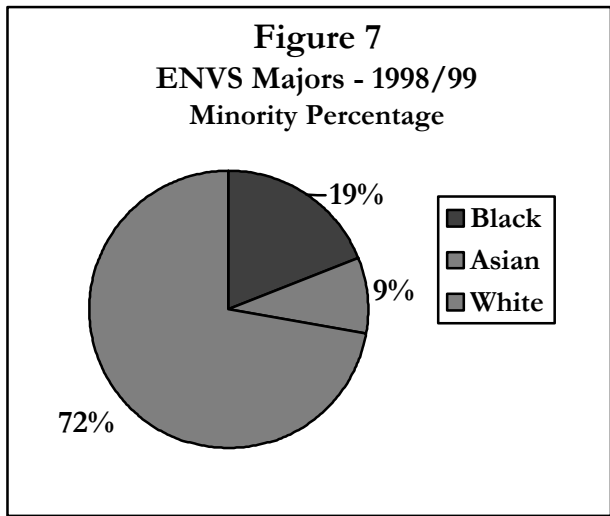
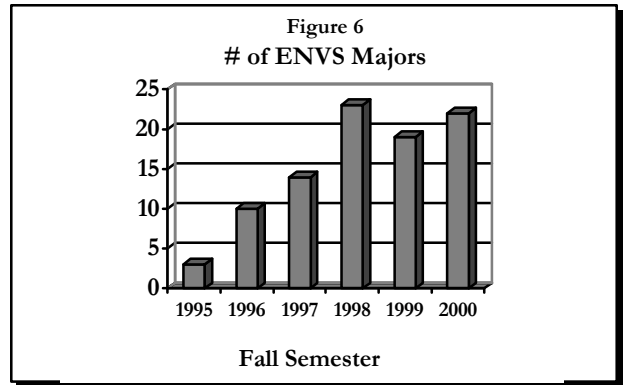
**Figure 5**  
**ENVS Credit Hours by Campus - 1995 to 2001**



ENVS enrollment at the Dundalk campus, which began in the fall of 1998, has remained pretty steady with a slight decline in the current academic year. At the Essex campus, however, enrollment in ENVS courses has increased dramatically in the last 2 years. In FY 1999, ENVS credit hours at Dundalk totaled 153. One year later, in FY 2000, ENVS credit hours had shot up to 495, an increase of 223.5%. For the current fiscal year, ENVS credit hours are 948, a 91% increase over the previous year.

Students in ENVS courses include those looking to fulfill their general education science requirements as well as interested in furthering their environmental education, obtaining an environmental degree, or seeking a career working in an environmentally related field. This section of the program review will provide additional insight about the types of students that choose environmental science as their major. The data presented in this section is almost exclusively for the Catonsville campus. As ENVS courses began relatively recently at the Dundalk and Essex campuses, data from these campuses was not available for this review.

To begin with, the number of ENVS majors increased from 3 in the fall of 1995 to 23 in the fall of 1998 (Figure 6). As previously noted, an error in the fall 1999 schedule of classes adversely affected both total credit hours and the number of program majors. At the time, it was felt that it would take roughly two years for the program to recover from this error, as several of the majors opted out of the program. Currently, the Catonsville campus has 19 students enrolled as majors and the Essex campus has 3 students enrolled.



The majority of ENVS program majors are part-time students, around 70%, roughly consistent with the CCBC full-time/part-time split overall. As for gender, both females and males represent equal proportions, roughly 50%. With regards to race, Figure 7 depicts the relative percentage of minority students for the 1998 and 1999 fiscal years. Twenty-eight percent of ENVS program majors are minority students, roughly consistent with CCBC's overall minority rate of 30%. In addition, the vast majority of ENVS students are not first-time students. The relative percentage of first-time students, averaged across the 1998 and 1999 fiscal years was 13%. This is consistent with the fact that most ENVS majors are older, part-time students.

Whether due to students interest in environmental issues, or because many ENVS majors are returning students, generally ENVS program majors seem to be performing well in their courses. Of courses taken by ENVS students in the fall of 1999, final grades are recorded for 88%, 9% withdraw, 2% audit classes, and 1% receive incompletes. Of the final grades recorded, over three-quarters are B s or higher (Figure 8).

Grade	%	Cumulative %
A	41%	41%
B+	8%	49%
B	27%	76%
C+	2%	78%
C	9%	87%
D+	1%	88%
D	1%	89%

Not surprisingly, the largest percentage of courses taken by ENVS students are in the Math, Sciences and Engineering Division, followed by Liberal Arts and Business, Social Sciences

Division	Percentage
Math, Science & Engineering	61%
Liberal Arts	16%
Business, Social Sciences & Human Services	12%
Applied Technology	6%
Allied Health & Wellness	5%
Total	100%

& Human Services (Figure 9). In addition, the average course completion rate for ENVS majors for 1998 and 1999 is 80%, higher than the CCBC rate overall of 71.5%. Figure 10 provides a breakdown of the course completion rates by department by ENVS majors. For the most part, ENVS students are completing courses taken in other departments. The only potentially significant exception to this trend is the course

completion rates for English and Math, both important skills to environmental professionals.

Lastly, as a closing point with reference to course completion rates it is also worth noting that ENVS courses have had consistent higher rates than for the Catonsville campus overall. For the last five years, ENVS course completion rates have been between 5 to 11% higher than for the Catonsville campus. This is likely a function of student interest in ENVS courses, performance of ENVS faculty, and the need for students to complete their general education science requirements.

**Figure 10**  
**Course Completion Rates by ENVS Majors**  
**1998-1999**

100% - ART	100% - PHI	84% - SPE
100% - COM	100% - RDG	80% - BIO
100% - CVC	100% - SOC	75% - HEA
100% - EAS	100% - SPA	69% - ENG
100% - EXP	100% - THE	63% - MAT
100% - HIS	94% - CHE	42% - PSY
100% - ITR	93% - CIS	33% - ANT
100% - OST	92% - ENV	

The ENVS A.A.S. degree program is designed to be a two-year, full time program totaling 62 credits. As the majority of ENVS students are part-time, the graduation rate has been small. As noted previously, the ENVS program opened its doors in the fall of 1995. The first student to make his through the program graduated in May 1998 with both an A.A.S. degree and certificate. The program's second graduate successfully completed her coursework and received her degree in the spring of 1999. Two ENVS students graduated in May 2000.

Once ENVS students have successfully completed the majority of their coursework, the next step is to provide applied, workplace experience. ENVS staff and faculty have been actively engaged in developing environmental science practicum programs in which a formal learning contract is developed between the employer, student, and the ENVS program. This assures that the theory and principles learned in the classroom are applied at the worksite.

The practicum program has been a very successful program in that every student placed in a practicum, to date, has been offered full-time employment upon completion of the practicum. In fact, in some ways, the success of the practicum program has adversely affected the program's graduation rate. Students come to the ENVS program to further their education and find an environmental career. Students typically begin their practicum during the latter stages of their coursework at CCBC, and this is encouraged in order to assure that students have completed enough coursework so that they can make a real contribution on the job. At the same time that students are thinking about their practicum, they often begin looking at 4-year institutions to transfer to. Many ENVS students, upon acceptance at a four-year institution and near completion of their practicum find no particular advantage in actually completing their coursework because their goals of advancing their education and finding employment are largely met.

Because of its success in finding good workplaces for students, the ENVS program has served as a regional environmental career center, not just for CCBC students but for individuals interested in environmental employment and careers from around Maryland and occasionally Out-of State. Student, their parents, mid-career professionals, and end-of-career retirees regularly seek information and advice from ENVS faculty about education and career decisions and opportunities. One such recent case involved a heart surgeon who had developed tendonitis in his operating hand, was forced out of medicine due to potential liability risks, and was interested in pursuing an environmental career. In addition, many employers contact the ENVS program looking for qualified staff. In fact, there are consistently many more jobs and internship opportunities that have been referred to the ENVS program, than there are students to take advantage of these opportunities.

## **E. GENERAL PROGRAM INFORMATION**

**1. Articulation Agreements** - ENVS staff and faculty have been actively negotiating articulation agreements with area education institutions for the last several years. Articulation agreements are currently in place with a number of 4-year college and universities (Figure 11). Negotiations are underway with representatives from Towson State University who recently completed development of their environmental science program. An articulation website which would provide students the opportunity to research their course articulation options is currently under development as well.

ENVS faculty have also provided assistance to environmental programs at area colleges and universities as development of these programs was underway. These include the Environmental Science program at UM College Park, the Environmental Management Program at UM University College, the Geography and Environmental Science program at UM Baltimore County, and the Environmental Science program at Towson State, as well as other community colleges including the Harrisburg Area Community College. ENVS faculty also participated in a DACUM held by Howard Community College to help develop their energy management curriculum.



With regards to involvement with high schools, the ENVS program has worked closely involved with the Western School of Technology and Environmental Science, located in Arbutus. The Western curriculum and the ENVS A.A.S. program were originally developed as part of a Tech Prep 2+2 initiative. Staff from both schools have worked closely together on a number of projects and graduates from Western began entering the A.A.S. program in the fall of 1997.

In addition, ENVS faculty at the Dundalk campus are currently engaged in a cooperative program with Sparrows Point High School through the development of a 4-course sequence. The courses include ENVS 101 Introduction to Environmental Science , ENVS 102 Introduction to Environmental Sciences Laboratory , ENVS 142 Environmental Law and Regulation , Zoology , and Introduction to Statistics .

A another example of ENVS program involvement with high schools is the Environmental Curriculum Integration Project, completed in 1998. The goal of the project was to initialize integration of environmental concepts more traditional disciplines particularly those within the math and sciences, but also within business, ethics, sociology and other relevant schools of thought. The project, which was funded by the Baltimore County Career Connections Office, was composed of four principal activities: 1. Curriculum Identification; 2. Resource Categorization and Compilation; 3. Disciplinary Outreach; and, 4. Final Report.

Lastly, the ENVS program co-sponsored, with the Maryland Association of Environmental and Outdoor Educators, a series of global change workshops for high school teachers on the Catonsville campus in the spring of 1999. The workshops, which were attended by teachers from across the state, focused on several issues including ozone depletion, global warming, biodiversity, and deforestation.

**2. Faculty Information** - The ENVS program consists of two full-time environmental science faculty at the Catonsville campus, affiliated full-time faculty from disciplines and departments across the CCBC system, adjunct faculty and staff. In addition, each CCBC campus has a full-time faculty member that serves as a coordinator of environmental programs.

**Figure 12**  
**ENVS Staff and Faculty**

Faculty/Staff	Campus	Dept	Degree	Rank	Tenure
Anderson, Allison	Catonsville	ENVS	BS Env. Science, 1990	Grant Coordinator	
Bulavinetz, Rich	Catonsville	ENVS	MS Ecology, 1985	Adjunct Professor	
De Stefano, Chris	Catonsville	ENVS	MS Biology, 2000	Adjunct Professor	
Farrant, George	Catonsville	CHEM	Ph.D. Chemistry	Full Professor	
Fox, Chris	Catonsville	ENVS	MA Geography, 1983	Associate Professor	
Gunther, Mary	Catonsville	ENVS	MS Env. Science, 1998	Adjunct Professor	
O'Neill, David	Dundalk	BIOL	Ph.D.	Full Professor	
Revelle, Penelope	Essex	BIOL	Ph.D. Biology	Associate Professor	
Russ, Thomas	Catonsville	ENVS	M.P.A., 1995	Assistant Professor	
Thorndill, David	Essex	BIOL	Ph.D. Biology	Full Professor	
Webber, Lawrence	Catonsville	ENVS	MA Geography, 1988	Adjunct Professor	

For the last two academic years, one hundred ENVS course sections were offered across the three CCBC campuses. Of that total, sixteen sections were cancelled, an average of four per semester, or roughly 1 per campus per semester. Of the remaining 84 courses, 36 were taught by adjunct faculty, which represents a percentage of 40%. Full-time ENVS faculty taught the remaining 60%.

**3. Inventory of Instructional Resources** - The ENVS program is principally housed in the Tudor House on the Catonsville campus. The Tudor House offers adequate space to house ENVS faculty and staff and the small conference/office area in the main room is also used for evening ENVS courses and meetings.

The Tudor House is wired to the main campus network and the desktop computing facilities used by the ENVS staff are adequate. In addition to desktop computers, the ENVS staff has access to a Gateway Laptop computer, Epson Perfection Scanner, HP DeskJet Color Printer, and Plexwriter CD Rewriter. Video equipment regularly used by the program staff and faculty include an Olympus Digital Camera, RCA hand-held video camera, high resolution projector, and mini TV screen/VCR desktop unit.

Over the last five years, the ENVS program has acquired small-scale equipment and supplies to support the instructional mission of the program's courses. Figure 13 contains a list of equipment by course and title.

**Figure 13**  
**ENVS Instructional Equipment**

ENVS 116	Atmospheric Science & Air Quality Mgmt.
HNu Detector	Air Sampling Kit
ENVS 126	Hydrospheric Science & Water Quality Mgmt.
Cam-line measuring tape	15/8 PVC Well bailer & accessories
Hand-held Water analyzer	Water Sampling Field kit & Test Kit
ENVS 136	Soil Science and Conservation
Soil Gas Testing Kit	Soil Sampling Field Equipment Kit
2 tiered Soil Sampler	Sample containers (misc. glassware)
Screen Sieve Set	Munsell Soil Color Charts
Steel Pans	Soil Texture lab Module
ENVS 152	Site Assessment, Remediation & Restoration
Aerial Photo Set	Set of Historic Aerial Photos
Stereo Scopes	Set of Fire Insurance Maps

**4. Delivery Strategies** - ENVS faculty are continually seeking improved ways to deliver course content and enhance student learning. To begin with, the A.A.S. degree program course structure has been developed to optimize student choices and opportunities for transferring to four-year college or university, or find employment upon CCBC graduation, or both. This dual-purpose curriculum, therefore, seeks to combine theory with practice, principles with application, and classwork with fieldwork.

In addition, the next generation of environmental scientists and professionals must be knowledgeable about scientific, legislative and technological aspects of environmental issues across media -- air, land, water, and natural resources -- as well as understand the implications of environmental degradation on public health. Understanding the economic and environmental benefits of eliminating pollution at the source and using resources, like energy, water, and waste, more efficiently, is also critical.

The core program requirements include coursework in computer information systems, environmental science, biology, math, chemistry, and geography. Once students have completed their program requirements, they are then free to select from the list of program electives. These program electives are arranged to provide students with basics of media specific environmental issues and solutions as well as understand the synergy and complexity of multi-media problems. Towards the end of their coursework, students are advised to consider participating in the "Directed Practicum in Environmental Science" in order to provide applied, real world experience that is directly tied to classroom learning.

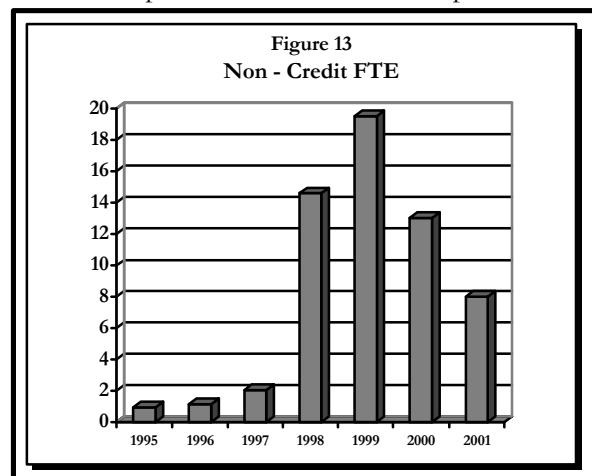
ENVS courses are offered in a variety of curriculum delivery modes, including on-site, compressed video, and on-line. Several of the courses, both introductory and advanced, are offered during the evening in order to better serve the ENVS target audiences. The ENVS program is also actively working to more fully integrate communication skills training, teamwork skills building, and outcomes assessment.

**5. Advisory Committee** - Since its inception in the fall of 1995, the Environmental Science and Technology Program at the Community College of Baltimore County has interacted with hundreds, if not thousands, of professionals from business, staff from government agencies and offices, representatives from non-profit organizations, and educators from academic institutions. It seems, therefore, only fitting that a subset of that population be asked to review the progress of the program over the last five years and help to chart its direction for the next five years.

The ENVS draft program review was e-mailed to fifty nine individuals who have had some stake in or involvement with the program. These fifty-nine individuals, representing a wide range of organizations and institutions, form the overall program review advisory committee (see Appendix 1). Committee members were directed to the program review website (<http://www.envpro.homestead.com>) the capability of providing feedback on-line as well as reviewing the comments of other advisory committee members was provided. In addition, a program advisory committee meeting was held on the 19<sup>th</sup> of April on the Catonsville campus.

**6. Continuing Education & Economic Development**

The ENVS program has, since its inception, a close and interactive relationship with the Division of Continuing Education and Economic Development. CEED's Dean, Mr. Michael Carey, was largely responsible for the creation of the ENVS program at Catonsville. The ENVS program began offering continuing education short courses in the fall of 1994 and a wide variety of courses have been offered(see Appendix 5). Enrollment in the non-credit program grew slowly at first and mushroomed in FY 1998 and 1999, with the hiring of a Business and Industry Liaison. Figure 14 depicts non-credit FTE generated by the ENVS program from 1995 through 2001.



The ENVS program's Business and Industry Liaison resigned in July 2000, which accounts for the more recent decline in FTE. Currently, there are no plans to fill the position, which was entirely grant-funded. In addition to public and professional short courses, the ENVS program has offered a number of education and training workshops over the last five years focused on emerging policies, programs, and technologies that improve both environmental and economic performance (Appendix 6).

In addition to ENVS non-credit short courses and workshops offered through the CCBC system, ENVS staff have been actively involved in developing professional course curriculum for distribution and use by other community colleges, businesses, institutions and organizations. One such project was the Bioremediation Curriculum Development Project. For this project, ENVS staff conducted a national assessment of bioremediation training and education, and assessed niche-training markets not met by existing education and training networks.

A similar project initiated and completed by ENVS staff was the Waste Minimization and Recycling Curriculum Project, a joint partnership between the Catonsville campus, Westchester Community College in New York, and Richland Community College in Dallas, Texas. The Waste Minimization and Recycling Curriculum Project resulted in the development of a new community college course entitled Solid Waste Management, Minimization, and Recycling. Activities related to these two projects were completed in 1996. The U.S. Environmental Protection Agency Office of Research and Development provided funding for these two projects, as well as the Pollution Prevention Curriculum Project described below.

The objective of the Pollution Prevention Curriculum Project, which began in 1996, was to develop a community college based pollution prevention course, course materials, and resource guides. Project outcomes include:

1. The Pollution Prevention: Catalysts for Change Workshop (September 1995)
2. A Source Reduction: Less Waste in the First Place Workshop (April 1996)
3. The U.S. European Environmental Technology Brokerage Event (June 1997)
4. The Pollution Prevention Industry Overview Workshop (October 1997)
5. Environmental Performance and Training Needs Assessment Statewide Survey (Fall 1996)
6. The development of a new community college course entitled Introduction to Pollution Prevention.

Also in 1996, the ENVS program launched the Maryland Green Printers Initiative to catalyze adoption of green printing practices, processes and technologies. Partnering organizations for the project included Printing Industries of Maryland, the Maryland Department of the Environment, U.S.E.P.A. Region 3 Pollution Prevention Office, and the Printing Technology Program at CCBC-Catonsville. Activities completed as part of the initiative included the development of a Green Printing Bibliography & Information Resource Guide, a listing of Maryland Printing Technology Education and Training Programs, and the creation of a Green Printers Industry Advisory Board. The results of the project were also incorporated into the Partnership for Environmental Technology Education national green printing workshop series.

In 1997, CCBC was chosen by the National Environmental Education and Training Foundation (NEETF), located in Washington, D.C., to serve as the lead community college for the development of community college based industrial ecology curriculum. The ENVS program was selected by NEETF because of the unique and successful business partnerships and linkages developed by the program and the experience of ENVS faculty in developing innovative environmental curriculum. Industrial ecology can help businesses reduce costs and improve environmental performance through wiser materials use, product re-design, energy efficiency, waste reduction, and pollution prevention. A number of corporations provided funding for the project including; AT&T, R.R. Donnelly and Sons, Inc., Hitachi, the GE Fund, Kimberly Clark, as well as the U.S. Environmental Protection Agency Region 3 Office of Pollution Prevention. The industrial ecology curriculum was completed in the spring of 2000 and is now being disseminated through the Partnership for Environmental Technology Education.

A environmental or green curriculum was developed by ENVS staff in 1999 and 2000 for purchasing managers of companies and businesses as part of a project funded by the U.S. Environmental Protection Agency Region 3 Office of Pollution Prevention. Project staff have developed a Green Procurement Curriculum and piloted a Green Buying workshop in July 2000. Current plans for the project include a second workshop to be offered in May 2001, and the development of an on-line Green Procurement Training course to be offered as part of the National Association of Purchasing Managers education and training program.

Lastly, the ENVS program is currently involved in a project to develop curriculum that addresses the environmental & health impacts of energy use, particularly global warming. The project, entitled The Statewide Energy Pollution Prevention Program, or SEPPP is working to:

1. Network state government stakeholders to improve the state's "eco-nomic" performance.
2. Increase awareness of alternative energy technologies & management strategies.
3. Develop community college "Energy & the Environment" and "Energy & Global Warming" courses.
4. Offer "Energy & the Environment" & "Energy & Global Warming" course at community colleges statewide.
5. Infuse environmental concerns into existing energy-related community college curriculum.

Funding for the Statewide Energy Pollution Prevention Program has been provided by the U.S. Environmental Protection Agency Region 3 Office of Pollution Prevention. The project is scheduled to be completed by January 31, 2002.

**7. Cooperative Education and Internship Information** - Environment Project staff began focusing on Career-to-Work programs in early 1995. Recognizing that no formal Career-to-Work program involving environmental science and technology education was in place in Maryland, Environment Project staff became involved with the Maryland State Department of Education Career Connections initiative. Environment Project staff helped draft a state proposal for federal School-to-Work funds and coordinated a panel on environmental education at a federal School-to-Work site visit.

In September 1995, the ENVS program received support from the Maryland State Department of Education for a project entitled Environmental Technologies School-to-Careers Pilot Project to develop environmental School-to-Career programs. A critical element of the success of the project was the active involvement of environmental employers. At that time, no comprehensive listing of environmental employers in Maryland existed. The ENVS program partnered with the Maryland State Department of Education, Maryland Department of the Environment, Maryland Department of Business and Economic Development, Chesapeake Bay Foundation, Baltimore Urban League, and the Western School of Technology and Environmental Science to produce a statewide directory of environmental business, education, and career resources in Maryland.

"Environment Maryland! A Directory of Business, Education and Career Resources" was released by Governor Glendening at a press conference in Baltimore in July 1996. "Environment Maryland!" profiled nearly 1,000 private, non-profit and government environmental employers and educational institutions across the state. In addition, the directory contains information on national and state employment trends and career pathways. Seven thousand copies of "Environment Maryland!" were printed and distributed to:

- All 1,000 companies, organizations, and institutions listed in the directory
- All public high schools in the state through their county science coordinators
- All two-year and four-year colleges and universities in Maryland
- All public libraries in Maryland
- All members of the 1997 Maryland State Legislature
- Hundreds of students interested in environmental careers through class presentations
- High school science coordinators and career & technology directors for Maryland counties
- Key officials at the headquarters for the US Environmental Protection Agency and US Department of Energy in Washington, DC and their respective regional offices in Philadelphia, PA; Council on Environmental Quality
- Select members of the US Congress on committees relating to the environment

"Environment Maryland!" is considered to be a model workforce development directory and the publication has brought national recognition to the ENVS program and the Maryland State Department of Education. Specifically, The Environment Project received an award in 1997 from the National Association of Environmental Professional Academic Centers of Excellence program for the state's efforts in linking academic institutions with environmental employers focusing on workforce development. Five years later requests for "Environment Maryland!" are still regularly received from Maryland students, educators, and parents as well as interested individuals from across the U.S.

Capitalizing on the publication of "Environment Maryland!" and the involvement of the Maryland Environmental Business Alliance, the ENVS program received an Employer Incentive Fund grant in 1997 from the Maryland State Department of Education. The mission of the grant was to implement School-to-Career programs with area environmental employers. As part of the grant project, an Education & Training Technical Advisory Committee, a MEBA subcommittee was created to provide guidance in implementation of School-to-Work programs. A series of workshops and employer led programs were conducted as part of the grant, all focused on different aspects of environmental School-to-Career programs. At these workshops, involving area employers, educators, and students, perceived obstacles to School-to-Career were openly discussed and resolved.

As a follow-up to "Environment Maryland!" as well as continue its work in cooperative education program development the ENVS program is near completion of a website version of "Environment Maryland!" The central mission of the website is to link environmental employers, educational institutions, and students interested in environmental careers in order to foster environmental education and workforce development opportunities. "Environment Maryland! on the Internet" will allow:

1. Companies across the state seeking to comply with the Clean Water Act and other environmental regulations, or engage in clean-up operations, can identify specific expertise & capabilities of Maryland environmental companies.
2. Students interested in environmental education can research programs at high schools and colleges around the state. Students and job seekers can access information about environmental internship and career opportunities available in state and federal offices, private companies, and non-profit organizations.
3. Companies and government agencies can directly access Maryland's environmental companies for joint ventures and networking. Maryland environmental businesses can find partners for contracting opportunities across the U.S. and overseas.

**8. Marketing Activities and Plan** - Over the past six years, the ENVS program has employed several mechanisms and strategies for disseminating information about the program. These include:

- A. Presentations at local high schools;
- B. Exhibitions at environmental conferences and fairs;
- C. Targeted mailings of brochures, program information, and flyers;
- D. Articles in national, regional, and local newsletters and periodicals;
- E. Appearance on local TV shows;
- F. Maintenance of Internet website;
- G. Representation on boards of regional and statewide environmental education organizations;
- H. Publication of ENVS newsletter, "Green Ink";
- I. "E-mail-outs" and "fax-outs" about upcoming programs and courses; and,
- J. Presentations at area and statewide workshops and conferences.

In addition, the program has been engaged in three large-scale activities aimed at high school students, parents, educators, and guidance counselors that facilitated dissemination of information about environmental careers and the ENVS program. These include the Governor's Youth Environmental Summit held in 1997 at the Baltimore Convention Center. Over 900 high school students and educators from around the state attended this one-day

conference. ENVS staff and faculty managed the event with funding received from the Maryland State Department of Education, the Maryland Association of Environmental and Outdoor Educators, and the Chesapeake Bay Trust.

ENVS faculty participated on the board of the Maryland Association of Environmental and Outdoor Educators (MAEOE), a K-12 environmental educators statewide association. In addition, ENVS faculty have participated in several of MAEOE's annual conferences, the most recent held in February 2001 at which two ENVS faculty gave a presentation entitled "Environmental Employment in the New Millennium".

Lastly, in 1998, the ENVS program received a grant from the Baltimore County Career Connections Office to develop and publish two environmental career guides for high school guidance counselors, teachers, students, and parents. Published in 2000, "Green Work" contains information about environmental employers, and "Green Jobs" describes environmental employment and careers.

The ENVS program has considered other strategies as well but has not had the time or resources to fully pursue them. These include a statewide environmental career fair. The fair will bring together private, public and non-profit environmental employers, students interested in environmental careers, their parents, environmental educators and guidance and career counselors. ENVS staff have also discussed the creation of a short "Careers in Environment" video for use in classrooms, distribution at career centers, and made available on the World Wide Web.

**9. Employment Opportunities for Graduates** - The environmental science and technology employment sector is scarcely thirty years old having emerged with the beginning of environmental regulation in the United States, which began in 1970 with the passage of the National Environmental Policy Act. The combined impact of thirty years of government and private spending has created a collection of environmental programs that has resulted in employment of well over 2 million Americans. Contrary to the popular belief that most environmental jobs are with government agencies, such as park rangers, most environmental jobs in the United States are found in the 80,000 or so private companies that comprise the environmental industry. These companies specialize in environmental technologies, products, services, or information related to a wide range of environmental issues such as air quality, water pollution, hazardous waste, industrial hygiene, and alternative agriculture, among others.

Although the environmental industry is composed mainly of small companies, the industry is quite large when compared with other industries. For example, more people work in environmental occupations than in motor vehicle and aerospace manufacturing combined. For every one worker in the biotechnology industry, there are ten environmental workers. About one in fifty U.S. workers in combined service and manufacturing sectors is employed in the environmental industry.

National environmental employment trends hold special significance for Maryland. The state's long standing sensitivity to Chesapeake Bay related issues and its location adjacent to Washington, D.C., has provided Maryland with a significant level of environmental employment. There are nearly 800 private environmental companies in the state with expertise in various environmental specializations. Some are manufacturers of pollution control equipment, monitoring and sampling devices, or consumer goods from recycled materials. Others are consultants that provide engineering, legal, marketing, or financial expertise and assistance. Still others are distributors of environmental products or information. The environmental industry in the state employs over 40,000 Marylanders. This level of employment is over 3 times larger than the employment generated by the state's biotechnology industry, and is slightly larger than other important high tech clusters such as information technology and telecommunications. All together, Maryland private environmental companies account for over 5 billion dollars in gross annual revenue.

A second cluster of environmental employment centers on companies looking to comply with environmental regulations and quasi-private/public companies such as utility companies and hospitals. These businesses and institutions also hire environmental staff, known as environmental management or environmental, health and

safety staff, to provide in-house environmental expertise. These industries include electronics, utilities, chemicals, paper products, metals, and plastics. Environmental managers help these industries comply with regulations as well as manage all kinds of environmental issues.

The rise of corporate environmental management is validated by scores of research reports put out by consulting firms. These reports all indicate that the forces of consumer demand coupled with environmental regulations are challenging corporations to rethink their manufacturing, production, and management strategies. Because this growth of green opportunities was not as visible or sudden as the introduction of a new technology, its impact on employment has been virtually unexamined. Yet across the country and Maryland, new positions have been created and new divisions have been established.

There are few, if any, reliable estimates of the number of environmental management personnel employed in Maryland. Companies are not required to, nor do they, provide statistics on the number of environmental management staff they hire. Yet, it seems that because every company and quasi-private company must comply with environmental regulations, and because there are some 135,000 private companies in the state, there must be several thousand environmental management personnel in Maryland.

A second important job trend related to environmental management is the rapidly emerging field known as pollution prevention. Pollution prevention, or P2, seeks to minimize the amount of pollution and waste created in the first place. This can be achieved by re-engineering the manufacturing process, altering the amount and type of chemicals and materials used to make products, or developing new methods of management. Not only can pollution prevention help companies improve their environmental performance; it can also save them money.

The trend towards preventing, rather than controlling, pollution is catching on. Several leading multinational and U.S. companies have incorporated zero waste, zero emissions goals into long-term strategic plans. Companies like Xerox, Dow, DuPont, IBM, Ford, and others, are finding ways to change basic methods of production or eliminate the use of toxic chemicals or materials previously thought to be essential. In addition, computer and copier manufacturers are designing new machines to be more easily taken apart after their useful life so that the parts can be easily reused or recycled. Increasing emphasis on pollution prevention is likely to increase the demand for environmental management staff as well as raise the level of environmental training among all production workers.

Despite the growing importance of the environmental science, technology, and management sectors there is a tremendous lack of information available to educators, students and parents about environmental employment and career opportunities. Environmental industries do not fit cleanly into the SIC code system, the backbone for the U.S. Department of Labor's employment statistics and the Occupational Outlook Handbook. In addition, the many state resources currently available to high schools and colleges that provide career and occupational information also do not include statistics on environmental employment. The ENVS program conducted the most accurate and comprehensive assessment of environmental employment in Maryland in 1996 as part of the "Environment Maryland!" directory.

All told, some 80,000 Marylanders now work to protect the environment and more jobs are being added every day. Air pollution engineers, park rangers, wastewater operators, wetlands ecologists, hazardous waste technicians, geographic information system specialists and environmental toxicologists are just a few of the hundreds of titles of environmental jobs. The common thread for all environmental jobs is that their principal function is to protect public health and the environment.

Some environmental careers are growing at a particularly rapid rate. The hot jobs are those found in environmental management, pollution prevention, energy efficiency and multimedia environmental solutions. The next generation of environmental professionals must be knowledgeable about scientific, legislative and technological aspects of environmental issues across media -- air, land, and water --, understand the economic and environmental benefits of eliminating pollution at the source, and be proficient at using resources, like energy, water, and waste, more efficiently.

**10. Summary**

**a. ENVS Program Income/Revenue/FTE** - Over the past five years, the ENVS program has clearly been successful in providing theory and applied learning experiences and opportunities for its students. In addition, the program has increased credit hours, completed grant funded projects, established linkages with business, and gained national visibility. From a cost revenue standpoint, the ENVS program has been successful as well.

**Figure 14**  
**ENVS Credit Program Income/FTE, Non-Credit Revenue/FTE, & Grant Program Revenue**  
**FY 1990 FY 2001**

Fiscal Year>	FY 01	FY 00	FY 99	FY 98	FY 97	FY 96	FY 95	FY 94	FY 93	FY 92	FY 91	FY 90
Credit Balance (Tuition FT & PT Pay)	(\$365)	\$28,772	(\$20,810)	\$18,695	\$4,514	\$3,055	(\$17,523)	(\$22,324)	(\$36,519)	\$4,695	(\$31,070)	(\$40,690)
Credit FTE	79.37	57.33	48.27	33.27	23.10	20.90	16.43	17.10	20.97	16.63	17.30	15.03
Credit Balance & FTE Recovery	\$98,367	\$100,095	\$39,234	\$60,079	\$33,251	\$28,135	\$1,983	(\$1,462)	(\$13,707)	\$17,819	(\$14,237)	(\$26,063)
Non Credit Revenue	\$10,545	\$19,400	\$20,398	\$19,635	\$2,604	\$1,473	\$1,194	\$0	\$0	\$0	\$0	\$0
Non Credit FTE	8.00	13.00	19.52	14.58	2.05	1.16	0.94	0	0	0	0	0
Non Credit Revenue & FTE Recovery	\$20,497	\$35,572	\$44,681	\$37,773	\$5,154	\$2,865	\$2,310	\$0	\$0	\$0	\$0	\$0
Total Instruction Balance/Revenue	\$10,180	\$48,172	(\$412)	\$38,330	\$7,118	\$4,528	(\$16,329)	(\$22,324)	(\$36,519)	\$4,695	(\$31,070)	(\$40,690)
Total Instruction FTE	87.37	70.33	67.79	47.85	25.15	22.06	17.37	17.10	20.97	16.63	17.30	15.03
Total Instruction Plus FTE Recovery	\$118,864	\$135,667	\$83,915	\$97,852	\$38,405	\$31,000	\$4,293	(\$1,462)	(\$13,707)	\$17,819	(\$14,237)	(\$26,063)
Grant Funded Programs	\$154,234	\$66,314	\$31,000	\$217,292	\$82,449	\$66,259	\$213,101	\$149,054	\$23,069	\$0	\$0	\$0
Total Credit/Non-Credit/Grant Revenue	\$273,098	\$201,981	\$114,915	\$315,144	\$120,854	\$97,259	\$217,394	\$147,592	\$9,362	\$17,819	(\$14,237)	(\$26,063)

Figure 14 depicts the total revenue balance for the ENVS program from FY 1990 through FY 2001. Revenue balance is the result of total tuition income less salaries paid to full-time and adjunct faculty. For the six-year period from FY 1990 through FY 1995, the total revenue balance was -\$143,413. For the six-year period with the ENVS program in place, FY 1996 through 2001, total revenue balance is \$33,862, a difference of \$177,275. Over the same two six year periods, credit FTE increased from 103.47 to 262.23, an increase of 253%. With state FTE funds recovery included, the difference in total revenue balances for the two six-year periods becomes even greater, from a negative \$35,667 for the FY 1990 1995 period to a positive \$359,160 for FY 1996 2001.

With regards to non-credit programs, data on salaries and expenses for ENVS non-credit courses was not available and so the revenue figures depicted in Figure 14 represent only income. Nonetheless, a very positive financial return is associated with the ENVS program, particularly with state FTE funds included. Total FTE for non-credit programs between FY 1990 and 1995 was .94. For the FY 1996 2001 period, total non-credit FTE was 58.31. Finally, with regards to grant programs total funds generated exhibit a similar pattern. The first environmental grant awarded to the Catonsville campus was granted in FY 1993. An ENVS program coordinator was hired in 1994 and the program has been successful at continuing to develop its grant activities since that time.

**b. ENVS Program Priorities** - The ENVS program has developed a number of priorities for the next five year period. These priorities, as well as the resources required to successfully complete these priorities, are listed below.

**1. Urban Focused Programs** The world is becoming increasingly urban, yet environmental science as a discipline is rooted in the hinterland and countryside. The challenge for environmental science in the 21<sup>st</sup> century is to become increasingly meaningful to urban communities, not only since urban activities are the principal sources of pollution, but because urban populations are most affected by environmental degradation. Sustainable development must become sustainable urban development and the ENVS program is exploring mechanisms and projects to increase its reach into urban areas. The ENVS program has recently embarked on a project to foster economic development in Baltimore by increasing markets for product repair and reuse.

**2. International Programs** Though the history of environmental science in the United States dates back only to the late 1960 s, the U.S. is among the world s leaders in policies, technologies, and education programs to ameliorate environmental degradation. This position of leadership provides unique opportunities for the ENVS program to expand it s activities and offerings overseas. Even as this review is being completed, ENVS faculty are negotiating on an education and training program in southeast Asia.

**3. Cross Discipline Integration** The future of environmental science and education lies not only in urban areas and across oceans, but across the campus as well. Environmental principles must become better integrated into all disciplines, for it is only through the strength of disciplinary diversity that solutions to environmental problems can be more fully realized. Towards that goal, ENVS faculty have begun preliminary discussions with the General Education Committee about including environmental principles into all general education courses.

**4. Math and Communication Skills Integration** In addition to integrating environmental principles into other disciplines, there is also a need to better integrate math and communication skills into ENVS courses. Over time, students in ENVS introductory and elective courses seem to be increasingly math adverse or, at least, shy. A working command of basic mathematical principles, however, is essential to successful career performance. ENVS faculty are currently considering mechanisms to increase math competency throughout the curriculum. As for communication skills, recent surveys of environmental employers indicate the need for better verbal and written communication skills of employees. Working in the environmental science field requires the ability to synthesize technical, scientific and quantitative information and communicate the results of analysis in plain, clear terms. A number of options are being discussed by ENVS faculty to accomplish this goal.

**5. Growing the Program** As the program recognizes the importance of human resources in improving environmental quality, increasing the number of ENVS majors and graduates central to the program's long term success. ENVS faculty are considering four clusters of strategies and programs to meet this goal. The first set of strategies targets high school and incoming CCBC students and includes activities such as:

- A. On-site presentations and visits to local high schools by ENVS graduates, faculty and staff;
- B. Environmental career nights at area high schools for students and parents;
- C. Outreach to Baltimore City and County guidance counselors;
- D. Continue working with the Maryland Association of Environmental and Outdoor Educators;
- E. Profiling ENVS graduates on website;
- E. Partner with a local four-year institutions to provide first two years of environmental science program;
- F. Increase course scheduling & location flexibility to better meet emerging needs of potential students; and,
- G. Offer multi-course certificate programs geared to specific environmental issues.

The second strategy cluster involves increasing ENVS majors from among the pool of students already in the CCBC system. Activities to be considered to recruit students include:

- A. Hosting a luncheon program for academic advisors throughout the CCBC system;
- B. Hosting ENVS open house for CCBC students;
- C. CCBC Environmental Film Festival; and,
- D. Increasing the activity level of student environmental organizations.

The third set of strategies will provide support, assistance, and resources for existing ENVS majors. Strategies to increase student retention as well as better integrate the program across the three campuses:

- A. Assigning existing majors to specific faculty members for advisement and counseling;
- B. Offering web-based version of ENVS elective courses;
- C. Offering compressed video versions of ENVS elective courses;
- D. Offering ENVS elective courses on-site at Essex and Dundalk.;
- E. Offering ENVS elective courses at a centrally located facility, such as MDE; and,
- F. Offer Self-Paced versions of ENVS courses.

The fourth strategy cluster involves increasing program participation by students of diverse racial, economic, gender, and ethnic backgrounds. Several strategies are being considered to increase diversity. These include:

- A. Outreach to Baltimore City Schools currently implementing environmental science academies;
- B. Classroom visits to Baltimore City Schools with potentially interested students;
- C. Networking with CCBC foreign students make linkages with native country educational institutions, and;
- D. Working with embassies in Washington, D.C. to connect with academic institutions abroad.

**6. Laboratory Experience** - Currently, there are no laboratory facilities in-place on the Catonsville campus for on-going use by the ENVS program. Without these facilities, the program will not meet its curricular goals and demands. Several advisory committee members noted the need for laboratory space in their comments.

ENVS faculty have begun discussions with campus administrators of converting one of the temporary buildings, T-107, for use as a dedicated ENVS classroom and laboratory. ENVS courses currently utilize a total of about 1 classroom s space during each week of the semester. ENVS sections currently held in rooms around the campus would be relocated to T-107 and courses scheduled for T-107 relocated to currently occupied by ENVS courses. This solution would minimize the loss of classroom space to the campus as a whole and allow ENVS courses to better integrate environmental sampling and laboratory experiences for ENVS students.

Dedicated laboratory space would likely help in acquiring surplus equipment from local companies. ENVS faculty are currently negotiating the acquisition of surplus air monitoring, sampling, and laboraoty equipment from a major Maryland air technology company. While it appears likely that the program will obtain the equipment at no-cost, there is simply no space available to the program to set the equipment up. The conversion of T-107 to an environmental classroom and laboratory would allow the ENVS program to successfully complete the acquisition of the air laboratory equipment as well as better integrate existing equipment and technology into ENVS courses.

**7. Internet Instruction** The ENVS program currently offers three web-based courses. ENVS faculty intend to continue development of this delivery mechanism. A fourth web based course will be developed this summer and come on-line in the fall 2001 semester. In addition, the ENVS program also recognizes the tremendous potential for the World Wide Web and other technologies to enhance traditional, on-site courses. ENVS faculty are currently exploring new methods and mechanisms for integrating on-line resources across the ENVS curriculum.

#### **c. ENVS Resources Request**

**1. T-107 Classroom/Laboratory Conversion** The ENVS program s most immediate and pressing need is for dedicated laboratory space. The ENVS program proposes that T-107 be converted to the ENVS classroom and laboratory and that classes currently scheduled for T-107 be moved to those rooms vacated by ENVS sections. It is requested that this conversion begin this summer in order to have the equipment and room ready for the fall 2001 semester.

**2. Essex ENVS Faculty Member** - A critical resource needed to meet the growing demand for existing and new ENVS students is a full-time ENVS faculty member at the Essex campus. Currently, ENVS courses at Essex are being taught by a combination of Biology Department faculty and adjuncts. While this has been a successful strategy to this point, further growth of the program is contingent on a dedicated ENVS faculty member. This faculty member would help teach the ENVS 101 and 102 general education science audience as well begin to offer ENVS electives to help grow the program and fulfill major student requirements.

**3. Tri-Campus ENVS Administrative Assistant** - The third priority for the ENVS program is to better manage its growing complexity and resource needs. Currently, the program at Catonsville has partial use of a secretary physically located in another building. While this arrangement has barely kept pace with growth over the last five years, it has become clear that a full-time administrative assistant is needed. The position should be shared between three campuses and the individual in the position travel between the three campuses during the week in order to provide assistance to the program.

**4. Operating Funds Increase** - The fourth priority for the ENVS program is an increase in the operating funds for instructional materials and supplies. The ENVS program at Catonsville has been allocated the same level of operating funds for the last five years despite significant increases in enrollment. While the ENVS program has been fortunate in acquiring materials and supplies from grant funds, there are many instructional materials and resources which can be acquired only with campus funds. The ENVS program proposes that its operating funds allocation be doubled for the 2002 fiscal year.

### **III. Executive Summary**

The mission, of the CCBC Environmental Science & Technology program is to optimize environmental education and career opportunities for all students interested in environmental issues, education, and careers. The A.A.S. degree in Environmental Technology began accepting students into the program at the Catonsville campus in the fall of 1995. The name of the program was changed to Environmental Science and Technology (ENVS) in the spring of 1997 and a non-degree certificate program was also added. The Dundalk and Essex campuses began to offer ENVS courses in the fall of 1998. Though this is a five year program review, much of the data tabulation is for the six-year period from the fall 1995 semester, when the program began, through spring 2001. For the six-year period from 1995 to 2001:

- \* Total ENVS credits hours are 253% greater then the previous 6-year period;
- \* The ENVS program has achieved six consecutive years of double digit growth in credit hours with growth in some fiscal years approaching 50%  
FY 96 over FY 95 > +27.18%;    FY 97 over FY 96 > +10.53%;    FY 98 over FY 97 > +44.01%;  
FY 99 over FY 98 > +45.09%;    FY 00 over FY 99 > +18.78%;    FY 01 over FY 00 > +38.435.
- \* Total credit FTE increased from 103.47 to 262.23, an increase of 253%;
- \* Total credit tuition less salaries in addition to state FTE funds recovery increased from -\$35,667 for the FY 1990 - 1995 period to +\$359,160 for the FY 1996 - 2001 timespan;
- \* ENVS staff and faculty completed 27 externally funded projects totaling over \$1 million dollars in funding;
- \* Representatives from over 400 businesses, government agencies, educational institutions, and non-profit organizations have attended ENVS programs and events;
- \* The ENVS program helped to create three statewide environment and energy business coalitions;
- \* Non-credit FTE increased from .94 to 19.52;
- \* The ENVS program sponsored 16 conferences and workshops on emerging issues and technologies; and,
- \* The program received an Academic Center of Excellence award from the National Association of Environmental Professionals in 1997 as well as honorable mention in the Partnerships and Linkages Category by the National Council of Instructional Administrators in 1999.

The ENVS program has set it sights on a number of priorities and initiatives for the next five years. These include: a greater focus on urban environmental problems; the development of international education and training programs; infusing environmental principles into other disciplines; integrating math and communication skills into the ENVS curriculum; increasing the number of ENVS majors and graduates; enhancing laboratory experiences; and continuing to explore the role of Internet-based instruction.

To successfully complete these priorities, as well as continue to build on the success of the first five/six years, the ENVS program requests the following:

1. Conversion of temporary classroom T-107 into a dedicated ENVS laboratory and classroom;
2. The hiring of a full-time ENVS faculty member on the Essex campus;
3. The creation and funding of a tri-campus ENVS administrative assistant position; and,
4. A doubling of the ENVS allocated operating funds for instructional materials and supplies.

**A. Appendices**

**Appendix 1  
Environmental Science and Technology  
Program Reviewers**

Ms. Seta Culman	Vice President	Abell Foundation
Mr. Edward Conoway	CEO	All American Environmental Services
Ms. Michele Bondima	Faculty	Baltimore City Community College
Mr. Donald Outen	Staff	Baltimore County
Ms. Valerie Brennan	Staff	Baltimore County Public Schools
Ms. Susan Kenney	President	Bay Associates
Mr. Michael Carey	Executive Dean	CCBC
Dr. George Farrant	Faculty	CCBC-Catonsville
Mr. George Collins	Counselor	CCBC-Catonsville
Ms. Allison Anderson	Staff	CCBC-Catonsville
Ms. Chris Destefano	Adjunct	CCBC-Catonsville
Dr. Dennis Helfritsch	Adjunct	CCBC-Catonsville
Mr. Christopher Fox	Chair	CCBC-Catonsville
Mr. Thomas Russ	Faculty	CCBC-Catonsville
Ms. Jessica Lackey	Graduate	CCBC-Catonsville
Ms. Cheryl Silver	Student	CCBC-Catonsville
Mr. Scott Jeffrey	Assistant Professor	CCBC-Catonsville
Mr. Hal Rummel	Faculty	CCBC-Catonsville
Mr. Joel Martin	Staff	CCBC-Catonsville
Dr. Donna Linksz	Dean	CCBC-Catonsville
Ms. Paula Noeller	Faculty	CCBC-Catonsville
Dr. Bernard Nebel	retired Professor	CCBC-Catonsville
Ms. April Warwick	Coordinator	CCBC-Catonsville
Mr. Peter Law	Director	CCBC-Catonsville
Mr. Dan McConochie	Senior Director	CCBC-Catonsville
Ms. Gayle Fink	Staff	CCBC-Catonsville
Dr. Willa Brooks	Faculty	CCBC-Catonsville
Dr. Dave O' Neill	Faculty	CCBC-Dundalk
Dr. David Thorndill	Faculty	CCBC-Essex
Dr. Penelope Revelle	Faculty	CCBC-Essex
Dr. Ronald Drisko	Faculty	CCBC-Essex
Mr. Dave Minges	Director	Chesapeake Bay Trust
Mr. Ned Tillman	President	Columbia Technologies
Mr. Gary Fuhrman	Director	Constellation Energy/BG&E
Mr. Frank Pine	Environmental Scientist	EA Associates
Dr. Steven Frysinger	Faculty	James Madison University
Mr. John Mitchell	Staff	Maryland Department of the Environment
Mr. Andrew Sawyers	Staff	Maryland Department of the Environment
Ms. Sarah Taylor Rogers	Staff	Maryland Department of Natural Resources
Mr. Dale Baxter	Assistant Director	Maryland Energy Administration
Mr. Gary Heath	Director	Maryland State Department of Education
Mr. Keith Rosenstiel	Staff	Perkin Elmer/EG&G
Mr. Tom Davis	Consultant	Tom Davis & Associates
Mr. Toney Begay	Staff	Tribal Colleges Environmental Initiative
Mr. Ric Lemaire	Staff	U.S. Department of Defense

*CCBC Environmental Science and Technology Program Review*

Dr. Suzanne Giannini-Spohn	Staff	U.S. Environmental Protection Agency
Ms. Diane Berger	Staff	U.S. Environmental Protection Agency
Dr. Al Montague	Staff	U.S. Environmental Protection Agency
Mr. Jeff Burke	Staff	U.S. Environmental Protection Agency
Mr. Larry Brown	Staff	U.S. Environmental Protection Agency
Ms. Nan Ides	Staff	U.S. Environmental Protection Agency
Ms. Theresa Martella	Staff	U.S. Environmental Protection Agency
Dr. Andrew Miller	Chair	University of Maryland Baltimore County
Dr. William Jones	Faculty	University of Maryland Biotechnology Institute
Dr. Bruce James	Chair	University of Maryland College Park
Mr. Thomas Lingan	Attorney	Venable, Baetjer & Howard
Mr. Larry White	Vice President	Versar
Mr. Ken Burch	Principal	Western School of Technology & Environmental Science

**Appendix 2**  
**A.A.S. Environmental Science and Technology Degree**  
**Program Outline**

**A. General Education Requirements (17 - 18 Credits)**

CINS/CMSE 155 - 3 credits - Information Literacy through the Internet  
ENVS ??? - 3 credits - Environment & Society (pending approval)  
BIOL 110 - 4 credits - Introduction to Biology  
ENVS 101 - 3 credits - Introduction to Environmental Science  
MATH 153 - 4 credits - Intro to Statistical Methods or MATH 165 - 5 credits - PreCalculus

**B. General Education Electives (20 Credits)**

Arts & Humanities - 6 credits  
English Composition - 6 credits  
Interdisciplinary & Emerging Issues - Wellness & Health - 3 credits  
Interdisciplinary & Emerging Issues - Global, Historical, & Cultural Perspectives - 2 credits  
Social & Behavioral Sciences - 3 credits

**C. Program Requirements (12 credits)**

CHEM 121-122 - 4 credits - General Chemistry I & Lab  
CHEM 146-147 - 4 credits - Introduction to Organic Chemistry &  
ENVS 102 - 1 credit - Introduction to Environmental Science Laboratory  
GEOG 101 - 3 credits - Introduction to Physical Geography

**D. Program Electives (12 credits)**

BIOL 106 - 4 Credits - Zoology  
BIOL 230 - 4 Credits - Microbiology  
BIOL 104 - 4 credits - Botany  
ECON 202 - 3 Credits - Introduction to Micro Economic Principles  
ENVS 116 - 3 credits - Atmospheric Science and Air Quality Management  
ENVS 126 - 3 credits - Hydrospheric Science and Water Quality Management  
ENVS 136 - 3 credits - Soil Science and Conservation  
ENVS 141 - 3 Credits - Solid and Hazardous Waste/Materials Management  
ENVS 142 - 3 credits - Environmental Law and Regulation  
ENVS 143 - 1 credit - Hazardous Materials & Waste Management Laboratory  
ENVS 146 - 3 Credits - Natural Resource Systems  
ENVS 152 - 3 Credits - Introduction to Site Assessment, Remediation and Restoration  
ENVS 153 - 3 Credits - Environmental Policy, Economics and Management  
ENVS 156- 3 Credits - Environmental Management Systems  
ENVS 191 - 196 - 1-6 credits - Special Topics in Environmental Science  
PHYS 110/111 - 3 Credits - Fundamentals of Physics I

**E. Program Option (1 - 10 credits)**

ENVS 271 - 276 - 1-6 credits - Directed Practicum in Environmental Science  
ENVS 291 - 294 - 1-4 credits - Independent Study in Environmental Science

**Appendix 3**  
**Environmental Science and Technology Certificate**  
**Program Outline**

**PROGRAM REQUIREMENTS** (21 credits)

- BIO 121 - 4 credits - Fundamentals of Biology
- \*CHE 121-122 - 4 credits - General Chemistry I & Lab
- \*CHE 146-147 - 4 credits - Introduction to Organic Chemistry & Lab
- ENV 101 - 3 credits - Introduction to Environmental Science
- ENV 142 - 3 credits - Environmental Law & Regulations
- \*MAT 131 - 3 credits - Introduction to Statistical Methods

**PROGRAM ELECTIVES** (18 credits)

- \*ENV 116 - 3 credits - Atmospheric Science and Air Quality Management
- \*ENV 126 - 3 credits - Hydrospheric Science and Water Quality Management
- \*ENV 136- 3 credits - Soil Science and Conservation
- \*ENV 141 - 3 credits - Solid and Hazardous Waste/Material Management
- \*ENV 143 - 1 credit - Introduction to Hazardous Materials Waste Management Laboratory
- \*ENV 146 - 3 credits - Natural Resource Systems
- \*ENV 152 - 3 credits - Site Assessment, Remediation and Restoration
- \*ENV 153 - 3 credits - Environmental Policy, Economics and Management
- \*ENV 156- 3 credits - Environmental Management Systems
- \*ENV 191- 1-4 credits - Special Topics: Environmental Science
- ENVS 271 - 276 - 1-6 credits - Directed Practicum: Environmental Science
- ENV 291-294 - 3 credits - Independent Study in Environmental Science

**Appendix 4**  
**Environmental Science and Technology**  
**Course Descriptions**

**ENVS 101 Introduction to Environmental Science** Students in ENVS 101 will explore earth's natural systems, as well as how human activity affects the environment. Students will apply the scientific method to investigate natural flows of chemicals, water and energy in terrestrial, aquatic, and atmospheric systems, and how humans impact these natural flows and systems. Students will also assess how policy, individual behavior, and technology can prevent, control and reverse environmental harm. 3 credits; 3 lecture hours; Prerequisite: Exemption from or successful completion of RDG 101.

**ENVS 102 Introduction to Environmental Science Laboratory** - Students enrolled in ENVS 102 will experience concepts and principles of environmental science in a direct, hands-on manner. ENVS 102 provides students with laboratory experiences, field trips, and special assignments to demonstrate the principles, processes, techniques, and technologies of natural environmental systems and solutions. 1 credit; 3 laboratory hours per week  
- Co-requisite: ENVS 101; Prerequisite: Exemption from or successful completion of RDG 101.

**ENVS 116 Atmospheric Science and Air Quality Management** - Air pollution, acid rain, ozone depletion, global warming -- all result from changes to atmosphere chemistry and all have enormous impacts on human health and the natural environment. Students in this course will explore the basics of atmospheric chemistry and investigate how human activities are polluting and changing the global atmosphere. Students will also examine laws, regulations, and technologies designed to protect air quality as well as evaluate air sampling and monitoring procedures. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS 126 Hydrospheric Science and Water Quality Management** - Only about 1% of the water on earth is freshwater accessible to humans. Whether this water is fit to drink, suitable to swim in, or fish safe to eat, -- all are a function of water quality. The national emphasis on clean water as well as the international focus on water-borne diseases have created renewed emphasis on water quality issues. Students in this course will learn how the global hydrosphere functions and investigate topics such as water composition, dynamics, supply, pollution, legislation, and treatment technologies. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS 136 Soil Science and Conservation** - Soil is essential for a healthy human communities and natural ecosystems. Yet many urban, industrial, and agricultural activities contaminate and degrade soils. Students enrolled in this course will be exposed to the nomenclature, methods and standards of soil science as it is applied in environmental practice. During the course, students will identify and delineate soil types, investigate soil morphology and ecology, and explore management and restoration techniques. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS141 Solid and Hazardous Waste/Material Management** - As global population increases -- over 6 billion humans now inhabit earth -- disposal of waste from our homes, institutions, workplaces, and military installations, has spawned local, national, and global debate. Students in this course will examine current practices, laws and regulations pertaining to solid and hazardous waste management. Students will review waste classifications, explore waste generation and treatment technologies, solve problems in waste management and auditing, and evaluate waste minimization and recycling programs. 3 credit hours; 3 lecture hours; Prerequisite: CHEM 121-124, ENVS 101, or permission of program coordinator.

**ENVS142 Environmental Law and Regulation** - Since 1970, numerous environmental laws have been enacted. Understanding these laws is important to many jobs and careers, not just environmental. Students in this course will focus on long-standing legislation such as the Clean Air Act, the Clean Water Act, Resource Conservation

and Recovery Act, Superfund, and the Toxic Substance Control Act, as well as more recent programs such as Pollution Prevention Act and Brownfields. Students will also assess the regulatory frameworks responsible for environmental regulations. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS143 Hazardous Materials & Waste Management Laboratory** - Many environmental jobs and positions require specialized training in hazardous waste and material handling. Students in this special one-credit laboratory course will receive the required OSHA 29CFR 1910.120 Hazardous Waste Operations training which will qualify them to work on-site at environmental remediation and restoration operations. 1 credit; 3-laboratory hours/week; Prerequisite: ENVS 101 or permission of program coordinator.

**ENVS 146 Natural Resource Systems** - Earth is home to over 100 million species, only, a fraction of which has been identified. While the implications of species extinction are recognized globally, the loss of biodiversity from human activities continues at record pace. Students in this course will explore the basics of ecology and natural resource systems and delve into topics such as biodiversity, resource extraction, and habitat management. Students will also examine scientific, economic, and policy aspects of natural resource decision-making and utilize resource valuation methodologies. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS 152 Site Assessment, Remediation and Restoration** - Cleaning polluted and contaminated sites has become a mainstay of efforts to improving environmental, and often economic, performance. Students taking this course will investigate pollution sources, the fundamental principles of site assessment, and techniques, processes, and technologies commonly used to remediate and restore sites. Students will learn how to assess the environmental parameters of a given site, develop site remediation plans, and review site remediation and restoration case studies. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS 153 Environmental Policy, Economics and Management** - Environmental issues are often resolved in the realms of policy, economics, and management. Many environmental advocates and practitioners, however, are unfamiliar or uncomfortable with operating in these spheres. Students enrolled in this course will explore real-world decision-making and delve into the complex array of legal, economic, and business factors that influence environmental issues. Students will learn about techniques to interpret, analyze, and weigh decision-making parameters as well as utilize conflict resolution and practical models of negotiation through research and case studies. 3 credit hours; 3 lecture hours; Prerequisite ENVS 101 or permission of program coordinator.

**ENVS 156 Environmental Management Systems** - Corporations, institutions, and organizations around the world are using environmental management systems to reduce and eliminate pollution. Students in this course will focus on pollution prevention techniques, processes, and technologies as well as environmental management systems, used as an organizing framework to achieve pollution prevention goals and lower costs. Students will also delve into a host of related topics such as industrial ecology, waste minimization, chemical and material substitution, and alternative technologies. 3 credit hours; 3 lecture hours; Prerequisite: ENVS 101 or permission of program coordinator.

**ENVS 191 – 196 Special Topics: Environmental Science** - Students taking this course have the opportunity to explore issues or topics either outside the traditional areas of environmental science, or which are not addressed in other ENVS courses. Students should consult with an adviser or program coordinator to determine transferability and/or applicability to curriculum requirements. 1-6 credits; 0-6 lecture hours per week; 0-12 laboratory hours per week. Prerequisites (if any) will be determined for each Special Topics course.

**ENVS 271-276 Directed Practicum: Environmental Science** - Students enrolled in this optional course have the opportunity to gain valuable applied worksite experience through a coordinated work experience with a private, non-profit or government environmental employer. The practicum is conducted under supervision of

faculty member with approval of the program coordinator. Practicum and worksite placement should relate to the student's specific future career interests and it is highly recommended that this course be taken during the student's last semester or last 15 credit hours. 1-6 credits; .5 hours conference; 4.5-16.5 fieldwork hours per week required; Prerequisites: permission of program coordinator.

***ENV 291-294 Independent Study in Environmental Science*** - Students in this optional course can select a topic or issue of specific interest to them and pursue an independent study experience. Students may earn from one to four credits per course depending on the time invested and the quality and demands of the project(s) selected. Written declaration of sponsorship by one or more faculty members, with approval of program coordinator, must be obtained. 1-4 credits; 3-12 laboratory hours per week. Prerequisite in ENV 101 or permission of program coordinator.

**Appendix 5**  
**Environmental Science and Technology Program**  
**Participating Companies/Organizations 1994 - 2000**

*CCBC Environmental Science and Technology Program Review*

A&A Environmental Services  
AAI Corporation  
Aarcher Inc.  
AAS Environmental Inc.  
AB Associates  
Abatement Environmental Resources, Inc.  
Abbey Drum Company  
Aberdeen Provind Grounds  
Aberdeen Proving Ground, DSHE  
ABT Associates, Inc.  
Advanced Engineering & Planning  
Advanced Filter Technologies, Inc.  
AEG Environmental  
Aerosol Monitoring & Analysis, Inc.  
Alfred L. Singer, Attorney At Law  
All American Environmental Services, Inc.  
Alternative Fuels Consulting  
American Bio Catalysts, Inc.  
American Yeast  
AMG Resources Corp.  
AMOCO  
Andrew Garte & Associates  
Andrew Hoerner  
Anne Arundel Dept of Social Services  
Antares Group Inc.  
Apex Environmental Inc.  
Apple Ford, Inc.  
Aqua-Flow, Inc.  
ARD Environmental, Inc.  
ATC Associates, Inc.  
Athena Environmental Services, Inc.  
Atomic Engineering Corp  
Auto-Flex, Inc.  
Balt. Co. Public Works  
Baltimore Aircoil Company  
Baltimore City Dept. of Public Works  
Baltimore City Government  
Baltimore Co. Dept. of Economic Development  
Baltimore County Public Schools  
Baltimore County Recycling Divison  
Baltimore Development Corporation  
Baltimore Resco  
Baltimore Urban League  
Bay Associates Environmental, Inc  
BayStar, Inc.  
BDM Environmental  
Bechtel Power Corp  
Best Manuf. Practices, Ctr of Excellence  
Bethlehem Steel  
Better Bioremediation Technologies  
Better Buildings, Inc.  
Better Engineering Manufacturing  
BGE Co.  
BH Laboratories  
Bio Grow Systems, Inc.  
Biospherics, Inc.  
Bishop & Associates  
Black & Decker (U.S.) Inc.  
Black & Veatch  
Black & Veatch Waste Science, Inc.  
Brandywine Enterprises, Inc.  
Bregman & Company  
Brightwater Consultants  
Brook Environmental & Engineering Corp.  
Brookes Group  
Brown and Root Environmental  
Browning-Ferris Industries, Inc.  
BSI Technologies, Inc.  
Buchart Horn / BASCO  
Building Diagnostics  
C. R. Daniels, Inc.  
Canadian Embassy, The  
Canadian Embassy, The  
Carroll Community College  
Certified Environments, Inc.  
CETCO  
Charles P. Johnson & Associates, Inc.  
CHB Consulting  
Chemspec Inc.  
Chesapeake Bay Foundation  
Chesapeake Bay Trust  
Chesapeake Environmental Management Inc  
Chesapeake Finished Metals  
Chesapeake Paperboard Co.  
Chrysler Corporation  
City of Baltimore, Dept. of Planning  
Clarke Michael, Inc.  
Clean Harbors of Baltimore, Inc.  
Clean Rock Industries, Inc.  
Coleman Energy & Environment  
Colonial Metals Inc.  
Columbia Technologies  
Concurrent Technologies Corporation  
CONDEA Vista Chemical Co.  
Congresswoman Morella's Office  
Connor Environ. Services & Eng. Assessments  
Consoer Townsend Envirodyne Engineers, Inc  
Constellation Energy, Inc.  
Crestline Industries, Inc.  
Crown, Cork and Seal  
CT & E Environmental Services, Inc.  
D.W. Baird & Associates  
Daft-McCune-Walker, Inc.  
Dames & Moore

*CCBC Environmental Science and Technology Program Review*

Damilic Corporation  
DANA Insurance & Risk Management  
DATANET Engineering  
Delmarva Recycling, Inc.  
Derby Group, The  
Dewberry & Davis  
Diversey Equipment Technologies  
Diversified Inspection Services Inc.  
Dixie Printing and Packaging  
Donovan L. Olsen Professional Engineer  
Dow Environmental, Inc.  
Dresser Industries, Wayne Division  
Dundalk Community College  
Duron Inc.  
Duron Paints & Wallcoverings  
Dynamac Corporation  
Dynasurf Chemical Corp.  
E.A.I. Corp.  
EA Engineering, Science & Technology, Inc.  
EA Laboratories  
Earth Data Incorporated  
Earth Engineering and Sciences, Inc.  
EAS Environmental Analytical Services  
Eastalco Aluminum Company  
Eastern Environmental  
EBA Engineering, Inc.  
Eco Dynamics Corp  
ECO Purification Systems USA, Inc.  
ECODEME GROUP, Ltd.  
EcoLogiX  
Edrich Lumber  
Edwards & Kelcey  
EG & G Pressure Science  
Elissa Cuffs -Consultant  
Ellicott International  
EMG Inc.  
Energetics  
Energy Systems Engineering, Inc.  
Engineering Consulting Services, Ltd.  
ENSAT, Inc.  
ENSR  
Entech, Inc.  
Environ Corporation  
Environmental Concern, Inc.  
Environmental Elements Corp.  
Environmental Fund for Maryland  
Environmental Management Collaboration Ltd  
Environmental Management Services, Inc  
Environmental Marketing Group  
Environmental News Magazines, Inc.  
Environmental Policy Network  
Environmental Profiles, Inc.  
Environmental Quality Resources, Inc.  
Environmental Resource Management, Inc.  
Environmental Support Services, Inc.  
Environmental Technologies Group  
Envirosystems, Inc.  
Epoch Consultants, Inc.  
Essential Technologies  
ETI  
Evans & Steirhoff  
Fairfax Recycling, Inc.  
Fairfax Recycling, Inc.  
Farboil  
Fluor Daniel GTI  
FMC Corporation  
Fluor Daniel GTI  
FMC Corporation  
Foster Wheeler Environmental Corp  
French Bray, Inc.  
Froehling & Robertson  
G. Macy Nelson, Attorney  
Gannett Fleming, Inc.  
Gascoyne Laboratories, Inc.  
General Physics Corporation  
General Science Corp  
Geo-Technology Associates Inc.  
GEOMET Technologies, Inc.  
GeoServices Corporation  
Geotechnical & Env. Mgmt. Services  
Geraghty & Miller, Inc.  
Gershman, Brickner & Bratton  
GETF  
Giant Foods  
Glass Manufacturing Industry Council  
Gordon, Feinblatt, Rothman, Hoffberger & Hollander  
Government Institutes  
Governor's Legislative Office  
Governor's Workforce Investment Board  
GOW International  
GP Environmental Services  
GRACE Davison  
Grace Fielder & Associates  
Greater Baltimore Com.-Tech Council  
Greenhorne & O'Mara, Inc.  
Groundwater & Environmental Services, Inc.  
Group CK  
GTS Duratek  
Guilford Pharmaceuticals, Inc.  
Halethorpe Extrusions Inc.  
Haley & Aldrich  
Hallaton, Inc.  
Hampshire Research  
Handex of Maryland, Inc.

*CCBC Environmental Science and Technology Program Review*

Hanifin Associates, Inc.  
Hazardous & Medical Waste Services, Inc.  
HazTECH News  
HazTrain  
Heery International  
Hillis-Carnes Engineering Associates, Inc.  
House of Seagram  
Howard County Bureau of Waste Management  
Howard County Intern'l Trade Asst. Ctr  
Howard County Public Works  
HP-Woods Research Inst  
HS Processing L.P.  
ICF Kaiser Engineers  
IMS Environmental Services  
Ingersoll Dresser Pumps  
Inst. Of Scrap Recycling Industries  
Int'l Trade Admin. - Off. of Env. Tech Exports  
Interagency Environmental Technology Office  
Intercet  
Intercontinental Export-Import, Inc.  
ITC Consulting  
Jenkins Environmental Inc.  
John E. Harms Jr. & Associates  
Johns Hopkins Applied Science Lab  
Johns Hopkins University  
Johnson Logging Company  
Kaydon Ring & Seal Inc.  
KCI Technologies, Inc.  
Keibler-Thompson Corp  
Kelly Scientific Resources  
Kevin Ferguson  
Keywell Corporation  
Kop-Flex Inc.  
Laidlaw Environmental Services, Inc.  
LAN Engineering & Environmental Services  
Latshaw Associates  
Law & Economics Consulting Group  
Law Engineering, Inc.  
Leadtec Services Inc.  
Lehigh Portland Cement Co.  
Linowes and Blocher, LLP  
Loading Dock, The  
Lockheed Martin Corp.  
Long Life Treated Wood Inc.  
Longwood Environmental Management  
Lower Shore Manufacturing Network  
LTR Corporation - Recycling Systems  
MACTEC, Inc.  
Manufacturing Extension Partnership  
Martin Marietta-Middle River Aircraft Sys.  
Maryland Chamber of Commerce  
Maryland Department of the Environment  
Maryland Dept. of Transportation  
Maryland Energy Administration  
Maryland Environmental Service  
Maryland House of Delegates  
Maryland Occupational Safety & Health  
Maryland Paper Company  
Maryland Recyclers Coalition  
Maryland State Senate  
MaryPIRG  
Matrix Group  
McCormick & Company Inc.  
McCormick Ingredients  
McCormick Paints  
McCrone, Inc.  
McGuire Woods Consulting  
McKenna & Cuneo, LLP  
MD Dept of Business & Economic Development  
MD Environmental Tech. Demonstration Ctr  
MD State Dept. of Education  
Memtec America Corporation  
Meridian Sciences, Inc.  
Metcalf & Eddy  
Metro. Washington Council of Governments  
Mid-Atlantic Waste Systems  
Miles & Stockbridge  
Millennium Inorganic Chemicals  
Mircon Inc.  
Modern Landfill and Recycling  
Montgomery Scrap Corp.  
Multinat'l Environment & Social Assessment Serv.  
NACLS  
Nat'l Assoc. of State Development Agencies  
Nat'l Environmental Education & Training Fdtn.  
National Insurance Services, Inc.  
Naval Surface Warfare Center-Indian Head Div.  
Niro, Inc.  
Northrop Grumman  
Nova Screen  
Nutshell Enterprises, Ltd.  
O'Brien & Gere Engineers, Inc.  
Ober Kaler Corp.  
OHM Remediation Services Corp.  
PADER - Bureau of Waste Mgmt.  
Pan American Investment Consulting Corp  
Parsons Brinckerhoff  
Peer Consultants  
Penniman & Browne, Inc.  
Pepsi-Cola Company  
Phase Separation Science, Inc.  
Philips Technologies  
Phoenix Services, Inc  
Piper & Maubury, LLP

*CCBC Environmental Science and Technology Program Review*

PMT & Associates  
Polar Property Inspection Systems, Inc.  
Ponderosa Fibres of America, Inc.  
Poole & Kent Organization  
PORI International, Inc.  
Post, Buckley, Schuh and Jenigan, Inc.  
Potomac Abatement, Inc.  
Potomac Electric Power Co.  
Printing Industries of Maryland, Inc.  
Prizim Inc.  
Proctor and Gamble  
Property Inspection Services  
Public Sector Consulting Group  
Public Technology, Inc.  
Purdum and Jeschke, LLC  
Quantum 21  
R.E. Wright Environmental  
Rad Elec Inc.  
Radiance Services Company  
Rainbow International  
Rayloc  
Red Star Yeast  
Redland Genstar, Inc.  
Regional Manufacturing Institute  
Resource Management Concepts, Inc.  
Reynolds Aluminum Recycling  
Robert B. Balter Co.  
Roy F. Weston, Inc.  
RR Donnelley & Sons Co.  
Rummel, Klepper, & Kahl  
Ruppert Environmental  
S. S. Papadopulos & Associates, Inc.  
SAIC  
Sapphire Group  
Saul Environmental Consulting  
Save Our Streams  
Schnabel Environmental Services  
Scientific Specialties  
Secour International, Inc.  
Semmes, Bowen & Semmes  
SERDP Program Office  
SJH Consultants, Inc.  
Soil Safe, Inc.  
Solarex Corporation  
Sparrows Point High  
Speaker Casper R. Taylor's Office  
St. Agnes Health Care  
St. Mary's Disposal and Recycling  
Stearns & Wheler, LLC  
Stone Industrial  
Straughan Environmental Services  
STV Incorporated  
Suburban MD High Technology Council  
Sun Company, Inc.  
Superior Management, Inc.  
Sverdrup Civil, Inc.  
Systems Management Inc. (SMI)  
T & P Engineering  
Tate Access Floors  
Tate Engineering, Inc.  
Tate Engineering, Inc.  
TBN Associates  
Technical Resources, Inc.  
Tetra Tech Inc.  
Tetra Tech, Inc.  
The Baltimore Sun  
TI Group, Inc.  
Tidewater Inc.  
Towson University  
TPH Technology, Inc.  
TPS Technologies, Inc.  
Trigen Energy - Baltimore  
UM - Center for Environmental Science  
UM Center for Marine Biotechnology  
UMCP - School of Public Affairs  
UMUC - International Programs  
Unisource  
United Parcel Service, International  
United Propane, Inc.  
Univ. Of MD College Park  
Universal Recycling  
University of MD Technology Extension Service -  
Engineering Research Center  
US Army Corp of Engineers, Baltimore Dist.  
US EPA, Waste ID Branch  
US Export Assistance Center  
US Postal Service  
US-Asia Environmental Partnership  
USA Lights  
USDOE - Philadelphia Support Ofc.  
USEPA  
USEPA Reg. 3  
USEPA-Office of Pollution Prevention and Toxics  
Varian  
VEK Corp  
Venable, Baetjer and Howard  
Versar, Inc.  
Virginia Environmental Council  
Virginia's Center for Innovative Technology  
Viskon Aire Corp.  
Vitro Corporation  
Vulcan Hart / PMI Corp.  
Vulcan Hart / PMI Corp.  
W.L. Gore & Associates, Inc.

*CCBC Environmental Science and Technology Program Review*

W.R. Grace & Company	Whiteford Environmental
Waste Management Industrial Services	Whitman, Requardt & Associates
Waste Management of MD, Inc.	Whitney, Bailey, Cox & Magnani
Waste Policy Institute	William Baker, Jr. Inc.
Waste Science Inc.	Willis Corroon Corporation of Maryland
WATEK Engineering Corp	Wise Metals, Inc.
Water Chem	WMX Technologies, Inc.
Watermark Corp.	Woodward-Clyde Federal Services
Webcraft Technologies Inc.	WOR-WIC Community College
Western School of Tech. & Environmental Science	World Bank
Weyerhauser Recycling	World Links Inc.
Wheelabrator Environmental Systems	World Trade Center Institute
Wheelabrator Water Technologies	WSSC Environmental Services Unit
White & White	WWSI

**Appendix 6**

**Environmental Science and Technology  
Non-Credit, Short Course Offerings**

Advanced Home "Eco"nomics

Applications of Energy Management Principles  
Basics of Environmental Auditing

*CCBC Environmental Science and Technology Program Review*

Brownfields Initiatives: Implications for Baltimore	Instructional Methods for Environmental Managers
Clean Air Debate: Issues and Concerns	Introduction to Bioremediation
Coming into Compliance with Md. Air Certification	Introduction to Environmental Management
ECO Shopping: Saving the Environment & Money	Introduction to Environmental Risk Assessment
Ecosystems of the Patapsco Valley	Introduction to Pollution Prevention
Elements of ISO 14000: An Introduction to EMS	Introduction to Water Quality Policy
Environmental Business Symposium	Introduction to Water/Wastewater Technology
Environmental Communication Skills	Local Environmental Issues and Regulations
Environmental Issues	New Clean Air Standards - Sorting out the Facts
Environmental Monitoring & Sampling	New Energy Efficient Lighting Technologies
Environmental Project Management	Organizing a Pollution Prevention Program
Environmental Quality and the Community	Overview of Maryland's Smart Growth Initiative
Environmental Resources on the Internet	Practical Applications of Bioremediation Technology
EPA & Brownfields: Implications for Baltimore	Principles of Compliance Management Systems
Facility Level Environmental Regulation Course	Principles of Environmental Management Systems
Fundraising for Environmental Initiatives	RCRA Groundwater Monitoring Requirements
Getting the Most Out of Your Recycling Program	Recycling/Solid Waste Mgmt for Business & Industry
"Green" Gardening and Landscaping	Reducing Environmental Liability through P2
Greenway Guides Naturalist Training	The Environmentally Friendly Conference
HAZWOPER Annual Refresher	The Environmentally Friendly Home
Hazardous Waste Site Worker	The Global Greenhouse Gas Agreement
Home "Eco"nomics	Update on Brownfields Legislation in Maryland
How to Conduct an Environmental Waste Audit	Reporting Requirements: Revised Clean Water Act
How to Find a Job Working for the Environment	Waste Management: Analysis and Alternatives

**Appendix 7**  
**Environmental Science and Technology**  
**Workshops and Conferences**

*CCBC Environmental Science and Technology Program Review*

A. December, 1994 - a 1/2 day workshop on December 1, 1994 in conjunction with the Maryland Department of Economic and Employment Development to discuss upcoming environmental initiatives at Aberdeen Proving Grounds. The workshop was attended by 220 representatives from Maryland's environmental industry were present, largest gathering of that type to date.

B. November 1995, a 3-day workshop entitled *How to Develop and Implement Environmental Programs* geared to community colleges in Brownfields pilot cities. The workshop was co-sponsored by the Hazardous Materials Training and Research Institute, HMTRI. Over 40 representatives from community colleges around the country and Hawaii attended the workshop and learned about ways to initiate development of environmental, hazardous waste, and bioremediation education and training programs.

C. May, 1996, *Lead Paint Workshop for Historic Baltimore Housing* was offered on the Dundalk campus. Over 100 people attended this workshop focused on educating landlords about their responsibility under the Maryland lead paint abatement regulations.

D. October 1996- a workshop titled *Lead Paint Identification and Clean up for Home Owners* was held on the Catonsville Campus. Over 125 people attended to hear discussion of Maryland's Lead Paint Abatement laws and regulations. Vendors also displayed information for attendees.

E. December 1996, a one-day workshop for members of the Maryland Environmental Business Alliance entitled *Update on Brownfields Legislation in Maryland*. Business representatives, approximately 95, attended to hear presentations by Maryland Delegate Ronald Guns and Thomas Filder, Chief of Pennsylvania's Brownfields program. A panel discussion including several environmental attorneys and representative from concerned non-profit organizations debated their specific concerns with Maryland Brownfields legislation.

F. May 1997, a seminar on Maryland firms' international business successes was offered jointly with the Maryland Environmental Business Alliance. Firms who have worked successfully overseas presented case studies. Other presentations included support services available at the federal and state level to assist companies expanding into international markets.

G. February 1997, a seminar titled *Environmental Technology Development: Today's Innovation* was offered jointly with the Maryland Environmental Business Alliance. Over 80 attendees heard presentations by Maryland firms who are successful implementing different environmental technologies. A panel with members from US Environmental Protection Agency and the Maryland Department of Business and Economic Development discussed the services available to assist companies to identify technical solutions to environmental concerns.

H. September 1997, a training session titled *Green Work Group* was offered for employers and educators to discuss how internship programs save money and improve Maryland's workforce. The goal of this session was to encourage employers to begin or expand their internship program as well as help educators with their role in environmental internships.

I. December 1997, we hosted a national videoconference titled *Green and Profitable Printing '97*. The videoconference focused on small lithographic print shops and ways they could reduce waste, improve efficiency, and protect the environment. For this workshop, we involved faculty and students from the College's Printing Associates degree program and the non-credit printing training program.

J. February, 1998, a one-day workshop titled *Green Development in Maryland* was attended by co-sponsored with the Virginia Housing and Environment Network, Urban Land Institute, Maryland Department of Natural Resources, and the Home Builders Association of Maryland.

K. November 1998 - A *P2 Techniques for Lithographic Printers Workshop* was held at CCBC-Catonsville. The workshop explored techniques and practices to cut costs and improve environmental performance including source

reduction, resource conservation, reuse and recycling. There were over 30 attendees with representatives from high school and college printing programs, printers, printing associations and Design for the Environment program.

L. December 1998, a one-day conference entitled "Utility Deregulation in Your Future" to examine the potential economic and environmental impacts associated with energy deregulation. Just under 100 people attended the workshop, which covered topics on deregulation from the perspective of the State government, utility companies, energy service companies and end users. This workshop was cosponsored with the Maryland Energy Institute.

M. January 1999 a seminar titled Environmental Technology Opportunities in Latin America was held jointly with the Maryland International Trade Association. The seminar focused on grant opportunities available to Maryland firms and case studies of Maryland environmental companies who have successfully worked in Latin America.

N. February 1999 - a one-day conference, "Challenges in Air Quality Management", to explore trends and emerging issues in air quality management. Co-sponsoring organizations included the Maryland Environmental Business Alliance, University of Maryland University College, the National Center for Hazard Communications, the Institute for Environmental Management, the Maryland Chamber of Commerce, and Environmental Managers of Maryland.

O. February 1999 a week long training session titled Energy Star Training was offered to representatives from community colleges from across the US. This was a joint program with the Partnership for Environmental Technology Education. Faculty from community colleges across the US received grants to attend our train-the-trainer session focused on energy management issues and the Energy Star Program.

P. March 2000, a seminar on pfiesteria was offered jointly with the Maryland Environmental Business Alliance. Researchers from North Carolina presented on their research regarding the pfiesteria outbreaks in the Chesapeake Bay. The meeting was well attended and participants noted a wish to continue tracking this issue in Maryland, specifically the actions of the Maryland legislature.