WATER AND WASTEWATER TREATMENT TECHNOLOGY
NEEDS ASSESSMENT

EXECUTIVE SUMMARY

★ This needs assessment was initiated by the Emerging Technologies Environmental Science Consortium in response to state wide interest in environmental programs. The Consortium consists of Oakland Community College, Schoolcraft College, Wayne County Community College, Lansing Community College, Kellogg Community College, Grand Rapids Community College, Northwestern Michigan College, and Delta Community College.

★ Information for the assessment was obtained from a survey of employers in the field, a literature search, data from state and federal government sources, information from professional organizations, and a study of programs offered by other higher educational institutions.

★ Although many employers mentioned that post-secondary education would benefit those in the field, a high school diploma is the minimal educational requirement of 91.3 percent of employers surveyed. Only 7.8 percent of the employers require an associate degree.

★ The near term employment outlook for the water and wastewater field is unfavorable based on data obtained. According to MOIS and to several industry experts, supply and demand are currently in balance and no unmet openings are predicted for the near future. Only 11.8 percent (26) of surveyed employers indicated they are now hiring (See Table 2).

★ Analysts point toward the industrial wastewater field as being a source of jobs for the future, but disagree as to how and if this could be taught in a classroom setting.

★ One company (Williams and Works Operations Services), has an extensive hiring need for people skilled in water and wastewater technology. They are interested in working with a community college in starting a program.

★ There are both in-house and external training offered in this field. Some employers and analysts advocate a need for more training in the form of courses specifically tailored for water or wastewater. Those who desire more training programs and continuing education for their employees want the facilities to be near their plants and the classes to be offered in the evenings. Others maintain that there is no need for additional training; that it is difficult to motivate employees to take advantage of the proliferation of training programs now offered.

★ Higher education institutions in Michigan are primarily preparing students for the certification exams and to subsequently work for a municipality. One program is concentrating on updating the skills of current water and wastewater treatment employees. All the programs have an internship component, are highly regarded by local employers and are typically quite successful at placing their graduates.

EMERGING TECHNOLOGIES ENVIRONMENTAL SCIENCE CONSORTIUM
WATER AND WASTEWATER TREATMENT TECHNOLOGY
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INTRODUCTION

The purpose of this report is to review current industry needs related to the field of water and wastewater treatment technology. This report is intended to assist the Emerging Technologies Environmental Science Consortium in planning and evaluating future programs related to water and wastewater treatment technology. The Consortium was created by Oakland Community College (OCC) and Schoolcraft College, who jointly submitted a grant proposal to the Michigan Department of Education (MDE) for developing an Environmental Science/Studies curriculum. The MDE approved grant funding from the Emerging Technologies Fund. In addition, the MDE sent a letter to all community colleges in Michigan informing them of the Consortium and inviting them to join the Consortium (Appendix B). On September 29, 1992 the Consortium held its first meeting at which time it was decided to study water and wastewater treatment technology. The Consortium includes:

Oakland Community College
Schoolcraft College
Wayne County Community College
Lansing Community College
Kellogg Community College
Grand Rapids Community College
Northwestern Community College
Delta Community College

The information presented in this needs assessment was obtained from the following sources:

1. A comprehensive literature review
2. Data from the Michigan Employment Securities Commission (MESC)
3. Data from the Michigan Occupational Information System (MOIS)
4. Information compiled from phone interviews with industry analysts and experts
5. An examination of related programs in other higher education institutions
6. Survey of 223 employers in the water and wastewater fields

Description of Occupation

This needs assessment focuses on all occupations which test and/or treat water and/or wastewater. According to MOIS, 86.8 percent of employees who test and treat water or wastewater can be found within municipalities. These employees are classified as either water-treatment plant operators or wastewater treatment plant operators. Typically, those employed in municipally operated systems must also live within the city in which they work.

A water-treatment plant operator controls treatment plant machines and equipment to purify and clarify water for human consumption and for industrial use. The Occupational Outlook Handbook lists the operator's duties as,

> "Operating and controlling electric motors and pumps, regulating the flow of raw water into treating plants, dumping specified amounts of chemicals, such as chlorine, ammonia, and lime into the water, and adjusting automatic devices that admit specified amounts of chemicals into tanks to disinfect, deodorize, and clarify the water. Once the water has been treated, the operators adjust controls to regulate flow rates, loss of head pressure and water elevation. They can then distribute the water. During this process, they test water samples to determine acidity, color and impurities, using colorimeter, turbidimeter, and conductivity meters. They also continuously record data, such as residual content of chemicals, water turbidity, and water pressure."

Wastewater treatment-plant operators work with sewage treatment, sludge processing, and disposal equipment. According to the Occupational Outlook Handbook, these operators,

> "Control the flow and processing of sewage. In order to do this, they monitor control panels and adjust valves. They observe variations in operating conditions and interpret meter and gauge readings and test results. They start and stop pumps, engines, and generators to control flow of raw sewage through filtering, settling, aeration, and sludge digestion processes. They are also routinely conducting lab tests on the water."

In addition to working for municipalities, occupations within water and wastewater are also available with private manufacturing and environmental companies. Those who work with industrial wastewater are cleansing the wastewater of chemical impurities, as opposed to the biological waste which is found in the municipal plant's wastewater.

All facilities which discharges to ground or surface water are required by state law to employ a certified worker. Both facilities and employees need to be "certified," which means they are licensed by either the Michigan Department of Natural Resources (DNR) or the Michigan Department of Public Health (DPH). The DNR certifies wastewater facilities and operators, and the DPH certifies water facilities and operators (Appendix C). The DNR also runs a

certification program for industries and industrial wastewater workers (Appendix C). However, not all industries are covered under the state law, since most channel their wastewater directly into municipal systems rather than into ground or surface water.

Each water and wastewater facility is certified based on the number of residents within its community. State law also requires at least one employee within each facility to be certified at the level of the facility. This person is usually the superintendent, and he or she is usually licensed at the highest level which indicates that they have fulfilled the education and experience necessary to take the high level examinations. Other workers in the facility may be certified at varying levels, depending on their education, and more importantly, on their experience.

METHODOLOGY

Methods of Data Collection

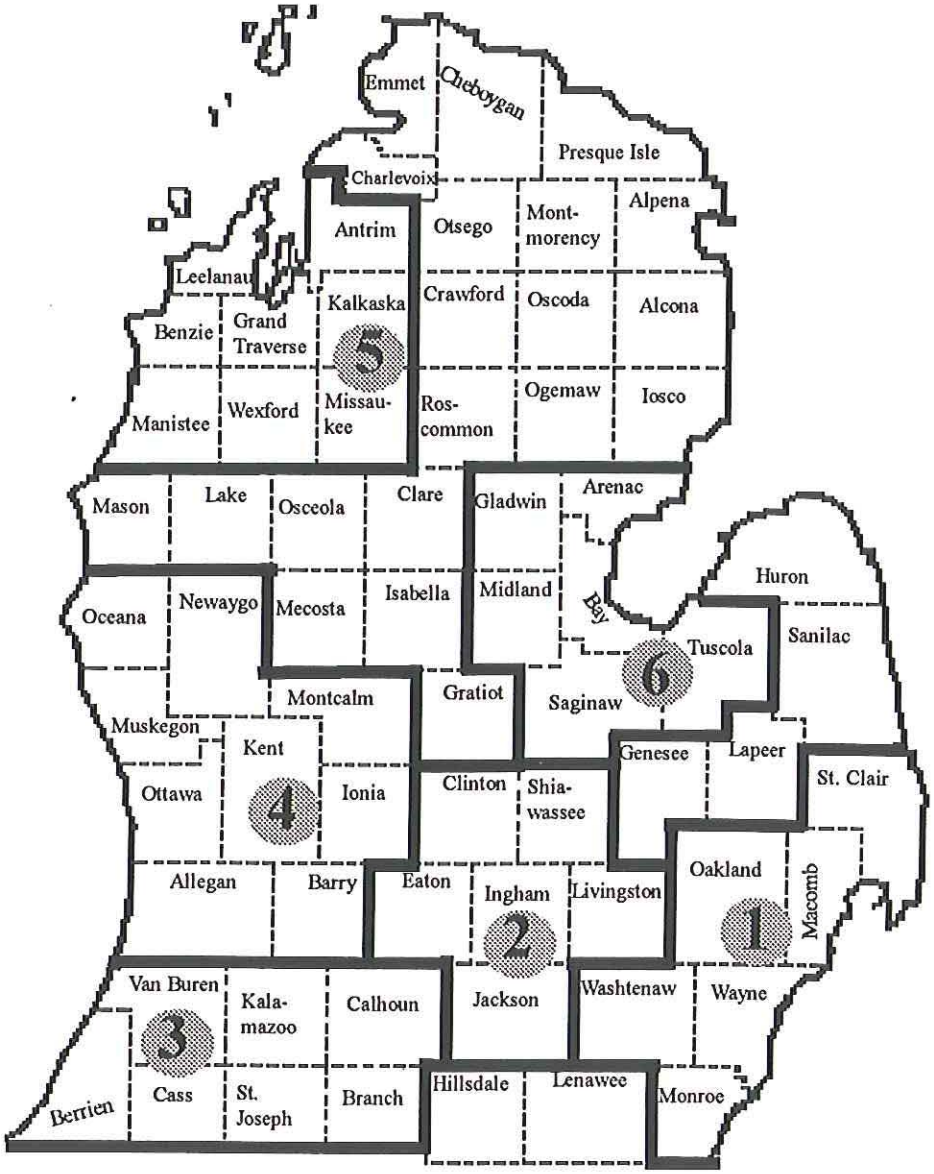
In order to obtain background information on the water and wastewater treatment field, a literature search was performed and a variety of professional, industrial, public and regulatory organizations were contacted. A review of existing water and wastewater treatment programs in higher educational institutions in Michigan was conducted. Comparisons of enrollment and graduation information were made, and the program content was examined.

A telephone survey of two hundred and twenty three (223) employers was conducted between November 11 and November 23, 1992. These employers are located within six regions throughout the state. These regions were established in order to incorporate the communities surrounding each college involved in the Consortium. The six regions consist of:

Region 1: Southeast Michigan (Oakland Community College, Schoolcraft College, Wayne County Community College)
Region 2: South Central Michigan (Lansing Community College)
Region 3: Southwest Michigan (Kellogg Community College)
Region 4: Mid West Michigan (Grand Rapids Community College)
Region 5: Northwest Michigan (Northwestern Community College)
Region 6: Mid Central Michigan (Delta Community College)

An "employer list" was generated for each region. The employers were selected at random from a variety of sources, and included those suggested by members of the Consortium, by the Michigan Department of Natural Resources (DNR), by the Michigan Department of Public Health (DPH), and those found in The Million Dollar Directory published by Dun & Bradstreet and in Ward's Business Directory. The majority of the employer list consisted of municipal/city water and wastewater facilities, but private sector employers including

REGIONS SURVEYED



manufacturing and environmental firms were also included. Within the municipal system, there were a variety of sizes and plant types represented on the employer list in order to provide a comprehensive view of employer needs throughout the six regions. The same survey was used for all regions (Appendix E). Employers were asked a series of questions regarding hiring practices and potential employment opportunities. Additionally, detailed information was solicited from these employers regarding desired qualifications and specific skill levels for entry level employees.

Methods of Data Analysis

Survey findings were analyzed by means of frequency distributions, measures of central tendency and correlations. Verbal responses were analyzed for content (Appendix F). The number of employers surveyed in each region was based on a percentage of the total water and wastewater employers located in the region. Table 1 presents a breakdown of the number of employers surveyed in each region.

Table 1
Employers Surveyed By Region

Region	Employers
Region 1	62
Region 2	35
Region 3	32
Region 4	45
Region 5	20
Region 6	29
TOTAL	**223**

Source: W/WWT Employers Survey, November, 1992

ANALYSIS

Water and Wastewater Treatment Outlook

Employers were asked to identify what functions they perform related to water and wastewater treatment. Table 2 indicates the number of employers in each region who perform various functions. The majority of the organizations perform more than one function. Sewage treatment and water quality testing are most commonly performed, but there are variations by individual region.

Table 2
Functions Performed by Employers in Each Region

	Reg 1	Reg 2	Reg 3	Reg 4	Reg 5	Reg 6	Total
Sewage Treatment	75.8	77.1	54.8	79.1	80.0	79.3	74.5
Water Quality Testing	74.2	79.4	87.5	68.2	75.0	58.6	73.8
Municipal Water Treatment	58.1	67.6	78.1	45.5	30.0	34.5	54.3
Water Remediation	35.5	73.5	53.1	31.8	25.0	13.8	39.4
Industrial Wastewater Treatment	35.5	45.7	31.3	43.2	20.0	37.9	36.9
Stormwater Runoff Control	41.9	60.0	28.1	16.3	15.0	10.3	31.2
Soil Testing	24.2	36.4	12.5	16.3	20.0	17.2	21.5
Other*	___	5.7	50.0	2.3	___	3.4	9.0

**Other includes design of municipal water treatment, repair of water treatment and distribution systems, recording of precipitation and the maximum and minimum temperature, metering for the weather service, spreading sludge on fields, working with wells, and testing for agricultural herbicides.*

Source: W/WWT Employers Survey, November 1992

NOTE: The above functions can be further defined to assist in the reading of this report. "Sewage treatment" and "wastewater treatment" will be used interchangeably from this point on. The term "industrial wastewater treatment" will only be used to signify water that is contaminated by chemical wastes generated by industries as opposed to individuals. Finally, "municipal water treatment" will be used to describe city systems that purify water for household and industrial use, and in specific cases when "water treatment" pertains to the work done by a private environmental firm, this will be noted.

Municipal Water and Wastewater

There are approximately 360 municipal wastewater plants and 70 water facilities in the state of Michigan. Employment for water and wastewater employees is usually steady because treatment of water is essential, regardless of economic conditions. According to the MESC, there is currently a predicted eleven percent (11%) growth per year for wastewater treatment plant operators in Michigan. This growth rate is considered average. There are on average 100 annual openings (30 due to growth, and 70 due to replacement). Supply and demand are presently in balance, and few opportunities are projected for additional workers to enter this field in the near future.

According to MOIS, the state-wide expanding population and growth of the economy are expected to increase demand for water and wastewater treatment services. When new plants are constructed to meet this demand, employment of water and wastewater treatment plant operators should increase. "Many water and sewage departments are planning extensive expenditures to meet the future demand for new storage facilities, treatment plants, pumping stations, transmission mains and rehabilitation of existing plants" (MOIS). Also according to the prediction of MOIS, employment opportunities will be greater for those operators trained in the use of computers for data collection and analysis; highly trained operators will have an advantage in securing new positions or advancing to higher-level jobs.

Although these factors should help to increase the future employment of water and wastewater treatment plant operators, the lack of funding for public works projects has delayed most of the planned plant construction and rehabilitation and, as a result, this has *reduced* demand for these operators. It remains unclear how the new Clinton Administrations campaign promises concerning major new funding for public works projects will impact public water and wastewater facilities.

Industrial Wastewater

Some of the employers surveyed mentioned that there is potential growth in the industrial wastewater field. Municipal wastewater systems cannot accept certain chemicals, and Industrial Pretreatment Programs (IPPs) have been in place for the last five years to make sure these

chemicals are treated before the municipal system receives the wastewater. Not all communities have industries which require an IPP program. Examples of these industries are metal processing, automotive, plastics, and food processing companies. The municipality must identify those industries which dump water into their system, and then issue a permit restricting the industry to discharging only a limited level of chemicals. The industry must then treat the majority of its own waste. This generates a lot of paperwork which is closely monitored by the DNR.

Occasionally such industries will try to hire operators who have wastewater experience to help them initiate the treatment process. This can be done on a short term consulting basis, or the operators may be hired full time. It is up to individual communities to require industrial certification (See Appendix C for certification details). Warren, Michigan is the only community in the Southeast Michigan area which requires its industrial pretreatment employees to be certified, however, many superintendents of wastewater facilities want this to be the norm. Since this is not now the case, anyone can be delegated to work with industrial wastewater, and often current industry employees are trained in this area in order to save the expense of hiring from the outside.

Howard Selover, (Chief of Operator Training for the DNR), indicated that industrial wastewater operators usually come from "within the industries, off the line in the case of the auto industry." Since these employees do not have to be certified, there is no pressure to hire new employees and the industries usually do their own training.

Haviland Engineering (Grand Rapids) installs industrial wastewater systems in small companies and also trains employees for three days on how to use the equipment. One of the builders for Haviland believes that this training is a good base, but is not sure that employees in these small companies fully understand all they should know about industrial wastewater. This could be combatted by hiring employees who are certified by the DNR. Since this is not required by law, the builder is certain that these smaller companies "will not hire a trained operator to run the industrial wastewater system until there are laws which force them to hire people who are certified." No one can predict when and if this will be mandated, but if so, there should be a greater need for certified people in industrial wastewater.

Storm Water Management

Other employers mentioned that storm water management will be a growing field in the near future, but they also indicated that this need can be met by retraining current wastewater operators; not necessarily by hiring new workers. Some are predicting that by 1994 the Federal Environmental Protection Agency (EPA) and the Michigan DNR will require stormwater to be treated as wastewater is now. Municipalities will then be responsible for it, but as of now, there is no required storm water treatment. It is difficult to prepare for this possible legislation, since no one knows exactly what it will entail; perhaps the salt level will be regulated, or maybe specific chemicals will have to be removed from the water.

Employment Opportunities

Of all employers surveyed, 89.2 percent hire *only* full time employees, 3.2 percent hire *only* part time employees, and 7.6 percent hire both full and part time employees. The average number of full time employees per employer is nine. The number of employees per plant varies by region, but the majority of plants hire between one and five full time employees. As would be expected, the more populated regions have more full time employees in their plants. Table 3 gives a breakdown of full time employees within each region.

Table 3
Full Time Employees Per Employer by Region

Full Time Employees	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Total
1 - 5	43.3	65.7	62.5	68.3	84.2	60.7	60.5
6 - 10	30.0	14.3	25.0	14.6	10.5	25.0	21.4
11 or more	26.7	20.0	12.5	17.1	5.3	14.3	18.1
	(N=60)	(N=35)	(N=32)	(N=41)	(N=19)	(N=28)	

Source: W/WWT Employers Survey, November, 1992

Only twenty-six (11.8%) of all employers surveyed are currently hiring. Out of the these, sixteen are wastewater plants or lagoon systems, nine are water facilities, and one is an engineering company. Of these 26 employers, 69.2 percent of hiring is due to employee turnover, and 38.5 percent is due to expansion of their operations. This closely corresponds to MESC information which reports that each year 70 percent of hiring is due to annual openings and 30 percent is due to growth. One employer in Region 1 and one employer in Region 4 (7.7% of the total) are hiring in order to meet regulations or legislation. There were no other reasons given for hiring. The following table presents this information by region. Some employers may have indicated that both employee turnover and expansion of the operations were the reason for the new hires, as was the case in Region 6 which has one employer hiring one new employee due to both reasons.

Table 4
Employers Who Are Currently Hiring
By Region

	Number of Employers	Percent Hiring	Due to Employee Turnover	Due to Expansion of Operations
Region 1	9	15.0	66.7	44.4
Region 2	5	14.3	80.0	20.0
Region 3	2	6.3	100.0	0
Region 4	8	18.2	62.5	37.5
Region 5	1	5.0	0	100.0
Region 6	1	3.4	100.0	100.0
TOTAL	**26**	**11.8**	**69.2**	**38.5**

Source: W/WWT Employers Survey, November, 1992

According to survey findings, the number of employers currently hiring is very low. Howard Selover concurs with these findings in regards to wastewater openings. "There is no need for new people to enter the field of wastewater treatment; there aren't many openings." Neither does he predict a big hiring need for the future. He said he now has "operators calling and looking for jobs." He admitted that the DNR is introducing more regulations, but stressed that the DNR's upgrades "do not require more personnel." Selover concurred with MOIS by insisting that "the only way there will be a demand for operators is if there is more construction, and program grants for construction are down; state funds are currently being recycled."

The City of Detroit has the largest wastewater treatment system in the world; they employ 900 workers, 300 of which are operators or maintenance employees. Dennis Christie, (Superintendent), maintains that they will always need qualified people, and he has seen a trend within the last ten years of more qualified people. But, due to both "economic problems and the fact that we have a relatively young work force," he does not see them hiring any more employees in the short term. On the other hand, Christie foresees the new administration in Washington introducing more regulations which *may* entail more hiring. However, according to surveyed employers, "new regulations" are not causing more hiring in Michigan at this time.

It is important to consider the role of unions in this field when discussing hiring practices. Some municipal plants are unionized which can limit the amount of hiring done from the outside. Dan Stefanski, (Superintendent of Monroe Wastewater Treatment Plant), says that his "outside hiring is locked due to the union; jobs go out for union bids." Since neither DNR nor DPH

certification is yet a minimal requirement at his plant, he bids to "any eligible Teamster with a driver's license and a high school diploma." He has tried to get certification to be a requirement but has had no luck. He would like to see a wastewater program in the Detroit area, but he says that his hiring would still be conducted within the union system.

Several other employers agreed with Stefanski, and indicated that they go to the unions first when they were hiring. Typically, when asked "How do you recruit new entry-level employees?" employers responded:

"First we have to post jobs with the union, and then we go to newspaper ads."
"Promote from within our plant."
"Jobs are posted within the city and then we go to local papers if we don't find someone"
"Through the union."
"Use the union system, then place ads in the local papers."

However, not every plant is unionized, and as is evident from the above quotes, most go to the union first, but can then look outside. Some plants have managed to get certification to be a requirement for employment, and if no one in their local union is certified, going "outside" is necessary for these municipalities.

Although Selover and Christie concur that the current economy and work force are not conducive to additional hiring, and some say that hiring is controlled by contractual agreements, there are others who disagree. Otto Green, (Superintendent of a wastewater plant in Bay City), was instrumental in beginning programs at both Bay de Noc and Delta Community Colleges. In his words, this is a "Good field, good job." Unlike Selover, Green sees a need for a program in the Detroit area to both provide continuing education and to attract new students to the water and wastewater field. He tries to hire as many college graduates as he can; he believes the industry needs "good science students." His plant had a "30 percent turnover in the last three years." (They have thirty employees). His experience has been that "there are usually a lot more job openings than there are students."

Bill Cretens would also like to see another community college program in Michigan. He is the President of Williams & Works Operations Services in Grand Rapids. They are a private management, engineering and design firm which does contract operations with municipalities to manage and run their water or wastewater plants in Michigan and eight other states. They supply all the managers, operators and technicians, and Cretens emphasized that they are "*always* hiring." In fact, they have growth projections for "100 new employees within the next year, and aggressive growth plans for the next five years." Cretens wishes there were going to be "100 college graduates to fill these positions", since highly trained people are the key to their success. Cretens is a graduate of Bay de Noc, and believes that if Bay de Noc can be successful in the Upper Peninsula, "there is no reason why a community college near a metropolitan area could not succeed." In disagreement with Christie, he also maintains that there is a shortage now of well trained people. Cretens is willing to assist in starting a program in water or wastewater. He has a strong need for qualified people and he wants them to be community college graduates.

Some employers and industry contacts suggested that the field of industrial wastewater treatment has more demand for new employees than either water or wastewater treatment. But, unlike the municipal field, industries do not require certified employees to handle their wastewater and like the municipalities, many of these industries are unionized. Although some of their employees are certified, Ford Motor Company once tried to make certification a condition of employment but were unsuccessful. Ford is one of the industries which handles a lot of wastewater. Big corporations such as the "big three" automotive companies already have their own employees and training in place. Bill Gaines, who oversees all of the industrial wastewater programs for Ford, said "Approximately 80 percent of their operators come from the United Auto Workers (UAW) and 20 percent come from the outside," and he does not foresee this changing. Ford and other large industrial companies of this type have had industrial wastewater treatment processes in place for "fifteen to twenty years," and Gaines does not think that this is "a good place to go looking for new employment; they have reached their capacity by now." General Motors and Chrysler also use their own employees and do their own training.

Smaller and newer companies may have more of a need, but again, they are not required to hire certified workers, so there is no guarantee that they will have the funds or desire to hire someone from outside their company.

Qualifications for Employment

Employers were asked to identify which academic skills and personal qualities they look for in entry level personnel. Table 5 presents regional breakdowns of the desired personal qualities and academic skills for entry level employees.

Employers were asked what is the single most important quality or characteristic they look for when hiring water or wastewater employees. A wide range of responses were obtained by this question:

"Math skills and the ability to work with others."
"Work ethics, dependability, responsibility, and maturity."
"Science backgrounds."
"Honest, hard working, dedicated."

Some of the answers were related to knowledge and others were related to personal qualities. Employers were then asked how entry level personnel could be better prepared for employment:

"Education."
"Courses in hydraulics and chemistry."
"Math and science skills."
"Education in water quality."
"Education - biological and mechanical."

Table 5

Employers Rating Personal/Academic Skills
As "Somewhat To Very Important" For Entry Level Employees

	Region 1		Region 2		Region 3		Region 4		Region 5		Region 6		
Skills	#	%	#	%	#	%	#	%	#	%	#	%	TOTAL
Teamwork	59	98.4	35	100.0	29	93.5	44	97.8	20	100.0	29	100.0	**98.2**
Individual Initiative	59	98.4	35	100.0	31	100.0	45	100.0	20	100.0	29	100.0	**99.6**
Problem Solving	59	98.3	35	100.0	31	100.0	45	100.0	20	100.0	29	100.0	**99.6**
Mathematical Skills	60	100.0	35	100.0	29	93.6	44	97.7	20	100.0	29	100.0	**98.6**
Organizational Skills	58	96.7	35	100.0	30	96.8	45	100.0	20	100.0	28	96.5	**98.2**
Writing Skills	51	85.0	34	97.1	26	83.9	44	97.8	20	100.0	26	89.6	**91.3**
Good Speaking Skills	54	90.0	35	100.0	31	100.0	41	91.1	20	100.0	27	93.1	**94.6**
Computer Skills*	42	70.0	29	82.8	19	61.3	30	66.7	11	55.0	17	58.6	**67.3**

**The low ranking of computer skills conflicts with MOIS information which predicts that those with the most computer skills will be in the greatest demand. Conversely, according to the employer survey, this is not the case at this time.*

Source: W/WWT Employers Survey, November 1992

Almost all the answers to this question were related to education in some way; some wished their employees would take advantage of the current education available, others wanted new educational programs tailored to their specific needs.

Of the total employers surveyed, only 25 percent indicated that they had a difficult time finding entry level personnel. Table 6 gives a breakdown of this by region:

Table 6
Employers Indicating They Had A Difficult Time Finding Entry Level Personnel By Region

	Number	Percent
Region 1	17	28.3
Region 2	6	17.1
Region 3	10	32.3
Region 4	13	28.9
Region 5	4	20.0
Region 6	5	17.2
TOTAL	**55**	**25.0**

Source: W/WWT Employers Survey, November, 1992

Many reasons were given for the difficulty in finding new employees. Employers in Region 1 commented, "Upper Peninsula people don't like to relocate to Southeastern Michigan," and that there are "Not many qualified people," and "There are not many people available who have licenses." There were also comments regarding the union. "Having to abide by the union's seniority rules are hard. I get people who have been hourly for 20-25 years; by the time they are trained and taught, it is time for them to retire." Some also complained that there were no local training facilities.

Region 2 employers commented that it is difficult to find qualified people. "People do not have enough basic skills," and "It is difficult finding people interested in this job."

Employers in Region 3 said they have trouble finding people who are experienced. "Most people don't meet the qualifications listed in the ads." They also complained of a lack of local applicants. "There aren't many licensed people in this area, and those who are licensed outside of this area do not want to move here for the salary offered." "People are not willing to relocate." They also complained of a lack of education in this field.

Table 7

Employers Rating Specific Skills
As "Somewhat To Very Important" For Entry Level Employees

	Region 1		Region 2		Region 3		Region 4		Region 5		Region 6		
Skills	#	%	#	%	#	%	#	%	#	%	#	%	TOTAL
Algebra/Math	58	95.0	35	100.0	29	93.5	43	95.5	20	100.0	28	96.6	**96.4**
Utility Equipment Maintenance	56	91.8	34	97.1	28	90.3	45	100.0	20	100.0	28	96.5	**95.5**
Chemistry	57	93.5	35	100.0	25	80.7	38	84.4	19	95.0	27	93.1	**91.0**
Laboratory Procedures	54	88.5	35	100.0	26	83.9	38	84.4	18	90.0	28	96.5	**90.9**
Applied Hydraulics	51	83.6	35	100.0	28	90.3	41	91.1	19	95.0	27	93.1	**90.9**
Utility Electrical Maintenance	50	82.0	34	97.1	24	77.4	40	88.8	17	85.0	21	72.4	**84.6**
Microbiology	48	78.7	35	100.0	19	61.3	34	75.5	16	80.0	23	79.3	**79.2**
Environmental Laws/Regulations	45	73.8	25	71.4	22	70.9	35	77.7	17	85.0	21	72.4	**74.6**
Physical Geology/ Geography	3	6.7	6	30.0	13	42.0	3	6.7	6	30.0	13	44.8	**23.6**
Hydrogeology/ Ground Water	9	20.0	10	50.0	13	44.8	9	20.0	10	50.0	13	44.8	**30.8**

Employers in Region 4, stated that it is hard to find qualified people. "Finding qualified people is now difficult. We used to work with Grand Valley when they had an environmental program and that was very successful for us, but that program no longer exists." "Reliable, educated people are hard to find." As in Region 1, some said that "Bay de Noc students don't like to relocate too far."

Employers in Region 5 wished that their applicants "Had Bay de Noc skills." They also wished their employees were already certified and that they possessed more math, mechanical, and chemistry knowledge.

Region 6 also had its complaints. "I have had several people apply who were not literate and were unable to follow directions." "The people don't have the background." "We need more trained people." Some also mentioned that the union posting requirements were hindering them.

Employers were asked to further identify what specific skills they were looking for in their workers. Table 7 presents a regional breakdown of the desired skills for entry level employees.

Other skills identified by employers were:

"Good communication skills."
"Business administration."
"Accounting."
"Driving skills."
"Reading skills."

Retraining Opportunities

In order to move up through the state's licensing system (See Appendix C), public employees need to be trained in areas tested on the certification exams. Of the total number of employers surveyed, 63.7 percent said that they offer some type of in-house training and 89 percent said they take advantage of external training opportunities. Tables 8 and 9 provide a summary of these findings.

Table 8
Employers Who Offer In-House Training by Region

	Number	Percent
Region 1	49	81.7
Region 2	29	85.3
Region 3	12	38.7
Region 4	27	62.8
Region 5	4	21.1
Region 6	16	57.1
TOTAL	**137**	**63.7**

Source: W/WWT Employers Survey, November, 1992

Employers offer a range of internal training opportunities. Some examples include classes on safety; professional and development programs; mechanical and electrical training; maintenance and lab technology; CPR courses; quality control/quality assurance programs; equipment and systems training; repair and maintenance; preventative emergency training; public awareness courses; lab training; and chemistry, math and hydraulics classes.

Table 9
Employers Who Use External Training by Region

	Number	Percent
Region 1	52	85.2
Region 2	27	77.1
Region 3	27	90.0
Region 4	42	93.3
Region 5	19	100.0
Region 6	27	96.4
TOTAL	**194**	**89.0**

Source: W/WWT Employers Survey, November, 1992

External training is available in every region, and the majority of employers offer either reimbursement or advanced payment for these classes. Some also offer time off to complete classes or attend seminars. There are many different avenues available for external training; most of which are handled through the DNR and the DPH. There are also associations as well as private sector organizations which offer classes and seminars. Some of these include: the Michigan Water Environment Association; Detroit Ball Bearing; the American Water Works Association (Run out of the DPH); the Michigan Municipal League; the EPA; the Michigan Rural Water Association; Williams and Works Operations Services; and Dickson Engineering.

Community colleges and universities are also utilized for training needs. Some employers mentioned that they had employees enrolled at Delta Community College. Many said that they send their employees to local community colleges to take classes in such areas as math, chemistry, hydraulics, English, business law, safety, and quality training. Employees also are sent to the University of Wisconsin for engineering and computer classes and to Michigan State University for various seminars and courses. Correspondence courses out of Sacramento, California are also available.

Often a superintendent will independently organize a class and then find a place to conduct it, be it at a community college or in a conference room within one of the water or wastewater facilities.

The DNR occasionally offers classes on-site at the plants, and other times the employees must travel to the seminars. Some examples of the classes offered by the DNR are safety, site training, laboratory control, math courses, sludge handling and disposal, and pump repair. There are also various classes offered through the DPH, two of which are hydraulics and math.

There are some who advocate starting more training and continuing education throughout the state. Eric Way, (Certification and Training Specialist for the DPH), believes that the "Detroit area should be a good place to start an evening training program for employees who are working in the field since there are a lot of people who work during the day and live in the Detroit area." Starting in January, 1993, the DPH will begin mandating a continuing education requirement for those in the water field. Water employees will have to take classes in order to maintain their licenses. One might think that this would lead to additional class offerings, but there are now many training programs which will satisfy this requirement; even classes such as basic college chemistry will count.

Patrick Raferty, (Superintendent of the Trenton Wastewater Treatment Plant), usually has training funds left over at the end of the year. The amount of training that he needs "Just isn't out there." He would like to see more training offered in the evenings. He would like to see classes in general wastewater operation, activated sludge, and the operation of a treatment plant in general. He is aware of Delta's program, but believes that this is too far for his employees to travel for night classes. He is very interested in having new training programs in the Detroit area.

The Mt. Clemens Water and Wastewater Treatment Plant also has a yearly budget for training costs, which is common industry-wide. According to Chuck Bellmore, (Superintendent), the employees who want to move to the top of the ladder want to take more classes, but they have a hard time finding those classes. His plant usually has "thousands of dollars left over at the end of the year." He would love to put this money towards education if it was in line with what they need. A regular chemistry or biology course might not be enough; the classes need to be related to water or wastewater.

Mike Smith, of the Michigan Rural Water Association, believes there is "a lack of *specialized* training throughout the state." He would like to see more training in such specific areas as water bacteriology for lagoon operators and electrical/maintenance training. He says that although there are a multitude of classes available, some are too intellectual, some are too expensive, and some are too broadly focused. His association would like to work with community colleges in Michigan to get some programs started.

Richard Golder, (Superintendent at Marine City Wastewater Treatment Plant), is another employer who would like to see more classes offered in the evenings. He also wishes the classes were more tailored to water and wastewater. However, Golder was more cautious than others in championing the viability of additional training programs. He indicated that most of his employees "are older and would not see a benefit in further training or education." According to Golder, once the employees have "reached the certification of their plant, they only receive pay raises on the cost of living, and there is no incentive to study further." So even though he wants more training for his employees, he couldn't guarantee that they would participate.

Tom Trahey of the Michigan Water Environment Association is also ambivalent when it comes to continuing education. He says "There is a need for new programs, but there is a problem with motivating the employees to attend any outside training." But he admitted that this is partially a problem of the distance between his plant and the available training. He works in Genessee County, which he said is too far from Delta Community College where he would like to send his employees.

Howard Selover from the DNR argues that "all the upgrading which is needed is taken care of by our own training office." There are others who agree that there is limited need for more training or continuing education programs. A representative from the Michigan Municipal League in Ann Arbor reported that they believe the current training needs are "Pretty well covered." William Darmstaetter, (Superintendent of St Clair Wastewater Treatment Plant), believes that the training loads are "sufficiently handled now by the DNR, community college engineering or science courses, and classes offered by private firms such as Williams and Works Operations Services."

It is difficult to come to a conclusion as to how viable new degree programs or continuing education courses would be in Michigan. It sounds as though there may be enough need to sustain a new continuing education program in Region 1, but not everyone is in agreement.

Delta Community College did a needs assessment in 1990, and, based on the results, began a program in water and wastewater. According to Ron Sharp, (Program Coordinator at Delta), they were promised more participation from state-wide employers than they are receiving. They were told that there is a need for more continuing education in the state, but they have not experienced the enrollment they were anticipating.

Employee Benefits

Wage and Salary

Employers were asked for examples of entry level positions and the corresponding salaries. Table 10 identifies the average annual salary for positions identified by employers. The entry level positions described by employers fall under four general categories:

1) assistants/apprentices
2) mechanics/maintenance workers
3) operators
4) technicians/lab techs

Note: There is a fifth category which describes employees within engineering or environmental organizations which was titled "field worker." Due to the small number of "field workers" identified by employers, they were not included in the analyses. Often environmental firm employees were described as technicians, and were therefore included under the technician category.

Table 10
Average Salary
Based on Occupational Title

Assistant Operator	$19,039
Maintenance Worker	$19,244
Operator	$21,729
Technician	$21,831

Source: W/WWT Employers Survey, November, 1992

Both MOIS and Howard Selover, from the DNR, stated that entry level workers start as "assistant operators." According to MOIS, apprentices and assistant operators working for the City of Detroit in early 1991 had annual earnings of $17,971 - $24,866 which is in line with survey results. However, most of the employers surveyed (87%) stated that their entry level positions are titled "operator." Whether they meant "assistant operator" instead of "operator" is impossible to know. It is possible that some organizations have assistant positions, while others start at the "operator" level. The survey instrument was clear in asking for "entry level" positions, and since 87 percent of employers said that their entry level position was titled "operator," this is the title and salary used in the analyses. The following tables (Table 11 - Table 16) give a detailed breakdown of operator salaries by region.

Table 11
Region 1
Operators' Entry Level Salaries
Mean = $24,240

Annual Salary	Percentages of Organizations Offering this salary level
Less than $10,000	2.2
$10,000 - 14,999	4.3
$15,000 - 19,999	13.0
$20,000 - 24,999	32.6
$25,000 - 29,999	34.8
$30,000 or more	13.0
	N=46

Source: W/WWT Employers Survey, November, 1992

Table 12
Region 2
Operators' Entry Level Salaries
Mean = $24,240

Annual Salary	Percentages of Organizations Offering this Salary Level
Less than $10,000	0
$10,000 - 14,999	0
$15,000 - 19,999	30.8
$20,000 - 24,999	53.8
$25,000 - 29,999	11.5
$30,000 or more	3.8
	N=26

Source: W/WWT Employers Survey, November, 1992

Table 13
Region 3
Operators' Entry Level Salaries
Mean = $22,008

Annual Salary	Percentage of Organizations Offering this Salary Level
Less than $10,000	0
$10,000 - 14,999	0
$15,000 - 19,999	26.1
$20,000 - 24,999	60.9
$25,000 - 29,999	8.7
$30,000 or more	4.3
	N=23

Source: W/WWT Employers Survey, November, 1992

Table 14
Region 4
Operators' Entry Level Salaries
Mean = $20,051

Annual Salary	Percentage of Organizations Offering this Salary Level
Less than $10,000	0
$10,000 - 14,999	11.4
$15,000 - 19,999	25.7
$20,000 - 24,999	51.4
$25,000 - 29,999	11.4
$30,000 or more	0
	N=35

Source: W/WWT Employers Survey, November, 1992

Table 15
Region 5
Operators' Entry Level Salaries
Mean = $19,718

Annual Salary	Percentage of Organizations Offering this Salary Level
Less than $10,000	0
$10,000 - 14,999	6.3
$15,000 - 19,999	43.8
$20,000 - 24,999	43.8
$25,000 - 29,999	6.3
$30,000 or more	0
	N=16

Source: W/WWT Employers Survey, November, 1992

Table 16
Region 6
Operators' Entry Level Salaries
Mean = $20,475

Annual Salary	Percentage of Organizations Offering this Salary Level
Less than $10,000	0
$10,000 - 14,999	8.7
$15,000 - 19,999	34.8
$20,000 - 24,999	47.8
$25,000 - 29,999	8.7
$30,000 or more	0
	N=23

Source: WWWT Employers Survey, November, 1992

Occupational Desirability

Many employers voluntarily mentioned that job security is very high within the municipalities, and that health and retirement benefits are excellent. Others mentioned the low stress and what a "great job" it is. Otto Green stated, "This is a good job and a good field."

When employers were asked what they were looking for in entry level personnel, some said that they would like for new employees to not be embarrassed about working in a sewage plant. Perhaps this indicates a possible image problem for potential wastewater employees.

Advancement Opportunities

The outlook for advancement opportunities varies according to the individual view of the employer. Some employers are very optimistic in describing the unlimited opportunities available in this field. Others, especially in the smaller plants, say that there is no advancement for their employees. A majority of the smaller employers emphasized that unless they experience unexpected community growth in their area, their employees would have to move to larger cities if they want to advance. Some mentioned that municipal employees can move into consulting firms, engineering or ground water engineering firms, or to a state agency, such as the DNR. There are also opportunities within industrial pretreatment programs and with the EPA which has regulator, enforcer, and administrative positions. Employees could also consider becoming a wastewater design or irrigation specialist.

Most agreed that there are advancement opportunities in the form of reaching a higher certification level (See Appendix C). This does not always mean a new title, but a higher level license does bring a pay increase. A common path for a municipal plant employee who starts as a trainee is to move through various operator levels (such as Operator I, II, and III) to some form of supervision. According to MOIS, those who begin as trainees may advance to operators when they have satisfied the training, experiences and certification requirements. Advancing to superintendent is the highest level available in the individual water and wastewater plants. Superintendents need to be certified at the level at which their plant is certified (See Appendix C for further details).

Some municipalities contract with private firms to manage and run their water or wastewater facilities. Williams and Works Operations Services is one such contracting company often used in Michigan.

Some employers abide by union rules which dictate advancement paths, such as seniority taking precedence over certification. Almost everyone mentioned that there is not much turnover, and a lot of employers stressed that they always promote from within. (See Appendix F for all of the comments regarding career path options.)

Entering the Occupation

Level of Training Needed

Most people enter the occupation with a high school diploma or its equivalent. Usually, these employees are neither experienced nor certified; they enter the occupation and then complete on the job training provided by the employer. However, some do enter the occupation by obtaining an associate degree or an apprenticeship. Right now, in most cases, one can obtain the same position with a high school diploma as with an associate degree. Howard Selover from the DNR believes that sometimes an associate degree can be an advantage "depending on the union at the plant, the size of the plant, and the hiring supervisor." Table 17 describes the educational requirements for entry level employment as indicated by surveyed employers.

Table 17
Level of Educational Preparation Required

Educational Level	**Percentage Who Require**
No Requirements	3.2
High School Diploma	91.3
One Year Certificate	0.5
Associate Degree	7.8
Bachelor Degree	0.9
Other*	4.9
	N=219

**These numbers total to more than 100% because some answered yes to more than one, such as "a high school diploma and a truck driver's license".*

Source: W/WWT Employers Survey, November, 1992

Employers also indicated other requirements such as:

"Additional training for Boiler Class license of Steam Class license."
"A valid driver's license."
"Some college chemistry"
"High school chemistry and physics."

There were seventeen employers who said they require an associate degree. Ten of these employers are in Region 1, six are in Region 4, and one is in Region 6. Two employers stated they require a bachelors degree; both of which are environmental engineering firms.

In addition to educational requirements, every facility which discharges to ground or surface water is required by state law to have a certified worker. Both facilities and employees are "certified," which means they are licensed by the State.

Some of the facilities surveyed (approximately 43%) require their entry level employees to be certified at a specific level; most often at the lowest level. Most employers have a grace period in which an employee can be trained and prepare for the certification exam and continued employment often hinges on one passing this exam. State law requires the superintendent of each facility to be licensed at the level of the plant. So, if there is a one person operation, then he or she must be licensed at the plant's certification level. Employers were asked whether or not they require their entry level operators to be certified which resulted in a variety of responses:

"F=4 license one year after being hired."
"F=4 license within two years of being hired."
"It's not mandatory to get a license, but four people have the B license."
"Prefer them to be certified but it's not required by the state because we dump *into* a municipality."
"D license within two years of being hired."

Currently Available Programs

According to the Michigan Department of Education's Michigan Community and Junior Colleges Enrollment Data Profile, in 1989-1990 there were 58 men and eleven women enrolled in a water or wastewater technology program at the community college level. At this time (1989 - 1990), Bay de Noc was the only community college in Michigan offering a water and wastewater program recognized by the DNR and DPH. However, there were universities offering two year programs in this field as well.

Bay de Noc Community College Bay de Noc has had a successful program in Water Purification Technology since 1969. There were 70 students in the program as of September, 1992. In 1991 there were 80 students and 18 graduates; in 1990 there were 71 students and 16 graduates; and in 1989 there were 62 students and 15 graduates. Barbara Hauser, the Program Director, said "All students are placed easily, there is more demand than supply. Placement has been 100 percent to date. There are employers all over the country." Bay de Noc also places students in Wisconsin and other states throughout the country. Students are required to complete a co-op program consisting of a month of working at a water treatment plant and one month at a wastewater treatment plant. Their program is certified by both the DNR and the DPH. As a result, immediately following graduation, their graduates take the state examinations for municipal water and wastewater operator certification. However, the program does not offer a course in industrial wastewater treatment. According to Hauser, this would be hard to do; as municipal plants are relatively standard, industries are infinitely different. They do train for industrial treatment within some of their standard courses. Hauser has seen more jobs within industrial pretreatment in the past few years, in addition, she has seen more and more young people entering the program as a whole. Bay de Noc's students are not enrolled for continuing education; most of them are recent high school graduates.

Delta Community College Delta developed a program in water and wastewater treatment in 1991. It was certified by the DNR and the DPH in May of 1991 and twenty students enrolled in the Fall 1991 term for classes offered in the evenings. As with Bay de Noc's program, Delta's has an internship component. As of Fall semester, 1992, they have seventeen students and no one has yet graduated. They tried to offer these classes during the day, but they were not filled. Unlike Bay de Noc, most of Delta's students are currently employed in the water and wastewater field and are enrolled for continuing education.

Northern Michigan University Northern had a two year water and wastewater program which was dissolved in 1988. In 1990 they introduced a one year certificate level program in wastewater and had two students in their first classes. These two students did not graduate; they were hired by the municipal facilities in which they were doing their internships. In 1991

Northern had 14 students and in 1992 they had 24. None have graduated yet, because in addition to the one year of classes, there is a required internship for a year which is set up by the university for each student. This certificate program has also been certified by the DNR. According to Walter Anderson, the Department Head, Northern is "Ahead of the curve" with this; they would like it to become an associate degree program. Bonnie Pergandy, one of the secretaries for the program said that people are "Screaming for help." There are now 24 students in the two year old program, and none of them are engaged in continuing education in the field; they are all moving into the water and wastewater field for the first time. Their curriculum deals with both biological and chemical wastewater treatment and they have their own laboratory facilities. Northern does not offer a program in water treatment because they have found that there are many more jobs available in wastewater. Anderson stresses that they have been successful working with unions when placing college graduates, and that the national job market is good.

Lake Superior State University Lake Superior State offers an associate degree in Water Quality Technology which has been in place for approximately twenty years. They also have courses in wastewater; one of their instructors works in a nearby wastewater treatment plant. There is a one semester mandatory internship, which can be either in the water or wastewater field. LSSU has found quite a demand for their students; most of them go to work for municipalities. In 1992 they had seven graduates, and in 1991 they had nine.

Henry Ford Community College Henry Ford has wastewater modules which are inserted into their powerhouse/building engineer training program. Gary Saganaski, the Director of the Corporate Training Office, reported. "Henry Ford found no occupational demand for those skills, so they cannot justify creating a water or wastewater program." They also found that "industry hires only from within and does their own training."

Employers' Interest Levels

Thirty percent of all employers surveyed said they would offer a paid internship to students in a water or wastewater program, and 45.2 percent said they would offer an unpaid internship. Table 18 gives a breakdown of these employers by region. In addition, some organizations said they would offer *either* an unpaid or a paid internship. See Appendix D to find specific employers who are willing to offer either paid or unpaid internships.

Table 18
Employers Who Would Offer an Internship by Region

	Paid	Unpaid
Region 1	32.7	40.7
Region 2	28.6	40.0
Region 3	14.3	24.1
Region 4	33.3	60.0
Region 5	35.0	40.0
Region 6	34.6	62.1

Source: W/WWT Employers Survey, November, 1992

Perhaps one of the most valuable outcomes of this assessment is that 66.1 percent of the total employers surveyed said they would be willing to help in the design or development of a water or wastewater program. Appendix D identifies those employers in each region.

Colleges are not required to go before the DNR or DPH in order to start a program or to create a curriculum. But once a student completes a program, they will need to be licensed by the DNR and the DPH eventually, and this can be a requirement for employment. Therefore, it helps if the curriculum gears the student towards this examination. Also, there is an experience requirement to take the exam and in some cases the length of experience required can be replaced by attaining an associate degree attainment. For example, Class "D" certification means a high school diploma and one year of experience. Delta college was able to offer the associate degree in lieu of the one year of experience; their graduates can still take the state's "D" exam even though they may not have a full year of experience. All of the DNR or DPH approved programs have an internship component. If a student is not in a board approved program, they would have to work for three months to a year before fulfilling the experience requirement needed to take the exam.

SUMMARY

There are differences in opinion as to whether a new community college level water and wastewater program is a viable option at this time. According to the MESC office, supply and demand are currently in balance, and there is not a prediction for new job openings within the near future. Neither did the employer survey utilized for this study uncover a noteworthy need in Michigan for new employees in the water or wastewater field. However, some do believe that there is a need in Michigan for new entrants in these two fields; a need greater than current programs can provide. Some also believe that there is an unmet national need, which was not measured by this study. Yet, one firm, Williams and Works Operations Services, may have a hiring need which could itself justify a new program.

An associate degree, while preferred by a few, has a very slight, if any, advantage over a high school diploma at this time. However, employers all spoke favorably of the associate degree programs which are now in place. These programs are geared toward placing graduates in municipal plants, although some graduates do go to work for consulting firms, state and federal regulatory agencies or laboratory operations. Based on this study's information, the students in these programs are having no trouble finding jobs.

APPENDIX A

EMERGING TECHNOLOGY GRANT

Schoolcraft College

18600 HAGGERTY ROAD • LIVONIA, MICHIGAN 48152-2696
313/462-4400

July 2, 1992

Jim Folkening, Supervisor
Michigan Department of Education
P. O. Box 30008
Lansing, MI 48909

Dear Jim:

I have enclosed a proposal for a Consortium Planning Grant through the Michigan Department of Education. Oakland Community College and Schoolcraft College are interested in jointly studying and developing an Environmental Science/Studies curriculum.

Oakland Community College would serve as the fiscal agent for the grant and provide overall coordination for the project. We are interested in working with any other colleges who might be interested from the Southeastern Michigan area, and hope that you can provide assistance in identifying these colleges. We plan to start the project by August 1 (although we will conduct the literature search in July).

If you have any questions, please call me at 313-462-4454 or Marty Orlowski at 313-471-7746.

Sincerely,

Denise Sigworth, Director
Grants and Institutional Research

DS/sew

Enclosure

cc: Martin Orlowski ✓
Conway Jeffress
Lou Reibling

EMERGING TECHNOLOGIES CONSORTIUM

The Southeastern Michigan Environmental Science Consortium

Purpose: Schoolcraft College and Oakland Community College are seeking support from the Michigan Department of Education, Higher Education Management Services, Community College Services Unit, to research, and if warranted, develop an Environmental Science Associate Degree program for the two schools.

Background: For the past several months, Washtenaw Community College, Macomb Community College, Oakland Community College and Schoolcraft College have been meeting on a regular basis to coordinate various research activities. The colleges have been sharing needs assessments, evaluation tools, and assessment processes. Through the course of these meetings, both Schoolcraft and Oakland expressed a desire to develop a program in Environmental Sciences. Oakland Community College recently completed a scanning report which identified various aspects of this field of study. First, there are over 25 job titles that are related to the Environmental Sciences. Secondly, there is a need to further document potential employers in southeastern Michigan of program graduates. And, thirdly, there is a need to prepare a task analysis of key job competencies and required educational degrees needed to work in this field.

During this past year, Schoolcraft College completed a committee review during which all available career publications at the local, state and national level were studied. Based on these findings, it was the recommendation of the committee to conduct a full needs assessment.

Current Needs: Schoolcraft and Oakland prefer to jointly assess and develop this new program. This would allow the two schools to develop curricula that, although not duplicative, would result in broad based planning of basic courses. Oakland's goals are to develop two programs: the first is a transfer program in pre-Environmental Sciences that would allow students to transfer to four-year college programs. The second program is an extension of the Alternate Energies Technology/Energy Management program to an Environmental Studies/Energy Management program.

Schoolcraft College has been approached by industry representatives to review the potential for a Waste Management program. In addition, faculty from the sciences are interested in developing an articulated pre-environmental sciences program with 4 year Bachelor of Science programs.

Proposed Needs: Schoolcraft and Oakland have identified the need to survey local employers to determine the employment outlook and job competencies for students who wish to enter these programs. Here-to-date no such assessment has been done in Southeastern Michigan. The Southeastern Michigan Environmental Science Consortium will work with other consortia and existing programs to collaborate findings and coordinate program development.

There are several activities that have been identified to occur during a 6 month time period.

Methodology: A literature search will be conducted which documents all recent developments in Environmental Science. This literature search will include state and national initiatives (such as grant and bond funding of programs), educational program development, and job outlook and projections. There will be a review and examination of the reference material. A focus group,

comprised of industry leaders and faculty from each of the colleges, will be responsible for overseeing the program development. Their role will be threefold: 1) they will review the literature and collaborate the findings; 2) they will review the survey to determine the validity of the instrument; and 3) they will provide input on the development of the program if the assessment warrants the development of a program.

The survey instrument will be developed by a primary researcher. The survey will be conducted by phone by a team of interviewers. Approximately 100 employers in Southeastern Michigan will be surveyed. In addition, another 20 employers and experts will be interviewed indepth. Employers will be identified by a variety of sources. One will be general business databases (such as Dun & Bradstreet). Another, and better source, is the mailing list of businesses that are part of state organizations (i.e. Association for Energy Engineers Mailing List, Independent Energy Industry Directory). The Yellow Pages will also be incorporated into the study. A final potential for names of employers is the classified ads of the Detroit News.

The survey results will be analyzed using a PC based statistical program. The final report will highlight the key areas of the assessment. All throughout the process, the focus group will review drafts, provide input and link information to workplace training needs.

The survey will focus on four major areas: employment outlook, job competencies, definitions of technical terms, and training and upgrading occurring in industry.

The final report will cover in detail the four major areas, as well as discuss the educational opportunities and transferability of courses to other colleges.

STATE OF MICHIGAN

DEPARTMENT OF EDUCATION

P.O. Box 30008
Lansing, Michigan 48909

ROBERT E. SCHILLER
Superintendent of
Public Instruction

September 22, 1992

MEMORANDUM

TO: Occupational Education Contact Persons

FROM: James H. Folkening

SUBJECT: Emerging Technologies Consortium -- Environmental Science

Oakland Community College and Schoolcraft College have applied and been approved for an Emerging Technologies Grant to assess the need for an occupational program in Environmental Science. On September 29th at 10:30 a.m. the Environmental Science Consortium will hold its first meeting. Any community college currently planning to develop an Environmental Science program may want to send a representative.

The purpose of the meeting is to discuss the process of new program development, the diversity of environmental science and which areas will be studied, and the persons who need to be involved.

If you are interested in attending this meeting, please contact Martin Orlowski, Oakland Community College, 313/471-7746, Denise Sigworth, Schoolcraft College, 313/462-4454, or Jerry Forrest, Community College Services Unit, 517/335-0405.

JHF:pc

cc: Community College Presidents ✓
C. Danford Austin, Associate State Superintendent
for Postsecondary Education
Gary D. Hawks, Deputy Superintendent
for Public Instruction
Ron Root, Director
for Higher Education Management Services

Oakland Community College
Environmental Needs Assessment
1992-93 Consortium Grant #7021-3

Budget:

Item	Amount	Rate	Hours	Descriptions
Primary Research	$3000.00	$12.00	250	Approximately 6 months
Interviewers	$350.00	$7.00	50	Survey of 100 employers
Secretarial Support	$240.00	$10.00	24	Typing, copying, etc.
Focus Group	$450.00			Includes meeting expenses (no salaries)
Documents/Reports	$600.00			Supporting materials
Literature Search	$400.00			Examination and collection of reference material
Travel	$125.00	.28 per mile		Mileage (based on college rat
Phone	$450.00			Employer and expert interviews
Copying	$150.00			Supporting material, final report
Sub-total:	$5765.00			
8% Indirect	$461.20			
TOTAL	$6226.20			

Approved
9/16/92

OAKLAND COMMUNITY COLLEGE
ORCHARD RIDGE CAMPUS • 27055 ORCHARD LAKE RD. • FARMINGTON HILLS, MICHIGAN 48018 • 313-471-7500

October 2, 1992

Dear Environmental Science Emerging Technologies Consortium Members,

As a follow-up to our September 29, 1992 meeting, I have prepared the enclosed summary of our discussions. This first meeting was very productive in establishing clear direction in terms of beginning to identify possible environmental science programs which might be developed at our institutions.

I have also included a list of all consortium members along with their institution, phone number, and fax number. If you should have any questions throughout the research process, please do not hesitate to call me at (313) 471-7746.

Sincerely,

Martin A. Orlowski,
Director
Institutional Planning & Analysis

Enc. Meeting Summary
Consortium Membership List

pc: J. Forest
D. Jaksen

/s

ENVIRONMENTAL SCIENCE EMERGING TECHNOLOGY CONSORTIUM
September 29, 1992 Meeting Summary

1. The status of Environmental Science programs at each college was discussed. As a result of this discussion it became apparent that considerable diversity exists between colleges in terms of developing and implementing Environmental Science programs. This further highlighted the evolving nature of the field.

2. It was decided that two specific areas would be assessed under the current grant; Water/Waste Water and Hazardous Waste (solid).

3. Information gained in the current research would begin to identify other potential curriculum for development including: pre-environmental science, soil testing etc.

4. The process for conducting the needs assessment was outlined and included the following steps:

    -Literature review
    -Examination of existing college and university programs
    -Employer survey by region
    -Employer focus group
    -In depth interviews with local, regional and national experts

5. Additional grant funding will be sought in order to compensate for the geographic diversity of consortium member institutions. This will enhance the validity and reliability of employer information which is regionally based.

6. Consortium members will be kept informed through Fax and phone conversations in order to reduce costs associated with travel.

7. Consortium members expressed interest in investigating possible articulation agreements with four year colleges and universities.

8. In order to ensure a broad based approach to the research process each consortium member will provide to the primary researcher by October 14, 1992 the following information:

    -List of experts including names, phone numbers, and addresses.
    -List likely employers including contact people and phone numbers.
    -List of colleges and universities that have similar or related programs.
    -Copies of recent studies that describe community/employer needs.

APPENDIX B

CONSORTIUM MEMBERSHIP

CONSORTIUM MEMBER LIST

Marty Orlowski
Director - Institutional Planning & Analysis
Oakland Community College
Orchard Ridge Campus
27055 Orchard Lake Road
Farmington Hills, MI 48334-4579
(313) 471-7746
(313) 471-7544 FAX

David Doidge
Dean, Academic Services
Oakland Community College
27055 Orchard Lake Rd.
Farmington Hills, MI 48334
(313) 471-7707
(313) 471-7544 FAX

Kay Palmer
Research Assistant
Office of Institutional Planning & Analysis
Oakland Community College
Orchard Ridge Campus
27055 Orchard Lake Road
Farmington Hills, MI 48334-4579
(313) 471-7746
(313) 471-7544 FAX

Cathy Augustine
Primary Researcher
Office of Institutional Planning & Analysis
Oakland Community College
Orchard Ridge Campus
27055 Orchard Lake Road
Farmington Hills, MI 48334-4579
(313) 471-7746
(313) 471-7544 FAX

Denise Sigworth
Director - Grants and Institutional Research
Schoolcraft College
18600 Haggerty Road
Livonia MI 48152-2696
(313) 462-4454
(313) 462-4470 FAX

Midge Carleton
Assistant Dean Allied Health
Schoolcraft College
18600 Haggerty Road
Livonia MI 48152-2696
(313) 462-4528
(313) 462-4543 FAX

Till Peters
Dean of Occupational Education
Grand Rapids Junior College
143 Bostwick Ave NE
Grand Rapids MI 49503
(616) 771-3920
(616) 771-3907 FAX

Rebecca Wieland
Assistant Dean - Occupational Programs
Delta College
University Center, MI 48710
(517) 686-9472
(517) 686-8736 FAX

Robert Welch
Faculty Advisor/Instructor
Lansing Community College
419 North Capitol Avenue
Lansing MI 48901-7211
(517) 483-9675
(517) 483-9619 FAX

Larry Kodoski
Faculty
Auburn Hills Campus
2900 Featherstone Road
Auburn Hills MI 48326-2845
(313) 340-6818

Eldon Enger
Professor of Biology
Delta College
University Center MI 48710
(517) 686-9244

Janet Dettloff
Department Head - Life & Physical Sciences
Wayne County Community College
801 Fort Avenue, Detroit MI 48226
(313) 496-2740
(313) 496-0451 FAX

Donald Olson
Dean of Vocational & Career Education
Wayne County Community College
801 Fort Avenue, Detroit MI 48226
(313) 496-2859
(313) 496-0451 FAX

Dick Cookman
Faculty
Northwestern Michigan College
1701 E Front Street, Traverse City
MI 49684
(616) 922-1264

John Cooper
Dean of Career & Occupational Education
Kellogg Community College
450 North Avenue
Battle Creek
MI 49017-3397
(616) 965-3931 x2357
(616)965-4133 FAX

Charles Dee
Dean of Instruction
Mid Michigan Community College
1375 South Clare Avenue
Harrison MI 48625-9447
(517) 386-7792

APPENDIX C

STATE CERTIFICATION GUIDELINES

STATE OF MICHIGAN
REQUIREMENTS FOR CERTIFICATION

Under Act 399, P.A. 1976
and
Administrative Rules
for
Water Treatment & Distribution System Operators

R 325.11910. APPLICATION FOR EXAMINATION; NOTICE TO ACCEPTED APPLICANTS OF EXAMINATION.

Rule 1910. (1) To be certified for the operation of a treatment system or a distribution system, an individual shall submit, to the department, not less than 45 days before the announced examination date, an application for examination on a form provided by the department. The information contained on the application shall be evaluated by the department, shall be subject to review by the advisory board, and shall constitute a part of the examination. The department may require verification of the education and experience of an applicant for an examination.

(2) Not less than 15 days before the examination, the department shall notify all applicants of its findings and shall notify those applicants accepted for examination of the date, time, and place of the examination.

R 325.11911. APPLICANT FOR CERTIFICATION; GRADING.

Rule 1911. (1) An applicant for certification shall be graded in 4 major divisions as follows:

(a) Educational qualifications of the applicant.
(b) Experience qualifications of the applicant.
(c) The written examination.
(d) The laboratory examination.

(2) An applicant shall satisfy the minimum criteria established by the department as outlined in table 1 for educational qualifications before admission to the written examination.

(3) Criteria used for grading shall be determined by the division subject to the approval of the advisory board and shall be made available by the department.

(4) An applicant for certification may be required to submit, to the division, on request, names of persons familiar with the experience qualifications of the applicant.

R 325.11915. RENEWAL REQUIREMENTS.

Rule 1915. (1) A certificate, other than a class D-SL certificate, shall be renewed on a 3-year cycle. For purposes of coordinating the expiration dates for certificates of persons who hold certificates in multiple categories, the renewal period may be more than 3 years. To renew a certificate, a certificate holder shall submit, to the department, not less than 45 days before the certificate expiration date, an application for renewal on a form provided by the department.

(2) To have a certificate renewed, a holder of a certificate other that a class F-4, D-4, or S-4 certificate shall have been actively working in a waterworks system and shall have completed, during the previous renewal cycle, not less than 24 hours of advisory board-approved training or continuing education, regardless of the category or class or number of certificates held. To have a class F-4, D-4, or S-4 certificate renewed, a certificate holder shall have been actively working in a waterworks system and shall have completed, during the previous renewal cycle, not less than 12 hours of advisory board-approved training or continuing education.

D11.7 10/92 Authority: Act 399, P.A. 1976

WATER TREATMENT AND WATER DISTRIBUTION CERTIFICATION EXAMINATION PROCEDURES

There are three examination categories, "F" for Filtration, "D" for Limited Treatment and "S" for Distribution. Each category has various levels, 1-4. The "1" level represents the upper most level and the "4" level is considered the entry level. The treatment (F and D) exams are scheduled for the first Thursday in May. The distribution (S) exams are scheduled for the first Thursday in November. The F-3 and entry level exams are given on both of these days.

1. **Starting Time:** Exams begin at 8:30 a.m. (local time). An applicant may not be allowed to write an exam if (s)he arrives at the examination site later than 8:30 a.m. Applicants are encouraged to arrive at the exam site by 8:15 a.m.

2. **Exam Classification & Level Approval:** It is expected that the applicant will write the exam(s) that they were approved to write.

3. **Number of Exams:** An applicant may write up to two (2) examinations except that an applicant may write all three entry level examinations at one sitting. The applicant should decide which exam (s)he wants to write first, but the applicants cannot look over the exams to decide. If an applicant arrives at the exam site approved to write a particular examination but decides (s)he would rather write a lower level exam in the same classification, (s)he may do so providing:

   a. Extra exams are available
   b. (S)he has been approved for a higher level exam
   c. (S)he does not review the higher level exam prior to making the decision not to write it.

4. **Applicants writing F and D examinations may also be required to take a laboratory examination.** Such applicants writing an F exam at the following locations are expected to take the lab exam on exam day: Detroit, Escanaba, Lansing, Marquette, Port Huron, Saginaw or Wyoming. Such applicants writing an F exam at other locations will be contacted later and a lab exam scheduled. Such applicants writing a D examination at any location are expected to take the lab exam on exam day.

5. **Cheating:** Examinees found to be cheating during the examination forfeit the exam and may not be allowed to write the exam again until approved by the Advisory Board.

6. **Make-Up Exam:** Make-up exams will only be given where an emergency prevents the applicant from writing the regularly scheduled exam. Applicants requesting a make-up exam must notify the department, in writing, within six (6) business days from the date of the scheduled exam with a valid reason for requesting a make-up examination. Make-up exams will be conducted in Lansing or Escanaba. There is no make-up exam for applicants writing the F-3, F-4, D-4 or S-4 examinations because these exams are offered twice each year.

7. **Grading of Exams:** Examinations are based on a final grade of 100% for perfect examinations. 60% is considered a passing grade. Partial credit may be given on particular questions, such as those involving calculations, definitions or short answers. On questions involving calculations, applicants must show all work. Answers without accompanying calculations and solutions will receive no credit. In the event the applicant receives a grade of 55-65%, the examination will be regraded. At least one other person grades the examination without knowledge of the previous grade to assure that no errors are made.

8. **Release of Scores:** Exam scores will be reported out on the official examination notification letter, within 45 days from the date of the examination. Please do not call the Division of Water Supply for a score during this time period.

9. **No Shows and Exam Failures:** If an applicant fails to show up for a particular examination twice, notification may be sent to the applicant's employer. If the number of times an applicant fails to show up for an exam and the number of times (s)he fails the exam adds up to three, it may be considered that (s)he has failed the exam three times. The applicant must then work with the district engineer to develop and complete a training program before they will be allowed to write the same or higher exam again (see item 10b). If an applicant, prior to an exam or on exam day, notifies the Division of Water Supply of a conflict or emergency situation which prevents them from writing, they will not be considered as a no show.

10. **Failures and Low Scores:**
    a. An operator who fails a particular certification examination with a score greater than 40% will be advised that (s)he should review suggested text prior to writing the next exam. This study effort could be in several forms; ie., formal courses, AWWA and MDPH sponsored applied courses, regional meetings, or other pertinent forms of training.
    b. An operator who fails with a score of 40% or less or who has failed the same level examination three times may not be eligible to write again until (s)he demonstrates that (s)he has been studying to prepare for the next exam. The operator must contact their district engineer to discuss areas of difficulty and consider a course of action. Once understood and agreed upon, the operator must accomplish the program laid out.

    In addition, the supervisors of the applicant failing an examination for the third time will be notified that significant preparation and review will have to be demonstrated before the applicant will be permitted to write again.

11. **Written Examinations:** The written examinations for all classifications are developed from need-to-know type exam questions. The design of the questions has been selected so that they are clear, not misleading or tricky. The style and number of questions per exam may change without notification.

Style of Questions:	**The number of questions per exam are:**	
True or False	**Exam**	**Number of Questions**
Problems/Calculations		
Matching/Multiple Choice	**S-1, D-1**	**25**
Short Answer: Define, Describe,	**F-1, F-2, F-3, F-4**	**20**
List, Name, Identify, Complete	**S-2, S-3, D-2, D-3**	**20**
	S-4, D-4	**15**

12. **Exam Content: The subjects typically covered on the various certification examinations are as follows. These subjects may change without notification:**

COMPLETE TREATMENT - F CLASSIFICATIONS

Alkalinity, Bacteriology, Chemistry, Chlorination, Coagulation-Flocculation, Contingencies & Emergencies, Corrosion, Cross Connections, Customer Relations, Filtration, Fluoridation, Hydraulics, Instrumentation, Laboratory, Management, Miscellaneous, Operation & Maintenance, Other Disinfectants, Plankton, Pretreatment, Pumps & Motors, Recordkeeping, Safety, Sampling, SDWA (Act 399), Sludge, Softening, Source, Storage, Taste & Odor, THM's-Organics

LIMITED TREATMENT - D CLASSIFICATIONS

Bacteriology, Chlorination, Contingencies & Emergencies, Corrosion, Cross Connections, Customer Relations, Fluoridation, Hardness/Softening, Hydraulics, Instrumentation, Iron Removal, Management, Miscellaneous, Operation & Maintenance, Phosphate, Pumps & Motors, Recordkeeping, Safety, Sampling, SDWA (Act 399), Taste & Odor, Wells

DISTRIBUTION - S CLASSIFICATIONS

Bacteriology, Chlorination, Contingencies & Emergencies, Corrosion, Cross Connections, Customer Relations, Hydrants, Hydraulics, Instrumentation, Main Installation, Management, Meters, Miscellaneous, Operation & Maintenance, Pipes & Joints, Pumps & Motors, Recordkeeping, Safety, Sampling, SDWA (Act 399), Storage, Valves, Water Quality

SUBSTITUTION OF EXCESS EXPERIENCE TOWARD EDUCATION

Excess experience only, can be substituted for education. This excess is based on exceeding the minimum points for the highest class in a category, for example, the F-1 requires 60 experience points. Therefore, if a person was applying for an F-3, (s)he would need 15 experience points to satisfy experience credit but (s)he would not begin calculating excess experience until after accumulating 60 experience points. Each excess experience point is worth 1/2 point of education with a maximum of 10 education points.

POINTS REQUIRED TO WRITE AN EXAMINATION

EDUCATIONAL QUALIFICATIONS

F-1	80	D-1	70	S-1	70
F-2	70	D-2	60	S-2	60
F-3	60	D-3	50	S-3	50
F-4	50	D-4	40	S-4	40

EXPERIENCE QUALIFICATIONS

F-1	60	D-1	48	S-1	48
F-2	30	D-2	24	S-2	24
F-3	15	D-3	12	S-3	12
F-4	3	D-4	6	S-4	6

F-1 Education Requirements--The 80 education points must include a high school education or equal and either two years of formal college credit or the equivalent. The equivalent is comprised of a list of "Required" and "Optional" courses determined by the Advisory Board. These courses are shown on page 6 of this document.

SCHEDULE OF POINTS GIVEN FOR FORMAL EDUCATION

8th Grade	40
H.S. or Equivalent	60
2 yr. Associate Degree	70
Bachelor Degree	70
Advanced Degree	70

	Approved Two Year	
*	Water-Wastewater Tech.	80
**	B. S. in Engineering, Chemistry or Bacteriology	80
**	Advanced Degree in Engineering, Chemistry or Bacteriology	90

EDUCATION POINTS ALLOWED AS SUBSTITUTION FOR EXPERIENCE

		F-1	F-2	F-3	F-4	D-1	D-2	D-3	D-4	S-1	S-2	S-3	S-4
**	Science B.S.	12	9	6	0	12	9	6	3	12	9	6	3
**	Advanced Degree	18	12	6	0	18	12	6	3	18	12	6	3
	Bachelor Degree	4	4	0	0	2	2	0	0	2	2	0	0
	Advanced Degree	4	4	0	0	2	2	0	0	2	2	0	0
*	W/WW Tech	0	0	0	3	0	0	0	6	0	0	0	6

* Curriculum approved by Advisory Board

** Degree must be in Engineering, Chemistry or Bacteriology

MAXIMUM POINTS ALLOWED AS EXPERIENCE IN ALLIED FIELDS

	F	D	S
Professional Engineer in Responsible Position of Water Design or Construction When Related to Water Works System	12	12	12
Registered Sanitarian in Public Health -- Work Related to the Control and Operation of Water Supplies	---	3	3

Applicants holding multiple MDPH certificates or multiple DNR certificates may apply points from only one certificate

MDPH Water Treatment Certificate F-1	---	---	18
MDPH Water Treatment Certificate F-2	---	36	12
MDPH Water Treatment Certificate F-3	---	24	6
MDPH Water Treatment Certificate F-4	---	12	---
MDPH Limited Treatment Certificate D-1	3	---	12
MDPH Limited Treatment Certificate D-2	---	---	6
MDPH Water Distribution Certificate S-1	3	12	---
MDPH Water Distribution Certificate S-2	---	6	---
DNR Wastewater Treatment Certificate A	18	18	---
DNR Wastewater Treatment Certificate B	6	6	---

NUMBER OF FULL CATEGORIES WORKING IN	POINTS/ MONTH	ALLOWABLE EXAM LEVEL	EXPERIENCE QUALIFICATIONS MUST INCLUDE
4	1	S-1	Working in 4 or more full categories* for 1 year AND 1 year of operating experience in a S-1 or S-2 system.
3	1/2	S-2	Working in 3 or more full categories* for 1 year.
2	1/2	S-3	Working in 2 or more full categories* for 1 year.
1	1/2	S-4	
1/2	1/4	S-4	

NUMBER OF FULL CATEGORIES WORKING IN	POINTS/ MONTH	ALLOWABLE EXAM LEVEL	EXPERIENCE QUALIFICATIONS MUST INCLUDE
4	1	F-1	Working in 4 or more full categories* for 1 year AND 1 year of operating experience in a F-1 or F-2 plant.
3	1	F-2	Working in 3 or more full categories* for 1 year AND 1 year of operating experience in a F-1, F-2 or F-3 plant.
2	1/2	F-3	Working in 2 or more full categories* for 1 year AND EITHER 1 year of operating experience in an F plant or hold an "A" Wastewater Treatment Certificate.
1	1/2	F-4	

NUMBER OF FULL CATEGORIES WORKING IN	POINTS/ MONTH	ALLOWABLE EXAM LEVEL	EXPERIENCE QUALIFICATIONS MUST INCLUDE
3	1	D-1	Working in 3 or more full categories* for 1 year AND 1 year of operating experience in a D-1 or D-2 plant.
2	1/2	D-2	Working in 2 or more full categories* for 1 year.
1	1/2	D-3	Working in 1 or more full categories* for 1 year.
1	1/2	D-4	

*Experience points awarded from allied fields and/or education MAY supersede requirements for working in full categories.

EDUCATION - F-1 APPLICANTS

F-1 candidates must be a high school graduate or equal, and must earn 80 education points to be eligible to take the written examination. This education requirement includes two years of formal college credits or the equivalent "required" and "optional" courses listed below. Each application will be thoroughly evaluated so that the operator will be given all the substitution credits (s)he is entitled to under the guidelines.

This list of courses will be provided to each treatment plant operator at the time (s)he is notified that (s)he has successfully passed a lower classification (F-2, F-3, F-4). Operators are urged to begin now to earn these credits so that when (s)he has gained enough experience to be eligible to write the F-1, (s)he will have sufficient education credits as well. If a person is considering taking a course which is not specifically listed, they should check with MDPH to make certain it is an acceptable equivalent.

	REQUIRED COURSES	MAX. POINTS GIVEN
1.	Basic Chemistry or equivalent	3.8
2.	Applied Math or equivalent	3.8
3.	Applied Hydraulics or equivalent	3.8
4.	M.S.U. Water Bacteriology	3.5
5.	M.S.U. Water Chemistry	3.0
6.	Water Treatment Plant Operation, Volume I	5.0
7.	Water Treatment Plant Operation, Volume II	5.0
8.	M.S.U. Effective Communication or equivalent	3.0
9.	M.S.U. Management/Supervision or equivalent	4.0

OPTIONAL COURSES

Must have satisfactorily completed SIX of the Optional Courses in addition to the required courses.

10.	Coagulation/Softening Short Course	2.0
11.	Water Distribution System Operation & Maintenance	5.0
12.	University of Michigan - High Level Seminars	1.5
13.	C.M.U. Plankton Course	2.8
14.	Pump/Motor Maintenance Course	2.0
15.	Basic Electricity	2.5
16.	Water Treatment Short Course I	2.5
17.	Water Treatment Short Course II	2.5
18.	Maintenance Management (M.S.U.)	3.0
19.	I.C.S. WTP Operation	Varies
20.	A Quantitative/Qualitative Chemistry Course	Varies
21.	A Sanitary Microbiology Course	Varies
22.	A Water Treatment Design Course	Varies
23.	An Accounting/Record Keeping Course	Varies

Please note that courses 8, 9, and 18-23 are not provided through the Michigan Section, AWWA or the department. They can be taken through universities, colleges, and community colleges. Courses 6, 7, 8, 9, 18 and 19 are all correspondence courses. Course 2 and 11 may also be taken by correspondence. Correspondence course versions are 3.0 points.

CONTINUING EDUCATION CREDIT

Continuing education credit may be awarded to individuals successfully completing a course. In order for a training course to qualify for continuing education, it must be advisory board-approved. A list of approved courses is shown on the following page. Because this approval process is on-going and this list is periodically updated, individuals holding active or inactive certification status will be mailed an up-to-date listing each January. Individuals may contact Eric Way (517-335-8313) at the Michigan Department of Public Health, Division of Water Supply about continuing education credit for courses not on this list.

SUCCESSFUL COURSE COMPLETION - One or two day meetings and seminars require full day attendance for successful completion. Upon arrival at the meeting or seminar (within one hour of the start of the meeting), individuals desiring continuing education credit must obtain a continuing education credit form. This form must be validated by a course official immediately following the conclusion of the meeting. A copy of this form is retained by the individual and a second copy is left with the course official. This second, validated form will be sent to the Division of Water Supply and recorded. If an individual leaves a meeting early, the form will not be validated and continuing education credit will not be given. Credit for one and two day meetings of this type are normally assigned on the basis of contact hours with 1 point for 10 contact hours. Partial credit will not be given for one day meetings. For courses of a longer duration, such as the MDPH sponsored 3-day courses or 12-week courses, successful completion generally requires individuals to, in addition to meeting the attendance requirement, write and pass a course ending quiz. Individuals not passing the course ending quiz but otherwise fulfilling the course requirements, may be awarded a lesser number of continuing education credits (partial credit).

REPEAT CREDIT - Full credit may be awarded for repeat attendance at meetings and seminars with a changing course content or agenda, such as regional meetings and the Michigan Section, AWWA annual conference. For courses that basically repeat the course content, continuing education credit may be awarded as follows. When repeating a course, one-half of the credit awarded to the individual in the previous renewal period may be awarded for each successful repeat. The minimum credit awarded for repeating a course is 1 hour (0.1 point). No credit will be awarded for repeating such courses during the current certificate renewal period. This method for calculating repeat credit is in effect on January 1, 1993. Courses taken prior to this date will not be subject to the repeat credit considerations discussed above.

CREDIT FOR COURSE INSTRUCTORS - Continuing education credit for course instructors may be awarded for certain courses of long duration. Such credit will be awarded based on the number of contact hours available to students taking the course, except that instructors may not be awarded more than one-half the number of continuing education hours required for their own level of certification. This maximum value applies to all such courses conducted by an instructor within the instructor's current renewal period.

IN-SERVICE TRAINING & COLLEGE COURSES - Advisory board-approved water utility in-service training and individual college courses may be awarded continuing education credit. For such courses not shown on the following page, determination of credit is done on a case-by-case basis. It is recommended that students electing to take such courses contact the Division of Water Supply prior to enrolling in the course.

OTHER CREDIT - Continuing education credit equal to 1 hour (0.1 points) may be awarded annually for an active individual, an active affiliate or an active organization repesentative membership in the American Water Works Association. This credit value is based upon full year membership. Accordingly, individuals holding membership each month of the 3-year renewal period may be awarded the maximum available credit of 3 hours (0.3 points). This credit may also be awarded in ensuing renewal periods.

CERTIFICATION STATUS: ACTIVE/INACTIVE

Individuals writing and passing a certification examination, including those not currently working in the water works industry, are issued active status certificates on the basis of a 3-year renewal cycle. This applies regardless of the number or status of certificates already held, however, individuals may not re-write an examination for which they currently hold active status. The certification levels denoted on the certificate will be for the highest held within each category (F, D or S). For example, an individual passes a D-3 exam in May 1992. An active, D-3 certificate is issued with an expiration date of July 1995. In May 1993, this individual passes a D-2 exam. A new, active D-2 certificate is issued with an expiration date of July 1996. In November 1994, the individual passes an S-4 examination. A new, active D-2, S-4 certificate is issued with an expiration date of January 1998. This process continues each time an individual passes a higher class examination (1, 2 or 3) in a category (s)he is already certified in and/or when they pass an exam in a category (F, D or S) that they are not already certified in. In each case, the expiration date of the certification classes already held is extended so that it coincides with the expiration date for the exam most recently written.

Prior to the expiration of an active certificate, individuals may apply for renewal. A renewal applicant actively working in the waterworks industry who has met the continuing education requirement, will be issued a new, active certificate. Individuals not actively working in the waterworks industry or not meeting the continuing education requirement but desiring to continue to hold certification, will be placed on inactive status certification upon request. Individuals not applying for renewal will lose certification upon expiration of the certificate.

Those placed on inactive status certification will be notified of such by letter. No certificate will be issued. Persons placed on inactive status certification are eligible for employment at a water works system, however they cannot serve as the "operator in charge" of a distribution system, a treatment system or a shift at a water treatment plant. Inactive certification may be made active with proof of water works employment and completion of the necessary education requirements. An application may be obtained from the Division of Water Supply for such requests. Individuals requesting a change in certification status (from inactive to active) must either be "up-to-date" regarding the continuing education requirement or they will need to "pick-up" additional, approved course work.

Determination of the number of credits required to be picked-up will be made by Michigan Department of Public Health, Division of Water Supply at the time of the request. An example is shown here to clarify. Say an individual had been issued an F-2, S-4 certificate with a three year renewal cycle and an expiration date of July 15, 1995. The number of contact hours (or points) is determined from the highest classification held; 24 hours (2.4 points) based on the F-2 in this case. Say this individual has not taken any training courses and requests to be placed on inactive status in July 1995. In July 1997, (s)he requests active status. The individual is working in the water works industry, but needs to "pick-up" the required continuing education. The calculation of required points is 2.4 for the 1992-95 renewal period plus 0.8 for each year or portion thereof up to the current year (1997 in this case).

Therefore the total points required for this individual is :

$$2.4 + 0.8 + 0.8 = 4.0 \text{ points}$$

Individuals will have up to 1 year to "pick-up" required training. After obtaining the necessary credits, an active certificate will be issued. For the individual in the above example, after picking-up 4.0 points from the list of advisory-board approved courses, an active F-2, S-4 certificate will be issued.

CONTINUING EDUCATION CREDITS ALLOWED FOR VARIOUS COURSES OF STUDY

Michigan Section, AWWA & Michigan Department of Public Health Sponsored Training Courses:

	MAX. POINTS GIVEN
M.S.U. Water Bacteriology Course	3.5
M.S.U. Water Chemistry Course	3.0
Improving Employee Performance	1.3
Fall Distribution System O & M	5.0
Basic Math & Hydraulics Short Course	2.5
Water Distribution Short Course	2.5
Math Short Course	2.5
Water Plant Operator Meetings	0.3
U of M High Level Seminar	1.5
U.P. Institute	0.9
U.P. Distribution Seminar	0.9
Applied Mathematics	3.8
Basic Chemistry	3.8
Applied Hydraulics	3.8
Cross Connection Control Seminar	0.5
AWWA Annual Section Meeting	0.9
Local Operator Association Meetings	0.1
Various One-Day Meetings, Seminars & Workshops	0.5
Spring Regional Meetings (0.5 points each year)	0.5
Fall Regional Meetings (0.5 points each year)	0.5

	MAX. POINTS GIVEN
M.S.U. Ground Water Seminar	1.0
Basic Instrumentation & Control	0.8
Distribution System Operators' Day	0.3
C.M.U. Plankton Course	2.8
Limited Treatment Short Course	2.5
Basic Electricity Short Course	2.5
Water Treatment Short Course I	2.5
Water Treatment Short Course II	2.5
Joint Expo	0.1
Home Study Training Programs:	
Water Treatment Plant Operation, Volume I	5.0
Water Treatment Plant Operation, Volume II	5.0
Water Distribution System O & M	3.0
Small Water System O & M	3.0
MSU Management Course	4.0
MSU Maintenance Management Course	3.0
MSU Effective Communication	3.0
Math Correspondence Course	3.0

Others--to be evaluated--1.0 point for 10 hours

Michigan Rural Water Association Sponsored Training Courses:

	MAX. POINTS GIVEN
Water Audits & Water Rates	0.6
Meter Maintenance & Testing	0.4
Line Locating & Leak Survey	0.6
Distribution Line Cleaning	0.6
Pump & Motor Maintenance	0.6
Distribution Symposium	0.5
Troubleshooting Instrumentation	0.6

	MAX. POINTS GIVEN
Scale Build-Up & Corrosion Control	0.6
Annual Technical Conference	0.6
Chlorinator Safety & Repair	0.6
Cross Connection Symposium	0.6
Water Utility Safety	0.4
Electrical Troubleshooting	0.6

Other Organizations Sponsoring or Conducting Michigan Advisory Board-Approved Training Courses:*

Alexander Chemical, Cardinal Division
Dixon Engineering, Inc.
Heath Consultants
Michigan Plumbing & Mechanical Contractor Association
Wayne County Environmental Health
American Water Works Association
Ductile Iron Pipe Research Association
Layne-Northern Company
Midwest Backflow Prevention

*Credits awarded for these courses vary and it is possible that not every course offered by this organization has been approved. Contact respective organizations for date of next course offering and credit information.

DEPARTMENT OF NATURAL RESOURCES

MUNICIPAL WASTEWATER DIVISION
GENERAL RULES

Filed with Secretary of State,

These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the department of natural resources by sections 3 and 6 of Act No. 98 of the Public Acts of 1913, as amended, section 33 of Act No. 306 of the Public Acts of 1969, as amended and Executive Reorganization Orders 1973-2 and 1973-2a, being sections 325.203, 325.206, 24.233 and 299.111 of the Michigan Compiled Laws.)

TABLE OF CONTENTS

PART 1. GENERAL PROVISIONS

R 299.2901. Purpose

Rule 1. These rules are promulgated for the purpose of implementing the provisions of the act.

R 299.2903. Definitions.

Rule 3. (1) "Act" means Act No. 98 of the Public Acts of 1913, as amended, being sections 325.201 to 325.214 of the Michigan Compiled Laws.

(2) "Board" means the board of examiners established by rule 16.

(3) "Department" means the department of natural resources.

(4) "Division" means the municipal wastewater division of the department.

(5) "Governmental agency" means and shall include a city, village, township, county, metropolitan district or other unit of government or the officers thereof.

(6) "Operator" means an individual who works in a treatment facility and who has some responsibility for the operation thereof.

(7) "Person" means an individual, partnership, association, corporation or any governmental agency.

(8) "Sewer system" means and shall include pipes and structures including pipes, channels, conduits, manholes, pumping stations and appurtenances, collectively or severally, actually used or intended for use by the public for the purpose of collecting, conveying or transporting domestic and industrial wastes to a treatment facility.

(9) "Sewerage system" means and shall include sewer systems and treatment facilities required to collect, transport and treat domestic and industrial wastes.

(10) "Superintendent" means an individual in charge of and responsible for the operation of a treatment facility and in whom is vested the authority and responsibility for the establishment and execution of the specific practices and procedures controlling the operations of the treatment facility in accordance with the policies of the owner of the facility and the department.

(11) "Treatment facility" means and shall include sewage or waste treatment works, structures, equipment and appurtenances, collectively or severally, actually used or intended for use by the public for the purpose of treatment or otherwise handling domestic and industrial wastes.

R 299.2905. Rescission.

Rule 5. The following rules are rescinded:

(a) The rule pertaining to issuance of construction permits being R 325.461 of the Michigan Administrative Code and appearing on page 2260 of the 1954 volume of the Code.

(b) Rules 1 to 8, being R 325.1121 to R 325.1128 of the Michigan Administrative Code and appearing on pages 2327 to 2330 of the 1954 volume of the Code.

PART 2. TREATMENT FACILITY CLASSIFICATION AND OPERATOR CERTIFICATION

R 299.2911. Treatment facility classification.

Rule 11. (1) Treatment facilities shall be classified by the director of the department into 4 classes designated as Class A, B, C and D. The classifications shall be based on population served, the type of treatment facility, the character and volume of wastes to be treated and the use and nature of the waters of the state receiving the effluent thereof. Treatment facilities in any size group may be placed in a higher classification by the director, by reason of the incorporation in the treatment facility of special features of design, or characteristics more difficult to operate than usual, or by reasons of a particularly difficult type of sewage or by reason of particular stream conditions or combinations thereof.

(2) A special classification may be designated for all treatment facilities utilizing the waste stabilization lagoon process and which do not include special mechanical devices such as aerators, chemical precipitation, disinfection or other factors.

(3) One of the following classifications shall be assigned to each treatment facility which serves the public:

(a) Class A, treatment facilities serving or designed to serve a population in excess of 50,000 persons.

(b) Class B, treatment facilities serving or designed to serve a population between 10,000 and 50,000 persons.

(c) Class C, treatment facilities serving or designed to serve a population between 2,000 and 10,000 persons.

(d) Class D, treatment facilities serving or designed to serve a population of less than 2,000 persons.

(e) Class L, treatment facilities utilizing the waste stabilization lagoon process.

R 299.2912. Treatment facility classification changes.

Rule 12. (1) When the director determines that 1 or more of the conditions described by the subrule (2) exists or are imminent, he may change the classification of a treatment facility after notice and opportunity for hearing on his proposed action at least 60 days prior to the classification change. Hearings conducted pursuant to this subrule shall be undertaken according to hearing procedures prescribed by part 5.

(2) The director may make a classification change of a treatment facility upon his finding that any of the following or any combination is occurring or may be expected to occur within 60 days:

(a) The population being served by the treatment facility has changed.

(b) There has been incorporated within the treatment facility special features of design or characteristics which render the treatment facility more difficult to operate.

(c) Certain wastes are being treated within the treatment facility which require special treatment facility design or operation procedures.

(d) Conditions of flow or use of the receiving waters require an unusually high degree of treatment facility operational control.

R 229.2916. Board of examiners; appointments.

Rule 16. The director shall appoint a board of examiners which shall consist of 5 members, of whom 1 shall be a Class A certified operator of a treatment facility, 1 shall be a qualified engineer registered in the state knowledgeable in the operation and maintenance of treatment works, 1 shall be a staff member of the division, 1 shall be a municipal official and 1 shall be a member at large. Of the members first appointed, 1 shall be appointed for a term of 1 year, 2 for terms of 2 years, and 2 for terms of 3 years. After the initial appointments, each member shall be appointed for a term of 3 years. Vacancies on the board shall be appointed in the same manner as original appointments.

R 299.2917. Board of examiners; duties and responsibilities.

Rule 17. (1) The board shall meet at least twice each year at such times and places as it may designate. It shall examine all persons making application for certification who meet the minimum requirements prescribed by rule 18. The board shall schedule at least 1 examination per year and shall make public the date for examinations at least 90 days prior to the date set for examination.

(2) As a result of the examination and application, the board shall recommend to the director the issuance or nonissuance of an operator certificate in the proper classification to the applicant.

(3) Members of the board shall not be compensated but shall be entitled to all actual and necessary expenses in the performance of their official duties according to the rates established by the latest edition of the standard travel regulations of the state.

R 299.2918. Operator certification; minimum requirements.

Rule 18. (1) Certification shall require written examination conducted by the board according to one or more of the following classifications based upon minimum education and experience qualifications and successful fulfillment of the requirements of each lower certification level:

(a) Class A. A college degree with sufficient engineering or allied subjects to understand the mechanics, electronics and hydraulics of a complex treatment facility and 4 years of acceptable operation experience in a Class B or higher treatment facility, 2 years of which shall have been in a supervisory position or a position of major operational responsibility; or completion of 2 years of a standard college curriculum in engineering or allied field with sufficient subjects to understand the mechanics,

electronics and hydraulics of a complex treatment facility and 6 years of acceptable operation experience in a Class B or higher treatment facility, 2 years of which shall have been in a supervisory position or a position of major operational responsibility.

(b) Class B. Completion of 1 year of college or its equivalent with sufficient subjects to aid in the understanding of the mechanics, electronics and hydraulics of a treatment facility, and 4 years of experience of acceptable operation in a treatment facility of Class C or higher, 2 years of which shall have been in a supervisory position or a position of major operational responsibility.

(c) Class C. Completion of high school or its equivalent and 2 years of experience of acceptable operation in a treatment facility.

(d) Class D. Completion of high school or its equivalent and 1 year of experience of acceptable operation in a treatment facility.

(e) Class L. Completion of high school or its equivalent and 1 year of experience in the operation of a waste stabilization lagoon system.

(2) Additional education or experience of an applicant may be substituted by the board for meeting the minimum qualifications prescribed in subrule (1).

R 299.2920. Application for examination.

Rule 20. (1) An individual desiring to be certified and classified for operation of a treatment facility shall file with the department, at least 45 days before an examination date announced by the board, an application for examination and certification on a form prepared and provided by the department. The information contained on the application shall be evaluated by the board and shall constitute a part of the examination.

(2) The board shall notify the applicants of their acceptance for examination and the time and place of the examination at least 30 days before the date of examination. If an applicant has submitted more than 1 application, the board shall attempt to schedule examinations for that applicant as conveniently as possible for the applicant.

R 299.2922. Examination procedures.

Rule 22. (1) Examinations for operator certification shall be prepared by the board or by others designated by the board and shall include but not be limited to the following 4 parts:

(a) An evaluation of the educational qualifications of the applicant.

(b) An evaluation of the experience qualifications of the applicant.

(c) An evaluation of the personal characteristics of the applicant.

(d) A written appraisal of the general subject of treatment facility operation in any or all of its phases.

(2) An applicant shall not be admitted to the written examination unless he meets the minimum requirements prescribed in rule 18.

(3) Separate examinations for each class shall be prepared by the board to encompass basic differences in the duties and responsibilities of operators, types of treatment facilities, variations in wastewater quality, conditions of receiving waters and such other factors as the board determines.

(4) Applicants previously admitted to examinations for certification under the provisions of previous rules shall not be denied admission for the same class of examination because of these rules.

R 299.2923. Examinations; grading; recommendations and notification.

Rule 23. (1) The minimum passing grade for the written examination is 70%.

(2) Upon completion of examination, the board or others designated by it shall grade each examination promptly and within 60 days after the date of examination, notify the director in writing of the results of each examination.

(3) At the time of notification of the director of the results of the examination, the board shall recommend to the director the issuance or nonissuance of a certificate of operator classification for each applicant. The results of the examination and the recommendation of the board shall be mailed to each applicant by the department.

(4) Applicants who fail to pass an examination may repeat the examination at any subsequent regularly scheduled examination of the board by submitting an application as prescribed by rule 20.

R 299.2924. Operator certificates; issuance.

Rule 24. (1) Within 30 days after receipt of examination results and the recommendations of the board, the director shall issue certificates to each applicant who has been recommended by the board for certification. The certificate shall indicate the class of operator as prescribed by rule 18 and the class of treatment facility in which the certified operator is entitled to be in responsible charge.

(2) An operator certificate may be issued by the director, without examination, in a comparable classification to any person who holds an operator certificate in any state, territory or possession of the United States, or any country, if in the judgment of the board the requirements for certification of operators under which the person's certificate was issued are not lower than the requirements prescribed by the board and these rules.

R 299.2926. Operator certificates; revocation and suspension.

Rule 26. The director may suspend or revoke the certificate of an operator, who after a hearing before the board is adjudged incompetent or unable to properly perform the duties of an operator in his classification, or who has practiced fraud or falsification or who has been negligent in the discharge of his duties or responsibilities. Notice of suspension or revocation shall be provided in writing to the operator and the owner of the treatment facility.

R 299.2927. Appeals.

Rule 27. (1) A person who feels himself aggrieved by any action of the board or the department pursuant to these rules, or who wishes to appeal any other action of the department or the board with respect to his certification, shall have an opportunity for a hearing before the commission on natural resources or its designated representative.

(2) A hearing conducted pursuant to this rule shall be conducted in accordance with part 5.

PART 3. SEWERAGE SYSTEM PLANS AND SPECIFICATIONS

R 299.2931. Definitions.

Rule 31. As used in this part:

(1) "Alteration" means the construction of any modification or addition to an existing sewerage system which changes the process or system capacity.

(2) "Construction" means erection or installation of sewer systems or treatment facilities including equipment and appurtenances in accordance with approved plans and specifications.

(3) "Permit" means a construction permit issued by the director of the department for a sewer system or treatment facility pursuant to section 6 of the act and these rules.

R 299.2933. Submittal of plans and specifications.

Rule 33. (1) Before the construction or alteration of a sewerage system or portions thereof, plans and specifications therefore shall be submitted to the department for review and issuance of a construction permit.

(2) The plans and specifications shall be submitted by the owner of the sewer system or treatment facility or alteration thereof or his designated agent. When a person files plans and specifications as an agent of an owner, the owner shall furnish the agent with a letter of authorization for filing the plans and specifications and the letter shall identify the plans or project and shall be submitted with the plans and specifications.

(3) Plans and specifications submitted to the department pursuant to subrule (1) shall not be considered adequate unless prepared by a professional engineer registered in the state and the plans and specifications shall be properly sealed by the engineer as required by law.

(4) When the owner of the proposed sewerage system is not a governmental agency the application for a permit shall include a resolution from the local governmental agency having jurisdiction stating that the governmental agency shall assume responsibility for the effective and continued operation and maintenance of the proposed sewerage system if the owner in any way fails to perform in this capacity. A copy of contractual or other arrangements between the owner and the governmental agency which provide for the continuity of service agreement shall also be submitted.

R 299.2935. Engineering reports; basis of design; minimum requirements.

Rule 35. (1) Before submission of plans and specifications, an engineering report or basis of design or both shall be submitted to the department for review and approval.

(2) An engineering report shall be required for all proposed projects dealing with construction of treatment facilities and major sewer systems. The engineer, when preparing the report, shall consider the material set forth under Section 11, *Engineering Report,* of the "Recommended Standards for Sewage Works" wherever applicable to the facility for which the report is being prepared.

(3) A basis of design shall be required for all proposed projects and may be included in the engineering report. Basis of design forms for treatment facilities and pump stations are available from the division office. The basis of design for sewer systems shall include, depending on applicability to the sewer system for which the basis of design is being prepared, but not necessarily limited to the following:

(a) A general map of the service area showing the location of the existing and proposed sewer system.

(b) The service area in acres.

(c) The present and future population densities per acre and total population.

(d) The present and future per capita sewage contribution; average and maximum.

(e) A description of commercial and industrial waste contributions.

(f) The present and design flow rates, average and maximum.

(g) The size of pipe, grade and where appropriate the size of pump station, number and capacity of pumps, size and length of force main and point of discharge.

(h) An analysis of the effect of the proposed additional flows on the existing sewerage system.

(i) A detailed explanation of steps to be taken in case of power failure or equipment breakdown including a description of special reserve units available for emergency treatment, storage or transportation of the wastewater.

(j) An analysis and determination as to the applicability of sections 2 and 5 of Act No. 245 of the Public Acts of 1929, as amended, being sections 323.2 and 323.5 of the Michigan Compiled Laws and Part 13 of the General Rules of the water resources commission being R 323.1311 to R 323.1329 of the Michigan Administrative Code.

R 299.2936. Plans and specifications; minimum requirements.

Rule 36. Information contained within the plans and specifications submitted to the department for review and approval pursuant to rule 33 shall include but

not necessarily be limited to the material recommended in Section 12, *Plans*, and Section 13, *Specifications*, of the "Recommended Standards for Sewage Works".

R 299.2938. Plans and specifications; review by department.

Rule 38. (1) Upon receipt of plans and specifications for the construction or alteration of a sewerage system or portion thereof, the department shall review them as soon as practicable to determine their completeness with regard to the minimum requirements specified in rule 36 and their acceptability with regard to accepted design standards for wastewater facilities in this state. In making its review, the department shall consider design criteria as set forth in "Recommended Standards for Sewage Works" and shall be assured that the sewerage system or portion thereof is so designed so as to protect the public health and prevent unlawful pollution.

(2) If the department determines that plans and specifications are incomplete or are inadequate, it shall notify the owner or his authorized agent of the proposed sewerage system or portion thereof and may request the resubmittal thereof with appropriate corrections or additions. The director shall not grant an approval of plans and specifications until they are complete and are judged to be adequate by the department.

R 299.2939. Approval of plans and specifications; permits.

Rule 39. (1) Upon the determination by the department that the plans and specifications for a sewerage system or portion thereof are complete and satisfactory, the director shall approve them and shall issue a permit for construction.

(2) A permit issued pursuant to the act and these rules expires unless construction commences within 2 years from the date of issuance. An owner of a wastewater facility may apply for reissuance of a permit in accordance with rule 33.

R 299.2941. Permits; conditions for issuance.

Rule 41. A permit for the construction of a sewerage system or portions thereof shall be issued by the director of the department only when both of the following conditions are met:

(a) Proper devices are or will be available and are in satisfactory operation for the collection, transportation and treatment before discharge into any public watercourse, lake, drain, ditch or groundwater, of the sewage or wastes collected or conveyed by such systems; or a definite program or agreement satisfactory to the department leading to the construction and operation of such collection, transportation or treatment devices shall have been officially adopted by the applicant for such permit and filed in the offices of the department.

(b) Where the plans and specifications for the work for which a construction permit is requested, have been properly prepared in accordance with the laws of the state and have been submitted to the director for his examination and approval, and which have been found to be in accordance with good modern practices, and, if built according to the plans and specifications, are of such nature and design as to protect the public health and prevent unlawful pollution.

R 299.2942. Revisions to approved plans.

Rule 42. The director shall approve any deviations from approved plans or specifications affecting capacity, flow or operation of units before construction of the changes. Plans and specifications so revised should be submitted well in advance of any construction work which will be affected by the changes, to permit sufficient time for review and approval. Structural revisions or minor changes not affecting capacities, flows or operation are permitted during construction without approval. "As built" plans clearly showing the work as constructed shall be submitted to the department at the completion of the work.

R 299.2943. Operation during construction.

Rule 43. Wherever possible bypassing of untreated wastewater or reduction in treatment effectiveness shall be avoided during the construction of sewer system or treatment facility alterations. Prior to commencing construction of the alterations, a program for completing the work in a manner which will minimize pollutional effects on the receiving water shall be submitted to the department for review and approval.

R 299.2945. Availability of documents.

Rule 45. "Recommended Standards for Sewage Works" prepared by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers may be inspected at the office of the division during normal working hours and may be obtained from the Health Education Service, Post Office Box 7283, Albany, New York, 12224, at a cost of $1.00.

PART 4. OPERATION AND MAINTENANCE OF SEWERAGE SYSTEMS

R 299.2951. Purpose.

Rule 51. This part prescribes procedures and requirements for the operation and maintenance of sewerage systems to ensure continuous protection of the public health, safety and welfare, the water resources of the state and the fish, wildlife and plant life associated therewith.

R 299.2952. Operator in responsible charge and changes.

Rule 52. (1) An owner of a treatment facility shall designate a superintendent who shall be a properly certified operator to be in responsible charge of the day-to-day operation and maintenance of each treatment facility and shall notify the division in writing of the

designation, including the address and telephone number thereof. The superintendent shall hold a certificate equivalent to or higher than the classification of the treatment facility. The owner of the treatment facility may replace the superintendent with another properly certified operator at any time and shall notify the department in writing within 10 days after the replacement.

(2) During construction of a new treatment facility and before placing the facility in operation the owner shall employ a properly certified operator who shall be in charge when the facility is completed and placed in operation. This individual shall become fully familiar with all facilities and equipment and shall train selected subordinate employees as appropriate both before and following facility start-up.

R 299.2953. Monthly operational reports.

Rule 53. The superintendent of a treatment facility shall file with the department each month or at such other intervals as the department may designate, on forms prescribed by the department, operating reports showing the effectiveness of the treatment facility operation and the quantity and quality of liquid wastes discharged into the waters of the state. When the superintendent is not available to file the report, the owner of the treatment facility may appoint a substitute acceptable to the department to file the report.

R 299.2955. Sewerage system operation and maintenance; general requirements.

Rule 55. (1) Sewerage systems shall be operated and maintained at all times as efficiently as possible and in a manner which will minimize upsets and discharges of excessive pollutants.

(2) The owner of the sewerage system shall provide an adequate operating staff which is qualified to carry out the operation, maintenance and laboratory testing functions required to insure compliance with the conditions of subrule (1).

(3) Wherever possible, maintenance of sewerage systems shall not result in degradation of effluent quality. If degradation of effluent is unavoidable maintenance shall be programmed and scheduled during non-critical water quality periods and shall be carried out in a manner approved by the department.

(4) All reasonable measures, including where appropriate the provision of shut off valves adjacent to storage tanks, catchment areas, relief vessels or entrapment dikes shall be taken for containment of any accidental losses of concentrated solutions, acids, alkalies, salts, oils or other polluting materials.

R 299.2956. As-built plans and specifications.

Rule 56. The owner of the sewerage system shall obtain and maintain reproducible as-built plans and specifications which accurately describe the entire sewerage system in its current condition.

R 299.2957. Operation and maintenance manual.

Rule 57. (1) The owner of a treatment facility shall prepare or cause to be prepared an operation and maintenance manual for the treatment facility which shall be used by the operator of the facility as a guide for facility operation and maintenance. The manual shall describe the function, start-up, shutdown and periodic maintenance procedures for each unit process and item of mechanical and electrical equipment. The appropriate responses or facility adjustments to minimize the impact of emergency situations shall be described so as to facilitate rapid implementation of a correct response during emergencies. A copy of the operation and maintenance manual shall be submitted to the department for its review, approval and filing 60 days before the date of operation.

(2) If the department determines that an operation and maintenance manual is incomplete or inadequate, it may return the manual to the owner of the treatment facility with its findings and recommendations and request modification thereof. The owner of the treatment facility shall modify and resubmit the manual to the department.

R 299.2959. Emergency measures, reports to department.

Rule 59. (1) If a breakdown of a sewerage system or component thereof or any emergency situation results in diversion from or by-pass of facilities necessary for the effective collection, transportation or treatment of the wastes and in the discharge of pollutants in excess of those authorized by a discharge permit issued by the water resources commission pursuant to Act No. 245 of the Public Acts of 1929, as amended, being sections 323.1 to 323.13 of the Michigan Compiled Laws, the owner shall take all such measures as may be necessary to correct the breakdown or emergency and eliminate or reduce the discharge of excessive pollutants.

(2) The owner of a sewerage system which discharges or permits to be discharged excessive pollutants to the waters of the state as a result of a facility breakdown or emergency shall notify the division promptly. The notice shall be supplemented by a written report filed with the division within 72 hours outlining the cause, its discovery and the corrective actions taken to minimize adverse impact to the waters of the state, restore facilities to operative condition and to eliminate the need for future diversion or by-pass. This rule does not supersede, rescind or otherwise alter any other existing or future procedure, rule or statute pertaining to pollution of the waters of the state.

R 299.2960. Enforcement.

Rule 60. A person who violates this part is subject to the procedures and penalties prescribed by the act or any other applicable law or rules of this state.

PART 5. HEARINGS

R 299.2971. Opportunity for hearings.

Rule 71. (1) A person who feels himself aggrieved by an action undertaken pursuant to the act or these rules, may file a sworn petition with the department, setting forth the grounds and reasons for his complaint or appeal and asking for a hearing before the commission on natural resources on the matter involved. The department shall thereupon fix the time and place for the hearing and notify the petitioner thereof by certified mail. At the hearing, the petitioner and any other interested party may appear, present witnesses and submit evidence. Following the hearing, the final decision or disposition of the case by the commission on natural resources shall be conclusive unless reviewed in accordance with and subject to Act No. 306 of the Public Acts of 1969, as amended, being sections 24.201 to 24.315 of the Michigan Compiled Laws, in the circuit court for the county of Ingham or for the county in which the person resides.

(2) An appearance at a hearing shall be either in person, by a duly authorized agent or by counsel.

R 299.2972. Hearing commissioner.

Rule 72. (1) That part of a hearing in a contested case in which testimony and evidence are to be taken may be referred to a hearing commissioner who shall be designated and authorized by the commission on natural resources to preside at the hearing.

(2) The hearing commissioner shall hear the evidence, prepare a record of the proceedings and a proposal for a decision including findings of fact and conclusions of law. The record of the proceedings and proposal for decision shall be filed at the department offices as early as possible after completion of the hearing. A copy of the proposal for decision shall be transmitted to each member of the commission on natural resources and shall be served by certified mail on all other parties to the proceedings.

R 299.2973. Agency files and records; use in connection with hearings.

Rule 73. The files and records of the department which are applicable to hearings conducted pursuant to these rules, except those materials exempted by section 22 of Act No. 306 of the Public Acts of 1969, as amended, being section 24.222 of the Michigan Compiled Laws, shall be available for inspection before or at hearings held by the commission on natural resources or the hearing commissioner, and the whole or a part thereof may be offered at a hearing as evidence on behalf of the department.

R 299.2974. Commission on natural resources' hearings.

Rule 74. (1) The commission on natural resources shall provide opportunity for either party to a contested case to submit thereto such arguments, exceptions or appeals regarding a hearing commissioner's report and proposal for decision as may be filed timely in writing by either party. To be considered by the commission, written briefs or exceptions shall be received at the office of the department in Lansing not later than 2 weeks before the date set by the commission for consideration of the hearing commissioner's report. An opportunity to present oral argument to the commission on natural resources may be provided at the commission's discretion noticed for that purpose.

(2) A certified copy of a final decision adopted in a contested case by the commission on natural resources shall be prepared and served by certified mail on the contesting parties or their attorneys together with the commission's finding containing a resume of the facts and grounds for decision.

Updated:11/24/92

WATER/WASTE WATER TECHNOLOGY NEEDS ASSESSMENT
EMPLOYER SURVEY
CODE BOOK

Variable	Column	Description/Codes
ID	1-3	Survey ID number. 100-199 = South-East Michigan (Detroit) 200-299 = South-Central Michigan (Lansing) 300-399 = Lower-Western Michigan (Battle Creek) 400-499 = Mid-Western Michigan (Grand Rapids) 500-599 = North-Western Michigan (Traverse City) 600-699 = Mid-Central Michigan (Bay City)
		1. Which of these functions are performed by your organization?
SEWAGE	4	a) Sewage Treatment 1 = Yes 0 = No 9 = Unknown/No response
INDUSTRI	5	b) Industrial Wastewater Treatment (Same as SEWAGE)
STORMWAT	6	c) Stormwater Runoff Control (Same as SEWAGE)
MUNICIPA	7	d) Municipal Water Treatment (Same as SEWAGE)
REMEDIAT	8	e) Water Remediation (Same as SEWAGE)
QUALITY	9	f) Water Quality Testing (Same as SEWAGE)
SOIL	10	g) Soil Testing (Same as SEWAGE)
OTHER	11	h) Other (Same as SEWAGE)
		2. How many operators and technicians do you have working in these areas?
PART	12-14	a) Part-time (30 hours or less per week) Actual number 999 No response
FULL	15-17	b) Full-time (more than 30 hours per week) Actual number 999 No response

		3. Among the technicians and operators you employ full or part time, what are examples of their job titles and salary ranges?
TITLE1	18	a. Trainee 1 = Yes 0 = No 9 = Unknown/No Response
WAGE1	19-23	b. Trainee annual salary. Actual number 99999 = Unknown/No Response
TITLE2	24	c. Mechanic 1 = Yes 0 = No 9 = Unknown/No Response
WAGE2	25-29	d. Mechanic annual salary. Actual number 99999 = Unknown/No Response
TITLE3	30	e. Operator 1 = Yes 0 = No
WAGE3	31-35	f. Operator annual salary Actual number 99999 = Unknown/No Response
TITLE4	36	g. Technician 1 = Yes 0 = No 9 = Unknown/No Response
WAGE4	37-41	h. Technician annual salary Actual number 99999 = Unknown/No Response
TITLE5	42	i. Field Engineer 1 = Yes 0 = No 9 = Unknown/No Response
WAGE5	43-47	j. Field Engineer annual salary Actual number 99999 = Unknown/No Response
HIRING	48	5. Are you currently hiring entry level water/wastewater technicians or operators? 1 = Yes 0 = No 9 = Unknown/No Response
		6. What is the primary reason for hiring these employees?

EXPAND	49	a) Expansion of your operations 1 = Yes 0 = No 8 = Does not apply 9 = Unknown/No Response
TURNOVER	50	b) Employee turnover (Same as EXPAND)
ADDITION	51	c) Additional work needed to meet regulations or legislation. (Same as EXPAND)
OTHER	52	d) Other reasons. (Same as EXPAND)
		7. What is the minimum educational qualification required by your organization for entry level personnel in Water/Waste water Treatment?
NONE	53	a) No specific educational requirement 1 = Yes 0 = No 9 = Unknown/No Response
HIGHSCH	54	b) High School diploma or equivalent (Same as NONE)
ASSOC	55	c) Associate degree (Same as NONE)
BACHELOR	56	d) Bachelor degree (Same as NONE)
CERTIF	57	e) Certificate (Same as NONE)
OTHER	58	f) Other (Same as NONE)
REQUIRE	59	8. Do you require your operators or technicians to be certified? 1 = Yes 0 = No 9 = Unknown/No Response
		9. Please consider the following list of skills and qualifications you as an employer would evaluate when hiring water or wastewater employees.
TEAM	60	a) Ability to work as a team member 3 = Very important 2 = Somewhat important 1 = Not important 9 = Unknown/No Response
ORGANIZE	61	b) Organizational skills (Same as TEAM)

INITIATE	62	c) Ability to use individual iniative (Same as TEAM)
WRITING	63	d) Writing skills (Same as TEAM)
MATH	64	e) Mathematical skills (Same as TEAM)
SPEAKING	65	f) Good speaking skills (Same as TEAM)
PROBLEM	66	g) Problem solving skills (Same as TEAM)
COMPUTER	67	h) Computer skills (Same as TEAM)
FINDING	68	11. Do you experience any difficulty finding well qualified entry level personnel? 1 = Yes 0 = No 9 = Unknown/No Response
		14. Please rate the importance of the following skills for entry level technicians.
ALGEBRA	69	a) Algebra/Math 3 = Very Important 2 = Somewhat Important 1 = Not Important 9 = Unknown/No Response
HYDRAUL	70	b) Applied Hydraulics (Same as ALGEBRA)
CHEMIST	71	c) Chemistry (Same as ALGEBRA)
MICROBIO	72	d) Microbiology (Same as ALGEBRA)
EQUIPMEN	73	e) Utility Equipment Maintenance (Same as ALGEBRA)
ELECTRIC	74	f) Utility Electrical Maintenance (Same as ALGEBRA)
LABORAT	75	g) Laboratory Procedures (Same as ALGEBRA)
GEOLOGY	76	h) Physical Geology and Geography (Same as ALGEBRA)
HYDROGEO	77	i) Hydrogeology/Ground Water (Same as ALGEBRA)

REGULATE	78	j) Federal and State Environmental Laws and Regulations (Same as ALGEBRA)
		17. Does your organization provide any formal in-house or external water or wastewater training for employees?
INHOUSE	79	In-House training 1 = Yes 0 = No 9 = Unknown/No Response
EXTERNAL	80	External training 1 = Yes 0 = No 9 = Unknown/No Response
		18. Would your organization consider offering internships (either paid or non-paid) for students in a water or wastewater treatment program?
PAIDINTE	81	PAID? 1 = Yes 0 = No 7 = Uncertain 9 = Unknown/No Response
UNPAIDIN	82	UNPAID? 1 = Yes 0 = No 7 = Uncertain 9 = Unknown/No Response
WILLING	83	19. Would you be willing to help in the design and development of a Water or Wastewater Treatment program? 1 = Yes 0 = No 9 = Unknown/No Response