Reviewer's Summary

As an outside member of the Environmental Toxicology (ENTX) Review Committee, I reviewed the Dept. of Environmental Toxicology Graduate Program Review (self-study, 2005-2011) in the context of the Graduate Program Review Guidelines that was provided and The Institute of Environmental and Human Health (TIEHH) website. I also requested and was provided lists of grant proposals submitted and funded as well as faculty and student publications. On the evening of February 2, 2012, the Review Committee was treated to an introductory dinner with Dean Felder and Marlene Kenady, at which the charge to the Committee was reviewed. The site visit on February 3 consisted of a tour of the facilities and separate meetings with the program Director, faculty and graduate students. The focus of the visit was on the ENTX MS and PhD programs.

The materials provided for the Committee were extensive and provided much useful information about the ENTX graduate program as well as the Department/Institute. The cordial and frank discussions with the Director, faculty and students were also instructive, and the hospitality shown by all involved was appreciated.

The general impression is that the ENTX graduate program has undergone remarkable development since its inception and continues to improve. Dr. Ron Kendall provides strong leadership and has been instrumental in developing the program into one that provides appropriate training in a collegial atmosphere and is recognized nationally for its contribution to graduate education. TIEHH faculty are productive and highly collaborative and have maintained strength despite losses of some key colleagues. They have been successful overall in attracting funding through remarkable initiative in submitting large numbers of extramural proposals to a variety of funding sources. They seem to be excellent mentors for the graduate students. Faculty and students desire greater transparency in the administration of TIEHH and involvement in decision-making about aspects of the graduate program.

The pool of applicants to the ENTX program has improved in recent years, and the matriculated doctoral and masters students who interacted with the Review Committee seemed intelligent, engaged and overall were quite enthusiastic about the graduate program. Because of external pressures to maximize student enrollment, there is unfortunate pressure to accept student numbers that have perhaps become too great relative to the numbers of faculty and the level of research funding needed to train the students. The program is nearing the point where it could be competitive for an institutional training grant from the NIH or other federal sources. The physical facility that houses TIEHH offices and laboratories constitutes a very good physical facility for research, and the addition of a BCL3 lab, an aviary and facility for housing small animals will provide improvements in the near future. The separation from campus remains an issue that reduces student productivity, as does the use of the same instrumentation for both students’ thesis research and course-related laboratory exercises.

Overall, the TIEHH and its faculty are impressive, and the ENTX graduate program operates very well in a collaborative atmosphere to train qualified students.
Dr. Kendall is an enthusiastic Director. In his discussion with the Review Committee, he reviewed the history and successes of the Institute. It is clear that he cares passionately about the TIEHH and its continued development and progress. He is a strong and capable leader who has accomplished much in starting and developing the Institute and the ENTX graduate program. Dr. Chris Salice acts as the Graduate Program Officer. In this role, he chairs the Admissions Committee, advises incoming students and brokers assignment of students to faculty thesis advisors.

The graduate program offers programs culminating in MS or PhD degrees in Environmental Toxicology and dual degree programs offering a Masters in Public Administration/Environmental Toxicology and a JD/Environmental Toxicology. The organizational relationship between the Department of Environmental Toxicology and the TIEHH as it regards the graduate programs was unclear from any of the materials presented to the Review Committee or from the website. Functionally, it appears that all of the important teaching and research operations are performed from the position of the Institute and that the Department exists for the purpose of the academic appointments of the faculty and the granting of graduate degrees. The Department and the Institute comprise the same faculty, and the Director/Chair is the same person—where one begins and the other ends in terms of administration and mission should be clarified.

Numbers of graduate teaching faculty has remained relatively constant at approx 15, although two of the more productive faculty members left the University in 2011. Fixed term (nontenure track faculty) declined to 0 (from 2 earlier), whereas teaching assistants (TAs) have increased from 0-2 to 10 in the 2010-11 school year. Any successful graduate program that involves laboratory research must have funding for the research and also to support student stipends. Generally, the faculty command enough research funding to support a viable graduate program in environmental toxicology.

Enrollment of MS students has risen over the last 6 years (from 14 to 27 ), whereas the enrollment of PhD students has maintained fairly steady at 20-30. ENTX has graduated 3-9 MS and 4-9 PhD students per year over the past 6 years. These numbers compare favorably with other institutions.

Many of the newly accepted students identify a laboratory in which they will work or are paired with a thesis advisor by the Admissions Committee prior to matriculation, whereas others work in several laboratories and choose an advisor within a semester or two after entering the program.

Students benefit from a wide variety of research areas represented by faculty interests. These include analytical toxicology, aquatic toxicology, ecology and wildlife toxicology, biomedical toxicology, and ecosystem modeling. The Zumwalt Program dealing with antiterrorism research, the Strategic Environmental Research and Development Program that deals with toxicologic issues relevant to the Dept. of Defense and the nonwoven and advanced materials lab all add to opportunities for students in the program.

The Director demands accountability and productivity of the students and faculty and strives for excellence in teaching and research. The faculty and staff are very supportive of their students, and the students appreciate this. A TIEHH Student Association provides a support network and a social structure for students and a liaison to faculty. The Director and the faculty clearly take pride in student and alumni successes.
The collegial atmosphere among the students and faculty was emphasized repeatedly and is evident in the extensive collaborative grants and coauthored publications that arise from the Institute. Many research reports have several faculty and students as coauthors. Students often work as teams, and this is encouraged by the Director. This occurs to an unusual degree relative to other institutions and is viewed as highly beneficial to the training of students. According to the Director, funds to support student research, stipends and training are used in a “dynamic” way to ensure adequate support for the training mission. The Director and the faculty are commended for maintaining this positive atmosphere for research and training.

Curriculum and Programs of Study (rating: very good)

The organization, requirements and milestones for the MS and PhD programs are generally typical of those of other institutions. The didactic curriculum is appropriate overall to meet the training goals. The students were generally positive about the course topic offerings and their content. They pointed to the considerable breadth of topics as a strength. Focused courses in some specific areas are lacking, but these can be taken on the main Texas Tech campus. However, difficulty in finding campus parking and lost time in traveling remains an issue with on-campus courses; students pointed to the difficulty in running experiments at TIEHH and attending class on campus. Nevertheless, several students have taken advantage of the wide variety of courses offered on the main campus.

The numbers of course offerings listed is large; at least 13 advanced courses are listed. Courses are typically moderated by a single faculty member but are largely team-taught. Toxicology I and II are two of the main core courses for both the MS and PhD programs. Formal coursework is also required in analytical toxicology, which includes instruction on use of the available instrumentation at TIEHH. The Toxicology I course covers basic principles and some organ systems, and Toxicology II covers other tissue/organ targets as well as the toxicology of some specific toxicant classes. There is a lecture on forensic toxicology, but apparently little on regulation or risk assessment (unless these topics are woven into other topics). The Toxicology II course is an appropriate extension of the topics covered in the Toxicology I course. Overall, the topics covered in these two core courses are impressive, as they represent comprehensive didactic training in toxicology. One question is whether all of the incoming students have adequate training in basic biology, including biochemistry, molecular biology, cell biology, physiology and genetics; these are the basic underpinnings of toxicology, and students are largely expected to have adequate training in these areas before acceptance into the program. The extent to which this happens is unclear. Students indicated that much of the lecturing in the two core toxicology courses is review of basic biology and organ function.

Comprehensive course descriptions and syllabuses containing expectations and other information are provided and should be useful for students, as is the table of steps required to complete graduate training (p 80 of the review document).

Although there is no formal course offered on scientific writing, the students thought that they receive adequate training from experiences in writing grants, thesis proposals and manuscripts for publication and that they get adequate help from their faculty mentors. There is a desire among the students for a course in ecological/wildlife toxicology to be taught. Apparently, such a course is listed but has not been taught in several years.

Safety is an important issue in any laboratory-based graduate program, and the Institute stresses safety with its students. Indeed, the Institute has become a model in this regard for establishing safety procedures in other Texas Tech programs.
The students uniformly thought that the ENTX program was an excellent one. The student survey and the discussion with the graduate students indicated that they are generally pleased with all aspects of the program—teaching quality, course offerings, research project availability and resources, access to faculty mentors and quality of mentoring. The students clearly appreciate the interactive nature of the faculty, the breadth of research areas represented by faculty interests, and the extent to which faculty make themselves available.

Despite the general satisfaction with the ENTX program, students thought that some aspects could be improved. The student survey results suggested some dissatisfaction with the seminar program, which involves few extramural speakers, and with the adequacy of the stipends. The average stipend is low compared with similar institutions. There was also some criticism of the communication of policies and appeal procedures and of the degree to which students are involved in decision-making. Some students thought that the initial guidance they received upon entry into the program was insufficient. The isolation imposed by the distance from the main campus and lack of interaction with students and faculty from other departments was viewed as a disadvantage.

Some but not all of the students would like greater opportunity to teach in order to develop their didactic skills for academic careers. The distribution of such opportunities seems to be uneven, and some students who have teaching responsibilities would rather not be burdened by them, whereas others who do not have such opportunity would welcome it. There was some discussion about offering an undergraduate course in toxicology; if it were instituted it could provide didactic teaching opportunities for the graduate students.

**Faculty Productivity (rating: very good-excellent)**

Numbers of tenure-stream faculty have remained relatively constant over the past 6 yr at approx 15, with a good balance among the 3 ranks. Comparisons of numbers to other universities is not very meaningful because of differences in program organization and roles of faculty. Several senior faculty have departed in the last few years for attractive positions elsewhere, and they have been replaced by junior faculty. This represents a commitment by the University to the ENTX program. Despite these departures, research grant support has remained steady. Unfortunately, two of the more productive and well funded faculty have left within the last year (Cobb and Cox). Retention of young and midcareer faculty who are productive and good mentors will be important in the near future to maintain the vitality of the graduate program. It appears that new faculty will be hired as replacements, as a search for one was ongoing during our visit. Such replacements will be essential if the current numbers of accepted students per year is to be maintained.

Faculty teaching loads are greater than is typical for a medical school but less than departments that have undergraduate teaching responsibilities. Students participate little as lecturers, but the TAs help to run the laboratory exercises associated with courses. The faculty were comfortable with their teaching loads.

Sponsored research expenditures are between $2MM-3MM/yr for the 6yr reporting period. Although it is not clear what is included in these figures, similar levels are listed for institutional comparators (p54 of the review document). There is generally good distribution of faculty who serve on student thesis committees, and outside service contributed by faculty is impressive. TIEHH boasts more members in SETAC than any other organization; quite an accomplishment considering that there were no members until about a decade ago. Few TIEHH faculty are members of the Society of Toxicology, even though toxicology related to human health is listed as an emphasis area.
Extensive collaboration within TIEHH, a diverse faculty, and research conducted from molecular to population levels characterize the ENTX program faculty. Scholarship is highly encouraged for the students by their faculty and the Director, and the students emphasized how supportive their faculty are compared to other programs of which they are aware.

Almost all of the faculty currently have some research funding. Much of the funding is from multi-investigator grants. Very large numbers of grants are submitted each year, testifying to the faculty’s initiative in pursuing research funding (see also the “Other Impressions and Comments” section, below). That the vast majority of proposals involve several investigators testifies to the richly collaborative environment in the TIEHH. This is reflected also in the peer-reviewed research publications—many of these are multi-authored publications. The majority of faculty appear to be productive, with either first- or senior-authored publications in the past 2 years and/or having been secondary authors on several publications. Although some of the publications are in well respected journals, many have appeared in lesser journals. Publication productivity is adequate but not outstanding, averaging about 2-4 peer-reviewed research papers per faculty per year.

There is no formal mentoring of junior faculty when they join the Institute. Although junior faculty feel free to turn to their more senior colleagues for consultation, each junior faculty member could benefit from a designated mentor who would meet regularly for discussion of issues of concern, monitor progress, help with networking, advise on the process of promotion, etc.

**Quality and Quantity of Graduate Students and Graduates (rating: very good)**

The faculty commented that the quality of students has increased in the past couple of years. In the Review Committee’s meeting with the students, they seemed bright and engaged. The meeting seemed to be well attended by the U.S. students, but the representation of foreign students was weak, making comprehensive evaluation difficult.

Prospective students seem to learn about the ENTX program from the TIEHH website and from the excellent reputation of the program. The website is well organized and contains useful information for prospective students. TIEHH seems to be a frequent topic in the lay press, and this can only help in publicity and fund-raising efforts for the program. Extensive partnerships of the Institute are listed on the website, but no details about them are provided. Similarly, there is a large list of adjunct faculty, but whether they are really an important part of the TIEHH and how they contribute are unclear. Although the website is excellent overall and should be a good recruiting tool for a generation of students who rely heavily on the internet, the listing of publications for several of the faculty is outdated. (Also, the word “lead” is consistently misused; should be “led”.) The location of TIEHH separate from the main campus creates a challenge in recruiting local undergraduates to the graduate programs. To help with this, an undergraduate course in Environmental Toxicology has been contemplated. Work-study programs also enhance contact with undergraduates.

Numbers of applicants to the ENTX programs have risen impressively in the past couple of years. Acceptance rates (matriculated students/accepted students) seem appropriate and have risen in the past two years (to about 2/3), indicating impressive improvement. The percentage of graduate students enrolled as doctoral students has declined in the past 3 years from 60-70% to 41-47%. The entry profile of students has risen. Quantitative GRE scores for enrolled students are quite good (above 650); however, the verbal scores are somewhat low. GPAs are excellent.
By far, most students from 2005-2008 were foreigners. In 2009 and 2010, more came from Texas, and the numbers of US students from outside Texas has risen. The program should try to continue this trend—ie, to increase competitiveness for qualified in-state residents and for US students from other states. This would help ENTX be competitive for a federal (eg, NIEHS) training grant.

The rise in time to graduation to 3.5 years for MS students (p 35 of review document) is somewhat concerning, and efforts should be undertaken to reduce this. The time to graduation for PhD students looks quite good at less than 4.5 years.

Student stipends vary but average about $17K/yr for PhD students and somewhat less for MS students. Although the cost of living is relatively modest in the Lubbock area, this level of stipend support is markedly low compared to other toxicology programs, and an increase could make the Texas Tech program more competitive with other institutions in attracting the best students. Students get to keep awards/scholarships when they are successful in attracting them. Although this seems appropriate and encourages students to apply for such awards, disparity in stipend levels can create dissatisfaction among students.

Over the past 6 years, several students have received awards/support from an impressive variety of professional organizations/societies such as SETAC, SOT and the National Academy of Sciences. This testifies to both the quality of the current students and their training. The numbers of the sources of the awards and the total amount of the awards seems to have increased substantially in the most recent reporting year (2010-11). The addition of a STAR grant added particularly to this increase.

The Director emphasized that the students in the ENTX program are treated as young professionals, and this seemed to be reflected in the behavior of the students and the attitude of the faculty. This is a very positive attribute of the program, and one that does not exist at all institutions.

Generally, the numbers of peer-reviewed research papers that the students publish is impressive. Many students not only are credited with several first-author publications but appear also as contributing authors on papers of their peers. Students seem to be in demand when they graduate, but the fraction of students who obtain faculty positions at research-intensive academic institutions is small.

In terms of numbers of students and opportunities for them, the ENTX program is at, and perhaps beyond capacity. See the “Other Impressions and Comments” section below for discussion of this.

Facilities and Resources (rating: very good)

The base budget for the TIEHH supports an impressive number of students ($226K/yr allocated for this). This represents an impressive commitment from the University. Teaching assistants participate in instruction of other students in laboratory exercises associated with various courses. The allocation of 10 graduate assistantships ($170K per year) a couple of years ago by the central administration has been very helpful to the program. These arose due to the excellence of the program being recognized by upper level administrators. Unfortunately, this number has been reduced to 6 this year due to an increase in fees.

Computer availability and the statistics support were appreciated by those involved in research at the Institute. The support staff is viewed as highly competent and helpful to the students and faculty. Each student has his/her own carrel, and the carrels are located together, providing for a quiet working environment yet ease of communication among the students. The expanded
number of vehicles available to students to travel to meetings on the main campus or to conduct research there was viewed positively.

The faculty and students thought that instrumentation and other equipment needed for laboratory research is generally adequate but that some equipment is outdated and replacements and upgrades would benefit the research enterprise. The provost has been helpful in funding upgrades and repair of instrumentation. That said, a lot of research equipment is used for both teaching (laboratory exercises) and students’ research. This necessitates more frequent repair than would be needed if the equipment were used only for research projects, and instruments are wearing out prematurely. The situation also presents problems with scheduling common-use instruments for research. This results in delaying experiments for students and hampers progress in completing their thesis research. This issue was raised repeatedly by both the students and the faculty.

Renovation is underway for a BSL3 containment facility. This may open up funding possibilities from agencies such as the CDC and Homeland Security. This is a $1.7MM investment that has been highly supported by the city of Lubbock, which has generally been an excellent supporter of TIEHH over time. There is also a new laboratory animal housing facility under construction that will apparently house rodents as well as reptiles. Although small, it may help the Institute to be more competitive for human health-related research funding from the NIH and other sources.

Despite the renovation of existing facilities, the faculty view was that laboratory space will be a constraint on growth of the graduate program in the future. Space and equipment dedicated only to teaching is highly desired by faculty and students.

Deficiencies in funding for students and research was listed as an issue; there was a perceived mismatch between funding available for research support and the numbers of students accepted—ie, too many students for the level of research funding. Frequently, students are expected to write extramural grants and compete for their own research funding and for funds to travel to scientific meetings. This seemed to be viewed positively by the majority of students, since it contributed to their writing ability and to the learning of grantsmanship that may be needed in their careers. That said, the degree to which this occurs is outside the norm; it should be the responsibility of the faculty to obtain grant support for the research in their laboratories.

Other Impressions and Comments

Faculty seem overall to be happy with TIEHH and its progress and development. However, there were some issues of concern. One is that administrative decision-making occurs in a highly centralized manner, with no transparency and very little input from the general faculty. The faculty responsibilities and contributions to the Institute are not matched with input to the administration of the unit. As it relates to the graduate program, this affects perceptions of inequalities in teaching assignments and allocation of resources. For example, many felt that the lack of a transparent process for assigning TAs made research planning difficult. Similarly, the likely users of the new animal facility were not consulted about its design. There was also frustration with the hiring process in the past. Although search committees are established to conduct the process, the successful candidate has been dictated by the Director without input from the faculty. The latest hire seemed to be an exception to this, and faculty were pleased that they had greater input.

Having regular faculty meetings in which information is exchanged and current issues are discussed between faculty and the Director would be one way to improve input and transparency. In addition, establishing a small faculty advisory committee charged with
discussing issues of concern with the Director could help. Such a committee should have representatives from both the senior and junior faculty.

A final area of concern to both the faculty and the Review Committee relates to the numbers of students admitted to the program each year. This decision is driven by a desire to enroll as many graduate students as possible in order for Texas Tech to qualify for state funds earmarked for state-supported universities based on a minimum enrollment criterion. This results in pressure to accept more graduate students than can be comfortably accommodated by the level of research funding and numbers of faculty available to act as thesis advisors. It also creates pressure to rush students through the doctoral education process, and there is a perception that some students are graduated before they are really ready. The numbers of students accepted should be dictated by the funds available for research projects and for student stipends. To allow such a decision to be dictated by external pressures is not consistent with sustainable, high-quality graduate education.

Another consequence of external pressures driving student acceptance rates is that faculty are pressured to write large numbers of grants in an attempt to keep up with students being forced upon them. Students too are pressured to write grants, and, although the students did not complain about doing so, it should be the responsibility of the faculty to fund their students’ research. Although the numbers of grants written each year by each faculty member is very impressive, many of these grants are for small sums of money, and the vast majority are not funded. One wonders if the pressure to crank out proposals at a very high rate has reached the point of diminishing returns, and if success would be greater if more time were taken in the writing of fewer, but very high quality and well thought-out proposals.

One change that might be considered is to allow faculty outside the TIEHH to act as thesis advisors for some of the ENTX students. For example, there may be faculty in the medical school who have grants that could support student research and pay student stipends and who would welcome the opportunity to do so in return for qualified students working in their labs. These students could remain ENTX students and fulfill all of the requirements of the program, and the Dept. of Environmental Toxicology would still get credit for graduating them. This paradigm of opening thesis advising roles for faculty in other units works well at other institutions and encourages collaboration among units.