Report of the Program Review
Department of Civil and Environmental Engineering
conducted Spring 2001

In Winter Quarter, 2001, Dean Landolt appointed a committee to review the Department of Civil and Environmental Engineering (hereafter the "Department") in the College of Engineering. This committee consisted of:

Nicholas Chrisman, Professor of Geography, UW, Chair
David Montgomery, Professor of Earth and Space Sciences, UW
Mark Tuttle, Professor of Mechanical Engineering, UW
Nicholas Jones, Professor of Civil Engineering, Johns Hopkins University
Richard G. Luthy, Professor of Civil Engineering, Stanford University

Overall, our impressions of the Department were very positive. Over the past ten years, there have been many changes. The Department has lost a substantial number of faculty positions, and in the process has focused its emphasis on a smaller number of areas of concentration. Throughout this process, the leadership has been strong. The Department's current combination of research foci include some of the most pressing problems associated with the socioeconomic development of the region. At the risk of oversimplifying a complex array, the Department plays a crucial role in developing the appropriate preparation for earthquakes (and other hazards), addressing congestion (and related transportation concerns), and the management of water resources issues (from understanding the local salmon habitat and regional climate change effects to modeling global circulation). The Department consists of a community of scholars who are at the core of addressing these demanding research issues, each taking his or her own particular direction. Overall, the complex tensions have been appropriately balanced. As in any enterprise, some elements are easier to achieve than others, and this review committee will not shy away from suggesting some changes in focus and direction. In addition, an excellent Department cannot exist in isolation, there are a number of issues that concern relationships with other parts of the University.

This report contains three parts: a summary of the process, our findings, and a series of recommendations to the Department, the College, the Graduate School and other appropriate units.

Summary of Process

On 2 March 2001, the internal members of the committee met with Deans Landolt, Denton, Campbell, Associate Provost Friedman and the staff involved in the review process. This meeting provided the charge to the committee with particular reference to the self-study document produced by the Department. The date for the site visit was set for 10 and 11 May. Over the next weeks, the schedule for the site visit was developed and confirmed with a meeting on 25 April between the chair of the committee, the outgoing chair and incoming acting chair of the Department. In the period prior to the site

visit, the chair of the committee offered to meet with junior members of faculty, and set up individual appointments with five in total.

The charge to this committee is broad. We are meant to look at the development of the Department since its last review 10 years ago, all degree programs, the overall scholarship of the faculty, and the future plans for the unit.

The committee convened on 9 May and prepared for the site visit process. The site visit proceeded with the following schedule:

Thursday, 10 May	
8:30-10:00	Departmental Overview (Mannering, Rutherford, Miller)
10:15-11:00	Structures and Geotechnical Faculty (8 attended)
11:00-12:00	Hydrology and Environmental Faculty (6 attended)
12:00-1:30	Lunch with undergraduates (approximately 25 attended)
1:30-2:15	Construction and Transportation Faculty (5 attended)
2:15-2:45	Professor Nihan, Director TransNow
2:45-3:15	Assoc. Prof. Booth, Director CUWRM
3:15-3:45	Hallenback, Director TRAC
4:00-5:00	Graduate Students (4 attended)
6:00-8:30	Committee discussions over dinner
Friday 11 May	
8:30-10:00	Tour of facilities
10:00-11:00	Junior Faculty (11 attended)
11:00-11:30	Staff (10 attended)
11:30-12:20	Individual meetings with Faculty (5 attended)
12:30-3:00	Lunch and executive session
3:00-5:00	Exit Interview

While the schedule was tight, the Committee was able to meet with nearly all faculty who were in town. The committee was able to tour all laboratory spaces under departmental control, as well as most of the graduate student office spaces. Since the number of graduate students attending on Thursday during the site visit was not adequate (due to a scheduling conflict with an outside speaker), Professors Montgomery and Chrisman met with approximately 25 graduate students during a lunch on Monday 14 May.

Findings

As expressed above, the overall impression of the Review Committee is very positive. The Department has gone through transitions that could demoralize a unit (such as reduction from 39 faculty to 28). In this process the Department has concentrated its efforts more sharply on certain key themes and combinations of expertise. We are impressed by how much this Department has been able to maintain and achieve relative to the support offered by the University. This Department has succeeded by concentrating on the things it does well.

Civil Engineering is a broad discipline, encompassing many facets of both the constructed and natural environments. In the past ten years, Civil Engineering as a discipline nationwide has gone through some changes in focus, as most programs have contracted somewhat, as for example by reducing or eliminating their surveying component or other specializations. Some of the reductions in the UW Department come from this kind of change in the discipline. But, it has not been a story of continued reductions. This Department recently added the "and Environmental" to its title. This change reflects and formalizes the ever-increasing importance of this area to the State and the Nation. Historically, the Department enjoys a tradition of excellence in environmental engineering and a strong program of scholarship in this direction. In the short term, the Department will need to make similar tough choices regarding strategic focus and resource allocations. The Construction Management component of the Department will become understaffed with an expected departure of a professor, and the hydrology/hydraulics group has also recently lost key faculty.

With appropriate support and careful choices of interdisciplinary cooperation, this Department can continue to make important contributions to some of the most pressing problems of the region as well as the civil engineering (and broader) research community. Scholarly careers require long investments for pay-offs that occur far in the future. The recent response to the Nisqually Earthquake demonstrates how these long-term directions can suddenly rise to public prominence. The Department has similar examples in dealing with congestion in transportation and in various components of water resources management. The University Administration, the State and the region should appreciate that the outcomes for public service are not simply a response to a crisis, but the result of long-term preparation and sustained involvement in education, research, and professional service.

The self-study produced by the Department for this review relies heavily on evidence of ratings produced by the National Research Council and US News and World Report. While the Department does well in these lists, the Committee feels that this kind of ranking is not the best indicator of continued success for the future. These rankings may reflect a range of issues (such as external prestige within the engineering community, the achievements of past graduates, and current public visibility) that are not so easily influenced. We believe that setting the specific goal of rising in these rankings is probably not worthwhile. A better strategy is to maintain focus in critical areas, stay committed to research and the needs of the State and the region, and invest in building up the PhD program.

This Committee feels that the appropriate measure of any Department has to be found in the full range of scholarship (research, teaching and service) expected by the University. Civil and Environmental Engineering is positioned to respond to some of the grand challenges to the civil engineering (and broader) research community, and in fact to society as a whole. Recognition at the national and international level comes from the base of research excellence. In the next ten years as the research environment becomes increasingly interdisciplinary, excellence will also reflect how a unit connects itself to a larger team of scholars to collectively address larger, integrated problems, or current problems in a broader context. Already there are some signs of participation in broad initiatives in this Department (such as the Center for Urban Water Resources), but the level of participation will need to expand and

become more a part of the norm for the unit. The University of Washington offers particularly strong partners in a number of related fields, but not all of the potential linkages have been made. With a strong interdisciplinary research base, tied to a focus on public service, the instructional program will renew itself as the new approaches develop.

In our review process we have identified a number of specific concerns that we feel need to be addressed. The following section is not ordered in any particular way, since many of the issues are interlocking.

Doctoral program

A recent report (not included in the self-study) documents the successes of the doctoral program of the Department. Indeed, the graduates have a strong record of publication and have obtained highly competitive jobs following graduation. Still, the distribution of doctoral research is uneven across the Department. Certain professors in some concentrations manage a very disproportionate share of the load. While some variability is expected, the doctoral degree should become a more widespread and core component of the Department for the following reasons. Advances in engineering research and technology development derive from PhD students who develop the expertise to study problems in depth. A PhD student spends a much longer period on campus productively involved in research than a Masters student. This longer period means a smaller proportion of their time is spent ascending the learning curve. PhD students also provide continuity in research; for example, a pool of experienced students is available to explain equipment use and experimental procedures, as well as standard computational methods to new students. Finally, PhD students are more likely to make a notable publishable contribution from their research. For all of these reasons, we believe a greater emphasis should be placed on PhD-based research than currently exists across the Department as a whole.

Governance

Historically, this large Department had the tradition of leadership by relatively strong chairs. Recently, the divisions were dissolved as administrative units, but complete unity has evidently not been achieved, nor should it be expected with such a large department. The heritage of relatively independent divisions within the Department led to some highly contentious arguments, particularly over hiring strategies. The Strategic Planning Committee, which was originally founded to broker the Strategic Plan, has become an executive committee de facto. While this may have worked to channel discussion for the planning process, the governance of the Department has to ensure that all faculty voices are heard.

Recently, the Department took steps to create a Council for undergraduates to voice their concerns. This seems to have led to useful suggestions and greater feelings of participation. It is surprising that graduate students do not have a parallel organization with even more direct involvement in committees.

Faculty Salaries

No issue can be more potentially divisive and damaging to Departmental morale than faculty salaries. The College and the University have assisted the Department in making some recent hires at the market rate for promising assistant professors, so the current salary market is easy to assess. The ongoing University-wide pattern of minimal raises for faculty once they are hired has created various forms of

compression and inversion between the junior and more senior faculty which has resulted in very serious equity issues. It is imperative for the continued strengthening of the Department that these issues be addressed, even if at present it is not clear how much the College and University can assist in this process given that salary problems are not unique to this Department.

Computing facilities

Computing facilities require continued investment and staff attention. The Department's recent efforts to improve these facilities through various funding mechanisms such as the Student Technology Fee program should be continued and expanded. Labs of Unix systems seem to be underutilized and there seems to be a transition under way from computer labs for graduate students towards a personal computer on each desk. Currently individual desk-top computers seem to be provided by faculty through grant support. This situation creates strong asymmetries in access to crucial technology among different research groups. Some departmental-level pool may be needed to ensure that graduate students, particularly PhD students, receive adequate access to the software and hardware required to support their research. Under current funding mechanisms, it is not clear how this will happen.

Recommendations

We have organized our recommendations outwards from the Department. This order does not reflect the Committee's judgement of priority; it reflects the relevant organizational entity to implement them.

Departmental Recommendations

1) The Department should take measures to expand the breadth of participation in governance. The Strategic Planning Committee, originally convened to address a specific purpose, has effectively become an executive committee. Such a body is certainly important for a large department, but this group should not be the primary originator of Departmental actions without adequate interaction with the faculty as a whole.
2) The Department should promote various ways for graduate students to become more active in Department-wide activities. Currently, graduate students seem to have no organization that could interact with the administration of the Department. While it may not be a faculty function to create such a body, we believe that the Department should cultivate and encourage ways for the graduate students to interact as a collective and to participate more directly in Department governance. In specific, we believe that graduate student representatives should be welcomed on certain committees (those with the responsibilities for faculty searches, curriculum, computing, space and equipment, for example). In addition, there should be increased formative experiences that cut across the specific tracks (that used to be the Divisions of the Department). While the undergraduates spend a whole year in common classes, thus bonding tight solidarity, the graduate students generally disperse quickly into their specializations without some shared experience. In other disciplines, shared "methods classes" often serve this role; such curricular issues and other means for promoting graduate student activities and involvement should be open to innovation by the faculty.
3) The Department, having substantially reformed both the Bachelors' degrees and the Masters' degrees, should now concentrate particular effort on the development of the Doctoral degree program.

Recruitment of the most qualified candidates is critical and should not be left to the resources available to individual investigators. With increased emphasis on a course-work Masters degree, there may be fewer students continuing from the UW Masters program into doctoral work. Efforts directed at external recruitment must become a key priority. In specific, we recommend that the Department try to pool and/or devote discretionary resources to provide multi-year offers so that individual short-term grant sources, teaching assistantships, and recruitment fellowships could be combined to attract the most competitive Doctoral students. Doctoral graduates from this Department have a good record of publication and competitive job placements, so investment in this part of the program should produce positive results for the overall scholarship of the Department. We see an imbalance in the amount of research performed by faculty supervising PhD students. A fundamental shift across the Department towards more research by PhD students will have positive outcomes on research impact, scholarly contributions, Department reputation, and overall visibility.

4) The Department has adopted and recently revised its Strategic Plan. This document sets a daunting number of goals, and proposes specific measures of performance towards these goals. This document, if it is to be effective, has to be taken at its word. The measures prescribed should be tabulated and tracked (or the concept of measures should be revised) and the Plan updated as necessary.
5) The Faculty Hiring Plan process should be continued and updated to reflect current vacancies and the mix of needs required. For this purpose, the Strategic Planning Committee seems to have worked well in balancing the various perspectives across the Department. In particular, this committee needs to address the issue of whether to remain viable in Construction [the Review Committee recommends that that this area be maintained by coordination with the Construction Management Department in the College of Architecture and Urban Planning] and Hydraulics [the committee recommends maintaining expertise in this area if construed broadly to include computational fluid dynamics and various components of water resources management].
6) The physical facilities of the Department require attention, which is in some cases considerable. Selected labs have received recent renovations, but continued efforts are required. Some of the graduate student office spaces provide what is at best characterized as a dismal ambience and require some renovations to make them functional (let alone attractive) and productive spaces. Building on the apparent successes (to community building and ambience) associated with recent renovations (such as the main office space), some of the other common spaces in the Department should be refurbished.

College Recommendations

1) It would be desirable for the reductions in faculty to be stemmed. This unit is already under considerable pressure in its ability to discharge its responsibilities to the teaching, research and service missions. The College should also ensure that vacancies in faculty are filled expeditiously. Long delays in replacing faculty can damage the competitiveness of doctoral programs and place undue strains on faculty who have to cover gaps in the curriculum.
2) The College (working with other appropriate units) should pay attention to salary inequities in the Department. The Committee recognizes that the current situation developed out of the combination

of a number of distinct causes, and that there may not be sufficient resources to resolve the inequities in this Department immediately along with other units in similar situations.

3) The Department requires leadership in the form an active Chair. The search for a new Chair should take top priority. Some faculty in the unit believe that an external search would be most advantageous. Others (including the outgoing Chair) believe that there are strong internal candidates and an internal search should be given careful consideration. Clearly, the Department is at an important juncture, and the expeditious identification of new and appropriate leadership is critical. The Committee – in the time available and with the materials provided – is not in a position to recommend specifically whether an internal or external search is needed. This decision must be based on considering the current and future needs of the Department, as well as the availability of suitably qualified and motivated candidates inside the Department.
4) There was some concern among junior faculty members that mentorship advice from the Department in preparation for promotions was not completely aligned with the expectations of the College Council. Although perfect alignment is unattainable, there should some increased dialog between the Council, the Chairs of Departments and the individual mentor committees formed to work with junior faculty to ensure that junior faculty have a clear understanding of Departmental and University expectations.
5) For various reasons, many of them historical, a large proportion of the alumni donations to the Department are earmarked for undergraduate support. While any donations are laudable and appreciated, the College should work with the Department to make the current balance of needs apparent to potential donors, so that this valuable source of revenue might be more directly aligned with current needs.

Undergraduate Education

1) We recommend that the Bachelors' degrees be continued. The recent restructuring seems appropriate and the program seems to generate strong cohesion among the students.
2) The students in this program are quite strongly motivated to obtain practical experience, and many arrange summer jobs and internships without much direct interaction with the academic world. It would make some sense for the Department to celebrate these successes more openly, and to bring the employers closer to the Department in the process. This should be done in some way that does not add excessive time burden on the faculty. Increased use of a campus facility such as the Carlson Center for Service Learning may be appropriate.
3) Consistent with the earlier recommendation regarding multidisciplinary collaboration on problems of significant interest and relevance, undergraduate students – too – should be strongly encouraged at every opportunity to take full advantage of the breadth of non-Departmental offerings available in other engineering disciplines, and indeed outside of engineering. The faculty of the Department can set this example to a large extent.

Graduate School

1) The Committee recommends that the Graduate Council continue the current range of Masters degrees.
2) The Committee recommends that the Graduate Council continue the PhD program.
3) The Graduate School should work closely with the Department to enhance the competitiveness of the

financial offers made to incoming doctoral students.

Office of Research

1) In light of the findings about the increasing importance of interdisciplinary research, the University should reassess the process by which the return of overhead (RSA) is allocated to Departments. Some procedure must be designed that gives a fairer allocation of these valuable funds across interdisciplinary teams. The current all-or-nothing arrangement leaves too many at the whims of informal agreements and incomplete memory. This recommendation does not derive specifically from any particular weakness in the Department, in fact, this unit seems to allocate these funds quite fairly if they do arrive in the budgets of the unit.