

**Review of the Programs of the Department of Geological Sciences,
California State University, East Bay**

Report and Recommendations

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Summary of Findings and Recommendations

- The number of TT faculty is below the “critical mass” for a comprehensive department with multiple undergraduate and graduate degree programs. Working with the dean, the department should have a definitive plan of action to strengthen its programs. Together they should make a concerted effort to grow out of the difficult situation.
- Increase participation in the G.E. program, Liberal Studies, and Environmental Sciences programs. In particular, offer at least two, or possibly three, sections of the new G.E. upper-division courses per quarter. Use the “surplus” FTES from the new G.E. courses to fund additional faculty positions. It is possible to grow to 6 or 7 TT faculty members within 4 or 5 years.
- Teaching productivity as measured in terms of sections per FTEF is near the national norm, but in terms of student credit hours per FTEF, or FTES per FTEF (SFR), it is at about the national 25%-quartile value. To increase teaching productivity, maximize class sizes of non-lab general courses.
- Expenditure per FTES is about normal as compared to the national norms. The same level of funding should be sustained with special augmentations to counter the effect of the loss of the vehicle pool and to hire additional part-time lecturers to help teach the new G.E. courses.
- The mission statement of the department is adequate and appropriate, and it is consistent with the university’s mission. To achieve its goals, the department needs continuing support and a long-term commitment by the administration.
- Establish a dialog between the faculty and the dean to improve morale, allay concerns, and reaffirm administration’s support for the faculty.
- All faculty members are active in research and/or scholarly activities. Staff and faculty work cooperatively and collegially. The department chair successfully provides an effective leadership. The department has a high potential to succeed.
- Support faculty members to attend workshops on course development especially for G.E., introductory and general courses.
- Establish linkages with the UC Berkeley faculty to develop opportunities for collaborations in teaching and research.
- The number of students in the graduate program is too small. I recommend supporting the project based MS degree option for at least two or three years.

- The department should indicate its displeasure over bureaucratic delays, but work with the graduate admission office to expedite the application-admission process.
- Students are dissatisfied with the availability of courses. They are also concerned about the future accessibility of field education. To remedy this, the department chair should maintain an open line of communication with students to minimize their apprehension caused by uncertainties. The department should also create a roadmap for undergraduate student advisement based on a consistent two-year cycle of course offerings. Avoid canceling classes just because of low enrollments.
- Hire a TT faculty member to cover the area of hydrogeology ASAP. Use a qualified and competent part-time lecturer in the meantime. Identify and recruit outstanding minority or female candidates for the TT faculty position.
- Review and update all catalog listings.
- Math 2304 should be listed as a required course rather than implicitly in the footnote. Faculty should encourage students to take calculus-based Physics.
- A data analysis and/or statistical application course is needed and should be considered for the B.S. curriculum.
- Consider a restructuring of Geol 4320 with an increase of one unit or more.
- A lower-division introductory Environmental Science course should be introduced and taught by the Geology faculty for the Environmental Science Program. Ideally, this course may also be included as part of the university's G.E. program.
- Consider the possibility of participating in teaching subjects, such as evolution of life, paleontology, and earth history, under Area IIIA-a of the Liberal Studies curriculum, in addition to teaching only Area IIIA-b.
- Develop web-based and distance-learning non-lab courses. Convert appropriate existing non-lab courses to web-based or distance learning format.
- Conduct alumni and employer surveys to obtain long-term assessment data.
- Increase student recruitment effort by working with the university's recruitment and outreach office. Increase publicity through local public media.
- Ask the school to implement a more reliable and better organized information technology support service.

- Make a contingency plan for Mr. Garbutt's anticipated retirement. Additional budget is needed for a smooth transition.

1. Introduction

This report is submitted as part of the five-year program review process for the Department of Geological Sciences at California State University, East Bay (formerly California State University, Hayward). The comments and recommendations contained herein are based on:

- (1) statistics provided by the department chair, Dr. Detlef Warnke,
- (2) staffing and FTES data provided by the dean of the School of Science, Dr. Michael Leung,
- (3) information obtained from the printed copy of university catalog for 2004-2006, and from the on-line catalog at the university's website,
- (4) a memorandum to CAPR from the department, dated January 6, 2005, which includes the Self Study and Planning Document, and
- (5) information and comments collected verbally during the site visit, supplemented by a faculty member's written comments received via e-mail after the visit.

As a part of the review process, I visited the department on February 11, 2005. During my visit, I met and discussed the department's programs and its operation with Dean Michael Leung, Chair Detlef Warnke, Associate Professor Jeff Seitz, Assistant Professors Mitch Craig and Luther Strayer, and a group of students, consisting of two graduate and three undergraduate students. All interviews were held in private, except for the open discussion with the students whom I met as a group. All discussions were candid and forthright. Without any reservations, I believe that all interviewees' comments are sincere and constructive, and hence, their concerns should be addressed and their suggestions taken in earnest. During my visit, I did not have the opportunity to interview the members of the department's supporting staff, Ms. Diane Wilson and Mr. Phil Garbutt, but I did obtain reliable information and comments on their work and performance.

This report is subdivided into nine sections. Each section contains general reviews of factual information followed by my opinions and recommendations. Important findings and recommendations are also summarized in the front section of the report. As an external reviewer, I am not cognizant of all the limiting factors and practical constraints under which the department has to operate, and therefore, I do not expect that the department will implement all my recommendations and suggestions. Nevertheless, I trust that they will help to improve the department's operation, raise the quality of its educational programs, and thus enhance its ability to achieve its mission and goals.

2. Background

I have had the opportunity to associate with the Department of Geological Sciences for a number of years, and therefore, I have been reasonably familiar with the department's academic programs and its mode of operation. I served as an adjunct professor and a lecturer of the department in the 1980's. Since then, I have visited the department in many occasions. I also served as the department's program reviewer in 1995. As a faculty member who also have served as department chair and program coordinator on a sister campus (California State University, Fresno), I am aware of many practical limitations as well as the political and financial realities under which CSU science departments operate.

Many of the background information about the academic discipline of geological (or earth) sciences presented in my 1995 review report are still valid and applicable today. For this reason, I will not restate them here. For details, please refer to the *Background* section of my 1995 report.

During the past decade, in my opinion, the most important new developments in geological sciences are in the following areas:

- Global climate change and earth system science – An integrated approach to study global environmental issues, such as global warming, ocean-atmosphere interaction, global hydrologic and hydrogeochemical cycles.
- Biogeochemistry – An integration of geochemistry, biochemistry, microbiology, and physiology for mainly environmental applications.
- Environmental and hydrological sciences – Current emphases include remediation technology, fate and transport of contaminants, fracture hydrology, waste water treatment, desalination, water conservation, waste recycling, and water resources management.
- Application of Earth Science in public policy and safety areas – These include GIS application, land use and planning, resource estimation and management, geohazard mitigation, such as landslides, earthquakes, and, of course, tsunamis.

Although the industrial job market in the energy and mining sectors has recovered slightly since a decade ago, it remains rather depressed, and most job opportunities in these areas are positions stationed overseas. Engineering and environmental consulting firms still constitute the largest employment sector for many geology graduates. Consequently, most geology graduates depend heavily on job openings in the hydrologic-environmental areas. Hence, state board registrations and certifications for geologists, hydrogeologists, and/or geophysicists continue to be important career goals for them. The practical experience requirements have been reduced. Currently, candidates can be admitted to take their license examinations with a minimum of only three years of

professional geological experience after the bachelor's degree, and a minimum of two years of professional geological experience after the master's degree.

3. Overall Impression

By virtue of its undergraduate and graduate degree programs, the department of CSUEB can be classified as a *comprehensive department* (based on the Carnegie Classification). In addition to its own majors programs, the department also supports other university programs, namely the General Education and the teachers' education programs, as part of its overall mission. Furthermore, it also participates in offering an interdisciplinary undergraduate degree (B.S.) program in Environmental Science in collaboration with the departments of Biology, Chemistry, and Geography.

Since my last review in 1995, the number of full-time tenure-track faculty members has been reduced from six to four despite my previous recommendation to increase to a more desirable number. The current faculty is composed of two tenured and two probationary faculty members in addition to part-time lecturers. For a comprehensive department with a broad range of responsibilities, I consider the current size of full-time tenure-track faculty to be inadequate. Faculty members are under tremendous pressure to teach in addition to conducting research and performing numerous other academic duties required to function as a department. Even under this hardship, I am very pleased to report that all faculty members are able to maintain a high spirit and a great sense of accomplishment. Most importantly, they all work in unison towards the department's mission and goals. Their dedication and enthusiasm are nothing but highly commendable.

Dr. Warnke's leadership as department chair is critical for the department's success. Under the current less-than-ideal budgetary situation, he provides inspirational guidance to the relatively junior faculty members. Furthermore, he is able to maintain a sense of purpose and create a supportive environment for career development and scholarly activities. Without a doubt, the department is in good hands.

With regard to the support from the administration, the feeling among the faculty may not be as unanimous. Some expressed frustration with the limited budgetary support from the school's administration, but at the same time, some expressed appreciation for the dean's generous help in securing external research grants. For this reason, I would like to encourage a dialog between the department faculty and the dean to clarify the administration's position and explain the practical limitations with respect to departmental and faculty supports. It will be particularly important to agree upon future expectations and a mutually acceptable plan of action for the department for the next few years. This will help to allay any concerns, enhance communication, and improve faculty's morale despite the current unfriendly budgetary climate.

4. Mission and Goals

I have examined the department's mission statement included in the *Memorandum to CAPR* dated January 6, 2006. I have found that the statement is adequate and covers a set of goals pertinent to current social needs and economic forces. It is also consistent with and central to the university's mission, values, and vision.

Inasmuch as these goals are appropriate to the nature of the department and the makeup of its faculty, it is necessary to point out that the department's primary mission is "*to provide an excellent field and laboratory based education...*" In order to realize this, the availability of modern laboratory equipment for instruction and the accessibility to field training areas are obviously essential. The costs of meeting these programmatic requirements are understandably high relative to many other non-laboratory non-field based degree programs. Unfortunately, due to the small size of the department and a relatively modest budget, meeting these requirements would not be easy without the administration's strong support. Although I concur unequivocally with the department's mission statement, I am concerned about the department's current ability to work toward its goals because of a limited budget and a small faculty. Therefore, I believe that a long-term commitment by the administration to support and strengthen the department's programs is absolutely necessary.

5. Curriculums

The department offers two parallel curriculums leading to a B.S. degree and a B.A. degree with Major in Geology. In addition, a curriculum leading to a Minor in Geology is also offered at the undergraduate level. Jointly with the departments of Biology, Chemistry, and Geography, it also offers a curriculum leading to a B.S. degree in Environmental Science with an option in Geology.

At the graduate level, the department currently offers a curriculum leading to a M.S. degree in Geology with a 9-unit thesis requirement. It is also preparing to offer a new M.S. degree curriculum in which the 9-unit thesis requirement is substituted with a 2 to 4-unit project and additional course work.

Consistent with its mission, the department also offers courses servicing the university's General Education curriculum, Environmental Studies, and Liberal Studies programs. The Liberal Studies program is designed particularly for training K to 8 teachers. Reviews of these external programs are not part of this departmental review process and therefore beyond the scope of this report. However, since service courses for these curriculums could generate a significant portion of the total FTES of the department, they nevertheless are important components of the department's overall programs, and therefore will be taken into consideration when the issues of funding and resources are addressed.

5.1 Undergraduate Major Programs

Although both the B.S. and the B.A. curriculums can be used to satisfy the educational requirements for geology license examinations, only the B.S. curriculum is designed to train professional geologists and intended to prepare students for graduate studies in geology. On the other hand, the B.A. curriculum is more suitable for students seeking the single-subject high school teaching credential.

In general, the undergraduate major curriculums adequately cover the basic geology subjects in addition to the three supporting areas of Physics, Chemistry, and Mathematics (mainly Calculus), all of which are essential for a comprehensive geology education. Although these curriculums are appropriate for realizing the mission and goals of the department, they represent only a bare-bone minimum and they provide students with few options to develop their individual interests within geology. This serious limitation is due to the small size of the faculty. Accordingly, the only way to improve this situation is to let the size of the faculty grow so that a broader range of geological specialties can be covered.

Constrained by a tight budget, many courses, particularly the elective courses, are now offered only in alternate years. Furthermore, several classes were cancelled in the past couple of years due to low enrollments. The limited course offerings have affected the ability of students to complete their course of study in a timely manner. Unfortunately, this was one of the more serious complaints voiced by the students during my visit. In addition, many field components of the curriculum may be negatively impacted by the elimination of the vehicle pool. Since field training is an essential element of geological education, a satisfactory solution for fully maintaining the field components of the curriculums must be found.

In view of this, it is imperative to point out that virtual field trips (i.e. students looking at pictures on computer screens) can never replace the actual experience in the field. Such a watered-down approach to field education can be likened to training and certifying surgeons by only requiring the inexperienced doctors in residence to watch video tapes without requiring them to perform any real hands-on surgery. This simply cannot be done.

The B.S. curriculum currently requires two quarters of Calculus (Calculus I and Calculus II) and it includes an option of either the calculus-based or algebra-based Physics sequence. Additionally, the calculus-based Physics sequence requires Calculus III as a prerequisite. Therefore, Calculus III implicitly becomes a core requirement if the calculus-based Physics sequence is selected.

Based on the scope of work that geology graduates most likely have to perform nowadays as part of their professional work, analytical thinking, problem solving, and quantitative skills are essential. Furthermore, because calculus-based Physics can better prepare students for professional or research careers, I would strongly recommend emphasizing the importance of Physics and Mathematics by moving Math 2304 (Calculus III) into the

core course listing rather than in the footnote while still leaving the algebra-based Physics option available. Although the curriculum will remain unchanged, it would make a difference in the minds of students who may then give more serious considerations of taking the more rigorous course of study. The current listing (in the footnote) deemphasizes its importance and it may in fact cause students to shy away even though many of them may be perfectly capable of taking on the more challenging course. In addition, faculty advisors should encourage students to consider the more rigorous course of study so that they can live up to their highest potential. For geology, it remains true that the level of ability to do science is limited by one's ability to understand mathematics.

For similar reason, data analysis and applied statistics are also very useful and important tools in geological analyses. Almost all areas of geology require some application of statistical methods in analyzing field or laboratory data. The current curriculum does not include a course specifically geared toward this important area. I would like to recommend developing a new "Quantitative Geology" course covering statistical methods and data analysis in geology to be included in the list of electives, if not in the core. Alternatively, in view of the limited resources, it may be more practical in the interim to identify an existing statistical application course (e.g. STAT 3031) to be included in the list of electives, or as a required course. In such case, Geology faculty may also work with the Statistics Department faculty to develop work examples in Geology to be used by the course or course section recommended for Geology majors.

Another very important area that currently needs to be strengthened is hydrogeology. Students have expressed their frustration and concern about the availability of the hydrogeology course because Dr. Nancy Fagan has recently retired. Since hydrogeology is considered to be essential by most prospective employers, students worry that they may not be able to obtain the training and experience that they will need to compete in the job market. Hence, I strongly recommend hiring a replacement of Dr. Fagan as soon as possible. For the same reason, I would also like to recommend considering an increase of credit units by at least one for Geol 4320 (Hydrogeology). Because most undergraduate introductory hydrogeology courses on other campuses carry 4 semester units, in my opinion, a 4-quarter-unit course does not provide enough time to cover all the topics deemed necessary for geology practice. An alternate approach may be restructuring the existing course into two more compact courses of three units each. Obviously, this will have to be done by the new TT faculty hired to cover this area.

To facilitate students' advancement towards the completion of their degree requirements, I would recommend the department to develop a four-year roadmap which students can follow and use as a planning and advisement tool. This four-year roadmap should be based on a fixed and consistent two-year cycle of course offerings, which should not be changed under normal circumstances despite the fact that some courses may have low enrollments. This will give students a definitive guide to plan ahead and obtain a limited guarantee on course availability. This potentially will help to attract more students into the major programs, because many prospective students may have avoided the geology degree programs due to the perceived uncertainty in getting the courses that they want.

There are two important reasons for not canceling Geology courses in the major curriculums only because of low enrollments. Firstly, students' education should be our top priority. The department may save a few thousand dollars of lecturer's salary, but students risk a much bigger loss if their graduations are delayed. Secondly, the major degree programs are central to the mission of the department. Without them, the department would be reduced to nothing but a junior college level teaching factory. I feel that most current faculty members would not want to work in such a downgraded environment. Because most departmental FTES (currently more than 75%) are generated by a few high enrollment G.E. lower-division classes, and these "net-FTES-gaining" classes are in effect supporting a larger number of the "net-FTES-losing" low enrollment major courses, the difference in a handful of students in those low enrollment classes for the majors would not cause any significant negative impacts on the total number of departmental FTES. Similarly, a substantial percentage-wise increase in the number of majors may not generate any significant positive impact on the total departmental FTES. Therefore, the key is to focus on expanding the "net-FTES-gaining" portion of departmental course offerings, and at the same time, maintain a consistent two-year cycle of course offerings for the major curriculums without adversely impacting students' ability to complete the curricular requirements within a reasonable time (four years).

A suggestion was made by a faculty member to review and update the catalog listings periodically, and delist any outdated courses. I agree. I presume that the university already has an established procedure. If not, I would suggest that the department faculty takes the initiative to do so.

Since the allocation of resources is often tied to the number of FTES generated by the department as a whole or by individual courses, a faculty member has expressed his concern about the tendency of lowering academic standards in order to accommodate a larger number of students. I hope that this is only a perception rather than the fact. Very often, faculty members, in particular probationary and part-time faculty members, feel the necessity to lower the standards of their courses in order to accommodate and attract more students.

Although I think that this concern is a real issue, I do not believe that lowering academic standards is the only way to attract more students. Offering an attractive course does not necessarily equate to offering a watered-down course. Students love to attend courses that are well organized. They like courses of which the lectures are truly interesting and stimulating. They want courses which have lots of hands-on learning activities. They like lecturers who are dedicated to teaching; teachers who show care and attention. Above all, they want to obtain information with a computer through the internet rather than walking over to the library building. They are truly the e-generation! With that in mind, I would like to recommend more attention should be focused on course materials and course development.

In my opinion, developing successful G.E. courses is crucial for the future success of the department, and therefore, I would suggest that each faculty member should be given the

opportunity to attend at least one or more of the workshops focusing on teaching techniques and course development for introductory science courses. There are many available summer workshops sponsored by the CSU, NSF, and a number of scientific organizations. I would also strongly recommend the dean to make available additional funds to the department faculty in order to support this very important effort.

5.2 Graduate Program

The M.S. degree curriculum is quite flexible and it successfully provides an opportunity for students to study a particular area in depth. Although Geology covers a wide range of diverse subjects, graduate students are able to focus on their primary fields of interest. The current number of active graduate students is only about 6 or 7, although the official number of students on record may be a little higher. For this reason, the department cannot justify offering more than one graduate class per quarter and very often, I was told, the courses were recent repeats, leaving students without much choice.

On a brighter note, the department's cross-registration agreement with the University of California, Berkeley does provide an excellent opportunity to strengthen the graduate degree program. I would definitely encourage the faculty to advise students to take full advantage of the arrangement as much as possible. Riding on this agreement, individual faculty members should also establish linkages with the UC faculty and develop opportunities to co-teach courses, co-advise graduate students, share equipment, and collaborate in research.

All graduate courses are offered in the evening to accommodate students, many of whom have a daytime job. I was told that CSUEB's graduate program is the only evening graduate program in Geology offered in the San Francisco Bay Area. Therefore, it has been able to attract more mature working students who need an additional degree to advance their careers, or want to improve their geological knowledge and skills as required by their jobs. Nevertheless, this program currently fails to attract a critical mass of students partly because of its limited course offerings, and as a result, the department cannot justify more graduate courses because of the small number of students. It is a Catch-22 situation.

To attract more students into the program, a new project (non-thesis) based M.S. degree is being introduced. In the past, many students did not complete their graduate studies mainly because of the 9-unit thesis requirement. Working students cannot usually set aside a large block of time to pursue a substantial thesis research project. Hence, the 9-unit thesis requirement has become a formidable obstacle, and this has been the main reason for the low completion rate. With the new project based option, the graduate program will be better suited for the population of working students. It will likely attract more students into the program. Moreover, project based M.S. degree programs are not uncommon in applied science fields, such as engineering. Therefore, I agree that providing students with an optional thesis requirement is a reasonable approach to strengthen the program.

Graduate programs are always more expensive than undergraduate programs, but they are an integral part of a comprehensive department. Without graduate programs, there would not be any graduate teaching or research assistants. Without graduate assistants, there would not be any significant amount of research activities. For that reason, I recommend supporting the new M.S. degree program for a period of at least two or three years. After that, an assessment of the new program should be conducted. If it fails to increase the number of students in the program significantly, a more drastic step, including a temporary suspension of the program, should then be considered. Nevertheless, when the size of the faculty recovers, the strength of the graduate program will naturally improve.

With respect to graduate recruitment and admission, there is some dissatisfaction about long delays in processing graduate applications and admissions. The delays allegedly hamper the department's ability to recruit new students. I am unsure about what actually causes the delays and what the administrative process entails. Regardless, I would encourage the department to voice its discontent about these delays with both the graduation admission office and the university's graduate studies committee or other appropriate committees. The department chair may also contact other departments that may have the same problem so as to organize a bigger voice to demand improvement. In addition, departments may also enlist their deans' voice in this matter.

5.3 Environmental Science

The department participates in offering an interdisciplinary degree program leading to a B.S. degree in Environmental Sciences. The program is jointly offered by the departments of Geological Sciences, Biology, Chemistry, and Geography. I do not have access to the student statistics of this program. However, I have learned that the number of students who have elected the Geology option of this program has been rather small, and therefore, they do not significantly add to the department's total FTES. Nonetheless, I believe that the Environmental Science degree program has the potential to grow if a substantial effort in recruitment is made. Since it is an interdepartmental, inter-school program, a concerted recruitment effort should be made.

The lower-division core of this program is comprised of a number of general introductory courses in the sciences, but noticeably absent is an introductory Environmental Science course that can provide students with a survey of current environmental issues, and their scientific contexts. In my opinion, an introductory Environmental Science course should be introduced by the Geology faculty into the lower-division core, and the absence of such a course is a flaw in the curriculum.

In the current curriculum configuration, Geology, among the other sciences, has the lowest number of units (5 units) in the lower-division core (while Biology has 10; Chemistry, 23; Physics, 12). It is only logical and pedagogically sound to increase Geology's share of courses at the lower-division level by including an introductory Environmental Science course, which can provide an "earth science flavor" to attract

more students into taking the Geology option. Under the existing curriculum, by the time when students finally take the additional Geology courses in the upper-division core, it may be already too late for students to switch to the Geology option.

An introductory Environmental Science course would not be too difficult to develop because of the availability of a large selection of textbooks and teaching materials. On many university campuses, such a course is also counted as a lower-division G.E. course quite popular among non-science majors. Hence, I would also suggest the department faculty to consider developing this new course keeping in mind the possibility of including it in the G.E. curriculum, in addition to the lower-division core of the Environmental Science program.

Because neither this Environmental Science program nor the G.E. curriculum is under the direct control of the department's faculty, the department must then work jointly with other departments and academic units in this effort. It will also need the dean's support and consent in order to achieve this goal.

5.4 General Education and Liberal Studies

Similar to many other Geology departments in the CSU system, the General Education and Liberal Studies programs provide more than 75% of the department's total FTES, and therefore, these programs virtually support the rest of the department's degree programs. By paying more attention to these programs, the share of FTES generated by them could be increased. For this reason, I strongly recommend the department to take decisive steps to optimize (or maximize) its participation. Dr. Seitz told me that a plan to offer new upper-division courses for the G.E. program is underway. These new courses include Geology of National Parks, Meteorology, Oceanography, etc., most of which can potentially generate high demands. These courses will be taught typically without laboratory requirements, and therefore their enrollments will not be limited by the usual constraint of laboratory resources. Furthermore, part-time lecturers can be hired without much difficulty since the subject matters are typically general in nature and do not require specialists. Dr. Seitz indicated that the department intended to offer one or two of these new G.E. courses per quarter, and their frequencies of offering will depend on the availability of lecturers.

Assuming that each class section has 45 students and these are all 4-unit courses, two class sections per quarter will generate 24 FTES. Further assuming a current (2002) funding level of \$4,795 per FTES (see table on Page 21), this will increase the department's budget by \$115,000 per year, which is more than enough to fund one additional FTEF position after accounting for the cost of hiring a part-time lecturer. Since part-time lecturers are usually paid only for the units they actually teach at or near the entry level of the pay scale, these courses could be a very effective means to help the department grow. Towards this objective, I recommend offering at least two sections of these courses per quarter, and after the first year, increasing to three or four sections per quarter depending on the demands.

To do this, the department must first secure the availability of classrooms with desirable capacities. Furthermore, the dean must support the department with an initial investment of hiring qualified and competent part-time lecturers. In order to compete with similar courses offered by other departments, these new courses must develop a reasonably good reputation at the start. Therefore, the department should pay very close attention to the quality of the lecturers it hires, and should not just offer the job to the cheapest candidate available. Whenever possible, regular TT faculty should also be used.

Many non-laboratory courses could be transformed into web based electronic (distance learning) format. This instructional delivery format would be very popular among working students who otherwise cannot fit all required classes into their schedules. However, in order to maintain the same academic standard as any regular courses, instructors must spend a very substantial amount of initial effort in preparing and designing electronic courses. Therefore, it may not be feasible or advisable to entrust part-time lecturers to do the course development work. Nevertheless, I would encourage the tenure-track faculty to pursue the possibilities. Although the initial amount of work may be daunting, the ensuing reward and satisfaction will make it very worthwhile.

The department only offers one 5-unit lower-division course for the Liberal Studies curriculum under Area IIIA-b – “Physical Sciences”. The courses in this area also include courses offered by the departments of Physics and Chemistry. Meanwhile, the department does not offer courses under Area IIIA-a – “Biological Sciences”, which is exclusively populated by courses offered by the Biology Department. Because areas, such as paleontology and the evolution of life through earth’s history, can be considered to be biological science, the Geology Department should explore the opportunity in teaching Area IIIA-a “Biological Sciences” as well.

5.5 Outcome Assessment

An outcome assessment plan was included in the Self-Study and Planning document provided by Chair Warnke. It lists three different sets of learning objectives corresponding to the three degree programs – B.S., B.A. and M.S. The document also identifies the various course objectives and syllabus requirements that can provide the faculty with the opportunities to assess students’ abilities to meet the overall program learning objectives. There were no assessment data available for this review. It is probably because outcome assessment activities have been implemented only very recently and there are no statistically meaningful data available at this point in time.

Nonetheless, while the assessment of the immediate learning outcomes may be sufficient for now, the longer term educational effectiveness on students’ career development is not evaluated. According to the Self-Study and Planning document, an alumni database has been created, and therefore, I would recommend conducting an alumni survey to determine the long term career impacts of the department’s degree programs. At the same time, it would also be beneficial to solicit written inputs from experienced and

established alumni using the same survey questionnaire. Also, the department may be able to obtain some useful feedback from major employers who can provide helpful comments on the curriculums and practical suggestions for the department's programs.

6. Faculty

Due to retirements, the number of full-time tenure-track faculty members has been reduced to only four. I consider this number to be below the critical mass for a comprehensive science department that offers both undergraduate and graduate degree programs. In spite of the small number of TT faculty, I found that all faculty members are well qualified, active, and enthusiastic. Although there is some concern over the administration's ability and willingness to support its programs and provide needed resources for the department, members of the faculty only view the current situation as a temporary setback due to the state's budgetary woe. Most importantly, all of them have been able to maintain a good spirit to go forward.

Chair Warnke has been with the department for more than 30 years, while the rest of the faculty members only joined the faculty within the last eight years. The chair successfully provides an effective leadership and moral support for the more junior faculty. I am very pleased to point out that unlike many other larger academic departments that I have seen, the small faculty works very well together in a cooperative and collegial manner. This is an admirable and a very desirable attribute of the department faculty which, I believe, indicates a high potential to become better and stronger.

Another indication of an active and enthusiastic faculty is that all four tenure-track members are engaged in scholarly research, grants and contract activities in their areas of specialty or professional interests. The more junior faculty does appreciate the help and encouragement that the chair has offered in addition to the support that has been made available by the dean.

In summary, I believe that despite its size, the faculty is active and enthusiastic, and therefore, the department has a very high potential to grow out of the current difficult situation, given the ways and means. Towards this end, a plan of action to increase the number of TT faculty to a more desirable level is essential to the department's future success. (A very brief and preliminary plan is presented under Section 9).

7. Students

CSU East Bay, by virtue of its location and academic programs, is a "commuter campus". Therefore, only a small percent of students develop strong ties with the department. This may explain the small number of students who were able to meet with me on a Friday. Nevertheless, I found these students to be intelligent, motivated, and in possession of a

mature attitude. Furthermore, the small student population allows them to readily obtain academic advisement from the faculty. Evidently, they know their subjects well, and all of them have a clear vision of their career objectives.

Students have expressed their fond appreciation of the faculty. They fully understand the difficult situation under which the faculty has to work, and they are very supportive of what the faculty has done. However, their sense of the current situation does give rise to some deep apprehensions.

Students' primary cause of concern is the availability of courses as previously discussed, partly because it has a direct impact on their graduation and career development plans, and also because one year's delay in graduation may translate into very significant financial losses.

Specifically, students have expressed their concerns over the following areas:

- Hydrology courses, in particular, at the graduate level, are not being taught.
- The elimination of the vehicle pool may have an adverse effect on their educational experience, in particular, learning field techniques and the required field mapping experience. Field education is considered by many students and prospective employers as the hallmark of the CSUEB degree programs, and it can provide students with an advantage over their competitors graduated from the other more research oriented universities nearby, including UC Berkeley and Stanford. Students are especially anxious about the possibility of canceling the summer field geology course.
- The choice of upper-division electives is limited. Many times, the same course was offered in consecutive years, apparently due to the small pool of faculty's specialties. Many curricular areas that students consider important have hardly been covered. For example, the GIS course has not been taught for some time.

All these related curricular issues should be addressed as previously recommended. In addition, I would also like to recommend the department chair to maintain an open line of communication with student representatives. Uncertainties cause apprehensions; rumors and hearsays aggravate the situation. Students will surely appreciate timely and accurate information on important curricular decisions. This will help to eliminate unnecessary worries and guess work.

Student recruitment is a critical element in order for the department to grow. It deserves some additional efforts and attention. The faculty should consult with the university's recruitment and outreach specialists about ways to attract prospective students into the field of Geology. In my opinion, for such a small and over-worked faculty, visiting individual high school classes and pleading students to sign up is a very ineffective way to boost enrollment. Instead, the department should maintain strong ties with geology departments and instructors of the Bay Area's junior colleges, which can send a steady

stream of transfer students to CSUEB. In addition, the faculty should take every opportunity to publicize the department's programs and geological career opportunities through public media and group presentations. Examples could be: writing op/ed articles in newspapers, giving public comments on news radios, offering public presentations for libraries, museums, or other non-profit organizations. With the current concerns about earthquakes, tsunamis, and landslides, there should be plenty of opportunities to speak. Parents often have some influence on their children's career choices. I believe that speaking to adults is as effective as visiting high schools. Furthermore, recruiting materials, such as information flyers and posters are also essential. However, materials must be attractive and updated. They can be distributed to the area's high schools by mail and by the university's recruitment staff during the many college recruitment events in the fall.

8. Resources

8.1 Instructional Equipment, Space, and Vehicles

The materials and equipment available for instruction appear to be reasonably adequate and appropriate for a geology department of its size. Instructional technology also appears to be accessible and available. Obviously, a continuous effort to upgrade and maintain the equipment and materials is a basic requirement for preserving the quality of the department's academic programs. It is hoped that the administration will be sensitive to the department's needs.

Although computer hardware is readily available, a possible area for improvement is the technical support for computer classrooms. Although general technical expertise and services are usually obtainable, the accessibility of specific expertise related to computer classroom setup or operation may not be consistent. Some special services are haphazard depending only on the knowledge of the individual technical support personnel available at the time. Therefore, it would be more desirable for the school to implement a better management strategy with a better organized and a more systematic service structure to make sure that all areas of service are covered when they are needed.

The availability of research and office space is perceived by the faculty as an important issue as well as a limiting factor on productivity. I would recommend a review of all available departmental space by the faculty with the help of the department's technician to identify possible changes of space utilization so as to increase usage efficiency. If the result of the review shows that additional space is required, a request with justifications should be submitted to the dean for further consideration. Since space allocation is typically a "zero-sum" game played at the university's level, it will probably require very strong justifications in addition to patience and persistence. Space allocation is likely tied to growth in terms of FTEF and FTES.

Both the faculty and the students have expressed a great concern on the loss of the vehicle pool. Because field experience is an integral part of many geology courses, they are afraid that this loss will have a detrimental effect on the quality of field education,

which has been the hallmark of the CSUEB department. Due to this loss, the department is left without any option but to rely on rental vehicles. Since renting vehicles will probably cost more than using the vehicle pool, it is imperative that the departmental budget be augmented to cover the additional rental expenses. It is very important to maintain the same high quality of field education that has been offered by the department in the past.

8.2 Human Resources - Support Staff

The supporting staff consists of the department administrative assistant and the instructional technician. Both of them work satisfactorily, and are well liked by the faculty and students.

Ms. Williams, the administrative assistant, is very competent, helpful, and self-motivated. She ensures a smooth day-to-day operation of the department office and therefore, her valuable contribution should not be overlooked.

Mr. Garbutt, the instructional technician, has been with the department for over 30 years. He is the de facto curator of the teaching collections, and he also effectively maintains the department's equipment, laboratories, and teaching facilities. From the point of view of the faculty and students, Mr. Garbutt is an indispensable member of the department. Unfortunately, there has been an unsubstantiated rumor about Mr. Garbutt's impending retirement. This creates some unwarranted anxiety among faculty and students. Because his retirement is not a matter of if, but a matter of when, the department should therefore work with Mr. Garbutt to plan ahead as soon as a firm decision is made, or if it has been made. To ensure a smooth transition, there must be an overlapping period when both he and his successor work together. This necessitates a temporary augmentation of the technician's salary. For example, Mr. Garbutt may be hired as a part-time consultant after retirement, or under some other suitable arrangements to ensure a satisfactory and trouble-free handover.

8.3 Human Resources - Faculty

The curricular shortcomings previously described previously point to the fact that the number of faculty is currently below the critical mass. I form the opinion partly based on the department's degree program offerings, its mission, and the character of its faculty. However, I also believe that the department is only suffering a temporary setback, and without a doubt, it has a high potential to regain its strength in the numbers of faculty and students, and hence, its ability to offer quality and viable academic programs.

For this purpose, the top priority should be filling the hydrogeology position. As described earlier, the importance of hydrogeology in students' professional career

developments cannot be overemphasized. Therefore, I would recommend hiring a qualified part-time lecturer immediately while a formal search for a full-time tenure-track person is underway.

Based on the statistical data provided by the department, the ratio of minority students to white students is approximately 1 to 3, and the ratio of female students to male students is about 1 to 2. Since all current faculty members are white and male, I would encourage the department to make a conscious effort to identify and recruit outstanding qualified minority and/or female candidates to join the faculty.

To determine the appropriate funding level for the department and its cost efficiency, I have compared the department's 2002/2003 data with the national data based on the 2002 National Study of Instructional Costs and Productivity conducted by the University of Delaware (with data updated in 2003). The results of these comparisons are shown in the table below:

Instructional Cost for Geological and Earth Sciences/Geosciences

	<i>CSU East Bay</i>	<i>National norm for (Carnegie) comprehensive institutions</i>	<i>National quartile values</i>
<i>Credit hours per term per instructional FTEF</i>	207 (2002) 216 (2003)	246	213 (25%) 241 (50%) 278 (75%)
<i>Number of sections per term per instructional FTEF</i>	4.44 (2002) 3.91 (2003)	4.2	3.6 (25%) 4.1 (50%) 5.1 (75%)
<i>FTEF per term per instructional FTEF</i>	13.81 (2002) 14.46 (2003)	16.5	14.5 (25%) 16.4 (50%) 18.5 (75%)
<i>Direct Inst Exp. per qtr credit hour</i>	\$107 (2002) \$118 (2003*)	\$99 (qtr. hr.) \$149 (sem. hr.)	
<i>Direct Inst Exp. per FTES</i>	\$4795 (2002) \$5293 (2003*)	\$4511	

* Calculated using 2002 data. Because the number of TT faculty was reduced by one (20%) in 2003, the calculated cost may be over-estimated.

CSU East Bay data for calculation:

Total FTES per term generated by Geology (Fall 2002): 65.27 (from Dean Leung)

Total FTES per term generated by Geology (Fall 2003): 59.13 (from Dean Leung)

FTES per FTEF (Fall, 2002): 13.81 (SFR from Dean Leung)

FTES per FTEF (Fall, 2003): 14.46 (SFR from Dean Leung)

Number of section offered per term (Fall, 2002): 21 (from Dean Leung)

Number of section offered per term (Fall, 2003): 16 (from Dean Leung)

Total quarter credit hours per term (Fall, 2002): $65.27 \times 15 = 979$

Total quarter credit hours per term (Fall, 2003): $59.13 \times 15 = 887$

Total FTEF (Fall, 2002): $65.27 / 13.81 = 4.73$

Total FTEF (Fall, 2003): $59.13 / 14.46 = 4.09$

Estimated direct instructional cost for 2002 and 2003 (TT faculty + lecturers + operational budget): \$313,000 (estimated from 2003 cost data provided by department and pers. comm. w/Chair Warnke)

Note: Direct instructional expenditure per credit hour and per FTES is calculated assuming the FTES and credit hours generated in the fall quarter remain unchanged for the winter and spring quarters. This assumption may not be correct.

These data show that the department's teaching productivity in terms of the number of sections per term per full-time equivalent faculty (FTEF) is near the national norm for comparable institutions that were surveyed based on the Carnegie classification of comprehensive universities. The CSUEB values are 4.44 for 2002 and 3.91 for 2003, while the national norm is 4.2 for 2002.

However, when teaching productivity is measured by the total student credit hours per FTEF, and also the number of full-time equivalent students (FTES) per FTEF, the CSUEB figures fall below the national norm, to about the 25% quartile values. The CSUEB's figures for credit hours per term per FTEF are 207 for 2002 and 216 for 2003, while the national norm is 246 and the national 25% quartile value is 213. Since FTES and total student credit hours are linearly related by a constant factor, CSUEB's figures for FTES per term per FTEF also fall to about the same quartile range.

Evidently, these data indicate that the average section size at CSUEB must be smaller than the national average section size in terms of the number of students. Based on this observation, I would like to recommend finding ways to increase class size whenever possible. The enrollments in classes for the major programs are a function of the number of majors, which can be increased by a greater recruitment effort as recommended earlier. More importantly, because more than 75% of the department's FTES are generated by lower-division G.E./introductory type courses, the focus should be on maximizing the class sizes for these lower-division courses.

First, the department should try to offer all non-lab general courses in large lecturer halls. Since scheduling classes in large lecture halls may be a highly contentious exercise, the department should enlist the help of the dean and the higher administration, if the administration is genuinely interested in turning around a weak and small department into a strong and healthy one.

Second, because classes based on web-based asynchronous or distance learning format are not limited by scheduling or the classroom size, the faculty should consider this form of course delivery for all suitable non-lab courses.

The above table also shows that the 2002 CSUEB's expenditures per FTES and expenditures per student credit hour lie within 10% of the national norm. Because I have not been provided with the expenditure for 2003 and given the fact that the tenure-track faculty was reduced by 20% (by one) in 2003, the calculated expenditures per FTES and expenditures per student credit hours for 2003 may not be accurate. In addition, I have been told that the FTES figure of the fall quarter is typically lower than those of winter and spring quarters, and therefore, the actual annualized expenditure per FTES or per credit hour would be even lower. Since California is a high-cost state relative to the national average, and also, the cost efficiency typically decreases with the size of department due to a somewhat constant overhead cost to operate a department, I consider that the department is doing very well in terms of cost efficiency, although there is additional room for improvements as previously suggested in this report.

9. A Suggested Plan of Action

It is my opinion that the department has all the elements to succeed in the years ahead. I hope that the administration will continue to support the department's needs and sustain its growth. To strengthen the department's programs, the most fundamental step is to increase the number of students (FTES), followed closely by the number of faculty (FTEF). To achieve this, I would like to propose the following steps:

1. Restore TT faculty to the 2002 level as soon as possible. It is especially important to cover the much demanded areas, such as hydrogeology. This will improve the graduate program's vitality and viability, and enhance course availability for the undergraduate curriculum.
2. Offer additional General Education (and if possible, Liberal Studies) courses as soon as they are approved. Initially, identify and recruit good, competent lecturers, preferably with Ph.D. degrees, to cover these general courses. Use the largest lecture halls available. Plan to offer general courses in distance-learning and/or web-based formats, which should be developed by the regular TT faculty. Increase class enrollments up to whatever level that the university policy allows. Hire graduate students as graders, if needed.
3. Obtain a budget augmentation from the dean to cover new lecturer positions until these new course offerings are self-sustaining (usually after one or two years).
4. Review "surplus" FTES generated after one or two years, and use these additional FTES to create additional tenure-track faculty positions.

Possible first year scenario (2005-06)

A minimum of two additional G.E. sections will be offered each quarter.

Assuming 4 credit units for each course and 45 students per section, they will generate 24 additional FTES. Using the 2002 expenditure per FTES value (\$4,795), an additional \$115,000 will be generated. Subtracting the cost of a two-third lecturer position for approximately \$27,000, the net gain will be approximately \$88,000 for the following year. The budget gain can be applied to fund one additional TT faculty position for the following academic year (2006-07).

To do this, an initial budget augmentation of approximately \$27,000 from the administration is needed for academic year 2005-06.

Possible second year scenario (2006-07)

Return \$27,000 of initial augmentation to the administration, if required.

Use \$50,000 for a new TT faculty position at the assistant professor level.

Use the remaining \$38,000 for one full-time lecturer position to offer three G.E. sections per quarter.

This will generate 36 FTES equivalent to \$173,000 per year. The net gain will be \$135,000, which can be used to fund the new TT faculty at the assistant professor level and an additional TT faculty position at the assistant or associate professor level for 2007-08.

Possible third year scenario (2007-08)

With two new TT faculty members, the number of TT faculty will be six.

Following years

With additional course developments as previously proposed in the other potentially growing areas, including distance-learning, Liberal Studies, Environmental Science, etc., it is highly possible to further increase the number of TT faculty positions to 7 within the next four to five years.

This plan as suggested above is very preliminary, and it is presented only as an illustration of feasibility in addition to the other recommendations set forth in this report. Obviously, the final action plan will need to be further refined subject to many other practical limitations, and also with the help and consent of the administration. Most importantly, the department must first obtain a strong and continuing commitment from the school dean. Towards this end, the department has already taken a very positive first step in developing a number of new G.E. courses that are essential to this kind of action plan. Therefore, I truly believe that this or a similar plan is both workable and acceptable to both the faculty and the administration. Without any doubt, it will help the department regain its strength and ability in offering quality undergraduate and graduate programs within four to five years.

April 20, 2005

**Response to Outside Reviewer's Report
(Dr. C. John Suen, California State University, Fresno, dated April 2005)**

We greatly appreciate the reviewer's efforts in the preparation of this report. We will follow many of his suggestions, and indeed, some of them have already been implemented. We certainly see the need to increase FTES through increased participation in both the lower division and upper division GE offerings, and increased participation in the Multiple Subject and Single Subject Teacher Preparation programs.

We wholeheartedly agree with his recommendation to increase the number of TT positions in the department. As soon as the number of FTES increases (we think it will take about 2-3 years to accomplish this) we will seek at least one new TT position, probably in a water-resource field.

Although we generally agree with the reviewer's findings, we would like to clarify some items:

Summary of Findings and Recommendations

Item 12: The reviewer states that we should "avoid canceling classes because of low enrollments."

Because of budget cuts last year, it was necessary to cancel more courses than usual. This year we were more conservative in our course offerings and did not have to cancel any majors' classes.

2. Background

The reviewer states "Although the industrial job market in the energy and mining industries has recovered slightly since a decade ago, it is still depressed, and most job opportunities in this area are positions stationed overseas."

With oil prices at near-record levels, currently in excess of \$50 per barrel, the worldwide demand for geologists is expected to increase. Although most oil and gas companies in the US are based in Texas, the national demand should create vacancies in other geoscience-related firms, including geotechnical firms and research labs in California and the San Francisco Bay Area.

5.1 Undergraduate Major Programs

In this section, the first paragraph reads "the B.A. curriculum is more suitable for students seeking the single-subject high school teaching credential." This statement is not really correct. The single subject science teacher will be better prepared with a B.S. The B.A. degree may be more appropriate for students who want to pursue professional graduate programs in law, policy and business.

Second paragraph states that the curricula of the department “represent a bare-bone minimum and they provide students with few options to develop their individual interests in geology.” This is overstated. It is true that the Department would be able to offer a richer menu of elective courses with more faculty. However, our program is as rigorous and broad as any other undergraduate program at comparable institutions. A comparison of our B.S. program with other local institutions indicates that our program is comparable in breadth to those offered at San Francisco State University and San Jose State University and exceeds the minimum breadth requirements at UC Berkeley. Our philosophy for undergraduate education is to give students rigorous breadth of study in the Geological Sciences. A more focused study in an area of concentration is reserved for graduate studies. We currently do not offer, nor do our enrollments justify, a variety of options in the undergraduate degree.

The sixth paragraph argues for the inclusion of Math 2304 (Calc III) in the major core. We disagree. Math 2304 is not a prerequisite to any courses that our department currently offers. We recently increased the math requirement to include Math 1305 (CalcII). Students who choose to take Math 2304 may count the units towards their major electives and students who choose to take the Calculus-based Physics sequence are able to count the additional units toward their major. A number of students have chosen to take Math 2304 and the Calculus-based sequence. We believe that requiring the Math 2304 would amount to an unnecessary burden for students.

Paragraph seven suggests that we develop a new “Quantitative Geology” course and we will consider this. However, we encourage students to take courses in Statistics and currently allow students to count STAT 3031 as one of their major electives.

A class in quantitative geology or data analysis would be a good addition to our curriculum. In addition to statistical applications, geoscientists need training in spatial data analysis and time-series analysis.

Paragraph eight suggests that there is concern “about the availability of the hydrogeology course because Dr. Nancy Fegan has recently retired.” Since the departure of Dr. Fegan, Hydrogeology has been taught on a yearly basis, twice by a current TT faculty member and once by a part-time lecturer.

Paragraph nine suggests that we develop a “four-year roadmap” for students. This has been done. However, a vast majority of our students transfer from Community Colleges with varying backgrounds and levels of remediation. The roadmap is not an effective one-size fits all approach to advising our students.

5.2 Graduate Program

Paragraph 5: The reviewer states, “I recommend supporting the new M.S. degree program for a period of at least two or three years. After that, an assessment of the new program should be conducted. If it fails to increase significantly the number of students in the program, a more drastic step, including the temporary suspension of the graduate program, should then be considered.”

Note that the M.S. in Geological Sciences has been offered by this department since the late 1970s. New this year is a project-based approach that provides students with an alternative to the thesis. We need at least 5 years to fully evaluate this new approach.

5.3 Environmental Science

In section it is recommended that the Department offer an LD course in Environmental Science. We note however, that a general introductory course (ENSC 2800) has been in the catalog for years and is currently being offered through General Education. The course is being added to the lower division core of the Environmental Science Program. The Geology Department currently teaches this class and already gets the FTES for ENSC 2800.

5.5 Outcome Assessment

The reviewer suggests that we survey alumni or major employers to obtain long-term assessment data.

These are good suggestions. Employment history of alumni would be useful data. On previous alumni surveys, we have asked respondents to list which courses or topics are most important in their current work. A similar question could be asked of employers, and we will develop such a questionnaire during the next months.



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MEMORANDUM

DATE: 17 November 2005
TO: Dr. Julia Norton, Chair, Committee on Academic Planning and Review
FROM: Dr. D. A. Warnke, Chair, Department of Geological Sciences
CC: Dr. Vish Hegde, Committee on Academic Planning and Review
RE: Geology 5-year Review

In response to questions raised at the meeting of CAPR on 3 November 2005, we have provided updated data from Fall 2005 on the number of degrees granted and FTES, both of which show significant improvements over previous years.

Degrees Granted: The number of graduate and undergraduate degrees granted in 2005 will be the highest in the past four years, as shown in the graph in Attachment A. We expect an additional 5 students to complete the M.S. program later this academic year.

Historic FTES: The data reviewed by CAPR included Geology FTES from 1999-2004, and it was noted that levels in 2003 and 2004 were significantly below the 1999-2002 levels. We include here the Fall 2005 FTES, which are up approximately 20% over 2004 levels (see Attachment B). This is significant considering that Fall 2005 FTES for both the College of Science and University were lower than in 2004. Nonetheless, we recognize the ongoing need to recruit students, generate interest in our program, and more fully participate in General Education and service courses. One of the ways we are doing this is by offering a new course, GEOL 1000, Earth Systems Science, which is listed in the current course catalog and is scheduled to be offered Fall 2006. This course is being developed as a service course and will be required for all Liberal Studies majors.

Please note that historic FTES data for Geological Sciences tend to be underestimated for two reasons:

- In addition to courses with the GEOL prefix, we frequently teach classes with the SCI and ENSC prefixes. The latter are often not included in estimates of FTES for Geological Sciences.
- The historic FTES data provided with our 5-year review and this report consist only of Fall Quarter data. Fall Quarter FTES tend to be low in our department relative to other quarters because one of our four regular faculty members often teaches in the summer, but not in the fall.

Assessment: We are implementing a multiple-choice exam that will include questions from Geology core courses, for both BA and BS degrees. This will be an anonymous test, to be given at the beginning of our core sequence, and repeated at the end of the sequence in order to measure improvement. It will also enable year-to-year comparisons of different cohorts of students.

Appendix: CAPR 5 Year Review
 Statistics

Department: **GEOLOGY**

		Fall Quarter						
Category	Item	1999	2000	2001	2002	2003	2004	
A.	Enrollment History	Number of majors	30	26	29	32	33	27
		Undergraduate	21	17	20	22	23	19
		Graduate	9	9	9	10	10	8
		FTES generated	80.46/59	82.27/59	80.6/63	90.6/65	58.47/30/59	61.47/40
		Number of sections offered	17	20	23	21	16	15
		Average section size	20.1	16.4	16.0	18.2	29.9	14.0
		Number of students on wait list	0.0	0.0	3.0	0.0	0.0	0.0
		Degrees Granted	2.0	12.0	5.0	4.0	4.0	1.0
		Undergraduate	1.0	7.0	4.0	2.0	3.0	1.0
Graduate	1	5	1	2	1	0		
B.	Staffing	Headcounts of TT faculty	5.00	5.00	4.00	5.00	4.00	4.00
		FERP FTEF	0.33	0.33	0.00	0.00	0.00	0.00
		Total TT FTEF	4.33	4.33	4.00	5.00	4.00	4.00
		Lecturer FTEF	1.02	1.31	1.97	2.34	1.07	1.20
		Total FTEF	5.35	5.64	5.97	7.34	5.07	5.20
		Total Teaching FTEF	3.37	4.38	3.12	5.96		
		% Lecturer by FTEF (reported)	19%	23%	33%	32%	21%	23%
		% Lecturer by FTES (reported)	25%	44%	63%	76%		
% Sections taught by lecturers	25%	50%	65%	72%	45%	45%		
C.	Capacity Utilization	SFR for TT faculty	22.10	14.10	14.52	5.54	7.39	10.20
		SFR for lecturers	19.18	20.22	24.31	26.61	34.65	44.50
		Overall SFR	17.45	13.53	20.09	13.81	14.46	54.70
		System SFR	18.60	18.40	18.70	N/A		
		% capacity utilization*						
D.	Cost Factors	Total TT faculty cost					\$247,478	
		TT faculty Gen. Fund assigned time and leave cost						
		TT faculty grant release time cost						
		Actual TT Faculty instructional cost						
		Cost per FTES for TT faculty						
		Total lecturer cost					\$37,470	
		Lecturer assigned time and leave cost						
		Actual lecturer instructional cost						
Cost per FTES for lecturers								

MAJORS, FTES, FTEF AND SFR THROUGH THE CURRENT YEAR							
Fall Quarter							
Student Faculty Ratio	1999	2000	2001	2002	2003	2004	
Lower Division							
FTES	44.4	48.0	37.6	29.2	37.47/12.67	48.67	
FTEF	1.6	2.6	1.8	1.4			
SFR	27.3	18.4	20.8	21.1			
Upper Division							
FTES	11.9	8.7	23.9	32.1	19.40	8.27	
FTEF	1.1	1.5	1.3	3.1			
SFR	11.0	5.9	19.0	10.4			
Undergraduate							
FTES	56.3	56.7	61.5	61.3	56.87	59.60	
FTEF	2.7	4.1	3.1	4.5			
SFR	20.8	13.9	20.1	13.7			
Graduate							
FTES	2.5	2.5	1.1	4.0	1.60	1.87	
FTEF	0.7	0.3	0.1	1.4			
SFR	3.7	8.5	21.4	2.8			
Total							
FTES	80.46/58.7	82.27/59.2	80.6/62.7	90.6/65.3	58.47	61.47	
FTEF	3.4	4.4	3.1	5.9	4.54	5.2	
SFR	17.5	13.5	20.1	11.0			

COURSES, SECTIONS, AVERAGE SECTION SIZE							
				Fall Quarter			
		1999	2000	2001	2002	2003	2004
Courses							
Lower Division		5	5	4	3	4	
Upper Division		4	3	5	6	5	
Undergraduate		9	8	9	9	9	
Graduate		3	1	1	2	1	
Total		12	9	10	11	10	
Sections							
Lower Division		10	13	11	10	3/5	
Upper Division		6	5	10	10	8/6	
Undergraduate		16	18	21	20	11/11	
Graduate		1	2	2	1	9/1	
Total		17	20	23	21	20/12	
Average Section Size							
Lower Division		24.9	20.3	20.5	18.3	18.3/34.5	
Upper Division		13	9.2	13.4	18.2	12.3/13.6	
Undergraduate		20.4	17.2	17.1	18.3		
Graduate		15	9	4	17	6	
Total		20.1	16.4	16	18.2	13.6	
Section Enrollement							
Lower Division		249	264	225	183	55/138	138
Upper Division		78	46	134	182	82/60	39
Undergraduate		327	310	359	365	137/198	177
Graduate		15	18	8	17	14/6	7
Total		342	328	367	382	151/204	184

STUDENT DATA							
				Fall Quarter			
		1999	2000	2001	2002	2003	2004
UNDERGRADUATES ENROLLED							
Major							
Minor							
Other Degree							
Female			7	6	11	12	7
Male			10	14	11	11	12
American Indian			1	1	1	3	3
Asian/PI/F			1	2	1	0	0
African American			0	1	1	0	0
Latino			14	12	14	14	11
White			1	4	4	6	5
Other/Unknown							
Average GPA			2.72	2.84	2.83	2.88	
Average Student Age					27		
GRADUATES ENROLLED							
Female			3	4	3	3	3
Male			6	5	7	7	5
American Indian			0	0	0	0	0
Asian/PI/F			1	2	2	1	1
African American			0	0	0	0	0
Latino			0	1	0	0	0
White			5	4	5	6	5
Other/Unknown			3	2	3	3	2
Average GPA			3.29	3.03	3.26	3.70	
Average Student Age					36		

Blue= From Institutional Research and Analysis
Black= From Data Warehouse

Purple= From Data given to Dietz from Dean
Green Diane's data



CALIFORNIA STATE UNIVERSITY, HAYWARD

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School of Science

Department of Geological Sciences

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MEMORANDUM

DATE: January 6, 2005
TO: CAPR
FROM: D. A. Warnke, Chair, Geological Sciences
RE: Five-year review

The department of Geological Sciences has completed a self-study, review and formulated program changes. Several documents resulted from this effort

1. Self Study and Planning Document, including Dr. Ferriz' outside review of 5 years ago, and Dr. Suen's outside review of 10 years ago and our compliance with most of their suggested changes. Assessment procedures are now in place, and further improvements are planned for the future.
2. Outside Reviewer's Report
3. Department Response to Outside Reviewer's Report
4. Appendix of Department Information
 - a. Department Statistics
 - b. Department Mission Statement
 - c. Learning Outcomes for core undergraduate and graduate geology degrees.

A handwritten signature in black ink, appearing to be the initials "DW" or similar, located in the lower right quadrant of the page.

CSUH Department of Geological Sciences

Self Study and Planning Document

2004-2005

Since its establishment in 1965, the Department of Geological Sciences has enjoyed a reputation in California of producing bachelor's and master's degree-holders in geology that are well-prepared, versatile and successful in securing employment and obtaining scholarships/assistantships while pursuing advanced degrees.

We have a long tradition of teaching applied geology, with field and laboratory experiences key in all undergraduate courses. Our faculty is active in research, and regularly participates in professional meetings and workshops, and convenes special sessions and workshops at international meetings. In the past 5 years, we have also increased our involvement in general science and teacher education programs.

Change has been dramatic in our department over 5 years, mirroring a trend seen in many departments on our campus and elsewhere. We have experienced the retirement or departure of 2 tenured faculty members (Hirschfeld and Fegan), and added 2 tenure-track members (Strayer and Craig). We currently have 4 regular faculty positions, down from 7 in the previous decade. The small number of tenure-track faculty members has greatly increased our reliance on lecturers at all levels of instruction and led to a decrease in student service. This has impacted our hands-on curriculum which largely consists of sequential, progressive courses, many of which have numerous prerequisites.

During the past 3 years our FTES have decreased, largely because the number of sections offered had to be decreased, and because a large cluster class that was taught during Fall, was moved to later in the year - yet the institutional statistics are based on Fall enrollments. It must also be pointed out that our own FTES calculations (in green) are considerably higher than institutional statistics because large enrollments in "SCI" classes are not included in "GEO" statistics, although it is my understanding that this is being changed.

A notable improvement in the field of geology is the large number of entry-level jobs available. Nearly all of our graduate students and many of our undergraduates are working in geology-related employment, or have the opportunity to do so. In the past several years, our employment bulletin board has been full of advertised openings, with many jobs going unfilled because of lack of applicants. This trend is predicted to continue into the next decade given the price of oil, the scarcity of clean water, and the natural hazards in California (don't think a tsunami cannot occur here - it can!) and the population explosion.

Our budgetary decision that will have a very negative impact on the department is the disappearance of the motor pool, necessitating course fees. Based on 2002-2003 costs of vehicle usage, we estimate that vehicle costs (State vs. Enterprise SUVs will at least

double for years with geology summer field camp (\$9,142.78 to \$21,051.18), and triple for years without summer field camp (\$2,190.54 to \$7,798.18). These costs will have to be borne by the Department, and although we received additional allocations from the College of Science, a pass-along to students will be unavoidable.

Other departmental activities and goals reached in the past 5 years are itemized below:

- Developed further the BS program in Environmental Science, jointly with Biology, Chemistry and Geography. This program has grown to about 29 majors in the last few years.
- Developed the Single Subject Teacher Credential Program in General Science Breadth, and the Concentration in Geology (Earth Sciences). State approval for the new program will be sought during academic year 2004-2005.
- Created an alumni database in preparation for funding initiatives.
- Established a biannual schedule for majors classes with previously low enrollments. This has increased FTES in those classes.
- Offered General Education Clusters in science, working with other science departments. One of these clusters has 2 geology classes.
- Offered one interdisciplinary General Education Cluster in Social Sciences, with faculty from Sociology and Philosophy.
- Continued to offer new courses developed both for majors and non-majors.
- For Geology Majors:
 - GEOL 6300 Quaternary Geology
 - GEOL 6405 Geotectonic Development of California
 - GEOL 4130 Survey of Geochemistry
 - GEOL 4850 Hawaiian Geology
 - GEOL 4600 Introduction to GIS for Earth Scientists
 - GEOL 3601 Mineralogy and Optics (new class resulting from the combination of 2 older classes).
- For General Education and Teacher Credential Students:
 - GEOL 2300 Natural Disasters
 - GEOL 2000 Geology of California
 - GEOL 1000 Earth System Science
 - SCI 1005 Science, Technology and the Future
 - SCI 3335 Science, technology and Values (taught jointly with, and cross-listed in Philosophy)
 - ENSC 2800 Environmental Problems of California

- Obtained new instrumentation and equipment from CI-CORE and NEHERP grants and university funds, including ground penetrating radar (GPR) accessories, and new computers for numerical modeling and estuarine research. Many of these items have been used in courses, and for student research.
- Developed learning outcomes for all required courses in the BS/BA/MS program, and developed a framework for an assessment plan.
- Developed a new approach to the MS (using the Project format), tailored for the adult, working population. The proposal for this new approach was approved, and will be implemented in 2005-2006. We expect greater "efficiency", i.e., larger class enrollments through this new approach, and a speedier "throughput" of students to obtain the M.S. degree.

Compliance with Dr. Suen's recommendations of 10 years ago

- Raising requirements for calculus level mathematics, use of computers in individual geology courses.
We have added one additional quarter to calculus in the core curriculum. Use of computers as has been implemented in a number of courses, e.g., Hydrogeology, Geophysics, Sedimentation and Stratigraphy, and GPS classes to name a few. Our own workstation now has Arc GIS installed.
- Students should be required to take support courses as early as possible, instructors should use computer applications.
This is an ongoing advising problem - we do our best. Computer applications have been introduced in many of our classes.
- Graduates should be able to write properly.
Writing components have been introduced in all UD and graduate courses.
- Department should increase offerings of geophysics and geochemistry.
These courses are being taught on alternate years in order to increase efficiency.
- Department should offer engineering geology and petroleum geology.
These courses have been taught by Lecturers, when WTUs and personnel were available to teach these courses.
- Department should consider reduction in units for mineralogy/optical mineralogy.
Done
- Department should gradually reduce field emphasis.
We still feel that field emphasis is important, but teach Introduction to Field Methods and Summer Field Camp only in alternate years.

- Number of faculty members should be brought to 7 immediately and to around 10 in 2000.

Not a chance.

Compliance with Dr. Ferriz, recommendation of 5 years ago. This topic has been addressed in Dr. Fegan's rebuttal to Dr. Ferriz' recommendation.

Department of Geological Sciences Goals for 2005-2010:

Our main goal for the near and long term future is to maintain a high degree of educational quality in our undergraduate and graduate programs. In light of our current status and our needs, we have developed the following specific goals for the coming years, ordered in terms of priority:

1. Increase overall department FTES. This will be accomplished in the next five years through the introduction of GEOL 1000 (Earth Systems Science) in both the Multiple Subject and the Single Subject Teacher Preparation Programs. As more and more students will have to follow the new requirements, enrollment in this class will increase, necessitating the use of large lecture rooms and numerous lab sections. This new course will be offered as soon as feasible. The tragic events in southeast Asia clearly suggest that basic Earth Science must be introduced at the grade-school level.
2. Establish course fees for all classes with field trip requirements so that field study is not eliminated because of the disappearance of the motor pool.
3. Increase number of majors and retention in the BS program
 - Update the B.S. curriculum as required
 - Outreach to attract new majors
 - Reach out to **undeclared** students in General Education courses and Freshmen clusters
 - Events for new and current students, such as field trips and get-togethers.
 - Participation in Science Day, networking with prospective students.
4. Establish more active ties with graduate students to ensure success
 - Improve students' rate of progress toward degree, specifically establish and promote the new approach to the M.S. degree. Many of our graduate students have already expressed great interest in this new approach.
 - Develop new courses in fields in demand in the workplace (contaminant transport, applied geophysics).
5. Implement Assessment Plan
 - Finalize undergraduate assessment process
 - Implement assessment plan for graduate program.

6. Build network with local employers
 - Work with Career Development Center to establish working relationships with potential employers
 - Involve local companies in department events and research
 - Have meeting of Bay Area sections of geological societies on campus.

7. Support faculty/student development
 - Develop connections between students seeking research experiences and faculty members
 - Engage all faculty in the graduate program as instructors and thesis/project advisors
 - Attract experienced lecturers to teach specialized courses, such as Micropaleontology.
 - Encourage students to give presentations at major scientific meetings.

8. Facilities enhancement
 - Continue to update instructional and research equipment, including modernizing all computer workstations, and purchasing new software. Acquire new particle-size analyzer with grant monies.
 - Continue department 'beautification' activities, focusing on display cases.

Student Learning Outcomes Geological Sciences

B.S. Degree

- Must be able to do independent geologic mapping, including preparation of a geologic map, legend, and geologic history.
- Must be able to prepare, draft, and describe a stratigraphic section.
- Must be able to describe and explain the structural geology of a region.
- Must be able to communicate geologic concepts.

Assessment: The geologic map or maps prepared during GEOL 4820, Summer Field Camp. Communications skills are tested during GEOL 4800, Senior Seminar.

B.A. Degree

- Must be able, under supervision, to do geologic mapping, or serve as field assistant to a senior geologist.
- Must be able to prepare, under supervision, stratigraphic sections and structural cross sections.
- Must be able to communicate geologic concepts.

Assessment: Geologic maps and cross sections of various kinds prepared during GEOL 3910, Geologic Field Methods. Communications skills tested during GEOL 4800, Senior Seminar.

M.S. Degree

- Must be able to conduct independent geologic research, including preparation of a University Thesis or Project. The result should be of high enough quality to be presented at scientific meetings.
- Must be able to write reports, based on research carried out on behalf of an employer.
- Must be able to evaluate reports written by other earth scientists, and to use written materials and data sets available in the library or on the world-wide-web.
- Must be able to communicate complex geological concepts.

Assessment: The thesis or project will be evaluated by a Departmental committee, and returned to the preparer for revision, if necessary. There will also be an oral defense of the Thesis, and when appropriate, a defense of the Project. Communication skills will be tested in GEOL 6811, Graduate Seminar.

Department of Geological Sciences
California State University, Hayward

Mission Statement

Our primary mission is to provide an excellent field and laboratory based education in geologic science to prepare students for professional careers in geology, graduate study or teaching earth science at the K-12 level.

We also support a number of complimentary missions, including

- Providing a research based MS program, taught entirely in the evening to accommodate working professionals. This component also enhances our baccalaureate degrees by allowing us to provide quality research experiences for undergraduates.
- Providing general education courses and services courses to other university programs.
- Supporting the Environmental Science BS through having a faculty member on that program's advisory board, and by offering an option in geology.
- Providing in-service teacher training and continuing education opportunities for professional geologists.
- Community outreach and education, especially in the field of geologic hazards and earthquake awareness.

not accurate
per Jantz

California State University, East Bay

APR Summary Data

Geological Sciences Fall 2000 - 2004

Geology	Fall Quarter				
	2000	2001	2002	2003	2004
A. Students					
1. Undergraduate	16	17	19	21	16
2. Graduate	10	12	13	12	11
3. Total Number of Majors	26	29	32	33	27
4. FTES Generated	59.2	62.7	65.3	32.5	42.1
College Years					
B. Degrees Awarded					
	99-00	00-01	01-02	02-03	03-04
1. Undergraduate	7	4	2	4	3
2. Graduate	5	1	2	0	1
3. Total	12	5	4	4	4
Fall Quarter					
	2000	2001	2002	2003	2004
C. Faculty					
Tenured/Track Headcount					
1. Full-Time	4	4	5	4	4
2. Part-Time	1	0	0	0	0
3. Total Tenure Track	5	4	5	4	4
Lecturer Headcount					
4. Full-Time	0	0	0	0	0
5. Part-Time	3	4	5	2	3
6. Total Non-Tenure Track	3	4	5	2	3
7. Grand Total All Faculty	8	8	10	6	7
Instructional FTE Faculty					
8. Tenured/Track	2.9	1.9	3.6	2.7	2.5
9. Lecturer	1.5	2.1	2.3	0.5	0.7
10. Total Instructional FTEF	4.4	4.0	5.9	3.2	3.2
Lecturer Teaching					
11. % Lecturer/Total Instructional FT	33.3%	52.5%	39.0%	16.8%	20.9%
12. FTES Taught by Lecturer	36.2	51.5	45.2	12.2	24.9
13. % FTES Lecture/FTES Generated	61.1%	82.2%	69.3%	37.6%	59.3%
D. Student Faculty Ratios					
1. Tenured/Track	7.9	5.8	5.5	7.6	6.7
2. Lecturer	24.8	24.3	19.6	22.6	37.2
3. SFR By Level (All Faculty)	13.5	15.5	11.0	10.1	13.1
4. Lower Division	18.4	20.8	21.0	17.1	37.2
5. Upper Division	5.9	12.7	10.4	9.4	6.9
6. Graduate	8.4	3.2	2.8	3.7	6.4
7. Number of Sections Offered	14	16	17	18	14
8. Average Section Size	17	16	15	8	12