

**Department of Mining Engineering  
Mackay School of Earth Sciences and Engineering**

**College of Science  
University of Nevada, Reno**

**Strategic Plan  
March 2004**

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## Executive Summary

The Mining Engineering Department is part of the Mackay School of Earth Sciences and Engineering of the College of Science. The constitution of the State of Nevada, as adopted in 1864, calls for a State University with instruction in Agriculture, Mechanic Arts, and Mining. Instruction in Mining started at the University in the early 1870's while still in Elko. A School of Mines was formed in 1886; and the School of Mines at the University of Nevada had its first graduates in 1888. The mining industry plays a prominent role in the State of Nevada and has done so for well over a hundred years.

Graduates of the Department of Mining Engineering can work in a variety of positions in the Nevada and international mining industry. The Department provides an opportunity for Nevadans and others from the Great Basin to receive Mining Engineering degrees that could lead to high paying jobs and exciting, varied and challenging careers.

The Department of Mining Engineering is the oldest engineering program of the University of Nevada. The Department confers the following degrees: B.S. Mining Engineering (also with a Quarry Engineering option), M.S. Mining Engineering and Ph.D. in Geo-Engineering (the latter is administered jointly with Geological Engineering that is part of the Department of Geosciences and Engineering). The B.S. Mining Engineering degree is accredited through the Engineering Accreditation Commission of the Accreditation Board on Engineering and Technology, Inc. This program was accredited in 1999 for a six-year term, the maximum length that can be awarded; the next general visit is in the 2005-06 academic year.

Undergraduate Mining Engineering education in the U.S., Canada, Europe and Australia has been under significant pressure over the last decade as a result of low enrollments in many of these programs. Many programs were eliminated over this period, including the one at the Royal School of Mines, Imperial College, London. Similar actions have been taken in the Western and Central U.S. over the last three years. These closures and changes are all in states where the mining industry was historically an important component of the state and regional economies, but not today. These closures reduced the number of accredited Mining and Mineral Engineering programs in the U.S. to 14.

The freshmen classes in the Department of Mining Engineering have increased in numbers over the last two years and many of last year's freshmen have been retained in the program. This means that the total number of undergraduate students is increasing and it provides a good base for building towards a steady increase in students enrolled for the BS in Mining Engineering. If the freshmen enrollment of about 12 is projected over the next two years, and considering the present retention and transfer success, it is possible that the undergraduate enrollment will double to 48 in 2005 from 24 in 2001. A large percentage of our students are on the Dean's list (Semester GPA>3.7). Most of the graduates (BS and MS) over the last four years received multiple offers and most accepted jobs in Nevada, thereby contributing to the State economy.

On March 25, 2003 the University of Nevada received a pledge from Newmont Mining Company for \$2.5 million over the next five years. More than 50 percent of this gift has been earmarked for the Department of Mining Engineering.

The Mining Engineering faculty has been very active in research funding over the last number of years. The funding for fiscal years 2001 and 2002 exceeded \$1,000,000 and it was about \$750,000 in 2003 (to date).

The department has the following general goals:

- a) Enhance the undergraduate program over the next four years
- b) Make the undergraduate degree programs relevant and robust in terms of evolving workforce issues, economic and societal needs in the 21<sup>st</sup> century.
- c) Maintain consistent high level of research funding and increase opportunities for graduate studies.
- d) Develop and implement effective programs for the continual upgrading of the technical and management skills of professionals in the minerals sector through professional training.

The Strategic Plan presents strategies, timelines and metrics for achieving these goals. Apart from expanding our undergraduate recruiting and planning for the ABET visit, the Department plans to develop a new Graduate Program in Mineral Resource Management that will be delivered using on-campus and distance learning methods.

A phase-out retirement is expected in the next few years and it was assumed to start in the 2004-2005 academic year. A new faculty member must be hired to take up the important teaching and research load. The Department will also hire a new faculty member in Mineral Processing in the Fall of 2004 or Spring of 2005 from the gift monies provided by Newmont. It is estimated that this will result in a one-time cost to the University of \$130,000. Maintaining and upgrading the Departmental teaching laboratories will require \$15,000 annually.

The Department of Mining Engineering has a long time relationship with the Geological Engineering and Geoscience programs. It is essential to maintain this relationship and build on it. It is further important to develop synergies with other Departments in the College of Science. This may include close cooperation with Geography on community issues related to mining and Biology for microbiological processes to recover minerals and reclaim mine sites. Further cooperation with other Departments will also be explored.

## **1. Background**

The constitution of the State of Nevada, as adopted in 1864, calls for a State University with instruction in Agriculture, Mechanic Arts, and Mining. Because of the dominant role that mining played in the State at the time of its entrance into the Union this addition was allowed to the original Land Grant mission of the University (E.R. Larson, Mackay School of Mines, Reminiscences on the Growth of a College, 1972). Instruction in Mining started at the University in the early 1870's while still in Elko. A School of Mines was formed in 1886; and the School of Mines at the University of Nevada had its first graduates in 1888. While the size of enrollment has fluctuated over time, the recent increases in enrollment, the ongoing high quality teaching as well as the well- funded research activities make the Mining Engineering Department an important and essential part in fulfilling the mission of the University of Nevada.

## **2. Environmental Context**

The Mining Industry plays a prominent role in the State of Nevada and has done so for well over a hundred years. The discovery of the Comstock Lode in Virginia City in the late 1850's, only about 24 miles from the present campus of the University of Nevada, led to the development of a major silver mining boom in Nevada. It was one of the factors that made Nevada's acceptance to the Union a reality. Over the history of the Comstock about \$235,000,000 worth of silver and about \$189,000,000 worth of gold was produced, the largest portion of it between 1859 and 1921.

The next major development in Nevada mining was the Tonopah and Goldfield mining districts. These gold mines were developed in 1900 and 1902 respectively and yielded about \$149,000,000 and \$87,000,000 in metal production, respectively.

Nevada also contributed significantly to making the US the world's leading copper producer earlier in the 20<sup>th</sup> Century. The copper mines near Ely and Tonopah operated from 1907 to the 1970's. The total value of copper production in the state of Nevada until 1962 was \$1.1 billion, which accounts for 36 percent of the total value (\$3 billion) of the State's mineral and metal output at that time. This copper production resulted in Nevada ranking fifth among the States in total tonnage of copper mined.

Gold mining on the Carlin Trend took place at a few mines throughout much of the early 1900's. The first discovery of the Carlin trend was made in the 1960's and this area has produced more than 50 million ounces of gold, a milestone celebrated in May 2002. The Carlin trend is one of three ore zones in the world that has produced that much gold, the other two are located in Uzbekistan and South Africa. Nevada is currently in the biggest gold boom in its history producing about 8 million ounces per year. This places Nevada as the world's third largest gold producer behind South Africa and Australia.

The gold and silver mines in Nevada have been leaders in the development of heap leach technology during the 1980's. The Mackay School of Mines and U.S. Bureau of Mines

Laboratory on the campus played a significant role in the development of this technology that improved the efficiency of gold production worldwide.

Apart from being a world-class gold producer, Nevada also produces large amounts of industrial minerals including limestone, diatomaceous earth, and barite. Large volumes of aggregates are being produced in the State, which supports the development of infrastructure for the economic growth of the State. Many quarries in the Las Vegas and Reno areas provide relatively low cost materials, when compared to California. California producers are under significant pressure and are forced to import crushed rock from British Columbia, Canada and sand from the Baja in Mexico. The large volumes of aggregate available and its relatively low cost are important to Nevada as the fastest growing State in the Union. Many of our new Mining Engineers could play a significant role in this arena.

Nevada has an exceptional mining history. It is a world leader in the production of gold. The mining industry in Nevada is expanding, not contracting, and that will provide an ongoing demand for Mining Engineers. It is clear that the mining industry will continue to play a very important role in the future of Nevada's economic development, especially with the ongoing pressures on the gaming industry.

Graduates of the Department of Mining Engineering can work in a variety of positions in the Nevada and international mining industry. The mining industry was the first to truly operate on a global scale. Our graduates can decide to be part of this global industry and work in foreign countries for US and foreign mining companies or can decide to join an industry such as aggregate production or other industrial mineral producers and stay closer to home; in many instances living in and near large cities. The Department provides an opportunity for Nevadans and others from the Great Basin to receive Mining Engineering degrees that could lead to high paying jobs and exciting, varied and challenging careers.

There is no Mining Engineering program in California and many of our recent graduates have found positions with aggregate producers in that State. California aggregate production is the highest in the nation as aggregate production is closely tied to economic activity.

The Department of Mining Engineering at the Mackay School of Earth Sciences and Engineering is the oldest engineering program of the University of Nevada. The Department confers the following degrees: B.S. Mining Engineering (also with a Quarry Engineering option), M.S. Mining Engineering and Ph.D. in Geo-Engineering (the latter was approved in 1999 and is administered jointly with Geological Engineering that is part of the Department of Geosciences and Engineering). Graduate students can also obtain a M.S. Mining Engineering with a Minerals Economics option. The Department can also confer a professional degree, Engineer of Mines (E.M.). The requirements for this degree are described as follows in the UNR General Catalog:

Engineer of Mines (E.M.) that can be conferred upon graduates of the Mackay School of Mines or upon graduates of other institutions who have obtained the university's master of science degree in engineering. Degree candidates must have held responsible positions in engineering for a period of at least five years (for those with a bachelor of science degree) or four years (for those who hold the master of science degree). Candidates must submit theses, displaying their ability to conduct advanced engineering work. Investigations in literature compilations of routine laboratory tests, or presentations of the work of others are not considered.

Professional engineer degrees may also be conferred upon graduates of the Mackay School of Mines and upon graduates of other engineering colleges of equal standing when the graduate has met the following conditions:

1. Been actively involved, for a period of at least a year, in successful engineering work with a responsible position;
2. Have successfully completed one year of graduate work in engineering, including thesis, at the university.

The B.S. Mining Engineering degree is accredited through the Engineering Accreditation Commission of the Accreditation Board on Engineering and Technology, Inc. This program was accredited in 1999 for a six-year term the maximum length that can be awarded; the next general visit is in the 2005-06 academic year. The B.S. Mining Engineering at the University of Nevada was first accredited in 1936 (the same year that most other established Engineering Programs in the U.S. were accredited) and has been accredited continuously since then.

Undergraduate Mining Engineering education in the U.S., Canada, Europe and Australia has been under significant pressure over the last decade as a result of low enrollments in many of these programs. Many programs were eliminated over this period, including the one at the Royal School of Mines, Imperial College, London. Only two undergraduate programs remain active in the U.K.

Similar actions have been taken in the Western and Central U.S. over the last three years. The Mining Engineering Programs at the University of Idaho, Moscow; and Michigan Technological University, Houghton have been terminated during that period while the program at South Dakota School of Mines and Technology, Rapid City is changing into a Mining Engineering and Management Degree. These closures and changes are all in states where the mining industry was historically an important component of the state and regional economies, but not today. These closures reduced the number of accredited Mining and Mineral Engineering programs in the U.S. to 14. Appendix 1 presents some recent information about enrollment at all the ABET accredited Mining Engineering programs in the U.S.

The present situation is that 7 Mining and Mineral Engineering programs remain in the U.S. Mountain West (Colorado School of Mines, Golden; University of Utah, Salt Lake City; Montana Tech of the University of Montana, Butte; South Dakota School of Mines

and Technology, Rapid City; New Mexico Tech, Socorro; The University of Arizona, Tucson; and University of Nevada, Reno). This provides an opportunity for our program to expand its outreach to a larger geographical area.

The following summary of the student numbers for the Department of Mining Engineering, University of Nevada over the last few years is taken from Appendix 1. The freshmen classes over the last two years have increased in numbers and many of last year's freshmen have been retained in the program. This means that the total number of undergraduate students is increasing and it provides a good base for building towards a steady increase in students enrolled for the BS in Mining Engineering. If the freshmen enrollment of about 12 is projected over the next two years, and considering the retention and transfer success, it is possible that the undergraduate enrollment will double to 48 in 2005 from 24 in 2001.

Year	Freshman	Sophomore	Junior	Senior	Total UG	Graduate
2001	7	5	6	6	24	7
2002	12	2	6	6	26	7
2003 (Fall)	11*	10	3	5	29	6

\* Note that as a result of transfers there are 17 freshmen enrolled in Spring 2004.

A large percentage of our students are on the Dean's list (Semester GPA>3.7). The numbers over the last few years are as follows:

Semester	F '00	S '01	F '01	S '02	F '02	S '03
Number	5	3	6	6	9	7
Percent	23	14	25	25	35	27

The number of students graduating over the last few years is as follows:

Year	2000	2001	2002	2003
BS Degrees	4	2	1	2
BS with Distinction	1	1	1	1
MS Degrees	0	2	1	2

Most of these graduates (BS and MS) received multiple offers and most accepted jobs in Nevada, thereby contributing to the State economy.

Some statistics from a survey completed in Spring 2003 shows an interesting trend in the rank and age distribution of US faculty in Mining Engineering Departments.

Parameter	USA	UNR
Total number of Mining Engineering Faculty	78.5	5
Assistant Professors	18	0
Associate Professors	20.5	1

Professors	40	4
Number tenured	55	4
Number over age 50	42	5

The number of Mining Engineering faculty per program across the USA ranges from 2 to 9 with an average of 5.6. The five Mining Engineering faculty at Mackay is lower than that at six other Universities in the USA. The age distribution of Mining Engineering faculty in the U.S., more than 50 percent over the age of 50, is significant as a large number of new faculty will be required over the next 10 to 15 years to fill the vacant positions. This clearly provides an opportunity in building and maintaining a strong graduate program.

On March 25, 2003 the University of Nevada received a pledge from Newmont Mining Company for \$2.5 million over the next five years. More than 50 percent of this gift has been earmarked for the Department of Mining Engineering; the details are given on Table 1. These funds will allow the department to move forward in planning for the future.

The Mining Engineering and Geological Engineering programs are part of the Mackay School of Earth Sciences and Engineering in the College of Science starting January 1, 2004. This is a new adventure and will provide additional opportunities for collaboration with faculty from the other Science units (biology, mathematics, physics and chemistry). The Mining Engineering Department will help to build on the rich tradition of the Mackay School of Mines in this new College and will work hard to help develop a cohesive College that continue the many contributions to the University of Nevada, Reno and to the Nevada economy.

**Table 1**  
**Details of Newmont Gift Earmarked for Department of Mining Engineering**

<b>Item</b>	<b>Description</b>	<b>Amount per year</b>	<b>Total amount</b>
<b>Earmarked Specifically for Mining Engineering</b>			
One or more Positions in Minerals Engineering	Salary funding for one or more positions in the area of minerals processing, ideally with an emphasis on the use of technology to lower costs in mineral resource extraction and production. Newmont also understands that faculty support may be needed as well in the area of extractive metallurgy and these funds may be used to help fulfill faculty expertise in that area, perhaps through a Letter of Appointment position.	\$150,000	\$750,000
Endowed Professorship/Chair in Mineral Engineering	Begin the establishment of an endowed professorship or chair in minerals engineering. These funds will build upon the approximately \$100,00 in endowment funds already received for this purpose. The Mackay School will use the Newmont pledge to initiate a fundraising campaign to raise a minimum of \$2 million for an endowed faculty position in this area.	\$100,000	\$500,000
Research	Research in mining/minerals engineering. Newmont Nevada will determine the specific research needs and hopes that students can be identified to conduct these projects as part of their degree programs.	\$25,000	\$125,000
<b>Funds in Which Mining Engineering can Share</b>			
Undergraduate Scholarships	Continue the annual scholarship program, which is currently funded out of the corporate office in Denver. This excellent program provides tracking scholarships to Mackay students, such that "Newmont Scholars" receive \$2,500 for their freshman and sophomore years, \$3,000 for their junior years and \$4,000 for their senior years as long as they maintain a 3. GPA. This program has been successful in transitioning Mackay students to Newmont employees.	\$15,000	\$75,000
Student Travel	Mackay Student Travel Fund, which provides critical resources for Mackay students to attend professional conferences/meetings, academic conferences/ meetings and regional/ national engineering design competitions.	\$10,000	\$50,000

The Mining Engineering faculty has been very active in research funding over the last number of years. The following shows the total research awards to the faculty over the last three years.

Year	2000	2001	2002	2003 (to Oct)
Mining Engineering Research Awards	\$223,774	\$1,251,121	\$1,150,202	\$731,969
Expressed as average per faculty in Mining Engineering (note that there were 4 state funded faculty until July 1, 2002)	\$55,944	\$312,780	\$255,600	\$146,394

An important consideration for the Department of Mining Engineering is the “educational economics” aspects of the program. The undergraduate program of study requires completion of 131 credits of which 50 is taught by faculty from the Department. These are mostly taught in the junior and senior years. The undergraduate students take about 80 credits from other departments offering service courses, these include Chemistry, Physics and Mathematics, now part of the College of Science. It also includes 12 credits of service courses in the College of Engineering. Therefore, it is impossible to ever achieve the metrics used by the University to evaluate the viability of programs. The cost of graduating a mining engineer will always be high. However, it is a mission of the University to provide educational opportunities for Nevadans and to provide trained employees for industry. The Department of Mining Engineering accomplishes this.

There are strategies that can help improve the “educational economics” of the Department of Mining Engineering:

- Increase undergraduate enrollment – this is addressed below and we are making progress in this area.
- Teach undergraduate service courses, e.g. one section of Statics – this issue is addressed below as part of the undergraduate education.
- Increase the graduate program – this is addressed below and is an area where improvements can be made.

In summary, the Department of Mining Engineering is one of the smallest in terms of student numbers on the UNR campus, however it can be very proud of its accomplishments. There is a positive trend in our undergraduate enrollment, our students perform very well in the academic arena, and our faculty is very active in research. To add to this, Newmont Mining Company has expressed their confidence in the Department’s future by a strong financial commitment over the next five years. The mining industry is an extremely important part of the Nevada economy and the Department of Mining Engineering helps fulfill the mission of the University of Nevada to provide educational opportunities for Nevadans who serve this industry.

### 3. Departmental Vision and Goals

#### *Vision Statement*

The vision of the Department of Mining Engineering is to be acknowledged as the premier teaching and research institution in the Western United States for the education of mining engineers and other professionals for the minerals industry.

#### *Mission Statement*

The mission of the Department of Mining Engineering is to provide the state and region with relevant research and a workforce of outstanding professionals having superior knowledge, skills and problem solving abilities to enhance the economic well-being, safety, and security of society while producing the materials for a robust economy and maintaining environmental protection.

#### **Goals**

The department has the following general goals:

- a. Enhance the undergraduate program over the next four years
- b. Make the undergraduate degree programs relevant and robust in terms of evolving workforce issues, economic and societal needs in the 21<sup>st</sup> century.
- c. Maintain consistent high level of research funding and increase opportunities for graduate studies.
- d. Develop and implement effective programs for the continual upgrading of the technical and management skills of professionals in the minerals sector through professional training.

### 4. Objectives and Strategies Associated with Departmental Goals

An important consideration in the objectives and strategies for the Mining Engineering Department is the expressed need by industry for engineers with education in Mineral Processing. This was expressed both by the Mackay Working Group and the Newmont funding makes specific allowance for a faculty member in this area (refer to Table 1). This position will be advertised in the near future while the activities described below are ongoing. It must be noted that there is not agreement amongst the Mining Engineering faculty at this time about the alternatives considered so far for implementing a Mineral Processing option. It is expected that it will take considerable time and energy to accomplish this.

This section provides a series of objectives and strategies for each of the Departmental Goals identified in Section 3.

- a. Enhance the undergraduate program over the next four years.

*Objective – Increase undergraduate enrollment at the freshmen level over the next four years*

- Expand on the ongoing active recruiting program in Nevada with the support of the Mackay recruiting staff.
- Use the Quarry Mining Engineering Option and the WUE positions to increase the number of students from California. The partnership with industry will be fully developed to support recruiting of undergraduate students.
- Pay specific attention to retention of students.

*Objective – Recruit students from out of state two-year programs*

- Develop relationship with out of state 2-year programs in Mining Technology, e.g. British Columbia Institute of Technology, Vancouver.
- Develop a recruiting strategy that includes a competitive scholarship package.

*Objective – Develop 2+2 undergraduate program with Great Basin College*

- Work with personnel from Great Basin College (GBC) to establish a 2+2 program, this will allow students to complete the first two years of the Mining Engineering program at GBC.
- Consider other synergies with GBC, e.g. co-teaching of survey course.

*Objective- Update assessment plan and prepare for ABET review*

- Update the program assessment plan on a regular basis.
- Perform a curriculum mapping of the present program of study.
- Develop course specific review packages in preparation for the ABET review.
- Develop other materials and information for ABET review.
- Implement feedback loop for ABET review.

*Objective – Teach a service course*

- Obtain the approval to teach one section of Statics

- b. Make the undergraduate degree programs relevant and robust in terms of evolving workforce issues, economic and societal needs in the 21<sup>st</sup> century.

*Objective – Build on the successes of the present undergraduate degree program*

- Use the results of the curriculum mapping to perform a SWOT analysis of the undergraduate program.
- Obtain input from recent graduates on the relevancy of the present degree program.
- Compile a report on the findings that can be used as a basis for deciding on future directions.
- Upgrade computer facilities and support.
- Consider the development of additional capstone and general education courses that may serve to increase the Departmental FTE's.

*Objective – Develop a strategy for incorporating a Mineral Processing Option*

- Develop a series of alternatives for incorporating a Mineral Processing Option.
- Hold a series of industry discussions about this option and the educational needs.
- Discuss with Mining Engineering and other faculty at UNR.
- Develop staffing for these options, including hiring personnel for the Mineral Processing option from the funding provided by Newmont Mining Company.

*Objective – Review practical training in underground and surface mining*

- Evaluate use of the Burrus educational mine for training skills in underground mining.
- Develop partnership with industry for training students in underground and surface mining skills, including survey field camp.
- Review the internship programs with mining companies and update these to enhance their educational contributions.

- c. Maintain consistent high level of research funding and increase opportunities for graduate studies.

*Objective – Pursue research funding opportunities from government and industry sources*

- Actively use the laboratory resources to pursue funding opportunities from government and industry sources.
- Identify industry research needs and evaluate funding mechanisms to leverage funding.

*Objective – Develop an approach for strengthening the graduate program and obtain further funding for graduate research assistantships*

- Research funding from grants and contracts is the most common way of funding graduate research assistants. Obtaining research funding can be enhanced if graduate students can be funded to perform feasibility level or initiation type research. The results from such work can be used to write more competitive proposals.
- Develop an approach to fund more graduate students to perform developmental research or targeted research.

*Objective – Develop interdisciplinary research programs with other Departments in the College of Science and other Colleges*

- Multidisciplinary research is high on the agenda of funding agencies and opportunities to develop such programs will be developed.
- The first step is to develop a better understanding of the potential synergies that exist or that can be developed in the College of Science. A series of interdepartmental meetings with interested personnel will be held to explore this. Potential area may include: geochemical processes for environmental controls, biological processes for environmental controls as well as metal recovery, joint projects with the chemistry department to develop an alternative lixivants to cyanide, etc. It is more difficult to identify potential areas of synergy in the “hard engineering” fields of rock mechanics, ventilation, etc.
- Strengthen ongoing relationships with Economic Geology and Geological Engineering as well as with the Departments of Civil Engineering and Materials Science and Engineering in the College of Engineering.

- d. Develop and implement effective programs for the continual upgrading of the technical and management skills of professionals in the minerals sector through professional training.

*Objective – Identify continuing education options*

- Review the range of alternatives for continuing education including distance learning, joint programs with other institutions, etc.
- Discuss the options with industry stakeholders.
- Compile a list of options that can be implemented in order of preference.

*Objective – Develop a graduate program in Mineral Resource Management*

- Work with industry and other stakeholders, including the College of Business Administration, to compile a curriculum that will upgrade the skills of professional in the minerals sector.
- Obtain approval for the program and implement training.

Successful implementation of these objectives and strategies will result in a number of positive outcomes for the Department of Mining Engineering. These include:

- A higher number of undergraduate students that will improve the overall educational economics for the program, increase the number of students that will be available for employment to the industry and improve the educational experience for students.
- A competitive undergraduate curriculum will make it easier to attract good students and retain them in the program. It will also improve the chances of graduates to find employment.
- High levels of research funding will improve the status of the program and will improve our ability to attract good graduate students. It will also help to secure ongoing research funding.
- Developing a successful continuing education program can be a good entrepreneurial activity that will provide essential programs to the industry and enhance the leadership status of the program.

In short: successful implementation of the objectives and strategies will help us accomplish the vision of the Department of Mining Engineering to be acknowledged as the premier teaching and research institution in the Western United States for the education of mining engineers and other professionals for the minerals industry.

## 5. Resources

This section describes the resources of the Department of Mining Engineering.

### a. Personnel:

- 5 tenure-track faculty (4 are tenured as of the date of this document)
- 2 classified staff
- 1 state-funded graduate assistant

### b. Budgetary. The following is based on the most recent annual budget for the Department:

- Professional salaries and fringe: \$ 586,933
- Classified salaries and fringe: \$ 111,562
- Graduate Assistantships and fringe: \$ 14,245
- Wages \$ 1,048
- Departmental operating budget: \$ 15,750
- Indirect cost recovery: \$ 5,000 to 7,000 annually

### c. Space

- Office space for faculty<sup>1</sup> 951 ASF<sup>2</sup>
- Department office space 427 ASF
- Technician office space 307 ASF
- Grad assistant offices (LMR153A and 152A) 902 ASF
- Computer Room (LMR154) 491 ASF
- Laboratories:
  - Newmont Rock Mechanics (LME112) 823 ASF
  - Rock Mechanics (LME113)<sup>3</sup> 797 ASF
  - Rock Mechanics (LME107) 587 ASF
  - Keck Ventilation (LME105 plus LME105A&B) 1,885 ASF
  - Clarkson Hydraulic Transport (LME110) 679 ASF

<sup>1</sup> Including rooms LME 301, 302, 406, 409, 411, and 412

<sup>2</sup> ASF - assignable square feet

<sup>3</sup> Sample preparation laboratory, shared with Geological Engineering

○ Robotics and Fluid Dynamics (LMR155)	1,713 ASF
○ Rock Mechanics, heat dissipation, etc. (LMR152)	1,716 ASF
○ Mackay Club room, survey storage (LMR153)	756 ASF
TOTAL:	12,033 ASF

*Resource Strategies*

The departmental operating budget of \$15,750 is typically spent on the following expenses:

Photocopying	3,900
Office supplies	4,500
Phone bills	2,000
Postage	1,600
Field trips	750
Other	<u>3,000</u>
Total	\$15,750

The departmental budget has not increased over the last four years, while expenses have increased dramatically. Additional funds provided from the Dean's office of the Mackay School of Mines made it possible for the Department's students to go on further field trips, attend conferences, etc. Faculty members have also contributed from their research and development accounts for such activities.

The indirect cost recovery funds provide an extra source of revenue for the department. These funds are used for faculty and graduate student support on an as needed basis. Finally, the ICR account can be used when needed to supplement needs for graduate recruiting and an external seminar program.

It is expected that one of the full-time faculty of Mining Engineering will go on half-time retirement in the next few years, it was assumed for this plan that it will occur in the 2004-2005 academic year. There will be a need to replace this faculty member to take up the important teaching and research load. It is expected that recruiting will take place in the 2004-2005 academic year and that start-up funding will be required for a new faculty member. It is estimated that at least \$60,000 in University funds will be required for this start-up fund.

A new faculty member in Mineral Processing will be hired in the Fall of 2004 or Spring of 2005 from the gift monies provided by Newmont (refer to Table 1). This position is essential to fulfill the broader educational expectations of the Department of Mining Engineering. While the salary is mostly funded by the Newmont gift, some start-up funding will be required from the University. A match for this start-up fund will be provided by the Mackay School of Earth Science and Engineering. It is estimated that at least \$30,000 in University funds will be required for this start-up fund.

There maybe some need for renovation of space to accommodate the proposed new faculty. It is expected that this remodeling will cost in the order of \$20,000.

Graduate student office space is at a premium in the Department especially considering the expanded research program that could result from two new faculty members. The present space is barely adequate for our graduate students and we cannot loose any of the space to other programs. However, we also do not foresee an urgent need in the near future to significantly expand the space for graduate students.

The Department's computer facilities will have to be updated and improved to accommodate the higher number of undergraduate and graduate students. This will be necessary in the 2004-2005 academic year. It is requested that \$20,000 in technology funds be made available for this upgrade. There may also be further space requirements for these facilities as the undergraduate enrollment grows.

Total Resource Request	<u>One-time</u>
Faculty startup costs	90,000
Office renovation costs	20,000
<u>Technology costs</u>	<u>20,000</u>
TOTAL	\$ 130,000

There are also ongoing needs to maintain and upgrade the Departmental teaching laboratories, including the Burrus mine. It is estimated that this will require \$15,000 annually. The distribution of these resource requests for the period 2003 to 2008 is given in Appendix 2.

## 6. Timeline for Addressing Strategic Goals

### 2003-2004

- Goal a Continue recruiting efforts.  
Establish contacts with 2-year programs.  
Develop funding mechanism for recruiting students from 2-year programs.  
Complete development of 2+2 program with GBC.  
Update ABET assessment plan.  
Obtain approval to teach one section of Statics.
- Goal b Complete curriculum mapping and SWOT analysis of present undergraduate program in Mining Engineering.  
Complete strategy for incorporating Mineral Processing Option including staffing.  
Recruit for Mineral Processing Option.
- Goal c Complete review of practical training for underground and surface mining.  
Ongoing efforts to obtain research funding.

- Goal d Compile list of options for continuing education.  
Decide on implementation option.  
Progress with development of Mineral Resource Management Degree.

#### 2004-2005

- Goal a Continue recruiting efforts.  
Recruit students from 2-year programs.  
Implement 2+2 program with GBC.  
Ongoing updates and reviews of ABET assessment plan.
- Goal b Develop implementation plan for Mineral Processing Option.  
Implement updated practical training for underground and surface mining.
- Goal c Ongoing efforts to obtain research funding.  
Develop an approach for strengthening the graduate program.  
Explore potential synergies with other Departments in the Colleges of Science and Engineering through a series of targeted meetings.
- Goal d Implement continuing education option.  
Approval and implementation of Mineral Resource Management Degree.

#### 2005-2006

- Goal a Continue recruiting efforts.  
Work closely with GBC in implementation of 2+2 program.  
ABET visit.
- Goal b Implement Mineral Processing option.
- Goal c Ongoing efforts to obtain research funding.
- Goal d Review success of continuing education option and adjust as necessary.  
Implement and recruit for Mineral Resource Management Degree.

### **7. Performance Indicators**

- a. Enhance the undergraduate program over the next four years
  - Undergraduate student enrollments
  - Number of juniors recruited from 2 year programs
  - Completion of 2+2 program with GBC
  - Implementation of 2+2 program with GBC
- b. Make the undergraduate degree programs relevant and robust in terms of evolving workforce issues, economic and societal needs in the 21<sup>st</sup> century.
  - Complete review of undergraduate program
  - Complete review and implementation of Mineral Processing option
  - Complete review of practical training in underground and surface mining

- c. Maintain consistent high level of research funding and increase opportunities for graduate studies.
  - Annual research funding
  - Annual proposal activity
  - Complete plan for enhancing the graduate program
  - Number of graduate students
  
- d. Develop and implement effective programs for the continual upgrading of the technical and management skills of professionals in the minerals sector through professional training.
  - Complete review of continuing education options
  - Complete implementation plan for continuing education options
  - Complete development of Mineral Resource Management degree
  - Obtain approval of Mineral Resource Management degree
  - Implementation of the Mineral Resource Management degree

**Appendix 1**  
**Summary Information for Mining Engineering Departments in the U.S.**

University and Year	Freshman	Sophomore	Junior	Senior	Total Undergraduates	BS Degrees	Full Time Graduate Students	Fulltime Faculty
<b>Western Universities</b>								
Colorado School of Mines, Golden, CO. Department of Mining Engineering,								
99-'00	2	10	9	20	41	12	20	8
00-'01	7	8	8	14	37	9	24	8
01-'02	8	10	6	14	38	7	22	
02-'03	8	14	14	12	48		18	9
Fall 03								
South Dakota School of Mines and Technology, Rapid City, SD. Department of Mining Engineering								
99-'00	6	7	10	16	39	9	*	
00-'01	4	4	10	12	30	6		
01-'02								
02-'03		5	4	4		2		
Fall 03								
* MS Program ended in 1996								
New Mexico Institute of Mining and Technology, Socorro, NM. Department of Mineral and Environmental Engineering								
99-'00	5	1	2	5	13	3	4	4
00-'01	4	9	1	3	17	3	4	4
01-'02						1		
02-'03	3	5	4	6	18		8	4
Fall 03								

University of Utah, Salt Lake City, UT. Department of Mining Engineering, College of Engineering and Mineral Resources								
99-'00	20	10	7	7	44	6	2	4
00-'01	11	13	10	8	42	7	6	4
01-'02	13	9	5	12	39		7	4
02-'03								
Fall 03								
Montana Tech of the University of Montana, Butte, MT. Mining Engineering Program,								
99-'00	13	13	17	24	67	18	3	4
00-'01	8	6	13	24	51	14	4	4
01-'02	19	3	9	19	50	15	2	5
02-'03	23	9	8	14	54	15	2	5
Fall 03								
The University of Arizona, Tucson, AZ. Department of Mining and Geological Engineering, College of Engineering								
99-'00	3	14	17	18	52	19	5	4
00-'01	2	3	16	13	34	6	8	4
01-'02	3	4	5	13	25	6	9	4
02-'03	3	5	4	9	21	2	8	4
Fall 03								
University of Alaska, Fairbanks, AK. Department of Mining and Geological Engineering, School of Mineral Engineering								
99-'00	6	6	4	11	27	2	2	4
00-'01	5	4	2	10	21	3	1	4
01-'02								
02-'03								
Fall 03								
University of Nevada, Reno, NV. Department of Mining Engineering, Mackay School of Mines								
99-'00	6	7	4	10	27	9	5	4
00-'01	6	10	2	4	22	2	6	4
01-'02	7	5	6	6	24	0	7	4
02-'03	12	2	6	6	26	3	7	5
Fall 03	11	10	3	5	29		6	5

<b>Central US Universities</b>								
University of Missouri-Rolla, Rolla, MO. Department of Mining Engineering,								
99-'00	22	9	14	46	91	16	13	6
00-'01	31	11	20	34	96	18	11	6
01-'02	14	6	20	33	73	19	7	6
02-'03	23	8	13	34	78	21	7	6
Fall 03								
Southern Illinois University, Carbondale, IL. Department of Mining and Mineral Resources Engineering								
99-'00	1	7	4	15	27	3	15	6
00-'01	0	2	9	9	20	4	15	6
01-'02	3	0	4	9	16	3	16	6
02-'03	6	6	5	9	26	0	20	6
Fall 03								

<b>Eastern US Universities</b>								
University of Kentucky, Lexington, KY. Department of Mining Engineering, College of Engineering								
99-'00	9	5	5	17	36	6	9	8
00-'01	3	6	1	14	24	11	11	8
01-'02	9	4	3	8	24	4	11	8
02-'03	36	5	6	5	52	2	10	8
Fall 03								
West Virginia University, Morgantown, WV. Department of Mining Engineering, College of Engineering and Mineral Resources								
99-'00	5	11	11	11	38	3	14	5
00-'01	5	5	7	15	32	7	17	5
01-'02	9	6	5	15	35	8	17	5
02-'03	5	6	4	15	30		23	5
Fall 03								
Pennsylvania State University, College Park, PA. Mining Engineering Program, Department of Energy, and Geo-Environmental Engineering, College of Earth and Mineral Sciences								
99-'00	3	1		8	12	8	5	6
00-'01	4	4	4	3	15	3	2	6
01-'02	3	5	5	3	16	0	4	4
02-'03	2	2	4	4	12	0	3	4
Fall 03								
Virginia Tech, Blacksburg, VA. Department of Mining and Minerals Engineering, College of Engineering								
99-'00		30	32	52	114	32	19	8
00-'01		26	34	41	101	28	18	8
01-'02		38	24	41	103	24	13	8
02-'03		32	35	32	99	21	18	8
Fall 03								

**Appendix 2 Strategic Plan Implementation Schedule, 2003-2008**

Item	Amount	Source of Funds		New Funds	
		<i>Recycled or Newmont Gift</i>	<i>New Funds</i>	<i>Ongoing</i>	<i>One-time</i>
<b>2004-2005</b>					
New hire to replace retiring faculty	\$125,000	\$125,000*			
Start up for New Faculty hired to replace retiring faculty	60,000		60,000		60,000
Mineral Processing Faculty (Newmont Gift)	\$150,000	\$ 150,000			
Start up for Mineral Processing Faculty	30,000		30,000		\$30,000
Remodeling	20,000		20,000		20,000
Upgrading Computers	20,000		20,000		20,000
<b>Subtotal</b>	<b>\$405,000</b>	<b>\$275,000</b>	<b>\$130,000</b>	<b>\$15,000</b>	<b>\$130,000</b>
<b>2005-2006</b>					
Maintain and upgrade teaching laboratories				15,000	
<b>Subtotal</b>				<b>\$15,000</b>	
<b>2006-2007</b>					
Maintain and upgrade teaching laboratories				15,000	
<b>Subtotal</b>				<b>\$15,000</b>	
<b>2007-2008</b>					
Maintain and upgrade teaching laboratories				15,000	
<b>Subtotal</b>				<b>\$15,000</b>	

\*Recycled funding