Program Review Summary Page

For Instructional Programs

Program or Area(s) of Study under Review: Geology
Term/Year of Review: Spring 2021

Summary of Program Review:

A. Major Findings

1. Strengths:

- Headcount and enrollment increased within the program and are significantly higher than the institution.
- High fill rates indicate evidence of effective scheduling practices.
- Average class size is significantly higher than institutional average.
- Successful course completion rates are higher than institutional average.
- Geology and Earth Sciences courses serve as a GE requirement and serve transfer students.
- Competent, approachable, and student-invested faculty who incorporate innovative teaching methods and practices.
- The average annual geology-related job openings in Napa county are 1,290 and 153,610 in the SF Bay Area, through 2026.

2. Areas for Improvement:

- An overall 25% decrease in enrollment in GEOL 111 should be addressed.
- Program courses need Curriculum update.
- GEOL 199 should be archived.

3. Projected Program Growth, Stability, or Viability:

Labor Market Demand shows projected growth in geology-related jobs within Napa County at +9.8% and +10.4% in the San Francisco Bay Area, through 2026. Student enrollment has increased by 11.6% and fill rates are 88.5%, higher than the institutional level. Given this data and the role of geoscientists to find solutions to global natural resource, hazard, and climate challenges, the geology program is in a position of projected growth over the next few years.

B. Program's Support of Institutional Mission and Goals

1. Description of Alignment between Program and Institutional Mission:

- The geology and earth science courses meet GE requirements, preparing students for evolving roles in a dynamic world and serving students seeking transfer courses.

2. Assessment of Program's Recent Contributions to Institutional Mission:

- This is an area for improvement.

3. Recent Program Activities Promoting the Goals of the Institutional Strategic Plan and Other Institutional Plans/Initiatives:

- Participate in the STEM Summer Bridge programs (1)
- Participate in the MESA/STEM Fair (2)
- Over the past three years, the retention rate for the Geology Program was significantly higher than the rate at the institutional level. (3)

C. New Objectives/Goals:

The immediate objectives are:

- Increase GEOL 111 enrollment
- Update curriculum
- Recruit adjunct faculty
- Archive GEOL 199

The goals are:

- Draft AS-T in Geology and certificate degrees
- Develop a pathway partnership between local high schools, the geology program, and the local/regional geology workforce through curriculum alignment, field trips, guest lecture series, and volunteer/work experience.
- Improve student equity by increasing representation of accomplished people of color currently in the geosciences.

Program Review Report | Spring 2021

This report covers the following program, degrees, certificates, area(s) of study, and courses (based on the Taxonomy of Programs on file with the Office of Academic Affairs):

Program	Geology
Courses	GEOL-110
	GEOL-111
	GEOL-199
	EART-110

Taxonomy of Programs, July 2020

SECTION I

PROGRAM DATA

A. Demand

1. Headcount and Enrollment

	2017-2018	2018-2019	2019-2020	Change over 3-Year Period
Headcount				
Within the Program	216	202	241	11.6%
Across the Institution	8,843	8,176	8,181	-7.5%
Enrollments				
GEOL-110 Lec	160	147	186	16.3%
GEOL-111 Lab	56	38	42	-25.0%
EART-110 Lec/Lab	51	55	54	5.9%
Within the Program	267	240	282	5.6%
Across the Institution	36,115	32,545	33,102	-8.3%
Source: SQL Enrollment Files				

Headcount represents the number of unique students enrolled within the program during the academic year. One student in 3 courses counts as "1".
Enrollment reflects the number of registrations by individual students. One student in 3 courses counts as "3".

RPIE Analysis: The number of students enrolled (headcount) in the Geology Program increased by 11.6% over the past three years, while headcount across the institution decreased by 7.5%. Similarly, enrollment within the Geology Program increased by 5.6%, while enrollment across the institution decreased by 8.3%.

Enrollment in the following courses changed by more than 10% (±10%) between 2017-2018 and 2019-2020:

Course with an enrollment increase:

- *GEOL-110 (16.3%)*

Course with an enrollment decrease:

- *GEOL-111 (-25.0%)*

Program Reflection:

Overall, enrollment has increased by 5.6% and growth is evident in the geology program.

The program courses are introductory courses and fulfill GE requirements. The program does not have a transfer degree in geology or certificate degrees. Given the current growth in enrollment and in the geology-related job market, developing an AS-T in Geology would provide another pathway choice for transfer students seeking gainful employment. Developing certificate programs that support non-transfer students, such as in an area of geotechnical services, should also be considered.

The area of concern is the 25% overall decrease in the Physical Geology (GEOL 111) lab enrollment. During the highest enrollment year (17/18), one section of GEOL 111 was offered as an evening class. Evening lab classes have not been offered since that year, and to increase lab enrollment, scheduling an evening lab should be considered.

Given enrollment and program growth, it is vital that we recruit adjunct instructors and establish a reliable adjunct pool.

2. Average Class Size

	2017-2018		2018-2019		2019-2020		Three-Year	
	Sections	**Average Size**	**Sections**	**Average Size**	**Sections**	**Average Size**	**Average Section Size**	**Trend**
GEOL-110 Lec	4	40.0	4	36.8	5	37.2	37.9	-7.0%
GEOL-111 Lab	3	18.7	2	19.0	2	21.0	19.4	12.3%
EART-110 Lec/Lab	2	25.5	2	27.5	2	27.0	26.7	5.9%
Program Average*	9	29.7	8	30.0	9	31.3	30.3	5.4%
Institutional Average*	1,406	25.7	1,313	24.8	1,348	24.6	25.0	-4.3%

Source: SQL Enrollment and Course Sections Files
Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$$\frac{\text{Total \# Enrollments}}{\text{Total \# Sections}}.$$

It is not the average of the three annual averages.

RPIE Analysis: Over the past three years, the Geology Program has claimed an average of 30.3 students per section. The average class size in the program has exceeded the average class size of 25.0 students per section across the institution during this period. Average class size in the program increased by 5.4% between 2017-2018 and 2019-2020. Average class size at the institutional level decreased by 4.3% over the same period.

Average class size in the following course changed by more than 10% (±10%) between 2017-2018 and 2019-2020:

Course with an increase in average class size:
- *GEOL-111 (12.3%)*

Program Reflection:

Overall, the geology program shows a 5.4% increase in class size.

It is important to note that EART 110 is an integrated lecture/lab. The class size for labs are determined by the number of workstations in the lab classroom. There are 24 stations in the lab classroom and the average section size for EART 110 is 27, resulting in students doubling up at workstations. The lab classroom has limited space and to accommodate growth in the program and maintain lab safety, additional lab sections would be necessary and a larger lab facility should be considered.

The decrease in GEOL 110 lecture is not alarming as it was intentional to add a section to meet demand for more than one section. We should continue this scheduling practice to accommodate enrollment growth and to align with institutional averages.

3. Fill Rate and Productivity

Fill Rate*			
	Enrollments*	**Capacity**	**Fill Rate**
2017-2018	267	304	87.8%
2018-2019	240	280	85.7%
2019-2020	282	308	91.6%
Three-Year Program Total	789	892	88.5%
Institutional Level	91,739	112,746	81.4%
Productivity*			
	FTES	**FTEF**	**Productivity**
2017-2018	31.8	2.2	14.5
2018-2019	29.5	2.0	14.8
2019-2020	33.6	2.2	15.3
Three-Year Program Total	94.9	6.4	14.8
Source: SQL Enrollment and Course Sections Files			

<u>RPIE Analysis</u>: Fill rates within the Geology Program tend to be higher than the fill rate at the institutional level. [Compare program-level rate of 88.5% to institution-level rate of 81.4% over the past three years.] Between 2017-2018 and 2018-2019, both enrollment and capacity decreased, resulting in a decrease in fill rate (due to the higher rate of decrease among enrollments). Between 2018-2019 and 2019-2020, both enrollment and capacity increased, resulting in an increase in fill rate (due to the higher rate of increase among enrollments).

Productivity increased from 14.5 to 15.3 over the three-year period. The three-year program productivity of 14.8 is lower than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTES (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

Program Reflection:

Fill rate in the program is relatively high at 88.5% which indicates courses are scheduled at appropriate days and times that maximize enrollment and meets student demand.

4. Labor Market Demand

This section does not apply to the Geology Program, as it is not within the Career Technical Education Division. While this section is not required for the geology program review, the status of the geoscience labor market is a valuable tool for making decisions regarding the direction of a growing geology program and in developing Guided Pathways.

Economic Development Department Standard Occupational Classification Description (SOC Code): 29-2053	Numeric Change in Employment	Projected Growth (% Change in Employment)	Average Annual Job Openings (New Jobs + Replacement Needs)
Napa County (2016-2026)	+130	+9.8%	1,290
Bay Area[A] (2016-2026)	+16,150	+10.4%	153,610

California (2018-2028)	+53,600	+9.3%	606,970

Source: Economic Development Department Labor Market Information, Occupational Data, Occupational Projections (http://www.labormarketinfo.edd.ca.gov)

[A]Bay Area counties include: Alameda, Contra Costa, Marin, Napa, and Solano. Occupational projects for Santa Clara, Sonoma, San Francisco, and San Mateo are unavailable.

RPIE Analysis: The Economic Development Department projects increase of 130 positions for Napa County and an increase of 16,150 positions for the Bay Area for positions related to the Geology Program by 2026 (compared to 2016). This increase in positions translates into a 9.8% increase for the industry within Napa County and a 10.4% increase for the industry within the Bay Area (2016-2026). The projected growth for Napa County is consistent than the projected growth in California, while the projected growth for the Bay Area is also consistent with the projected growth in California (for 2016-2026). Approximately 1,290 openings for the Geology Program are projected each year in Napa County, while 153,610 openings are projected each year in the Bay Area (through 2026).

SOC Level	SOC Code	Occupational Title	Base Year	Projected	Numeric C	Percent a	Exits[6]	Transfers	Total Job Openings[8]
4	17-1022	Surveyors	4600	4900	300	0.065217	1200	2260	3760
3	17-3000	Drafters, Engineering Technicians, and Mapping Technicians	92800	97700	4900	0.052802	31300	63800	100000
4	17-2171	Petroleum Engineers	2500	2400	-100	-0.04	400	1360	1660
4	17-3025	Environmental Engineering Technicians	3800	4300	500	0.131579	1330	2590	4420
4	17-3031	Surveying and Mapping Technicians	4400	4700	300	0.068182	1280	4100	5680
2	19-0000	Life, Physical, and Social Science Occupations	185000	210400	25400	0.137297	37940	154830	218170
3	19-2000	Physical Scientists	38100	42300	4200	0.110236	7040	32820	44060
4	19-2042	Geoscientists, Except Hydrologists and Geographers	5000	5400	400	0.08	960	4660	6020
4	19-2043	Hydrologists	1000	1100	100	0.1	190	910	1200
3	19-4000	Life, Physical, and Social Science Technicians	47800	54100	6300	0.131799	11430	45870	63600
4	19-4041	Geological and Petroleum Technicians	1100	1200	100	0.090909	150	1040	1290
4	19-4099	Life, Physical, and Social Science Technicians, All Other	9800	11300	1500	0.153061	2880	9650	14030
4	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	1500	1600	100	0.066667	570	710	1380
4	25-1191	Graduate Teaching Assistants	10500	11500	1000	0.095238	4040	5040	10080
4	25-2022	Middle School Teachers, Except Special and Career/Technical Education	44900	47200	2300	0.051225	14320	19630	36250
4	25-2031	Secondary School Teachers, Except Special and Career/Technical Education	124000	130300	6300	0.050806	35320	53750	95370

Program Reflection:

We have not previously included job market data as a factor in determining course offerings or direction of the geology program. The average annual geology-related job openings in Napa county is 1,290 and 153,610 in the SF Bay Area, through 2026. The need for competent employees with education and training in the field of geology is on the rise. It would benefit the program to develop an AS-T in Geology and geotechnical certificates. This addition would also provide program sustainability as growth levels out.

Given the projected increase in geology-related jobs and program growth, the program goal is to develop an AS-T in Geology. Developing certificate programs that support non-transfer students, such as in an area of geotechnical services, are also under consideration.

To support the program goal, it is best practice to establish an Advisory Committee to ensure the program will meet regional labor market needs and to stay current and connected to current labor market demand.

B. Momentum

1. Retention and Successful Course Completion Rates

	Retention Rates (Across Three Years)			**Successful Course Completion Rates (Across Three Years)**		
Level	**Rate**	**Course Rate vs. Program Rate**		**Rate**	**Course Rate vs. Program Rate**	
		Above	**Below**		**Above**	**Below**
GEOL-110	95.7%	--	--	84.7%		X
GEOL-111	97.1%	X		87.5%	--	--
EART-110	97.5%	X		93.6%	***X***	
Program Level	**96.3%**			**87.0%**		
Institutional Level	90.5%			76.3%		

Source: SQL Enrollment Files
-- Indicates a value that is within 1% of the program-level rate.
Bold italics denote a statistically significant difference between the course-level rate and the program-level rate.
Bold denotes a statistically significant difference between the program-level rate and the institutional rate.
Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

<u>RPIE Analysis:</u> Over the past three years, the retention rate for the Geology Program was significantly higher than the rate at the institutional level. The retention rates of all Geology courses fell within the range of the program-level rate (without any statistically significant differences). The retention rate for the Geology Program falls in the 86th percentile among program-level retention rates (across 59 instructional programs, over the past three years).

Over the past three years, the successful course completion rate for the Geology Program was significantly higher than the rate at the institutional level. The successful course completion rate for EART-110 was significantly higher than the program-level rate. The successful course completion rate for the Geology Program falls in the 78th percentile among program-level successful course completion rates (across 59 instructional programs, over the past three years).

Over the past three years, the difference between retention and successful course completion at the program level (9.3%) was significantly lower than the difference at the institutional level (14.2%). This figure represents the proportion of non-passing grades assigned to students (i.e., grades of D, F, I, NP).

The following Geology course claimed a difference (between retention and successful course completion) that exceeded 10%:

- *GEOL-110 (11.0%)*

Program Reflection:

Overall, retention rate and successful course completion rate for the Geology Program was significantly higher than the rate at the institutional level.

High retention rates can be attributed to the quality of faculty. Faculty are competent, approachable, and incorporate a wide range of innovative teaching methods. Faculty stay current in pedagogy and industry trends through geoscience-related professional development.

Geology courses involve the understanding and application of physics, chemistry, biology, math and astronomy. This provides an opportunity to develop cross-discipline collaboration with other NVC science programs and can offer added sustainability across the STEM programs.

To address the lower successful course completion specifically in GEOL 110 lectures, teaching methods that focus on application and in-class group work will be incorporated. Early Alert programs, such as Starfish will also be incorporated.

2. Student Equity

	Retention Rates (Across Three Years)		**Successful Course Completion Rates (Across Three Years)**	
	Program Level	**Institution Level**	**Program Level**	**Institution Level**
African American/Black	100%	***86.4%***	78.6%	***65.3%***
Hispanic			88.9%	***73.9%***
First Generation			83.9%	***75.0%***

Source: SQL Enrollment Files
Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in ***bold italics***.
Shaded cells pertaining to retention rates indicate that statistically significant differences for those groups were not found at the institutional level.
Note: Spring 2020 grades of EW (Excused Withdrawal) are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: This analysis of student equity focuses on the three demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all other demographic groups, combined) over the past three years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the three groups listed above.

Within the Geology Program, the retention rate among African American/Black students was significantly higher than the rate at the institutional level.

Within the Geology Program, the successful course completion rates at the program level were significantly higher than the rate at the institutional level among all three groups.

These patterns reflect the findings from the comparison of retention and successful course completion at the program vs. institutional level, where the program-level rate for retention and successful course completion exceeded the institution-level rate.

Program Reflection:

Overall, successful completion rates for all three demographics are higher than institutional success rates.

Retention among African American students is 100%, however the successful completion is 78.6%. This indicates students are staying in the course, but not receiving the support needed to successfully complete the course.

The geosciences are historically lacking in demographic diversity. To address this issue and the needed support for minority students in the geology program, we will align with the broader geoscience academic community's EDI goals and increase representation through developing connections with current geoscientists that represent African American, Hispanic, and first generation students.

A second strategy to address equity is to collaborate with other NVC STEM programs and Napa County middle and high-schools in the Pilot a STEM Summit. The Summit is a supportive academic pipe-line that would better prepare students for college-level STEM programs.

3. **Retention and Successful Course Completion Rates by Delivery Mode (of Courses Taught through Multiple Delivery Modes, i.e., In-Person, Hybrid, and Online)**

This section does not apply to the Geology Program, as courses associated with the program were not offered through multiple delivery modes within the same academic year between 2017-2018 and 2019-2020.

C. Student Achievement

1. Program Completion

This section does not apply to the Geology Program, as there are not any degrees or certificates associated with the program. See Taxonomy of Programs.

2. Program-Set Standards: Job Placement and Licensure Exam Pass Rates

This section does not apply to the Geology Program, as the discipline is not included in the Perkins IV/Career Technical Education data provided by the California Community Colleges Chancellor's Office, and licensure exams are not required for jobs associated with the discipline.

SECTION II

I. CURRICULUM

A. Courses

Subject	**Course Number**	**Date of Last Review** *(Courses with last review dates of 6 years or more must be scheduled for immediate review)*	**Has Prerequisite** * Yes/No	**In Need of Revision** *Indicate Non-Substantive (NS) or Substantive (S)* ***& Academic Year***	**To Be Archived** *(as Obsolete, Outdated, or Irrelevant)* **& Academic Year**	**No Change**
GEOL	110	06/01/2019	no	no		no change
GEOL	111	08/11/2013	no	NS 2021-22		
GEOL	199	01/01/1986	yes	yes	Archive 2021-22	
EART	110	01/15/2016	no	NS 2021-22		

*As of fall 2018, prerequisites need to be validated (in subsequent process) through Curriculum Committee.

B. Degrees and Certificates[+]

Degree or Certificate & Title	**Implementation Date**	**Has Documentation** Yes/No	**In Need of Revision+** *and/or Missing Documentation* **& Academic Year**	**To Be Archived*** *(as Obsolete, Outdated, or Irrelevant)* **& Academic Year**	**No Change**
N/A					

*As of fall 2018, discontinuance or archival of degrees or certificates must go through the Program Discontinuance or Archival Task Force.

[+]Degrees and Certificates cannot be implemented until the required courses in them are approved and active.

Program Reflection:

Curriculum revisions need to be made to GEOL 111 and EART 110. GEOL 199 has not been offered within the past 4 years and should be archived.

SECTION III

II. LEARNING OUTCOMES ASSESSMENT

A. Status of Learning Outcomes Assessment

Learning Outcomes Assessment at the Course Level

	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
Number of Courses	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
4	3	3	75%	75%

Learning Outcomes Assessment at the Program/Degree/Certificate Level

Degree/Certificate	Number of Outcomes*	Number of Outcomes Assessed		Proportion of Outcomes Assessed	
		Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
N/A					

Program Reflection:

Overall, assessment is ongoing. GEOL 199 is to be archived.

SECTION IV

PROGRAM PLAN

Based on the information included in this document, the program is described as being in a state of:

- ○ Viability
- ○ Stability
- ● Growth

*Please select ONE of the above.

This evaluation of the state of the program is supported by the following parts of this report:

(Identify key sections of the report that describe the state of the program. Not an exhaustive list, and not a repeat of the report. Just key points.)

Program growth is indicated by:

- Student enrollment increased by 11.6% over the past three years.
- The average class size within the program increased by 5.4%.
- Fill rates within the geology program are at 88.5%, higher than the fill rate at the institutional level.
- Successful course completion rates were higher than the institution among the three demographic groups.
- Labor Market Demand shows projected growth in geology-related jobs within Napa County at +9.8% and +10.4% in the San Francisco Bay Area.

Complete the table below to outline a three-year plan for the program, within the context of the current state of the program.

Program: __Geology_____
Plan Years: __2021-2024_____

Strategic Initiatives Emerging from Program Review	Relevant Section(s) of Report	Implementation Timeline: Activity/Activities & Date(s)	Measure(s) of Progress or Effectiveness
Increase GEOL 111 enrollment	Section I.A.1: Headcount and Enrollment	Fall 2021, Spring 2022	Enrollment increase
Develop an AS-T degree and/or geotech certificates	Section I.A.1: Headcount and Enrollment Section I.A.4: Labor Market Demand	Spring 2023, Fall 2023	AS-T degree or certificates will be drafted.

Recruit adjunct instructors	Section I.A.1: Headcount and Enrollment	Summer 2021, Fall 2021, Spring 2022	Hire 1+ geology instructors
Improve student equity within the geosciences	Section I.B.2	Summer 2022 or 2023;	Pilot STEM HS Summit; Increased representation of accomplished geoscientists whom identify with the 3 demographics as part of the courses.
Revise outdated Curriculum	Section II	Fall 2021	Updates submitted and passed through Curriculum
Complete GEOL 199 CLO assessment	Section III	Fall 2021	Course should be archived.

Describe the current state of program resources relative to the plan outlined above. (Resources include: personnel, technology, equipment, facilities, operating budget, training, and library/learning materials.) Identify any anticipated resource needs (beyond the current levels) necessary to implement the plan outlined above.

Note: Resources to support program plans are allocated through the annual planning and budget process (not the program review process). The information included in this report will be used as a starting point, to inform the development of plans and resource requests submitted by the program over the next three years.

Description of Current Program Resources Relative to Plan:

The development of an AS-T in Geology degree would include the addition of 2 new geology courses, Historical Geology and Mineralogy. The labs associated with these two courses will require assessment of current equipment (microscopes, etc.) and upgrades if necessary. A dedicated lab space for Mineralogy will be necessary to house microscopes and related specialized equipment.

As the program grows, a separate rock prep area would provide space and use for the following equipment the program already owns: rock saw, sediment sieve, rock tumbler, and rock splitter.

Hiring 1 or more adjunct geology instructors.

III. PROGRAM HIGHLIGHTS

A. Recent Improvements

- Headcount and enrollment increased
- Fill rate increased, reflecting high demand for geology and earth science courses and effective scheduling practices.

B. Effective Practices

- The geology program incorporates effective scheduling practices, resulting in a high fill rate.
- The program implemented an effective adjunct hiring process.
- The geology faculty actively engage students in labs and lectures and are available outside of scheduled class time for academic support.

Feedback and Follow-up Form

Completed by Supervising Administrator:

Robert J. Van Der Velde
Senior Dean, Arts & Sciences

Date:

May 5, 2021

Strengths and successes of the program, as evidenced by analysis of data, outcomes assessment, and curriculum:

The Geology program offers students a solid experience in the sciences, often attracting those students who are not initially planning to major in the sciences. Enrollments are strong, and student retention and success data are a highlight of the program. For students who develop an interest in this field, job prospect are bright.

Areas of concern, if any:

Curriculum requires minor updates.

Recommendations for improvement:

Exploration of development of an Associate Degree for Transfer is appropriate, and should include identification of any resources necessary to support additional courses.

Anticipated Resource Needs:

Resource Type	**Description of Need (Initial, Including Justification and Direct Linkage to State of the Program)**
Personnel: Faculty	Continued need to recruit qualified adjunct instructors.
Personnel: Classified	
Personnel: Admin/Confidential	
Instructional Equipment	Additional equipment will be needed to support new courses if they are developed.
Instructional Technology	
Facilities	
Operating Budget	
Professional Development/ Training	
Library & Learning Materials	