C·O·E CENTERS OF EXCELLENCE
FOR LABOR MARKET RESEARCH

Geographic Information System Occupations

Labor Market Analysis: San Diego County

April 2023

Summary

NEW PROGRAM RECOMMENDATION?	EVIDENCE OF A SUPPLY GAP?	AT OR ABOVE THE LIVING WAGE?	EXPECTED EDUCATION FOR MAJORITY OF OCCUPATIONS ANALYZED	
● **Do Not Proceed with New Program**	☑ / ✗	☑ / ☒	☐ Doctorate Degree ☑ Master's Degree ☐ Bachelor's Degree ☐ Associate Degree ☐ Some College or Certificate ☐ HS Diploma or Equivalent ☐ Less than a HS Diploma ☐ Apprenticeship	
SUPPORT FOR PROGRAM MODIFICATION?	NUMBER OF INSTITUTIONS THAT PROVIDE TRAINING	NUMBER OF ANNUAL JOB OPENINGS		
☑ / ☒	HIGH	MEDIUM		

This brief provides labor market information about *Geographic Information System Occupations* to assist the San Diego and Imperial Counties Community Colleges with program development and strategic planning. *Geographic Information System Occupations* include "Cartographers and Photogrammetrists," "Geographers," and "Surveying and Mapping Technicians." According to available labor market information, *Geographic Information System Occupations* in San Diego County have a labor market demand of 93 annual job openings (while average demand for a single occupation in San Diego County is 289 annual job openings), and eight institutions supply 99 awards for these occupations, suggesting that supply is met in the labor market. On average, entry-level and median wages are above the living wage. This brief recommends not proceeding with developing a **new** program for these occupations but supports a program modification because although 2) entry-level wages are above the living wage, 2) supply is met in the region. The colleges should note that **employers typically require a master's degree or higher as the minimum educational requirement for these occupations.**

Introduction

This report provides labor market information in San Diego County for the following occupational codes in the Standard Occupational Classification (SOC)[1] system:

- **Cartographers and Photogrammetrists** (SOC 17-1021): Research, study, and prepare maps and other spatial data in digital or graphic form for one or more purposes, such as legal, social, political, educational, and design purposes. May work with Geographic Information Systems (GIS). May design and evaluate algorithms, data structures, and user interfaces for GIS and mapping systems. May collect, analyze, and interpret geographic information provided by geodetic surveys, aerial photographs, and satellite data.

- **Geographers** (SOC 19-3092): Study the nature and use of areas of the Earth's surface, relating and interpreting interactions of physical and cultural phenomena. Conduct research on physical aspects of a region, including land forms, climates, soils, plants, and animals, and conduct research on the spatial implications of human activities within a given area, including social characteristics, economic activities, and political organization, as well as researching interdependence between regions at scales ranging from local to global.

- **Surveying and Mapping Technicians** (SOC 17-3031): Perform surveying and mapping duties, usually under the direction of an engineer, surveyor, cartographer, or photogrammetrist, to obtain data used for construction, mapmaking, boundary location, mining, or other purposes. May calculate mapmaking information and create maps from source data, such as surveying notes, aerial photography, satellite data, or other maps to show topographical features, political boundaries, and other features. May verify accuracy and completeness of maps.

For the purpose of this report, these occupations are referred to as *Geographic Information System Occupations*.

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[1] The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. bls.gov/soc.

Projected Occupational Demand

Between 2022 and 2027, *Geographic Information System Occupations* are projected to increase by 59 net jobs or eight percent (Exhibit 1a). Employers in San Diego County will need to hire 93 workers annually to fill new jobs and backfill jobs due to attrition caused by turnover and retirement, for example.

Exhibit 1a: Number of Jobs for *Geographic Information System Occupations* (2012-2027)[2]
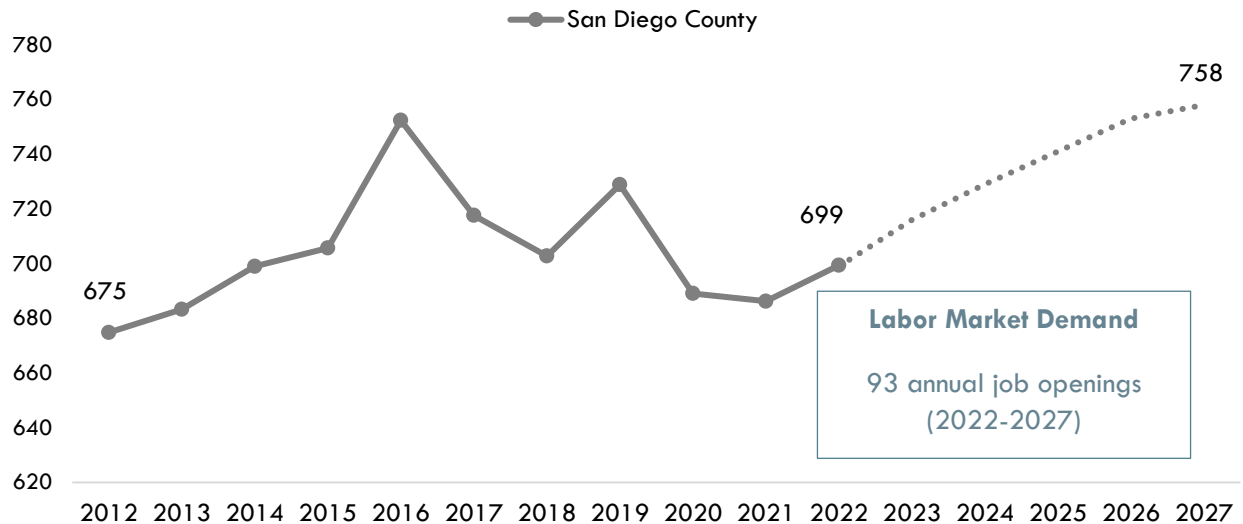
Exhibit 1b disaggregates the projected number of jobs change by occupation. "Surveying and Mapping Technicians" are projected to have the most labor market demand between 2022 and 2027, with 78 annual job openings.

Exhibit 1b: Number of Jobs for *Geographic Information System Occupations* in San Diego County (2022-2027)[3]

Occupational Title	2022 Jobs	2027 Jobs	2022 - 2027 Net Jobs Change	2022-2027 % Net Jobs Change	Annual Job Openings (Demand)
Surveying and Mapping Technicians	530	577	47	9%	78
Cartographers and Photogrammetrists	161	171	10	6%	14
Geographers	8	10	2	25%	1
Total	699	758	59	8%	93

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[2] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.
[3] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

Earnings

Exhibit 2a disaggregates hourly earnings by occupation. The entry-level hourly earnings for *Geographic Information System Occupations* range from $17.80 to $35.04.
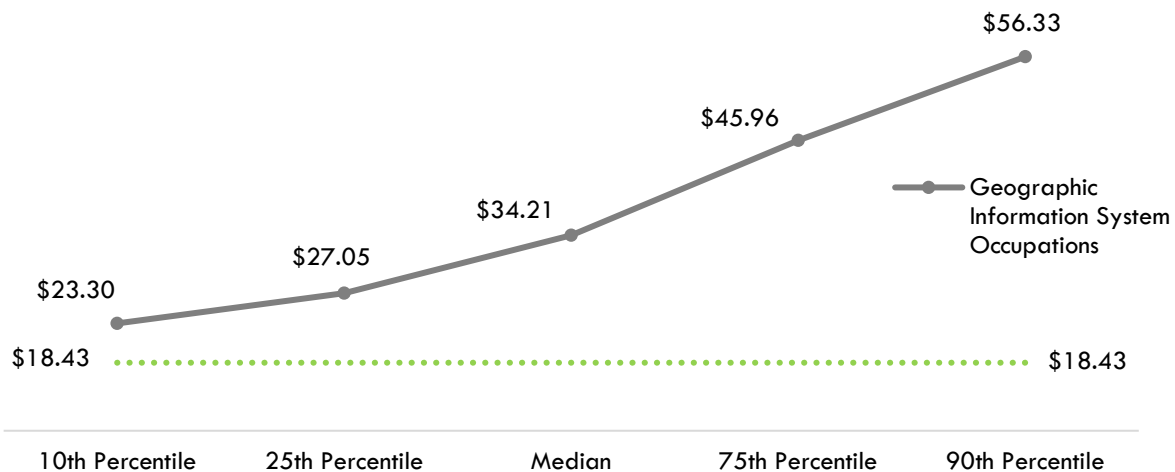
Exhibit 2a: Hourly Earnings for *Geographic Information System Occupations* in San Diego County[4]

Occupational Title	Entry-Level Hourly Earnings (25th Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75th Percentile)
Geographers	$35.04	$43.78	$53.47
Surveying and Mapping Technicians	$28.31	$29.24	$37.86
Cartographers and Photogrammetrists	$17.80	$29.62	$46.55

On average, the entry-level hourly earnings for *Geographic Information System Occupations* are $27.05; this is more than the living wage for a single adult in San Diego County, which is $18.43 per hour (Exhibit 2b).[5]

Exhibit 2b: Average Hourly Earnings[6] for *Geographic Information System Occupations* in San Diego County[7]

- 10th Percentile: $23.30
- 25th Percentile: $27.05
- Median: $34.21
- 75th Percentile: $45.96
- 90th Percentile: $56.33
- $18.43 (living wage line) — $18.43

Legend: Geographic Information System Occupations

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[4] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.
[5] "Family Needs Calculator (formerly the California Family Needs Calculator)," Insight: Center for Community Economic Development, last updated 2021. insightcced.org/family-needs-calculator/.
[6] 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.
[7] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.[8] There are six TOP codes and eight CIP codes related to *Geographic Information System Occupations* (Exhibit 3).

Exhibit 3: Related TOP and CIP Codes for *Geographic Information System Occupations*[9]

TOP or CIP Code	TOP or CIP Program Title
TOP 0301.00	Environmental Science
TOP 0302.00	Environmental Studies
TOP 0957.30	Surveying
TOP 1930.00	Earth Science
TOP 2206.00	Geography
TOP 2206.10	Geographic Information Systems
CIP 15.1102	Surveying Technology/Surveying
CIP 30.3501	Climate Science
CIP 30.3801	Earth Systems Science
CIP 30.4101	Environmental Geosciences
CIP 30.4401	Geography and Environmental Studies
CIP 43.0407	Geospatial Intelligence
CIP 45.0701	Geography
CIP 45.0702	Geographic Information Science and Cartography

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[8] TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data).
[9] This brief uses a conservative estimate of program supply and only calculates awards from the TOP codes in Exhibit 3.

According to TOP data, seven community colleges supply the region with awards for these occupations: Cuyamaca College, Grossmont College, Palomar College, San Diego City College, San Diego Mesa College, San Diego Miramar, and Southwestern College. According to CIP data, one non-community-college institution supplies the region with awards: San Diego State University (Exhibit 4).

Exhibit 4: Number of Awards (Certificates and Degrees) Conferred by Postsecondary Institutions (Program Year 2017-18 through Program Year 2020-21 Average)

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY18-19 to PY20-21)	Other Educational Institutions 3-Yr Annual Average Awards (PY17-18 to PY19-20)	3-Yr Total Average Supply (PY17-18 to PY20-21)
0302.00	Environmental Studies	**9**	**0**	**9**
	• Palomar	4	0	
	• San Diego City	2	0	
	• San Diego Mesa	3	0	
0957.30	Surveying	**2**	**0**	**2**
	• Cuyamaca	2	0	
1930.00	Earth Science	**2**	**0**	**2**
	• San Diego Miramar	2	0	
2206.00	Geography	**20**	**0**	**20**
	• Grossmont	7	0	
	• Palomar	3	0	
	• San Diego City	1	0	
	• San Diego Mesa	7	0	
	• Southwestern	2	0	
2206.10	Geographic Information Systems	**39**	**0**	**39**
	• Palomar	20	0	
	• San Diego Mesa	15	0	
	• Southwestern	4	0	

TOP6 or CIP Code	TOP6 or CIP Program Title	3-Yr Annual Average CC Awards (PY18-19 to PY20-21)	Other Educational Institutions 3-Yr Annual Average Awards (PY17-18 to PY19-20)	3-Yr Total Average Supply (PY17-18 to PY20-21)
45.0701	Geography	**0**	**27**	**27**
	• San Diego State University	0	27	
			Total	**99**

Demand vs. Supply

Comparing labor demand (annual openings) with labor supply[10] suggests that supply is met for these occupations in San Diego County, with 93 annual openings and 99 awards. Comparatively, there are 788 annual openings in California and 1,229 awards, suggesting that there is an oversupply across the state[11] (Exhibit 5).

Exhibit 5: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)

	Demand (Annual Openings)	Supply[12] (Total Annual Average Supply)	Supply Gap or Oversupply
San Diego	93	99	**6**
California	788	1,229	**441**

Please note: This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

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[10] Labor supply can be found from two different sources: Lightcast or the California Community Colleges Chancellor's Office MIS Data Mart. Lightcast uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.
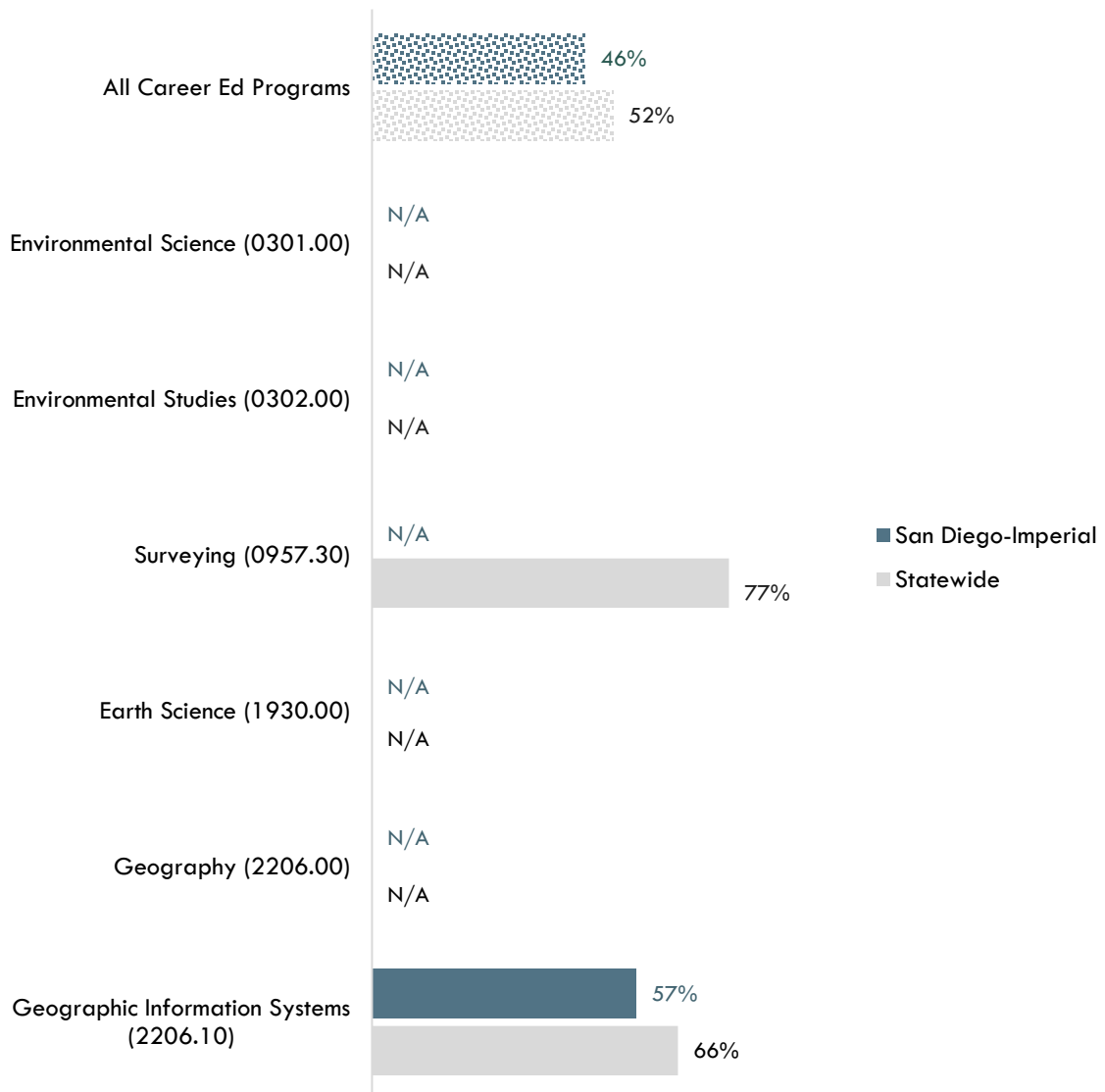[11] "Supply and Demand," Centers of Excellence Student Outcomes, https://coeccc.net/our-resources/.
[12] Awards included: associate degree; award <1 year; award 1<2 years; and postsecondary awards.

Student Outcomes and Regional Comparisons

According to the California Community Colleges LaunchBoard, 57 percent of students in the San Diego-Imperial region earned a living wage after completing a program related to *Geographic Information System Occupations,* compared 66 to 77 percent statewide and 52 percent of students in Career Education programs in general across the state (Exhibit 6a).[13]

Exhibit 6a: Percentage of Students Who Earned a Living Wage by Program, PY2019-20[14]

"N/A" indicates insufficient data

According to the California Community Colleges LaunchBoard, 90 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a program related to *Geographic Information System Occupations,* compared to 79 to 92 percent statewide and 73 percent of students in Career Education programs in general across the state (Exhibit 6b).[15]

Exhibit 6b: Percentage of Students in a Job Closely Related to Field of Study by Program, PY2018-19[16]

All Career Ed Programs — San Diego-Imperial: 71%; Statewide: 73%

Environmental Science (0301.00) — N/A; N/A

Environmental Studies (0302.00) — N/A; N/A

Surveying (0957.30) — N/A; Statewide: 92%

Earth Science (1930.00) — N/A; N/A

Geography (2206.00) — N/A; N/A

Geographic Information Systems (2206.10) — San Diego-Imperial: 90%; Statewide: 79%

Legend:
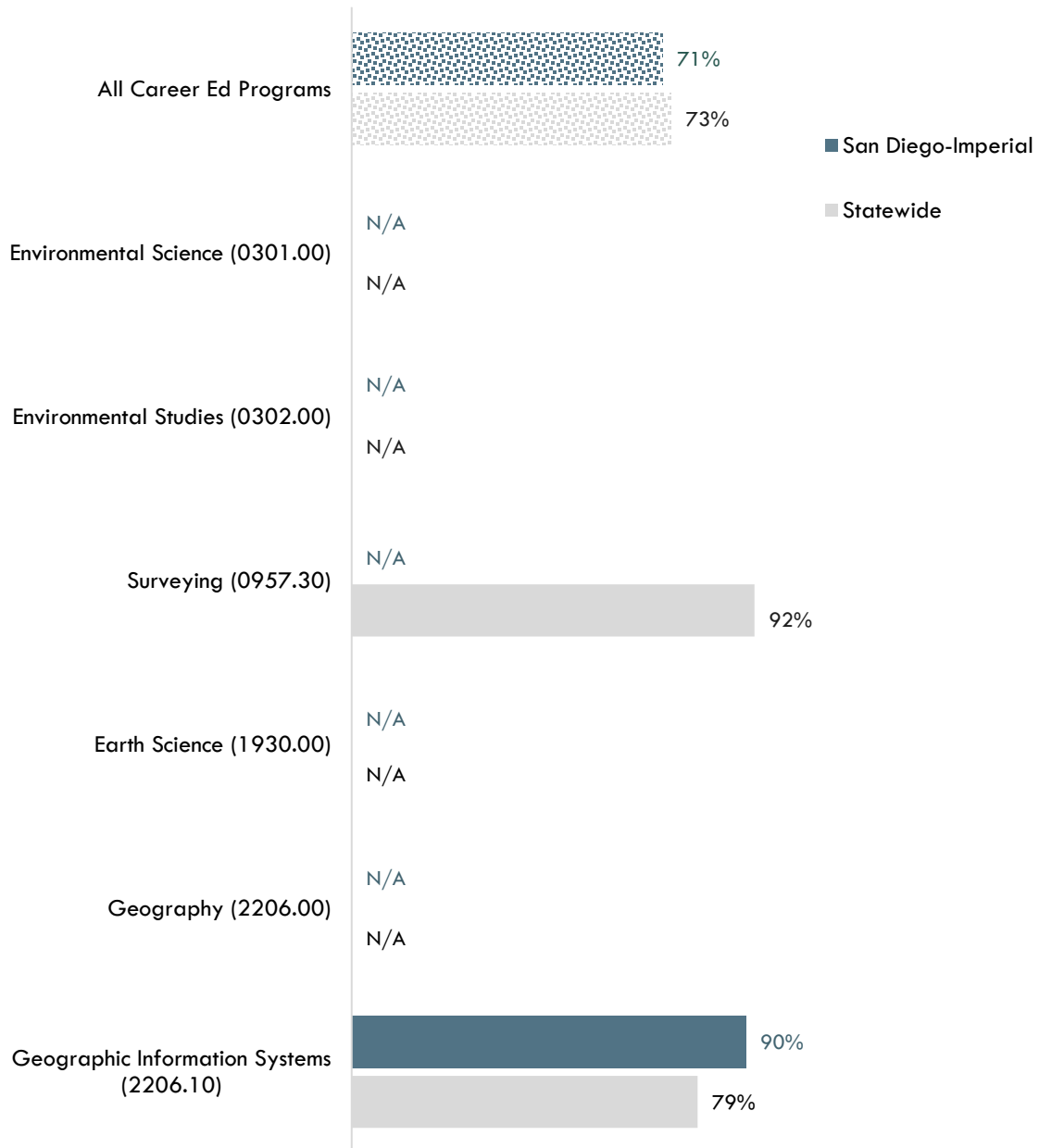■ San Diego-Imperial
■ Statewide

"N/A" indicates insufficient data

[15] "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.
[16] Most recent year with available data is Program Year 2018-19. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

Online Job Postings

This report analyzes not only historical and projected (traditional LMI) data, but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market that are not captured by historical data. Between 2019 and 2022, there was an average of 277 online job postings per year for *Geographic Information System Occupations* in San Diego County (Exhibit 7). Please note that online job postings do **not** equal labor market demand; demand is represented by annual job openings (see Exhibit 1b). While this brief includes online jobs postings data to help with curriculum development, the community colleges should note that this type of data is impacted by several variables: employers may post a position multiple times to increase the pool of applicants; a job posting can remain posted after a business decides not to fill a position; or an employer may use one posting to fill multiple positions, for example.

Exhibit 7: Number of Online Job Postings for *Geographic Information System Occupations* in San Diego County (2019-2022)[17]

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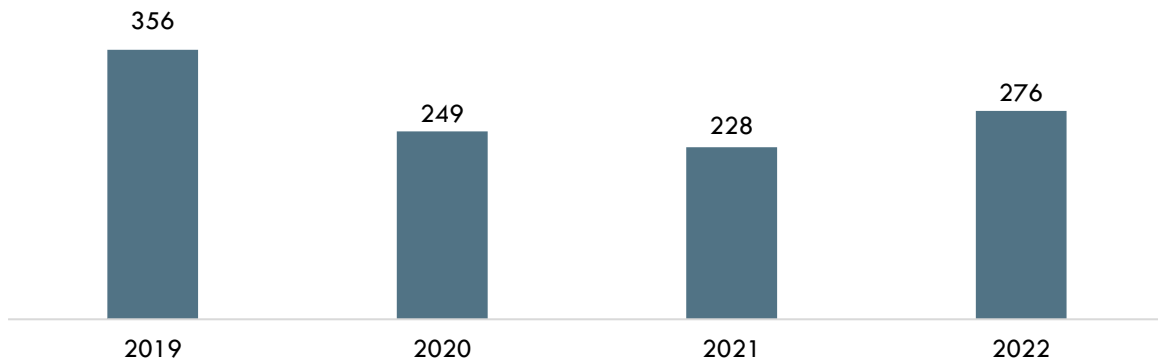
[17] Lightcast; "Job Posting Analytics." 2019-2022.

Top Employers

Between January 1, 2020 and December 31, 2022, the top five employers in San Diego County for *Geographic Information System Occupations* were NV5, GPAC, City Of San Diego, Rick Engineering Company, and University of California San Diego based on online job postings (Exhibit 8).

Exhibit 8: Top Employers for *Geographic Information System Occupations* in San Diego County[18]

Top Employers	
• NV5	• Sunrun
• GPAC	• County of San Diego
• City Of San Diego	• CyberCoders
• Rick Engineering Company	• Project Design Consultants
• University of California San Diego	• Army National Guard

Education, Skills, and Certifications

Geographic Information System Occupations have a national educational attainment ranging from a high school diploma or equivalent to a bachelor's degree (Exhibit 9a).

Exhibit 9a: National Educational Attainment for *Geographic Information System Occupations*[19]

Occupational Title	Typical Entry-Level Education
Cartographers and Photogrammetrists	Bachelor's degree
Geographers	Bachelor's degree
Surveying and Mapping Technicians	High school diploma or equivalent

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[18] Lightcast; "Job Posting Analytics." 2020-2022.
[19] Lightcast 2023.01; QCEW, Non-QCEW, Self-Employed.

Based on online job postings between January 1, 2020 and December 31, 2022 in San Diego County, employers posted a master's degree or higher as the most requested educational requirement for *Geographic Information System Occupations* (Exhibit 9b).[20]

Exhibit 9b: Educational Requirements for *Geographic Information System Occupations* in San Diego County[21]
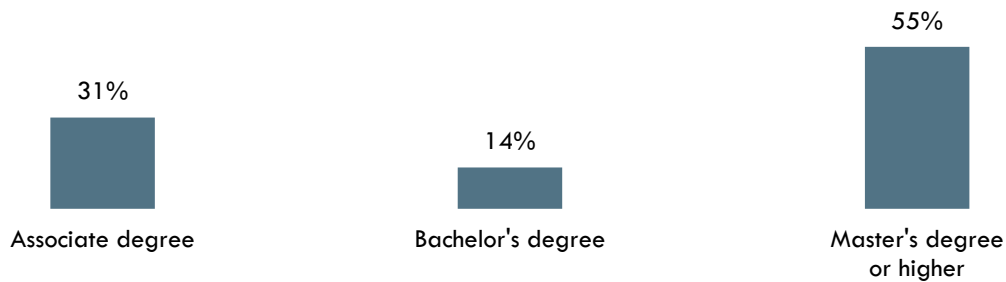

Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2020 and December 31, 2022.

Exhibit 10: Top Skills for *Geographic Information System Occupations* in San Diego County[22]

Specialized Skills	Soft Skills	Software Skills
• Surveying • Geographic Information Systems • AutoCAD Civil 3D • ArcGIS • Topography • Legal Land Description • Field Surveys • Global Positioning Systems • Field Notes • Data Collection • Computer-Aided Design • Construction • AutoCAD • Automation • Civil Engineering	• Communications • Management • Verbal Communication Skills • Self-Motivation • Customer Service • Planning • Research • Detail Oriented • Coordinating • Professionalism • Operations • Mathematics • Writing • Good Driving Record • Time Management	• Geographic Information Systems • AutoCAD Civil 3D • ArcGIS • Microsoft Excel • Microsoft Word • AutoCAD • Microsoft Outlook • Microsoft PowerPoint • Python • Mapping Software • SQL • Software Systems • Google Earth • MicroStation • Keyhole Markup Language

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[20] Lightcast; "Job Posting Analytics." 2020-2022.
[21] "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified April 9, 2021. bls.gov/emp/tables/educational-attainment.htm.
[22] Lightcast; "Job Posting Analytics." 2020-2022.

Exhibit 11 lists the top certification that appeared in online job postings between January 1, 2020 and December 31, 2022.

Exhibit 11: Top Certification for *Geographic Information System Occupations* in San Diego County[23]

Top Certification in Online Job Postings
1. Land Surveyor In Training
2. Drone Pilot Certificate
3. CDL Class C License
4. Secret Clearance
5. Security Clearance
6. American College Of Sports Medicine (ACSM) Certification
7. Master Of Business Administration (MBA)
8. 10-Hour OSHA General Industry Card
9. Basic Life Support (BLS) Certification
10. Board Certified/Board Eligible
11. CDL Class A License
12. GIS Certification
13. Six Sigma Green Belt
14. Standards Of Training Certification and Watchkeeping
15. Top Secret-Sensitive Compartmented Information (TS/SCI Clearance)

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[23] Lightcast; "Job Posting Analytics." 2020-2022.

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Important Disclaimers

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.