

Mining Technology Program of Study



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Draft for Review by the Nevada State Board of Education on
August 17, 2026

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Vision

All Nevada students are equipped and feel empowered to attain their vision of success

Mission

To improve student achievement and educator effectiveness by ensuring opportunities, facilitating learning, and promoting excellence



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Acknowledgements

The development of Nevada career and technical education (CTE) standards and assessments is a collaborative effort sponsored by the Nevada Department of Education (NDE) Office of Career Readiness, Adult Learning, and Education Options. The Nevada Department of Education relies on educators and industry representatives who have the technical expertise and teaching experience to develop standards and performance indicators that truly measure student skill attainment. More importantly, the NDE would like to recognize the time and commitment by the writing team members in developing the career and technical standards for Mining Technology.

Standards Development Members

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Business and Industry Validation

All CTE standards developed through the Nevada Department of Education are validated by business and industry through one or more of the following processes: (1) the standards are developed by a team consisting of business and industry representatives, or (2) a separate review panel is coordinated with industry experts to ensure the standards include the proper content, or (3) nationally recognized standards currently endorsed by business and industry.

The Mining Technology standards were validated through active participation of business and industry representatives on the development team.

Introduction

The standards in this document are designed to clearly state what the student should know and be able to do upon completion of a high school Mining Technology program of study. These standards are designed for a two-credit course sequence that prepares the student for a technical assessment directly aligned to the standards.

These exit-level standards are designed for the student to complete all standards through their completion of a program of study. These standards are intended to guide curriculum objectives for a program of study.

The standards are organized as follows:

- **Content Standards** are general statements that identify major areas of knowledge, understanding, and the skills students are expected to learn in key subject and career areas by the end of the program.
- **Performance Standards** follow each content standard. Performance standards identify the more specific components of each content standard and define the expected abilities of students within each content standard.
- **Performance Indicators** are very specific criteria statements for determining whether a student meets the performance standard. Performance indicators may also be used as learning outcomes, which teachers can identify as they plan their program learning objectives. The indicators are followed by designations that reflect the course sequence (e.g., L1 for the first-year course of a two-year program and L2 for the second-year course, C is to designate the indicators to be taught in the complementary courses) as referenced in the Core Course Sequence table.

The crosswalks and alignments are located in the Program Supplemental Program Resources document. These will show where the performance indicators support the Nevada Academic Content Standards. For individual course descriptions, please reference the Supplemental Program Resource or the Nevada CTE Catalog.

All students are encouraged to participate in the career and technical student organization (CTSO) that relates to the Mining Technology program. CTSOs are co-curricular national organizations that directly reinforce learning in the CTE classroom through curriculum resources, competitive events, and leadership development. CTSOs provide students the ability to apply academic and technical knowledge, develop communication and teamwork skills, and cultivate leadership skills to ensure college and career readiness.

The Employability Skills for Career Readiness identify the skills needed to be successful in all careers and must be taught as an integrated component of all CTE course sequences. These standards are available in a separate document.

The **Standards Reference Code** is only used to identify or align performance indicators listed in the standards to daily lesson plans, curriculum documents, or national standards. The Standards Reference Code is an abbreviated name for the program, and the content standard, performance standard and performance indicator are referenced in the program standards. This abbreviated code for identifying standards uses each of these items. For example, MINE TECH is the Standards Reference Code for Mining Technology. For Content Standard 2, Performance Standard 3 and Performance Indicator 4 the Standards Reference Code would be MINE.TECH2.3.4.

Mining Technology

Program Information

Program of Study: Mining Technology

Standards Reference Code: MINE TECH

Career Cluster: Cultivating Resource

Career Pathway(s): Energy & Natural Resources

Program Length: 2-year, completed sequentially

CTSO: FFA/SkillsUSA

Program Structure Required Program of Study Courses

The core course sequencing is provided in the following table. Complementary Courses are available and provided later in this document. The following courses provide a completed program of study. The Lab is a complementary course available concurrently with the Mining Technology II course.

Core Course Sequence (R)

Required/ Complementary	Course Title	Abbreviated Name
R	Mining Technology I	MINING TECH I
R	Mining Technology II	MINING TECH II

CONTENT STANDARD 1.0: INTEGRATE CAREER AND TECHNICAL STUDENT ORGANIZATIONS (CTSOs)

Performance Standard 1.1: Explore the History and Organization of CTSOs

- 1.1.1 Discuss the requirements of CTSO participation/involvement as described in Carl D. Perkins Law Level 1, Level 2, Complementary
- 1.1.2 Research nationally recognized CTSOs
- 1.1.3 Investigate the impact of federal and state government regarding the progression and operation of CTSOs (e.g., Federal Statutes and Regulations, Nevada Administrative Code [NAC], Nevada Revised Statutes [NRS])

Performance Standard 1.2: Develop Leadership Skills

- 1.2.1 Discuss the purpose of parliamentary procedure
- 1.2.2 Demonstrate the proper use of parliamentary procedure
- 1.2.3 Differentiate between an office and a committee
- 1.2.4 Discuss the importance of participation in local, regional, state, and national conferences, events, and competitions
- 1.2.5 Participate in local, regional, state, or national conferences, events, or competitions
- 1.2.6 Describe the importance of a constitution and bylaws to the operation of a CTSO chapter

Performance Standard 1.3: Participate in Community Service

- 1.3.1 Explore opportunities in community service-related work-based learning (WBL)
- 1.3.2 Participate in a service learning (program related) and/or community service project or activity
- 1.3.3 Engage with business and industry partners for community service

Performance Standard 1.4: Develop Professional and Career Skills

- 1.4.1 Demonstrate college and career readiness (e.g., applications, resumes, interview skills, presentation skills)
- 1.4.2 Describe the appropriate professional/workplace attire and its importance
- 1.4.3 Investigate industry-standard credentials/certifications available within this Career Cluster™
- 1.4.4 Participate in authentic contextualized instructional activities
- 1.4.5 Demonstrate technical skills in various student organization activities/events

Performance Standard 1.5: Understand the Relevance of Career and Technical Education (CTE)

- 1.5.1 Make a connection between program standards to career pathway(s)
- 1.5.2 Explain the importance of participation and completion of a program of study
- 1.5.3 Promote community awareness of local student organizations associated with CTE programs

CONTENT STANDARD 2.0: FOUNDATIONS OF MINERAL RESOURCES IN SOCIETY**Performance Standard 2.1: Understanding that every human-made product begins with mining**

- 2.1.1 Analyze the role of minerals in daily life (technology, infrastructure, food production).
- 2.1.2 Estimate how many people work directly or indirectly in Nevada's mining industry.
- 2.1.3 Compare modern mining operations with historical mining operations.
- 2.1.4 Identify the characteristics of a modern miner.

Performance Standard 2.2: The History of Mining in Nevada

- 2.2.1 Explain the role of Virginia City, the Comstock Lode, and the Gold Rush in Nevada's mining history.
- 2.2.2 Describe the connection between Nevada's silver discovery during the Civil War and its Battle Born nickname.
- 2.2.3 Examine the importance of mining in Nevada during the Great Depression.
- 2.2.4 Explain the discovery and development of modern gold mining infrastructure in Nevada.
- 2.2.5 Identify the role of rare earth elements and lithium in Nevada's mining industry.
- 2.2.6 Explain the evolution of the mining industry through advances in technology.

Performance Standard 2.3: Mining in the world today

- 2.3.1 Identify the minerals mined in Nevada, the counties where they are produced, and their uses.
- 2.3.2 Identify the minerals mined in the United States, the counties where they are produced, and their uses.
- 2.3.3 Describe the locations and importance of major mining hubs around the world.

Performance Standard 2.4: Economics of the mining industry

- 2.4.1 Describe the factors that affect the market value of precious metals.
- 2.4.2 Analyze the economic, environmental, and resource factors that determine mine openings and closures.
- 2.4.3 Evaluate the role of cost-benefit analysis, supply and demand, and technology in mining decisions.

Performance Standard 2.5: Ethics and Transparency in the Extractive Industry

- 2.5.1 Discuss the ethics of global mineral supply chains; examine the importance of transparency in reporting environmental and financial impacts.
- 2.5.2 Describe working conditions in modern mining industries.
- 2.5.3 Explain the importance of safety culture in the mining industry.

Performance Standard 2.6: Career Pathways in the mineral economy

- 2.6.1 Identify the educational pathways and skills needed for mining careers.
- 2.6.2 Explore mining careers around the world
- 2.6.3 Explain how industry expansion is increasing the need for mining professionals.
- 2.6.4 Examine the ways mining careers change over time.

CONTENT STANDARD 3.0: GEOLOGIC ORIGINS AND NEVADA'S MINERAL WEALTH

Performance Standard 3.1: Plate tectonics

- 3.1.1 Relate tectonic processes to the formation of Nevada's gold, lithium, and copper deposits.
- 3.1.2 Use geologic maps and stratigraphic columns to contextualize mineral-forming events.
- 3.1.3 Describe the role of orogenesis in shaping Nevada's geology.
- 3.1.4 Explain how specific rocks and minerals guide mining exploration and discovery.

Performance Standard 3.2: Geologic Timeline of Minerals of Interest

- 3.2.1 Compare the ages of Earth's oldest rocks and Nevada's rocks.
- 3.2.2 Describe the appearance of life within Earth's geological timeline.
- 3.2.3 Explain the timing of human existence within Earth's history.
- 3.2.4 Identify when mining began on Earth's timeline.

Performance Standard 3.3: Career Pathways in the mineral economy

- 3.3.1 Professional opportunities in geology
- 3.3.2 Research roles in geotechnology, production geology, resource/modeling geology, exploration geology.

CONTENT STANDARD 4.0: THE MINING LIFECYCLE: EXPLORATION TO CONSTRUCTION**Performance Standard 4.1: Outline the stages of discovery**

- 4.1.1 Utilize geologic maps and topographic data to determine historical and current information.
- 4.1.2 Recognize how different rock types are associated with different mineral deposits.
- 4.1.3 Determine appropriate surface sample locations from geologic map information.
- 4.1.4 Identify collection methods and qualities (e.g., surface samples, core samples, outcropping).
- 4.1.5 Research permit requirements for various locations and activities.

Performance Standard 4.2: Demonstrate exploration techniques

- 4.2.1 Utilize data from surface samples to determine possible drilling locations and type of contents.
- 4.2.2 Developing a cross-section utilizing collected data.
- 4.2.3 Investigate the different exploration techniques (core sampling, magnetic surveys, 3D modeling).
- 4.2.4 Identify information provided by the different exploration techniques.

Performance Standard 4.3: Ethics and Transparency in the Extractive Industry

- 4.3.1 Identify the roles of local, state, tribal, landowners, and federal agencies that will have an interest in mining activity.
- 4.3.2 Create map showing effects of a mining operation on the community and a communication plan for stakeholders.

Performance Standard 4.4: Career Pathways in the Mineral Economy

- 4.4.1 Professional opportunities beyond the mine site
- 4.4.2 Research roles in mineral prospecting, geologic mapping, water testing, soil testing, core sample evaluator, surveyor, environmental engineer, field biologist, etc.

CONTENT STANDARD 5.0: MINE ENGINEERING AND EXTRACTION METHODS

Performance Standard 5.1: Compare and contrast surface (open-pit) vs. underground mining

- 5.1.1 Identify various open-pit and underground mining methods and the conditions under which each is most applicable. Describe some pros and cons of each method (consider footprint, capital cost, operating cost, productivity, etc.).
- 5.1.2 Describe the characteristics of an orebody that make it more suitable for open-pit mining or underground mining. Consider depth to mineralization, grade (metal or mineral content per unit of mass or volume), dissemination of mineralization (bulk or narrow), etc.
- 5.1.3 Sketch a basic design for an open pit mine (bench layout, haul ramp) or an underground mine (shaft, ramp, tunnel network) appropriate for a given orebody's depth and shape.
- 5.1.4 Research a real-world mining operation that utilizes both open-pit and underground methods and explain the engineering and economic reasons each method was selected. (Hint: there are several modern examples in Nevada, such as Goldstrike, Gold Quarry, and Cortez Hills).

Performance Standard 5.2: Evaluate the engineering requirements for equipment, autonomous technology, and slope stability

- 5.2.1 Demonstrate how soil and rock types behave under pressure by building structures in dry sand versus wet clay to study slope stability. Introduce additional water or vibration to show impacts of external factors.
- 5.2.2 Sketch the airflow on an underground mine schematic to identify where fresh air enters, travels, and exits main and auxiliary mine workings (shaft, ramps, drifts, headings). In the schematic, try to focus the fresher air (closer to the intake) near active and future workings.
- 5.2.3 Using a provided open pit or underground mining example, calculate the number of primary production equipment units required to meet designed production rates (shovels/loaders, haul trucks, and drills).
- 5.2.4 Research how autonomous (self-driving) haul trucks and drone technology are utilized to reduce human exposure to hazardous conditions in a mine site.

Performance Standard 5.3: Ethics and Transparency in the Extractive Industry

- 5.3.1 Explain why mining engineers must consider slope stability, ventilation, equipment safety, and environmental impact in their designs and plans, even when those considerations could lengthen a project schedule or increase its cost.
- 5.3.2 Discuss the ethical responsibility of engineers to disclose risks (e.g., slope stability, tailings facility design, environmental hazards) to regulators and the public when designing and permitting mining projects.
- 5.3.3 Research a real-world case where engineering transparency — or the lack of it — affected mine worker safety or public trust.

Performance Standard 5.4: Career Pathways in the Mineral Economy

- 5.4.1 Professional opportunities beyond the mine site.
- 5.4.2 Research occupations in Mining Engineering, Maintenance Engineering, Mechanical Engineering, Geotechnical Engineering, Civil Engineering, Project Manager, Civil Engineering, Corporate Technical and Operational Leadership, Automation and Data Analysis; explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 6.0: MINERAL PROCESSING AND EXTRACTIVE METALLURGY**Performance Standard 6.1: Understand the Chemical and Physical Separation Processes (e.g., leaching, flotation, smelting)**

- 6.1.1 Sketch a simple flowchart showing how a truckload of raw rock goes through crushers/grinding mills and separation through screening.
- 6.1.2 Understand the operation and techniques used in resource extraction to include the leaching process, flotation circuits, roaster operations, and autoclaves.
- 6.1.3 Describe how heap leaching works, explaining how liquids are trickled over lined rock piles to dissolve and collect precious metals.
- 6.1.4 Compare and contrast various processing methods based on ore type (ore appropriate for leaching, double or single refractory [using heat], flotation).
- 6.1.5 Calculate the recovery rate of a mock mining project by comparing the weight of the valuables found against the total weight of the starting material.

Performance Standard 6.2: Identify the Byproduct Management Systems Required During Processing

- 6.2.1 Explain the purpose of a tailings storage facility and identify two design features used to prevent the leftover rock mud from leaking into the ground.
- 6.2.2 Discuss the detoxification phase required if cyanide is used in the extraction process.
- 6.2.3 Understand the storage phase once detoxified (underground, backfill process, tailings storage).
- 6.2.4 Discuss the long-term goals for storage of tailings and the possible reuse if new technology is developed for extraction of more metal from the tailings.

Performance Standard 6.3: Ethics and Transparency During Mineral Processing and Extractive Metallurgy

- 6.3.1 Discuss the importance of Global International Standards for Tailings Management (GISTM) for constructing and management of tailings facility integrity
- 6.3.2 Identify the six topics and fifteen principles of the GISTM
- 6.3.3 Research on of the GISTM topics for group discussion

Performance Standard 6.4: Career Pathways in Mineral Processing and Extractive Metallurgy

- 6.4.1 Explore professional opportunities beyond the mine site.
- 6.4.2 Research roles in Tailings Facility Engineer, Chemical Engineer, Mechanical Engineer, Project Manager, Finance and Accounting, Reliability Engineer, Legal Counsel, Community Relations, Human Resources Management, Administrators, Industrial Health Professional, Emergency Response Professional, Environmental Engineer, Process Operators/Technicians, Emergency Management.

CONTENT STANDARD 7.0: REGULATORY FRAMEWORK, PERMITTING, AND GOVERNMENT

Performance Standard 7.1: Identify the roles of the Bureau of Land Management (BLM), Nevada Division of Environmental Protection (NDEP), Environmental Protection Agency (EPA), and Environmental Acts?

- 7.1.1 Define the functions of federal and state agencies, such as BLM, NDEP, EPA, and NDOW, and their specific jobs in protecting public land, water, and air.
- 7.1.2 Understand the different acts that affect mining operations (NEPA, CERCLA, Clean Water Act, Clean Air Act, Endangered Species Act, etc.).
- 7.1.3 Describe how state permits (reclamation, water pollution control, air permits, water rights) interact with federal NEPA review for a Nevada mining project.
- 7.1.4 Explain the purpose of financial assurance/bonding and reclamation plans in ensuring long-term environmental performance of mining projects.

Performance Standard 7.2: Navigate the NEPA permitting process

- 7.2.1 Diagram the major steps in the NEPA process for a proposed mine on federal land in Nevada, from project proposal through public comment and agency decision.
- 7.2.2 Identify opportunities for public participation in mining-related NEPA and state permitting (public notices, comment periods, hearings) and describe why community input matters.
- 7.2.3 Outline the timeline of the National Environmental Policy Act (NEPA) to show how long it takes for a project on federal land to get approved.

Performance Standard 7.3: Understand the Nevada Administrative Code (NAC) as it pertains to mining

- 7.3.1 Discuss NAC related to mining operations (Land Reclamation (NAC 519A), Mine Safety and Inspection (NAC 512), Water Pollution Control (NAC 445A), Mineral Exploration & Claims (NAC 513, NAC 517).

Performance Standard 7.4: Explore Ethics and Transparency Practices in the Extractive Industry

- 7.4.1 Discuss the ethics of global mineral supply chains; examine the importance of transparency in reporting environmental and financial impacts.
- 7.4.2 Read through a list of public concerns regarding a new project and write down professional, fact-based responses to address neighbors' fears.
- 7.4.3 Explore public scoping (public meetings, tribal outreach, comment period) and hold a mock town hall.
- 7.4.4 Provide examples of cases with lack of transparency issues and ethical violations.

Performance Standard 7.5: Career Pathways in the Mineral Economy

- 7.5.1 Evaluate how emerging technologies (automation, data analytics, remote operations) are changing roles and skill requirements in the mineral economy.
- 7.5.2 Research roles in Environmental Scientist, NEPA Specialist, Attorney (Environmental or Natural Resources), Public Affairs Specialist, Environmental Planner, Financial Analysis, Permit Coordinator, Compliance Inspector, Tribal Liaison, and Community Relations; explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 8.0: SUSTAINABILITY AND CORPORATE SOCIAL RESPONSIBILITY (CSR)**Performance Standard 8.1: Analyze how mining projects meet international sustainability goals**

- 8.1.1 Identify and understand the 17 United Nations Sustainability Goals from a global perspective.
- 8.1.2 Analyze how mining projects meet the international sustainability goals.
- 8.1.3 Meeting the needs of the present without compromising the ability of future generations to meet their own needs.
- 8.1.4 Understand the World Gold Council's "Responsible Gold Mining Principles."

Performance Standard 8.2: Evaluate mining business policies, priorities, and practices for environmental stewardship and community investment.

- 8.2.1 Discuss the three Principles of Sustainability: Environmental Sustainability, Social Sustainability, and Economic Sustainability.
- 8.2.2 Explore governance, social, environmental and economic standards including ethical conduct, impact toward community sustainability goals, and ethical supply chain practices.
- 8.2.3 Discuss social impacts - Safety and Health, Human rights and conflict, Labor Rights, Working with Communities.
- 8.2.4 Discuss environmental impacts - Environmental Stewardship, Biodiversity, land use and mine closure, Water, energy and climate change.

Performance Standard 8.3: Explore Ethics and Transparency Practices in the Extractive Industry

- 8.3.1 Discuss the ethics of global mineral supply chains (e.g., "Conflict Minerals"); examine the importance of transparency in reporting environmental and financial impacts.
- 8.3.2 Identify global issues of human rights, labor sources, and community impact.
- 8.3.3 Explain how corruption impacts local, regional, and global operations.
- 8.3.4 Explore the due diligence process to avoid issues with extortion, human rights issues, and corruption.
- 8.3.5 Explain sourcing programs to include supplier vetting, compliance issues, and ethical business practices

Performance Standard 8.4: Career Pathways in the Mineral Economy

- 8.4.1 Discuss professional opportunities beyond the mine site
- 8.4.2 Research roles of lawyers, external/government affairs specialists, supply chain logistic personnel (buyers/purchasing, warehouse, finance), and human resources.

CONTENT STANDARD 9.0: STAKEHOLDER COLLABORATION AND PUBLIC POLICY

Performance Standard 9.1: Identify key stakeholders (Indigenous groups like the Western Shoshone, local communities, and environmental NGOs)

- 9.1.1 Research the presence of the stakeholder groups in Nevada and explain why mining companies must consult with them before working.
- 9.1.2 Identify key Indigenous groups e.g. the Western Shoshone and explain why mining companies must consult with and address issues before working.
- 9.1.3 Identify how Nevada's Mining Industry's Tax money contributes to help fund statewide schools, roads, and emergency crews.
- 9.1.4 Discuss overall non-tax contributions to state and local organizations and projects to promote sustainability and long-term community viability.

Performance Standard 9.2: Explore Public Policy Impacting the Extractive Industry

- 9.2.1 Discuss how the industry engages with and informs local, state and federal agencies potential impacts of public policy.

Performance Standard 9.3: Ethics and Transparency in the Extractive Industry

- 9.3.1 Discuss the importance of transparency in presenting environmental and financial impacts to stakeholders.

Performance Standard 9.4: Career Pathways in the Mineral Economy

- 9.4.1 Professional opportunities beyond the mine site.
- 9.4.2 Research roles in Geosciences, Environmental Engineering, Financial Analysis, Government Relations, and Community Relations.

CONTENT STANDARD 10.0: MINE SITE SAFETY, HEALTH, AND MSHA COMPLIANCE**Performance Standard 10.1: Demonstrate Knowledge of Mine Safety and Health Administration (MSHA) standards**

- 10.1.1 Define what MSHA is and it's important for worker protection.
- 10.1.2 Explore the reasons behind the creation of MSHA in 1977 (history of mining driving need for greater safety).
- 10.1.3 Compare and contrast the Mine Safety and Health Administration (MSHA) requirements/mandates to standard office, grocery store, or construction safety (OSHA).

Performance Standard 10.2: Assess, Analyze, and Implement Risk Mitigation for Mining and Industrial Environments

- 10.2.1 Explore potential hazards in everyday life and workplace environments.
- 10.2.2 Discuss the benefits of properly identifying and mitigating areas of hazard and risk.
- 10.2.3 Discuss what can be done to avoid or reduce risk.
- 10.2.4 Discuss hierarchy of controls that would be necessary to ensure safe working environments
- 10.2.5 Review a real-world industrial accident story to find the exact mistake or machine failure that caused the injury

Performance Standard 10.3: Explore the Importance of Ethics and Transparency for Accountability

- 10.3.1 Identify consequences of improper reporting of safety incidents (e.g., problems not fixed, future risk of injury).
- 10.3.2 Explore the importance of teamwork between workers and management in order to achieve a sustainable safety culture.

Performance Standard 10.4: Career Pathways in the Mineral Economy

- 10.4.1 Professional opportunities beyond the mine site.
- 10.4.2 Research roles in Geosciences, Environmental Engineering, Financial Analysis, and Community Relations; explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 11.0: ENVIRONMENTAL MONITORING AND DATA SCIENCE

Performance Standard 11.1: Use GIS to track land-use changes

- 11.1.1 Using GIS software, import, display, and analyze datasets over time (topographic, land usage, reclamation effects).
- 11.1.2 Utilizing digital programming, explore property lines/boundaries, ownership, and those areas that may be affected by mining activities.
- 11.1.3 Design a simple nature checklist to record the types of plants, birds, and soil conditions found in an area before any construction begins, for reclamation needs.

Performance Standard 11.2: Research environmental conditions and effects of a mining operation

- 11.2.1 Collect and analyze soil, air, and biological data to ensure regulatory compliance throughout the mine life.
- 11.2.2 Explore air quality (chemical pollutants, particulate matter/dust, greenhouse gas emissions) effect on ambient air in relation to Nevada and National Ambient Air Quality Standards (NVAAWS / NAAQS).
- 11.2.3 Explore water requirements for Water Pollution Control Permits (WPCP, National Permit Discharge Eliminations System (NPDES), and Safe Drinking Water Bureau.
- 11.2.4 Explore waste requirement processes for waste created by the mining site (solids, liquids, chemical).

Performance Standard 11.3: Ethics and Transparency in the Extractive Industry

- 11.3.1 Explore the Consolidated Mining Standards and UN Guiding Principles that impact environmental ethics and transparency in the extractive industry.
- 11.3.2 Explain why environmental scientists must never change or falsify their scientific data sheets, even if the numbers show a problem.
- 11.3.3 Discuss the importance of Sustainability Accounting Standards Board (SASB) reporting requirements.

Performance Standard 11.4: Career Pathways in the Mineral Economy

- 11.4.1 Professional opportunities beyond the mine site.
- 11.4.2 Research roles in a variety of sciences, Environmental Engineering, General Counsel and community outreach, field technicians; explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 12.0: WATER RESOURCE MANAGEMENT AND PROTECTION**Performance Standard 12.1: Monitor water quality**

- 12.1.1 List the different types of water (surface, ground, drinking, processed, waste) and required or desired maintenance of quality standards for each.
- 12.1.2 Design a spreadsheet to monitor temperatures, pH levels, conductivity, flow discharge calculations, metal and chemical content, etc.
- 12.1.3 Collect and analyze water samples.

Performance Standard 12.2: Analyze dewatering and water-recycling technologies used in mining operations

- 12.2.1 Explore tools needed for water recycling.
- 12.2.2 Design process for dewatering and water recycling.
- 12.2.3 Research the requirements for BMRR - Bureau of Mine Reclamation | NDEP - NV Dept of Environmental Protection | EDC - Engineering Design Changes.

Performance Standard 12.3: Ethics and Transparency in the Extractive Industry

- 12.3.1 Discuss the seventeen goals listed in the UN Sustainable Development goals and how they apply to different extractive activities.

Performance Standard 12.4: Career Pathways in the Mineral Economy

- 12.4.1 Professional opportunities beyond the mine site.
- 12.4.2 Research roles in Process Engineering, Financial Analysis, and Environmental Compliance, General Counsel, External and Government Affairs Relations, Wastewater Operators, Drinking Water Analysts, Sustainability Reporting Analysts, various Process Operators (entry level); explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 13.0: EXPLORE MINING RECLAMATION PURPOSE AND PROCESSES

Performance Standard 13.1: Explore Why Reclamation is Required and How it Reduces Long-Term Environmental and Safety Impacts

- 13.1.1 Discuss the history of reclamation and its effects on historical and modern mining methods, including how past mining practices led to reforms in today's reclamation regulations.
- 13.1.2 Understand state and federal governmental regulations as they relate to reclamation in the modern mining industry.
- 13.1.3 Identify basic reclamation practices, including reshaping land, stabilizing slopes, managing drainage, controlling erosion, and revegetating disturbed areas.
- 13.1.4 Interpret a simple reclamation plan and identify key elements such as site conditions, sequence of work, stabilization methods, and success criteria.
- 13.1.5 List the different types of reclamation processes utilized by different mining industries (e.g., concurrent geo Phyto remediation).
- 13.1.6 Explain how reclamation reduces long-term environmental and safety impacts and prepares land for future use.

Performance Standard 13.2: Understand the Financial Mechanisms of Reclamation Bonding

- 13.2.1 Explain why governments require reclamation bonds before mining activities begin, including protection of the public from unfunded cleanup costs.
- 13.2.2 Describe how reclamation bonds help ensure that land can be restored even if a company closes, goes bankrupt, or abandons a site.
- 13.2.3 Discuss the relationship between reclamation bonding and community trust, environmental protection, and long-term land use.

Performance Standard 13.3: Discuss the Ethical and Regulatory Requirements of Reclamation

- 13.3.1 Describe the importance of transparent reporting in reclamation planning, monitoring, bond management, and closure decisions.
- 13.3.2 Identify common transparency practices, such as sharing reclamation goals, documenting progress, reporting monitoring results, and communicating to stakeholders when sites do or do not meet performance standards.
- 13.3.3 Explain why ethical decision-making is essential in mine reclamation, including honesty, public trust, environmental stewardship, and responsible use of financial assurance.
- 13.3.4 Discuss how conflicts of interest, incomplete reporting, or misleading claims can undermine reclamation outcomes and community confidence.
- 13.3.5 Research third party standards that govern transparent reporting of reclamation disclosure.

Performance Standard 13.4: Career Pathways in Reclamation

- 13.4.1 Professional opportunities beyond the mine site.
- 13.4.2 Research roles in Geosciences, Environmental Engineering, Financial Analysis, and Community Relations; explore the high-wage potential of the Nevada mining industry.

CONTENT STANDARD 14.0: APPLIED MINING EXPERIENCE (WBL)**Performance Standard 14.1: Complete a Supervised Industrial Experience Focused on Mining**

- 14.1.1 Write a basic project proposal for a personalized, independent study or hands-on research project focused on a topic within Earth systems or mining (e.g., standards to address an authentic industry, environmental, engineering, or community challenge).
- 14.1.2 Schedule a virtual "day in the life" of a mining employee (Civil Engineer, Extraction Specialist, Health Provider, Equipment Repair, Reclamation Specialist, Blaster (Geotechnical) **to mimic a job shadowing experience**. *(also a career awareness option of existing videos is available <https://nevadamining.org/nvcareers>).*
- 14.1.3 Apply appropriate technical processes to research, analyze, design, construct, test, evaluate, or improve a proposed solution using industry practices, data, technology, and professional documentation.
- 14.1.4 Present project outcomes through written, visual, and oral communication while demonstrating professionalism collaboration, ethical conduct, and reflection on career readiness.

Performance Standard 14.2: Participate in Internships or Site-based Research Projects that Solve Real-world Industry Problems

- 14.2.1 Participate in one or more supervised career-connected learning experiences (e.g., mining conventions or expos, university symposium competitions) that expand understanding of mining careers, industry operations, emerging technologies, or postsecondary education pathways.
- 14.2.2 Create a log to track project hours, tools used, specific skills practiced, or industry interactions, for reference in building a record of skill attainment.
- 14.2.3 Develop and maintain a career readiness portfolio that documents technical competencies, industry engagement, leadership experience, certifications, employability skills, safety standards, that align to postsecondary or workforce goals.
- 14.2.4 Participate in a panel interview utilizing the career readiness portfolio for guidance.

Performance Standard 14.3: Investigate Application and On-boarding Processes in the Mining Industry

- 14.3.1 Create a resume and cover letter or letter of interest to accompany applications/on-boarding forms for a specific mining career pathway.
- 14.3.1 Complete an application and/or on-boarding forms for employment at a local mining project/entity.
- 14.3.2 Complete an application and/or on-boarding forms for employment at a regional mining project/entity.
- 14.3.3 Complete an application and/or on-boarding forms for employment at a global mining project/entity.