

Air Quality

CEC provides comprehensive air quality consulting services to help clients cost-effectively balance operational flexibility and regulatory compliance.

EMISSION INVENTORIES

Complete emission source information is critical to permit applications, modeling studies, risk assessments, compliance evaluations, annual reporting and internal studies. CEC uses published emission factors, specialized modeling software, field measurements and source testing methods to characterize the type and magnitude of emissions based on production capacities, equipment specifications, vendor data and site-specific information.

TESTING AND MONITORING

CEC performs source emissions testing using U.S. EPA sampling methods in conformance with the requirements of ASTM D7036-04 (Reapproved 2011). QSTI-certified testing personnel are experienced with state-of-the-art testing equipment, including continuous emissions monitoring systems (CEMS) and specialized instruments. CEC performs relative accuracy test audits (RATA) and CEMS measurements of SO₂, NO_x, VOC, mercury, and other related pollutants. CEC also maintains an inventory of portable and stationary samplers as well as meteorological instruments for ambient air monitoring studies. CEC has developed and implemented hazardous air pollutants perimeter monitoring programs for health risk exposure studies, nuisance exposures, and other informational purposes.

PERMITTING AND COMPLIANCE

Construction and operating permits are required for a wide range of processes and activities. With a thorough understanding of the processes that generate pollutants and the technologies that control them, CEC develops air permit applications for minor sources (state-only permits) and major sources (Prevention of Significant Deterioration [PSD] and Non-Attainment New Source Review [NA-NSR] permits). CEC recommends permitting strategies, provides guidance on appropriate control devices, prepares required permit applications, and develops compliance programs and procedures. CEC helps clients prepare for and respond to regulatory developments and modify permits to respond to changing conditions.

DISPERSION MODELING

Dispersion modeling uses meteorological conditions, terrain elevations, source characteristics, and emission estimates to predict expected atmospheric concentrations of regulated pollutants. CEC air dispersion modeling capabilities include the modeling systems of AERMOD/AERMET, CALPUFF/CALMET, numerous versions of ISC, MOBILE/CAL3QHC, HY-SPLIT, dense gas models such as DEGADIS and SLAB, screening models such as AERSCREEN, SCREEN3, TSCREEN, CTSCREEN, VISCREEN, COMPLEX1, and VALLEY, among others.

CONTROL SYSTEM EVALUATION

CEC advises clients on appropriate technologies relative to regulatory and permit compliance obligations. CEC evaluates best available control technology (BACT) and lowest achievable emission rates (LAER) to support PSD and NA-NSR applications. CEC helps facilities meet the requirements of reasonably available control technology (RACT) and maximum achievable control technology (MACT) and routinely performs best available technology (BAT) studies.





Civil & Environmental Consultants, Inc.

Air Quality Services for the Oil & Gas Industry

CEC assists oil and gas operators with the implementation of air permitting and compliance programs in response to federal, state, and local regulations. We provide services to upstream and midstream facilities throughout the Utica and Marcellus regions, and general air quality consulting expertise nationwide.

CEC's oil and gas air services team, centered in Pittsburgh, PA, offers tailored expertise to clients. This regional team of nearly 20 permitting and compliance professionals and an additional 20 stack testing personnel can readily mobilize to solve your most pressing permit application, regulatory compliance, modeling evaluation, and field measurement challenges.

PERMIT APPLICATIONS

CEC helps clients implement timely and effective air permitting strategies. Through active participation with the regional oil and gas trade associations and ongoing professional development, CEC stays abreast of local, state, and federal permitting changes. We work closely with air permitting personnel at the state and local levels and have developed long-term relationships that enable us to better serve clients. Whether it's a new GP-5A in PA, the electronic G70-D in WV, one of the many General Permits available from OEPA, or a major project subject to PSD or NNSR, CEC has experience. In fact, CEC has advocated on behalf of the industry through the public comment process and will continue to do so as regulations evolve.

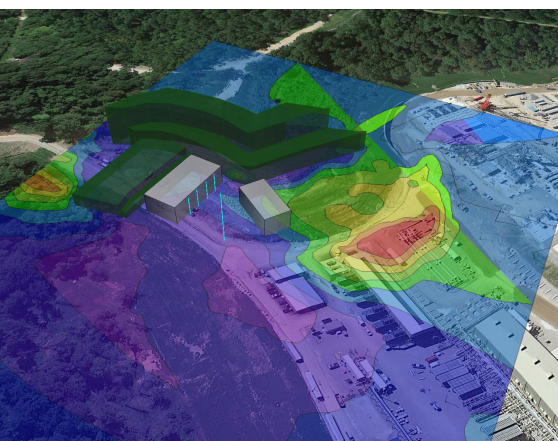
REGULATORY COMPLIANCE

Once facilities have been installed and are operating, CEC can help with ongoing compliance obligations. CEC inspects installations for conformance with permit application specifications, creates compliance calendars to help define the universe of operating permit recordkeeping and reporting obligations, and conducts third-party compliance audits to ascertain if compliance gaps exist. Among many other types of compliance-related services, CEC helps clients report under 40 CFR 98, Subpart W for GHG emissions, develop annual emission inventories, dissect complex regulations such as NSPS OOOO and OOOOa to help clients understand their obligations, and prepare state-specific compliance demonstration reports.

MODELING EVALUATIONS

CEC employs a team of air dispersion modeling scientists and engineers who use the latest versions of EPA-approved software such as AERMOD to perform required air impacts analyses. From screening-level air toxics evaluations to the refined modeling required for a PSD application, CEC has the trained personnel, skills, and resources to develop and negotiate modeling protocols, refine modeling inputs through an iterative process, and prepare written modeling reports.

In addition to dispersion modeling tools, CEC uses specialized models such as ProMax®, E&P Tanks, and GRI-GLYCalc to characterize emissions from process operations. Our engineers can specify the appropriate extended analyses for input to these emission estimation procedures and help to determine if facility designs will conform to specified permitting requirements. If enhanced emission controls are required, CEC can assist with the evaluation of RACT/BACT/LAER or other control technology options, as appropriate.





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Air Quality Services for the Oil & Gas Industry



FIELD MEASUREMENTS

CEC provides stack testing services in the U.S. and abroad from our Charlotte, N.C.; Knoxville, Tenn.; and St. Louis and Kansas City, Mo., offices. Our QSTI-certified personnel test compressor engines, thermal oxidizers, flares, and other point sources for all manner of regulated pollutants for compliance demonstration, engineering diagnostics, or CEMS certification.

CEC can address fugitive component LDAR needs as well. Through traditional walking surveys or in combination with our small unmanned aerial systems (sUAS) team, we complete NSPS OOOOa or state-specific fugitive leak surveys and work with clients to document that leaks have been fixed.

CEC also has developed and implemented long-term perimeter ambient air quality monitoring programs to characterize VOC emissions from shale gas surface impoundments and other area sources. Through upwind and downwind deployments of SUMMA® canisters or other time-integrated sampling systems, CEC collects data and evaluates source-specific contributions. In combination with portable meteorological monitoring instruments, we can help to evaluate odor complaints as well as possible mitigation measures.



Civil & Environmental Consultants, Inc.

Stack Testing

CEC provides comprehensive source emissions testing services as an accredited Air Emission Testing Body (AETB). CEC is accredited by the Joint Stack Testing Accreditation Council, Inc. (STAC) and the American Association for Laboratory Accreditation (A2LA).

CEC's experience tailors stack tests to the types of industry sources including coke, chemicals, cement, food & beverage, general manufacturing, metals, mining, minerals, power, pharmaceuticals, printing, refining, and wood products industries to name a few.

CEC performs source emissions testing using USEPA, CARB, NCASI, and other sampling methods in conformance with CEC's Quality Management Plan, meeting the requirements of ASTM D7036-04. Qualified Source Testing Individuals (QSTI) are experienced with state-of-the-art testing equipment, wet test method isokinetic sampling trains, continuous emissions monitoring systems (CEMS) and specialized instruments such as the Fourier transform infrared spectroscopy (FTIR) and Method 30B Mercury Sorbent Tube sampling and analysis.

CEC routinely measures compounds including SO₂, SO₃, NO_x, PM, PM₁₀, PM_{2.5}, THC, VOC, CO, CO₂, O₂, VEs, methane, ammonia, metals, air toxics (e.g., mercury, BTEX, formaldehyde, hydrogen chloride, chlorine, etc.). CEC's source testing professionals have conducted measurements on combustion sources fired with coal, oil, natural gas, landfill gas, biomass, and waste materials. Combustion source types include boilers, air heaters, turbines, engines, process heaters, kilns, coke ovens, incinerators, RTOs, flares, and more. CEC has also tested hundreds of non-combustion related sources, often exhausts from pollution control equipment such as baghouses and scrubbers, to evaluate efficiency and/or satisfy compliance requirements.

With multiple locations and mobile equipment, source testing teams can be deployed throughout CEC's wide footprint. CEC's services include:

- Emission Compliance Testing
- Manufacturer's Guarantee Tests
- CEMS Certification & Auditing
- HAPS & Air Toxics Testing
- Diagnostic & Optimization Testing
- Engineering Evaluation
- Greenhouse Gas Monitoring





Civil & Environmental Consultants, Inc.

Environmental Audits, Assessments & Brownfields Development

CEC performs services in a customized, phased manner focusing on key compliance and liability issues and presenting findings in terms of potential short- and long-term liability, including expected capital and operational expenditures necessary to correct problems.

CEC offers a complete range of environmental auditing and assessment services to industrial clients, law firms, site developers and financial institutions, and is a valued advisor in complex and time-critical projects involving financial and environmental liabilities, as well as varied risk tolerances. CEC audits and assessments are customized to evaluate such aspects as regulatory compliance (existing operations, as well as to-be-acquired or divested interests) and/or whether impacts to environmental media exist that pose human health and/or ecological risks as part of real property transactions and development. When risks are identified, CEC assists with achieving compliance, mitigating risks and interacting with agencies to obtain formal regulatory closure.

COMPLIANCE AUDITS

CEC evaluates the status of various private sector industrial clients as they relate to major environmental laws and regulations, including RCRA, CERCLA, CWA, CAA, TSCA, SDWA, OSHA, SARA Title III, and related state and local requirements. CEC focuses on identifying non-compliance issues, recommending appropriate solutions, and providing cost estimates to bring a facility into compliance. Audits support ongoing operations, as well as mergers and acquisitions, which can include unique considerations, risk tolerances, and historic/forward-looking objectives.

ENVIRONMENTAL ASSESSMENTS

CEC routinely conducts assessments of properties to identify environmental liabilities and determine if past or adjacent land uses have resulted in environmental impacts. Assessments are designed to meet industry standards, such as ASTM and AAI, as well as client-specific and state-mandated standards when regulatory closure is the ultimate goal. CEC conducts environmental site assessments with a focus on proposed land use and a practical evaluation of likely exposure pathways so that the need for potential additional assessment is supported by sound rationale. CEC's multi-disciplined capabilities allow for a more complete assessment, inclusive of potential business environmental risks, especially in cases of greenfield development and property redevelopment involving a change in use.

SITE INVESTIGATIONS

Site investigations may be recommended, if appropriate, to evaluate whether impacts to environmental media are present or to further study the extent and degree of known impacts. CEC uses current technologies for representation of data, including three-dimensional visualization of geologic and hydrogeologic information. CEC specializes in site characterization; groundwater modeling; soil, waste and water sampling; human and ecological risk assessment; regulatory liaison; site remediation; cleanup verification; cost allocation; and expert testimony. CEC completes an efficient and knowledgeable study of the most complex sites ranging from large industrial sites and landfills under state and federal jurisdiction to the corner gasoline station and neighborhood dry cleaner.





Civil & Environmental Consultants, Inc.

Environmental Audits, Assessments & Brownfields Development



BROWNFIELDS DEVELOPMENT

CEC has used our expertise in environmental assessments and site characterization to build a large and diverse brownfields redevelopment capability. CEC has successfully taken numerous idle industrial sites through the redevelopment/reuse process, with a particular emphasis on old metals manufacturing and related facilities. Our licensed professionals have successfully completed assessment and remediation at many locations across the United States, in many cases supporting acquisition of various liability protections available through state voluntary remediation programs. As a full-service, multi-disciplined firm, CEC brings a holistic approach to brownfield redevelopment where our engineers and environmental specialists work together to provide synergistic solutions that optimize reuse of a property through the site design process and the use of practical engineering and institutional controls.

Environmental Compliance

CEC audits corporate environmental health and safety programs; compliance with permit limits and state and federal regulations; and corporate policies and procedures.

COMPLIANCE AUDITING AND PROGRAM DEVELOPMENT

Audits are designed to help prepare and implement cost-effective solutions and improve systems for maintaining and tracking regulatory compliance.

Compliance support services include:

- Compliance assessments to support due diligence and acquisitions
- Programs and procedures development to assist with regulatory compliance
- Liability assessments and reserve estimates

ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT SYSTEMS

CEC assists with the creation, implementation and ongoing support of Environmental Management Systems (EMS) and Occupational Health and Safety Management Systems (OHSMS). Services include:

- Identifying EHS impact of activities, operations, processes, products and services
- Identifying and evaluating applicability of state, federal and local regulations
- Identifying responsibilities and resources for successful EMS or OHSMS implementation
- EMS/OHSMS application development and integration with IT
- EMS/OHSMS program development and auditing

POLLUTION PREVENTION/WASTE MANAGEMENT

CEC applies pollution prevention (P2) sciences and techniques to assist facilities with plans, projects and programs to reduce the cost of manufacturing chemicals or other products. P2 success depends on identifying the root causes of waste before considering P2 options. Service support includes:

- Evaluation of waste streams
- Process design/re-engineering and technology evaluations
- Program development and regulatory review
- Strategic planning of process changes to enhance on-site P2 initiatives

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLANS (SPCC)

CEC's approach to the management of above-ground storage tanks (ASTs) begins with the design of effective containment and spill planning. The following services help to achieve and maintain compliance:

- Evaluation of SPCC rule applicability
- Containment alternative evaluations and design
- Updating SPCC plans with certification by a professional engineer
- Inspection programs and employee training
- Contingency and Facility Response Plans
- Slug Control Plans (for Significant Industrial Dischargers)

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW ACT (EPCRA)

CEC routinely assists clients in complying with annual filings of Hazardous Chemical Reports (Tier II) and Chemical Release Reports (Toxic Release Inventory Reports). Services include:

- Rule applicability and Tier II/Form R reporting threshold evaluations
- Review of safety and chemical data sheets for completeness
- Preparation of Tier II reports from chemical inventory information
- Calculation of chemical releases and preparation of TRI Reports (Form R)





Environmental Compliance

INFORMATION TECHNOLOGY AND DATA MANAGEMENT

CEC offers custom solutions for organizing and maintaining information critical to environmental compliance, health, and safety programs, as well as other records maintenance. CEC develops integrated software applications to maintain, distribute and report documents, data, deadlines and other critical information through a single user interface. CEC utilizes Geographic Information System (GIS) technology that integrates common database operations with visualization and geographic analyses.

CLEAN AIR ACT (CAA)

CEC assists clients with various air quality compliance support items, including:

- New Source Review (NSR) Permitting
- Title V Air Permitting
- Minor Source Permitting
- Emission Inventories
- Detailed NSPS/MACT/NESHAP/ Permit Compliance Assessments/Audits
- Deviation and Compliance Reporting
- GHG Permitting/Reporting
- Continuous Emission Monitoring Systems (CEMS)

CLEAN WATER ACT (CWA)

CEC assists clients across many market sectors with various CWA issues, including:

- NPDES individual discharge permit acquisition and renewal applications
- NPDES storm water and general permit acquisition and renewal applications
- Storm Water Pollution Prevention Plan (SWPPP) preparation
- Routine Discharge Monitoring Report (DMR) completion and submittal
- Wastewater treatment plant design and upgrades to meet permit limits
- Assistance with design and implementation of Best Management Practices (BMPs)

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)

CEC assists clients with compliance with RCRA obligations, including:

- Waste Characterization Evaluations and Support
- Waste Management Planning and Evaluation of Beneficial Use / Recycling Opportunities
- Design of Hazardous Waste Storage Areas and Containment Buildings
- Implementation of weekly hazardous waste inspection programs
- Providing RCRA training for personnel involved with management of hazardous waste
- Preparation of Facility RCRA Contingency Plans
- Completion of Biennial Hazardous Waste Reports
- Completion of Various State Residual Waste (Non-Hazardous) Biennial Reports

TOXIC SUBSTANCES CONTROL ACT (TSCA)

CEC works with clients on various TSCA issues, including:

- Pre-manufacture notifications
- Completion of TSCA Chemical Data Reporting (CDR) Reports (Form U)
- Assisting with management of Electrical Equipment containing Polychlorinated Biphenyls (PCBs)

Industrial Wastewater Management

CEC provides compliance, testing, and design of appropriate technologies and processes for industrial wastewater and wastewater management.

INDUSTRIAL WASTEWATER MANAGEMENT/TREATMENT

CEC's wastewater engineering and design services range from initial/feasibility studies, stream modeling and assimilative capacity studies, to compliance reporting and operations monitoring for NPDES permits.

Services for the waste/landfill (solid and hazardous waste landfill leachate), electric power utility, chemical/petrochemical, pulp and paper, food and beverage, electronics and metal finishing/plating, automotive/manufacturing, and transportation/storage industries include:

- Wastewater Collection Systems, Pump Stations and Force mains
- Water Treatment, Storage, and Distribution
- Surveying
- Civil Engineering and Site Development
- Wetlands Management and Surface Water Resource Engineering
- Hydrogeology and Groundwater Modeling
- Site Assessment and Characterization
- Construction Phase Services
- Geotechnical Engineering
- Site Remediation and Waste Treatment
- Solid and Hazardous Waste Management
- Recycle and Reuse
- Cooling Tower Water Management

In addition, CEC has partnered with contractors to provide complete design-build services on various wastewater treatment projects.

SYSTEMATIC APPROACH

Industrial wastewater is complex, variable and difficult to treat. Successful systems often involve more than one technology or approach. CEC assists clients with determining appropriate technologies by conducting bench-scale and pilot-scale tests in our laboratories or on site. CEC's industrial wastewater solutions include:

Physical Chemical Technologies

- pH control
- Solids separation and removal
- Ion exchange adsorption
- Air stripping (VOC, H₂S)
- Membrane technology (ultrafiltration, reverse osmosis)
- Advanced oxidation processes treatment (AOP)

Biological Treatment

- Aerobic-fixed film & suspended growth
- Anaerobic systems
- Nitrogen removal
- Residual organic removal
- Selenium treatment
- Solids dewatering and management

Passive Systems

- Surface flow wetlands
- Vertical flow wetlands
- Subsurface flow wetlands
- Vertical biochemical reactors
- Sulfate reducing reactors
- Phyto-remediation systems
- Land application systems

Landfill Gas Services

CEC provides comprehensive Landfill Gas services addressing the variable composition and unpredictability of gas production inherent in landfill gas management.

Management of landfill gas (LFG) is one of the key environmental compliance challenges facing solid waste landfill facilities today. With the rate of production affected by waste composition and landfill geometry, and influenced by the microbial populations and the biological ecosystems within it, LFG creates challenges and opportunities for landfill operators. CEC provides:

LFG ENGINEERING SERVICES

- Landfill gas collection and control systems (GCCS) master planning, permitting and development
- Design of GCCS expansions, permitting, specifications
- Customized LFG generation and recovery modeling
- Odor evaluation and hydrogen sulfide generation modeling
- LFG piping system design and analysis
- LFG system engineering evaluations and field analysis

AIR PERMITTING AND COMPLIANCE SERVICES

- State air permit preparation and management, including major sources, PSD and NSR related to landfill expansions, flare systems and energy recovery projects
- Federal Title V program permitting, compliance and reporting services
- Clean Air Act (CAA) NSPS and NESHAPS program management, including applicability review, testing, compliance and reporting
- Federal and state greenhouse gas compliance, data management and reporting
- LFG system monitoring and operations data management and reporting
- Air modeling to landfill area sources and point sources using AERMOD and other EPA-approved models
- Specialized stack and source emissions testing

TECHNICAL FIELD SERVICES

- Routine operations and maintenance (O&M) of landfill leachate collection systems (LCS) and GCCS
- Operation of pump systems, including gas well pump systems, leachate pumps, pumping stations and storage (including controls, electric and heating systems)
- GCCS data management
- GCCS diagnostics, troubleshooting and specialized field evaluations, including camera inspections
- LFG monitoring, including odor surveys, surface emissions, gas migration probe and structure monitoring
- LFG testing programs, including sampling and analysis
- Specialized electrical control system diagnostics and repair services for flare systems, blower systems and other electronic controls
- Installation and calibration of meters and data acquisition systems





Civil & Environmental Consultants, Inc.

Landfill Gas Services

SPECIALIZED CONSTRUCTION SERVICES

CEC has a full suite of equipment to handle

GCCS extraction well and piping repairs, including butt fusion (up to twelve inches) and electrofusion welding. CEC also has the capabilities to perform extrusion welding repairs to geomembrane liners and caps and routinely performs:

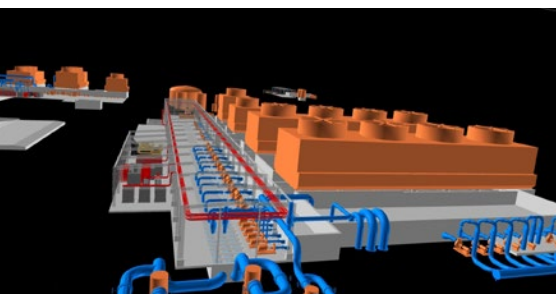
- Reconstruction and/or repair of LCS and GCCS components, including header and lateral pipelines force mains, well-head assemblies, raising wells, etc.
- LFG well drilling, installation and oversight Installation of horizontal collection trenches
- Installation of LFG system headers, laterals and condensate management components
- Installation of blower/flare stations
- Installation and maintenance of gas well dewatering systems

LFG RENEWABLE ENERGY

CEC provides renewable energy project feasibility analysis, including LFG modeling and financial pro forma analysis, and facility design and operations services. For project developers, services include solicitation, evaluation and selection of development proposals, as well as engineering due diligence related to renewable energy project development acquisition and financing.

Manufacturing Infrastructure Services

The Manufacturing Infrastructure Services (MIS) practice provides integrated mechanical, electrical, piping, structural, civil, and HVAC engineering to support the design and construction of new facilities or the modification, upgrade, or repair of existing facilities.



PRE-PROJECT PLANNING (PPP)

CEC projects, like any successful journey, start with a roadmap to success. Our staff has the broad project expertise and experience to guide you through the early stages of conceptual design. Our pre-project planning services include:

- Front-End Loading (FEL) Studies
- Process Flow Modeling
- Definition and Refinement of Project Objectives
- Conceptual Design
- Preliminary Engineering
- Light Detection and Ranging (LiDAR) Scanning of Existing Conditions
- 3D Renderings
- Facility General Arrangements
- Equipment Specifications
- Utility Sizing
- Scheduling
- Work Breakdown Structure (WBS)
- Identification of Long Lead-Time Equipment
- Total Installed Cost (TIC) Estimates
- Risk Analysis
- Permitting

DETAILED DESIGN

CEC offers multi-disciplinary design solutions tailored to your needs and the needs of your contractors. Value engineering and early engagement of the construction manager and installation contractors allows for clear and efficient designs with reduced construction durations, leading to lower construction costs and a faster time to market. Our detailed design services include:

- Project Management
- 3D Design
- Mechanical/HVAC Engineering
- Piping Engineering
- Electrical Engineering
- Civil Engineering
- Structural Engineering
- Architectural Design
- Scheduling
- Estimating/Cost Tracking
- Document Control

CONSTRUCTION SUPPORT

Our design team works with the construction manager and installation contractors to provide required information and clarifications allowing them to continue work on site and avoid costly downtime and errors.

- Review of Submittals and Shop Drawings
- Review and Response to Requests for Information (RFI)
- Contractor Change Order Review
- On-site Construction Audits
- International Building Code (IBC) Inspections
- As-Built Surveys and Drawings

Unmanned Aircraft Systems (UAS)

CEC utilizes UAS to conduct site inspections, topographic surveys, construction site monitoring, stockpile and landfill volumetric calculations, vegetation analyses, optical gas imaging, and other similar projects. UAS provide a cost-effective, low-environmental-impact solution that optimizes the quality and value of collected data.

CEC obtained a Federal Aviation Administration (FAA) Section 333 Exemption and FAA Part 107 Pilot Certifications to operate robotic UAS within the national airspace system for the purpose of conducting aerial data acquisitions. The use of UAS enables CEC to conduct data acquisition for project sites in a safe manner. The use of UAS also creates significant economic efficiencies, such as reductions in the number of field personnel required and the time required for both data acquisition and review.

Applications of the technology include:

AERIAL PHOTOGRAPHY/TOPOGRAPHY

Armed with the ability to capture 20 megapixel or greater photos, or record 1080p HD video from a unique vantage point, UAS can provide a data file typically containing 10 to 30 million points. By comparison, a conventional aerial survey data file may contain up to only 50,000 points. Aerial photographs can be used to display time-lapse project progress, monitor remote locations, or provide photography to be used in presentations, displays, or advertising. A survey-grade UAS equipped with a built-in GNSS/RTK receiver can obtain orthomosaic/digital elevation model/topography accuracy of as low as 3 cm (1.2 in), even in the most inaccessible areas. Our fleet also includes a High Definition 3D LiDAR Sensor equipped UAS capable of capturing 700,000 points/second to create high accuracy topographic maps, even in vegetated conditions.

METHANE LEAK DETECTION—OPTICAL GAS IMAGING (OGI)

Utilizing innovative thermal imaging technology, CEC has the ability to detect very small fugitive emissions of greenhouse gases and other smog-forming volatile organic compounds. Through the marriage of our OGI camera and our UAS program, we are able to provide quick and safe detection and visualization of fugitive emissions leaks, allowing facility owners and operators to quickly detect and repair leaks, prevent major damage, and comply with local and federal regulations. CEC provides certified OGI Thermography Technicians to comply with EPA OOOOa reporting.

VEGETATION ANALYSIS/PRECISION AGRICULTURE

Near-infrared (NIR) and multispectral cameras can be used to generate Normalized Difference Vegetation Index (NDVI) images for use in establishing vegetative cover percentages, which are necessary for close-out of NPDES and ESCGP-2 permits and the release of bonds in mining, among other uses. In agricultural applications, NDVI mapping can help maximize crop yields and assess environmental conditions for agriculture and environmental projects/permits. These images are then used to monitor soil composition and vegetative health, as well as measure and monitor plant growth, vegetation cover and soil/water condition, and biomass production.



Unmanned Aircraft Systems (UAS)

THERMAL IMAGERY

UAS can be outfitted with infrared cameras capable of capturing thermal signatures from wastewater discharges from cooling towers, heat loss from buildings and equipment, groundwater seeps and springs, and other heat signatures.

RIGHT-OF-WAY MONITORING

UAS can be used to visually monitor rights-of-way for both overhead and underground utilities to determine if revegetation efforts have been successful, if there is evidence of earth movements such as slumps and slides, if there has been unauthorized construction or storm damage, or if there is vegetative intrusion into overhead utility lines. UAS can be flown manually by an operator in visual contact with the UAS or pre-programmed to fly a specific flight path.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

The ability to shoot high-quality, geotagged photos allows for real-time GIS data acquisition and eliminates the need to contract aircraft or work around other schedules. Collected UAS imagery can be imported into CAD programs and GIS databases, or it can be stitched together to generate 3D reconstructions or develop topographic and aerial base mapping.

VISUAL INSPECTIONS

The ability to fly in close proximity to, and optically zoom in on, a target means that visual inspections of difficult-to-access objects or structures, such as stacks, bridges, reaction towers, pipe racks, etc., can be accomplished quickly and safely from a distance. High-resolution, HD-quality visual images can then be downloaded and electronically transferred to an array of users.

VOLUME DETERMINATIONS

UAS can rapidly fly over raw material stockpiles and excavation areas to calculate volumes or to determine waste placement volumes at landfills and assess remaining available airspace.

EMERGENCY AND DISASTER RESPONSE

Deploying UAS to capture photographs or video of an emergency or disaster scene prior to entry by first responders or investigators significantly increases safety and response planning. High-resolution aerial imagery from UAS integrates with traditional photogrammetry software to provide accurate, detailed information and long-lasting evidence.



Waste Management

CEC provides engineering and consulting services for the management and disposal of a broad range of wastes, including municipal, construction/demolition, residual, hazardous, gas exploration wastes, and coal combustion residuals.

SITE SELECTION AND CHARACTERIZATION

CEC performs “fatal flaw” analysis and related studies that identify potential conflicts with regulatory criteria and existing environmental liabilities. Services include evaluation of the following criteria:

- Permitting Requirements
- Local Planning Issues Such as Access, Zoning, Public Opposition
- Ecological Impacts
- Geotechnical and Hydrogeologic Investigations
- Environmental Liability Issues
- Environmental and Operational Due Diligence
- Operations Optimization

DESIGN AND PERMITTING

Designs are prepared to satisfy regulatory requirements and owner/operator preferences. CEC’s services include:

- Waste Disposal Facility Design and Permitting
- Waste Processing/Recycling Facility Design and Permitting
- Transfer Station Design and Permitting
- Leachate Treatment Design and Management
- Landfill Gas-to-Energy Design and Permitting
- Landfill Gas Management System and Permitting
- Erosion and Sedimentation Control Plans, Stormwater Plans
- Geotechnical and Soils Investigations
- Gas Management System Design
- NPDES Permitting and Monitoring
- Groundwater Monitoring System Design
- Wetlands Delineation and Mitigation
- Hydrogeologic Site Investigation
- Risk Assessment/Environmental Impact
- Waste Characterization Studies
- Construction and Operating Costs

GROUNDWATER ASSESSMENT/CORRECTIVE MEASURES

CEC performs a wide range of groundwater investigation services, including complete rate and extent assessments and remedial design incorporating corrective measures. CEC’s groundwater services include:

- Delineation and Analysis of Aquifer Flow Patterns and Quantities
- Groundwater Modeling and Contaminant Transport
- Design, Installation, and Operation of Remediation Systems
- Design of Pumping Wells and Extraction Networks
- Barrier Systems Design Including Slurry Walls and Cutoff Trenches





Civil & Environmental Consultants, Inc.

Waste Management

CONSTRUCTION SERVICES

CEC provides construction management and construction quality assurance (CQA) services for waste facilities. This can include augmentation of services performed by the client through full oversight of contractor(s) performance, schedule, and pay applications. CEC has CQA experience with the monitoring of the following:

- Compacted Soil Liner Construction
- Structural Fill Placement
- Geosynthetics Installation
- Mechanically Stabilized Earth (MSE) Structures
- Leachate Management System Installation
- Gas Management System Installation
- Slurry Wall Construction
- Mitigation and Replacement of Wetlands
- Survey Services For Construction Layout and As-Builts

MONITORING SERVICES

CEC provides comprehensive monitoring services during construction, operation, closure, and post-closure care of waste facilities. These services include:

- Maintenance/Monitoring/Reporting of Land Fill Gas Systems
- Source Testing Services for Air Monitoring
- Maintenance/Monitoring/Reporting of the Groundwater and Monitoring Network
- Surface water Testing, Reporting, and Management
- Leachate Collection System Testing and Disposal Evaluations

Water Resources

CEC balances regulatory compliance and environmental stewardship with the needs of industry, government and community by providing innovative solutions in context with economic impacts.



NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

The Clean Water Act (CWA) of 1972 and subsequent revisions set into play the regulation of discharges to surface water. The NPDES permitting program was delegated to most states for enforcement, targeting local government and commercial, residential and industrial clients. CEC stays abreast of the current regulatory directions and trends to help clients better manage resources and risk. Services include:

- Compliance Audits and Gap Analysis
- Stormwater Master Planning
- Hydrologic and Hydraulic Analyses
- SWPPP Design, Implementation and Inspection
- Stormwater Best Management Practices (BMP) Design

WATER QUALITY MANAGEMENT AND TOTAL MAXIMUM DAILY LOAD (TMDL)

Many states are under agreements with EPA to develop TMDLs for their impaired stream segments, and depending on the data and resources available, additional modeling and data collection are needed. CEC verifies these models and provides real-time data for use in the negotiation of effluent limits. CEC also provides baseline stream condition assessments and monitoring. Senior professionals are experts in sediment load modeling and reduction, which are key skills necessary to address sediment TMDLs. Services include:

- Pollutant Modeling
- TMDL Monitoring & Negotiation

USEPA WATERSHED APPROACH

The federal government, through Section 319 of the CWA, awards grants to cities, counties and nonprofit watershed organizations through a competitive grant process. These cost-shared grants support a wide variety of activities, including technical and financial assistance, education, training, technology transfer and monitoring. CEC guides organizations in pursuit of these grants and also develops watershed assessment plans and the technical and research aspects of these projects. CEC professionals incorporate this experience with ecological experience to provide services including:

- Watershed Planning and Stream Assessments
- Water Quality and Quantity Analyses
- Endangered Species Identification and Protection
- Stream Restoration