LANGAN

# Airport and Aviation

*Qualifications and Experience*


Technical Excellence · Practical Experience · Client Responsiveness



## SUSTAINABLE DESIGN

Langan professionals design solutions that maintain the inherent connections between structures and their natural surroundings. The result – sustainable communities for future generations to live, work and play.

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## HEALTH & SAFETY

Langan is committed to providing a healthy and safe working environment. Langan's goal is to be SAFE (Stay Accident Free Everyday).


# Corporate Summary



*SUSTAINABLE DESIGN:*
*As the recognized industry leader, Langan's team of over 125 LEED Accredited Professional provides sustainable solutions for every aspect of your project.*

## Integrated Solutions. Measurable Value.

Langan provides an integrated mix of engineering and environmental consulting services in support of land development projects, corporate real estate portfolios, and the oil and gas industry. Our clients include developers, property owners, public agencies, corporations, institutions, and energy companies around the world.

Founded in 1970, Langan employs over 1,000 professionals in its Parsippany, NJ headquarters and among regional offices in:

- New York City, NY
- White Plains, NY
- New Haven, CT
- Trenton, NJ
- Philadelphia, PA
- Bethlehem, PA
- Doylestown, PA
- Pittsburgh, PA
- Bridgeport, WV
- Cleveland, OH
- Arlington, VA
- San Francisco, CA
- Oakland, CA
- Sacramento, CA
- San Jose, CA
- Los Angeles, CA
- Irvine, CA
- Houston, TX
- Phoenix, AZ
- Miami, FL
- Fort Lauderdale, FL
- Tampa, FL

Langan International, the firm's wholly owned subsidiary headquartered in New York City, provides all firm services for projects in the Middle East, Eastern Europe, Latin America, and the Caribbean. Langan International regional locations are in:

- Abu Dhabi
- Athens
- Doha
- Dubai
- Istanbul
- London
- Panama

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# Langan International

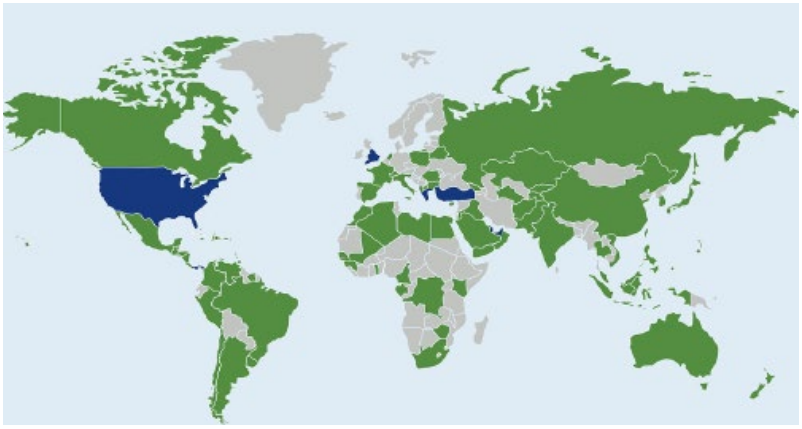
## Engineering and Environmental Solutions for the World's Most Challenging Projects

**Langan International**, a wholly-owned subsidiary of Langan Engineering, Environmental, Surveying and Landscape Architecture, DPC, provides land development engineering and environmental consulting for private developers, public agencies, property owners and institutional clients around the world.

From its headquarters in New York, and other "international" cities around the country, Langan International supports development projects throughout the Middle East, Europe, Asia, Africa, Central America, South America and the Caribbean. From the firm's strategically located international offices in Abu Dhabi, Dubai, Doha, Istanbul and Athens, Langan provides in-country expertise and resources to manage complex projects beyond the borders of the U.S. Together, the domestic and international offices of Langan perform around-the-clock in the process we call "reverse-off-shoring" to meet project deadlines and exceed expectations for global clients.

**Langan International offices are located in:**

- Abu Dhabi, UAE
- Athens, Greece
- Doha, Qatar
- Dubai, UAE
- Istanbul, Turkey
- Panama City, Panama
- London, UK
- New York City, NY
- Houston, TX
- Miami, FL
- San Francisco, CA
- Washington, DC



Green denotes countries where Langan has worked; blue denotes countries where Langan has offices

LANGAN
INTERNATIONAL

# Airports


## Helping Airports Take Flight

Langan has provided integrated surveying, engineering and environmenal services on a large variety of international and regional aiports across the country. Whether partnering on an airport's expansion or leading pre-construction services for a taxiway/runway, hangar improvements, transit connections, or new facility, Langan is a full-service partner to our clients. Our experience ranges from the Northeast to the Mid-Atlantic and the Southeast to the West Coast.

Our services have supported the following airports:

- Miami International Airport, Miami, FL
- Tampa International Airport, Tampa, FL
- Opa-Locka Executive Airport, Miami-Dade County, FL
- Newark International Airport, Newark, NJ
- Teterboro Airport, Teterboro, NJ
- Morristown Airport, Morristown, NJ
- McGuire Air Force Base, Wrightstown, NJ
- JFK International Airport, New York, NY
- LaGuardia Airport, New York, NY
- Stewart International Airport, Newburgh, NY
- Westchester County Airport, White Plains, NY
- Washington Dulles International Airport, Washington, DC
- Andrews Air Force Base, MD
- Reagan National Airport, Arlington, VA
- Logan International Airport, Boston, MA
- Philadelphia International Airport, Philadelphia, PA
- Pittsburgh International Airport, Pittsburgh, PA
- Lehigh Valley International Airport, Allentown, PA
- O'Hare International Airport, Chicago, IL
- Los Angeles International Airport, Los Angeles, CA
- San Francisco International Airport, San Francisco, CA
- Bob Hope International Airport, Burbank, CA
- Oakland International Airport, Oakland, CA
- Lemoore Naval Air Station, Lemoore, CA
- Travis Air Force Base, Travis, CA
- McCarran International Airport, Las Vegas, NV

# Site/Civil



## Responsiveness that Delivers Results

As an integral component of the design team, Langan works closely with the owner to develop conceptual site plans and realistic cost estimates. Our deadline-oriented professionals are available to our clients 24/7 to ensure timely approvals and permits to advance projects toward construction, occupancy, and ultimately revenue. Langan also supports projects with construction inspection and overall project management.

**Langan Site/Civil Services:**

- Project Management
- Site Feasibility Studies
- Conceptual Planning
- Site Engineering & Planning
- Grading & Drainage Design
- Stormwater Management Design
- Value Engineering
- Sanitary Treatment Plant Design
- Utility Infrastructure Design
- Water Supply/ Hydrological Investigations
- Permitting/Regulatory Compliance
- Wetland Delineation/ Mitigation
- Landscape Architecture
- Regulatory Negotiation
- Survey-Boundary/ Topographical/GPS
- Traffic/Transportation Engineering
- Waterfront Systems Design
- Property Acquisition Support
- Conceptual Reuse Planning
- Funding Identification/ Grant Assistance
- Regulatory Coordination/ Compliance
- Decommissioning/ Demolition Design
- Construction Management
- Construction Inspection
- CADD/GIS/Computer Animations
- SITEOPS® Optimization Services

# Geotechnical


## Foundations You Can Trust

Langan was founded as a geotechnical consulting company in 1970, and geotechnical engineering remains a core discipline at Langan today. We work closely with our clients and the design and construction team to engineer cost-effective geotechnical solutions appropriate for proposed structures and the governing site conditions.

Our reputation as a premier geotechnical consultant has been earned by managing hundreds of projects involving complex, technically challenging sites where highly specialized site preparation, foundations, and fast-track engineering solutions are required.

**Langan Geotechnical Services:**

- Subsurface Investigations
- Foundation Design
- Materials Analysis
- Soil and Rock Mechanics
- Retaining Structures
- Slope Stabilization
- Soil Improvement/ Ground Modification
- Dewatering Design and Permitting
- Subsurface Structure Design
- Excavation Support and Underpinning Design
- Earthquake/Seismic
- Geological Mapping of Rock Slopes
- Mine Investigations/ Studies
- Hydrogeology
- Earth and Rock Fill Dams
- Tunnels/Microtunneling
- Seawalls, Piers and Bulkheads
- Dredging
- Vibration Monitoring
- Pre-Construction Conditions Surveys
- Value Engineering
- Construction Documents
- Contractor Support Services
- Engineering Services During Construction
- Forensic Engineering/ Expert Testimony
- Cost Estimates

# Environmental

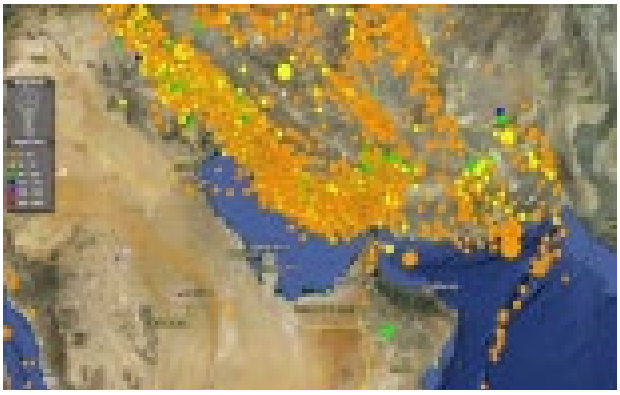
## Technical and Regulatory Knowledge

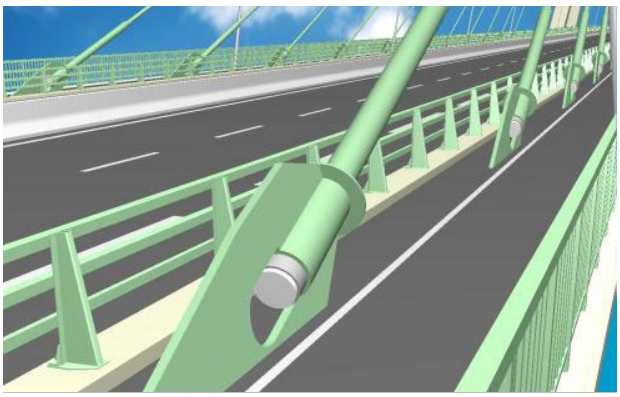
Langan works with project teams to provide leading-edge, focused, streamlined investigations and risk-based remediation. We excel in promoting and gaining regulatory acceptance of risk based strategies to obtain cost effective site closures. Langan possesses expertise in a wide variety of projects including state Voluntary Programs, Brownfields, RCRA, State and Federal Superfund, Manufactured Gas Plants (MGP) and Storage Tank programs.

**Langan Environmental Services:**

- Risk-Based Corrective Action
- Brownfields
- Storage Tank Management
- Due Diligence Support
- Environmental Assessments
- Site Characterization
- Permitting/Regulatory Approvals
- Remediation Design/ Oversight
- Water Resources/Supply
- Hydrological Investigations
- Wastewater and Stormwater Permitting
- Air Modeling
- GIS/Database Management
- Environmental Impact Statements (EIS)
- Manufactured Gas Plant Remediation Services
- Asbestos/Lead-Based Paint Abatement
- Management of PCB-Containing Materials
- Indoor Air Quality/Mold
- Demolition
- Waste Management
- Compliance Auditing
- Ecological Risk Assessment
- Human Health Risk Assessment
- Site Feasibility Studies
- Remediation by Natural Attenuation
- Expert Witness
- Exposure Assessments
- Free Product Volume and Mobility Modeling

# Earthquake/Ground Motion Services



## Stabilizing Developments

On November 1, 2010, Langan acquired Treadwell & Rollo, a premier earthquake engineering consultant headquartered in San Francisco. This partnership greatly enhanced Langan's already substantial expertise in seismic engineering. Now more than ever, clients throughout California and other seismically active regions around the world count on the ground-motion services provided by Langan. Our engineers evaluate the potential for fault rupture, soil failure, and ground deformation and develop detailed site-specific ground motion criteria for seismic design.

During the planning and/or due diligence phases of projects, we provide seismic hazards evaluations. For final design, we typically are called upon to develop detailed site-specific seismic criteria.

**Langan Earthquake and Ground Motion Services:**

- Field Mapping of Seismic Sources
- Development of Probabilistic and Deterministic Site-Specific Response Spectra
- Nonlinear and Equivalent-Linear Ground Response Analyses
- Development of Site-Specific Time Histories
- Seismic Stability of Natural and Artificial Slopes, Including Deformation Analyses
- Seismic evaluation of Landfills
- Soil-Structure Interaction Analyses
- Evaluation of Liquefaction Potential and Associated Deformations
- Liquefaction Mitigation Alternatives

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# Hazardous Materials

## Safety First

### Asbestos

Langan routinely performs buildings investigations for city, state and federal agencies for asbestos-containing materials (ACM). Our ACM surveys typically include review of original design documents, construction records, review of environmental reports for the property, site assessment, and the collection and analysis of bulk samples. In occupied buildings, the survey typically will not include intrusive means of access such as puncturing the walls, ceilings, or core sampling of roofing materials. Samples are typically collected following the AHERA regulations and are analyzed using Polarized Light Microscopy (PLM). Intrusive investigation of concealed spaces is performed only upon receiving written authorization.

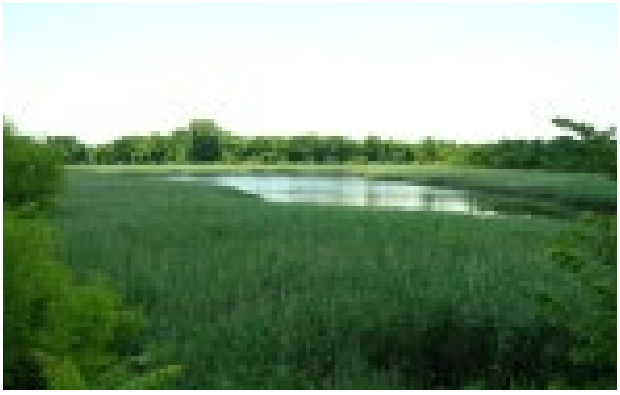
Non-friable organically bonded (NOB) materials, such as roofing, Vinyl tiles, etc., which may present difficulty in identifying asbestos by PLM, are re-analyzed using Transmission Electron Microscopy (TEM), in accordance with the State requirements. All sampling is performed by Langan asbestos professionals, who are certified Asbestos Hazard Emergency Response Act (AHERA) inspectors under USEPA and licensed to practice in individual state.

### Lead-Based Paint

Lead-based paint surveys are also routinely performed when directed by our clients. Langan utilizes a Niton fluorescence (XRF) Spectrum Analyzer to inspect the buildings for the presence of lead-based paint. The results of the inspection are compared to the federal HUD Guidelines governing lead in paint. The inspections are usually performed to address worker exposure to lead under 29 CFR 1926, and the disposal of demolition/ construction debris under the Federal Resource Conservation and Recovery Act (RCRA).

In addition to LBP screening inspection, we also perform waste characterization study for classification of the demolition debris. The recommended sampling protocols developed by the United States Environmental Protection Agency (USEPA) and those established by the United States Department of the Army's Environmental Hygiene Agency are primarily followed during the characterization study.

# Natural Resources/ Permitting



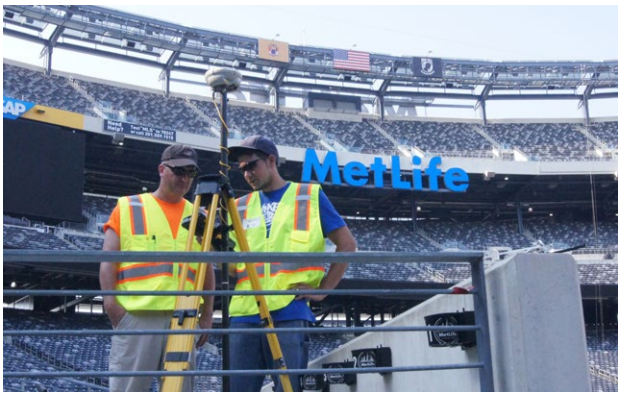
## Navigating Policy and Nature

Langan has developed strong relationships with federal, state and local regulators through our experience in more than 1,000 wetland and permitting projects. Our Natural Resource staff consists of certified professional wetland scientists, ecologists and wildlife biologists with extensive experience throughout the United States. Our federal and state permitting specialists work closely with our engineers to design a "permittable" project while providing the most economic return to our clients. Our ability to identify critical natural resource issues early in the design process and our in-depth understanding of regulatory programs and policies result in an expedited application and approval process.

**Langan Natural Resources/Permitting Services:**

- Wetland Delineation
- Army Corps of Engineers Section 10/404 Permit Applications
- State Permit Applications to Agencies, including SEQR
- Environmental Assessments / Environmental Impact Statements (EIS)
- NEPA Environmental Review Documents
- Alternatives Analysis
- Wetland Mitigation Design (Creation, Restoration, Enhancement)
- Wetland Mitigation Banking
- Coastal/Waterfront Development Permitting and Planning
- Dredge – Cut / Fill Analysis
- Wildlife Surveys and Habitat Assessments
- Threatened and Endangered Species Surveys and Habitat Assessments
- Essential Fish Habitat Assessments
- Baseline Ecological Evaluations (BEE)
- Natural Resource Damages Assessments
- Ecological Risk Assessment
- Wetland Functional Assessments
- Streambank Restoration / Bioengineering

# Surveying/Mapping




## Accuracy and Efficiency

Langan's survey group provides rapid response times and flexible schedules to meet client needs and maintain schedules for fast-track projects. Our field crews utilize state-of-the-art surveying equipment including electronic data collectors, global positioning systems (GPS), robotic and prismless total stations, and BIM-compatible 3D Laser Scanning.

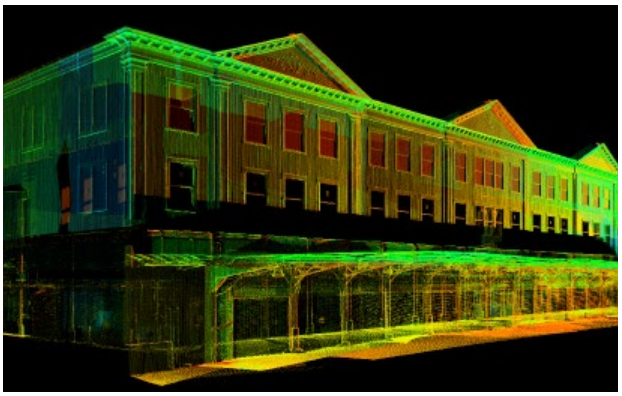
Equipped with Internet-enabled laptops, field crews accommodate design changes in real time and download data into Langan's network where it is edited, adjusted, analyzed and plotted. This allows for mapping that accurately reflects existing site conditions and boundary/legal issues, which could reveal potential problems early in a project's development.

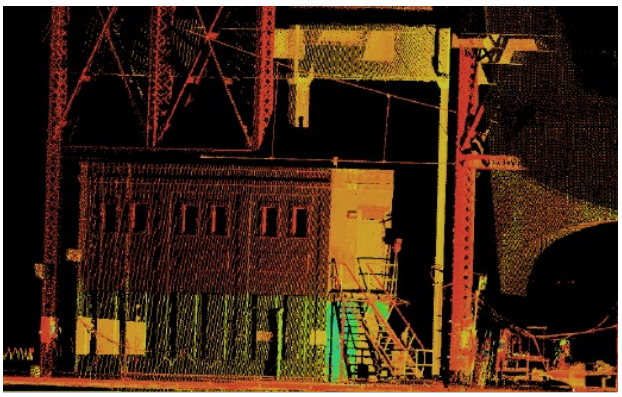
Such technology, coupled with the seamless integration with other firm technical disciplines, enables Langan's survey group to save time and money for our clients.

**Langan Survey/Mapping Services:**

- Boundary Surveys
- ALTA/ACSM Land Title Surveys
- Topographic Surveys
- GPS
- GIS/LIS Data Acquisition
- Deformation/Monitoring Surveys
- Wetlands Location Surveys
- Utility Surveys
- Subdivisions
- 3D Laser Scanning Construction Stakeout
- Hydrographic/ Bathymetric Surveys
- Environmental Surveys
- As-Built Surveys
- Photogrammetric Control
- Riparian Surveys
- Highway/Route Surveys
- Geographical Information Systems

# High Definition 3D Laser Scanning





## Work in the Data, Not on the Data

3D Laser Scanning is changing the surveying/mapping industry and Langan is leading the revolution. Since the addition of High Definition Laser Scanning services in 2003, Langan has offered the most accurate and highly detailed existing conditions surveys possible. This advanced technology allows for the collection of millions of data points in less time and with lower overall cost than traditional techniques. 3D Laser Scanning equipment allows end users to accomplish project objectives more efficiently and accurately at all stages, in turn minimizing overall project costs and reducing turn around time, while achieving a higher level of detail.

Our ability to offer a combination of High Definition Laser Scanning and conventional surveying methods allow Langan to deliver a complete product. As with all of our surveying services, the scanning effort is overseen by Professional Land Surveyors who bring experience and knowledge of traditional methods to this cutting-edge technology.

In scanning, the data collected is known as a “point cloud” which contains a 3D database of the entire project area and allows the measurement of any surface information that is visible in the cloud to be used during the entire project lifecycle. After processing, the data from the “point cloud” can be utilized to produce dimensionally correct 3D models and/or 2D dimensional plans, with outputs to Microstation, AutoCAD or a host of other platforms. The registered data can also be used as a base to create highly detailed site visualizations or mass models. The end data can be used for BIM support, forensics studies, to determine possible construction conflicts, to validate construction/fabrication dimensions, or even to model major motion picture sets.

With prior technologies the end user had to work on the data. High Definition Laser Scanning allows the end user the ability to work in the data and be “on site virtually” with the push of a button.

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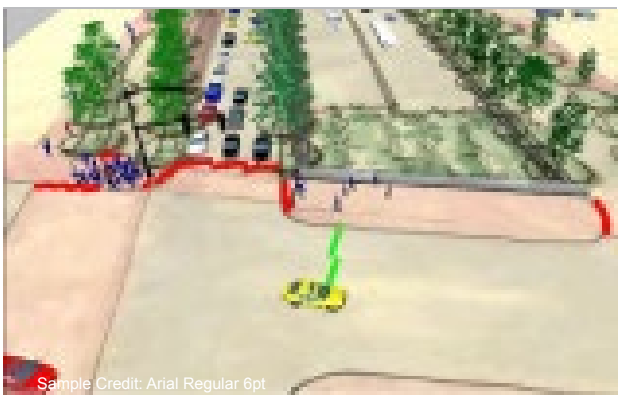
# Transportation Engineering




## Safe, Efficient, Innovative

Access is critical to any facility and Langan possesses decades of experience in total transportation engineering and planning services. In fact, from hospitals to universities to shopping centers to stadiums, we have developed programs, designs, and creative solutions that enhance access and circulation for facilities and major transportation systems throughout the United States.

Langan's transportation engineering and planning work includes highway and local street design, as well as the design of parking, transit, and non-motorized transportation facilities. For the planning and design of these types of facilities we have provided simulation modeling, master plans, traffic impact studies, operational analysis, signal design, traffic calming measures, signage and wayfinding studies, origin/destination surveys, travel demand modeling, corridor studies, urban transportation plans, transit station and route planning, terminal planning, bikeway planning, and permitting services through counties, municipalities, and the various transportation agencies.

**Langan Transportation Services:**

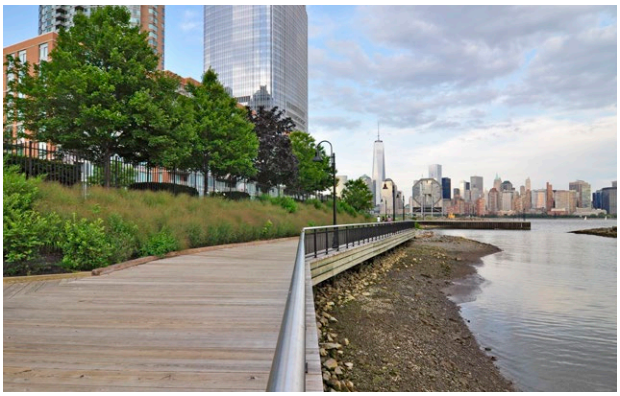
- Vehicular Traffic Studies
- Stadium and Event Planning
- Traffic Modeling & Simulation
- Master Planning
- Transit Studies
- Station Planning
- Environmental Impact Statements
- Parking Studies
- Corridor Studies
- Site Access / Site Engineering
- Airport Studies
- Site Feasibility Studies
- Streetscape Improvements
- Traffic Calming
- Value Engineering
- Bicycle & Pedestrian Safety Studies
- Toll Facilities
- Urban Development
- Grading & Roadway Design
- Infrastructure Rehabilitation
- Cost Estimates
- Contract Documents
- Construction Administration & Inspection
- Permit Application Packages
- Technical Specification
- STEPS
- SimTraffic
- Paramics
- VISSIM

LANGAN

# Landscape + Planning

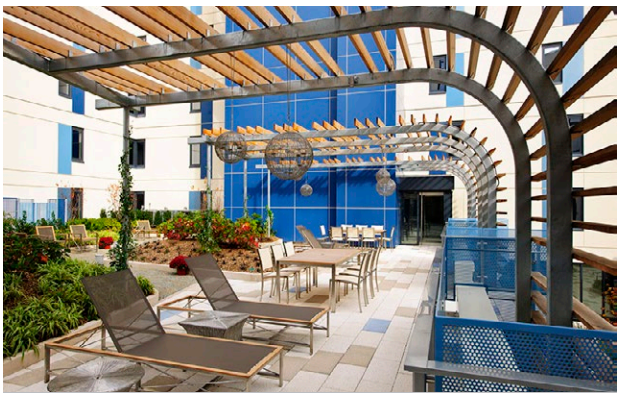
## Sense of Place

Langan Landscape Architects and Planners understand what makes places work. We shape effective design solutions that range from regional or city scale down to the most intimate courtyards and garden spaces. In every project we strive to identify and enhance the "sense of place," which makes every site unique and memorable. This places us at the forefront of the rebirth of our cities and aging downtowns, guiding their revitalization as destinations where people live, work, shop and play.



**Langan Landscape Architecture + Planning Services:**

- Site Feasibility and Yield Studies
- High Performance Site Planning
- Land Development Approvals
- Brownfield Redevelopment
- Waterfront Design
- Park and Playground Design
- Complete Streets, Streetscape Design and Traffic Calming
- Landscape Planting and Irrigation Design
- Landscape Restoration Design
- Contract Documents
- Rooftop Garden Design
- Site Lighting Design
- Water Feature Design
- Construction Administration and Inspection
- Expert Testimony and Zoning Reviews
- Community Outreach



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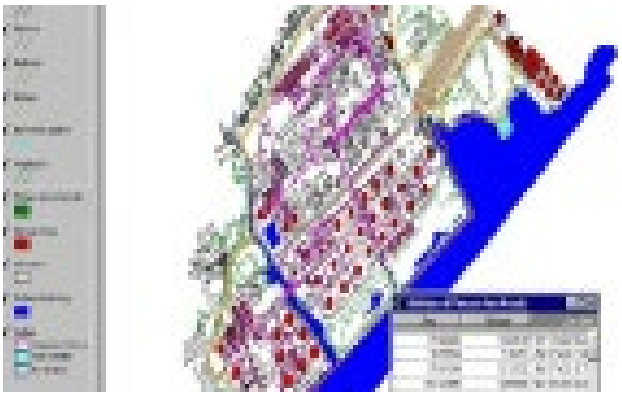
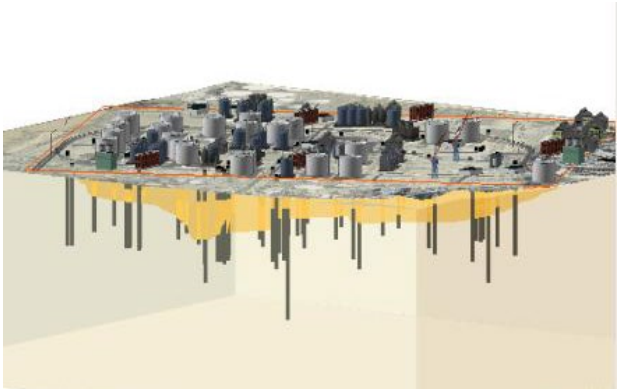
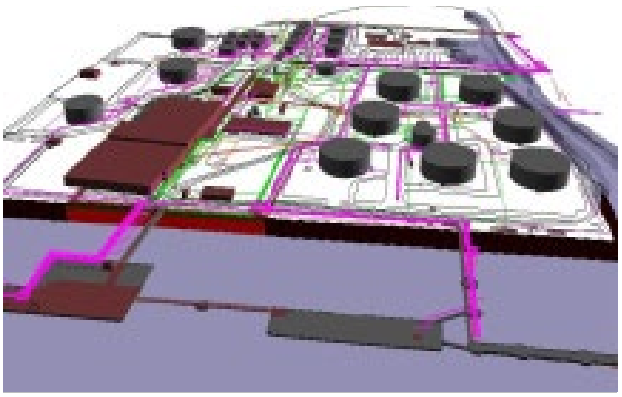
# GIS/Data Management







## Cutting-Edge Data Visualization

Langan utilizes the latest CADD, GIS, and Data Management software applications to analyze and design cost-effective solutions to our clients' problems. Our CADD-GIS group provides custom training, programming, and technical support to both our staff and to our clients in Autodesk's Map, Land Desktop and Civil 3D, as well as ESRI's ArcGIS suite of applications including ArcMap, ArcEditor, and ArcInfo and their assorted extensions. Langan utilizes SITEOPS software for value engineering and to provide design optimization of land development projects. We use Earthsoft's EQuIS Chemistry and Geology products to manage large datasets for our environmental and geotechnical clients, and use GIS, Rockworks, GMS and EVS to visualize the data. Langan also uses 3D Studio and various post production products to generate computer generated animations of our clients' projects, allowing them to see the virtual design before construction.

Langan provides our clients with easy access to their project data by developing Extranets and Sharepoint data portals that allow for easy data exchanges between all of the project team members. Our Web designers can develop custom Web-based applications using ESRI's ArcIMS and ArcGIS Server to further leverage our clients' data.

**Langan GIS/Data Management Services:**

- Software Integration
- Custom Programming
- Software Training
- Web Design
- CADD Conversions
- GIS Mapping
- 3D Animations
- Software Technical Support
- Data Entry
- SITEOPS®

LANGAN

# Sustainable Design

## LEEDing the Way

With more than **100 LEED APs** on staff, sustainable design weaves through all Langan services. Our diverse portfolio of intelligent site planning, design, and engineering coupled with our Brownfield and site remediation expertise places us at the forefront of the sustainable design movement.

Langan has been an instrumental player on dozens of Leadership in Energy and Environmental Design (LEED) and sustainable design projects. Our expertise allows us to make significant contributions in developing sustainable sites with an emphasis on stormwater management, low impact landscapes, brownfield redevelopment, materials recycling, energy conservation, and renewable energy design.

**Langan Sustainable Design Services:**

- LEED Site Feasibility Analysis
- Air Quality Assessments
- Asbestos Assessment and Abatement
- Lead-based Paint and Mold Removal
- Ecological Wastewater Treatment Design
- Low Impact Stormwater Design / Master Planning
- Brownfield Redevelopment
- High Efficiency Site Lighting and Irrigation Design
- Green Roof Design
- Streambank Restoration and Bioengineering Design
- Baseline Ecological Evaluations
- Wildlife and Habitat Evaluations
- Wetland Delineation, Design and Mitigation
- Urban Design and Regeneration Planning
- Geothermal Feasibility Studies and System Design Support

# Infrastructure


## An Impact Player on the Team

The engineers and environmental scientists at Langan have vast experience with respect to infrastructure design and consulting. Because of our knowledge and experience, we are an ideal choice for a sub-consultant to construction companies, engineering firms, and architects that specialize in infrastructure programs. Given Langan's nationwide office locations primarily in densely populated urban areas, we are strategically situated to be a local consultant on projects in places like the Washington DC region, New York City and the five boroughs, all of New Jersey, the state of Connecticut, Philadelphia and Eastern Pennsylvania, Miami, and California.

As a result, Langan has been a key player in some of the largest, most significant infrastructure projects both in the United States and overseas, encompassing highways, bridges, rail, major transportation hubs, airports, utilities, port facilities, and flood prevention.

**Langan Infrastructure Services:**

- Rail/Transit
- Bridges/Tunnels
- Port/Marine
- Airports
- Tunnels
- Water/Wastewater
- Roadways
- Utilities
- Energy
- Flood Prevention

LANGAN

# TURNBERRY AVIATION

**SERVICES:**

- *Subsurface Investigation*
- *Foundation Load Testing*
- *Geotechnical Value Engineering*
- *Construction Inspection*

**LOCATION:**

*Opa Locka Regional Airport*
*Miami-Dade County, Florida*

**CLIENT:**

*Turnberry Associates*

**DESIGN-BUILD CONTRACTOR:**

*The Ahrens Company*


This development consists of three executive aviation hangars with a combined footprint of 148,000 SF located at the Opa Locka general aviation airport in Northwest Miami-Dade County. Because of South Florida's location in a high-velocity wind zone, the large open spans associated with the structures resulted in high foundation uplift requirements.

Langan reviewed the existing foundation design, performed a subsurface investigation, performed an engineering evaluation and developed a more efficient and cost effective foundation anchor system consisting of short small diameter augercast piles.

The recommended anchor piles reduced foundation costs and installation schedule in half. Foundation load testing was successfully performed to confirm the load-carrying capacity of the anchor piles. Langan also provided full time inspection during anchor pile installation.

LANGAN

# FORT LAUDERDALE/HOLLYWOOD INTERNATIONAL AIRPORT
# T-4 REMEDIATION

**SERVICES:**

- *Work Plan Development*
- *Geotechnical Evaluation of Soil Conditions*
- *Soil Pre-characterization*
- *Well Installation and Abandonment*
- *Open-excavation Air-sparging*
- *Environmental Observation During Construction*

**LOCATION:**

*Fort Lauderdale, Florida*

**CLIENT:**

*Cummings-Balfour Beatty*

Langan was contracted to provide environmental services during utility construction in a petroleum-impacted area near the western gate of Fort Lauderdale/Hollywood International Airport.

The services include:

- Characterizing soil before excavation to determine which soil can be reused and which soil must be removed for off-site disposal
- Providing a geotechnical evaluation of soil conditions;
- Developing a comprehensive work plan for the entire project
- Developing a baseline of groundwater quality in advance of construction
- Abandoning monitoring wells in the construction footprint
- Observing the removal and segregation of impacted soil
- Sparging the open excavation to remove volatile petroleum compounds
- Reinstalling and sampling monitoring wells after construction

The project is expected to be completed in the spring of 2014. Because this is an active airport, much of the work has to be done at night when airport traffic is lighter.

LANGAN

# PAN AM TRACT 1 SOAKAGE PIT ASSESSMENT AND REMOVAL

**SERVICES:**

- *Environmental Assessment*
- *Environmental Oversight During Construction*

**LOCATION:**

*Miami International Airport*
*Miami, Florida*

**CLIENT:**

*Miami-Dade Aviation Department*


The Miami-Dade Aviation Department (MDAD) contracted Langan to assess the nature and extent of contamination in and around 11 soakage pits, which MDAD had to remove to make way for a utility corridor. The pits were installed more than 40 years ago; tenants washed and repaired airplanes near the pits, which collected the runoff from those operations. The $129,000 project (drilling and laboratory costs were handled directly by the client) included more than 200 soil samples, 45 groundwater samples, and 175 samples for field screening of petroleum hydrocarbon vapors.

After the assessment, Langan provided full-time environmental oversight of the removal of the soakage pits to ensure that the construction contractor handled and disposed of free product and contaminated soil and groundwater according to FAA, MDAD, and state and county regulations.

LANGAN

# JFK INTERNATIONAL AIRPORT – INTERNATIONAL ARRIVAL TERMINAL

**SERVICES:**

- *Technical Advisory Services*
- *Geotechnical Engineering*
- *Construction Methods*
- *Quality Control*

**LOCATION:**

*Jamaica, New York*

**CLIENT:**

*The Consortium of LCOR & Schiphol of Holland*

The JFK International Arrival Terminal (IAT) redevelopment project is part of the JFK 2000 improvement master plan. This $1.2 billion project includes a new 1.3 million SF, three-level terminal building with two concourses and new roadways that will also accommodate the new JFK Light Rail.

The IAT building is supported by more than 4,000 eighteen-inch-diameter driven Monotube piles. The piles were designed to withstand compression loads of 180 tons, uplift loads of 40 tons, and lateral loads of 9 tons. As a consequence of liquefaction, the piles were also designed to withstand downdrag load of 64 tons.

Langan served as Technical Advisor to the private developer (a consortium of LCOR of New York City and Schiphol of Holland), consulting on foundation, construction and environmental related issues. Langan's contributions include evaluation of technical matters such as pile relaxation, and of construction activities such as evaluation of driving operations and quality control procedures.

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# JFK INTERNATIONAL AIRPORT – JETBLUE HANGAR

**SERVICES:**

- *Subsurface Investigation*
- *Liquefaction Analysis*
- *Floor Slab/Pavement Design Criteria*
- *Foundation Design Criteria*
- *Construction Administration*
- *Completed On Schedule and Within Budge*

**LOCATION:**

*Jamaica, New York*

**CLIENT:**

*Turner Construction Company/HOK Architects Design-Build Team*

**DESIGN-BUILD TEAM:**

*HOK*
*Hatch Mott McDonald*


Langan was the geotechnical design engineer for an Aircraft Maintenance Hangar and support building for JetBlue Airways. Langan's role, as a member of the design-build team led by Turner Construction Company and HOK Architects, was to interpret subsurface conditions provided by others and develop a foundation system for the new structures. The subsurface conditions consisted of non-placed fill underlain by compressible organic soils, underlain by medium dense sand.

The greatest geotechnical engineering challenge was to develop design criteria for the hangar floor slab - a one acre are subject to heavy aircraft loads. Langan developed a subgrade improvement program that consisted of soil surcharge and heavy subgrade proof rolling. This eliminated the need for an expensive pile support system. Steel reinforcement was added to the slab at strategic areas to further distribute the heavy wheel loads.

The superstructure of the buildings was supported more conventionally on a timber pile foundation system. Well compacted fill was used around the pile caps to provide lateral restrain during seismic events and eliminated the need for expensive structural tie-beams beneath the hangar slab.

LANGAN

# JFK INTERNATIONAL AIRPORT – NORTHWEST CARGO FACILITY

**SERVICES:**

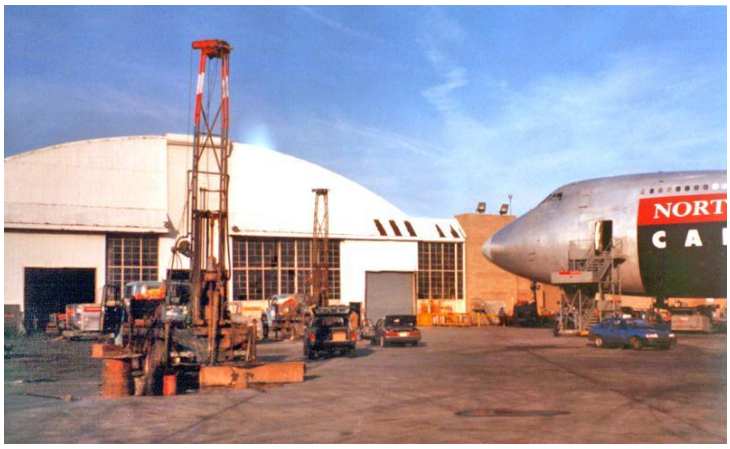
- *Subsurface Investigation*
- *Pavement Conditions Survey*
- *Liquefaction Analysis*
- *Floor Slab/Pavement Design Criteria*
- *Foundation Recommendations*
- *Topographic Survey*

**LOCATION:**

*Jamaica, New York*

**CLIENT:**

*McClier*



The Northwest Airline Cargo Facility is located on a 22-acre parcel of the JFK International Airport, New York. The new development will involve phased demolition of the two existing hangars and construction of new cargo facilities with a total building area of 82,500 SF.

Langan developed a subgrade improvement program that eliminated the need for pile foundations and allowed the structure to be built on conventional shallow foundations. This design resulted in substantial cost savings during construction.

Langan's services included a subsurface investigation and geotechnical design including foundation type, anticipated settlements, pavement and floor slab design criteria, recommended subgrade improvements, and a detailed liquefaction analysis. The proposed building has stringent settlement criteria because of a laser related ULD operation.

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# JFK INTERNATIONAL AIRPORT
# TWA FLIGHT CENTER HOTEL

**SERVICES:**

- *Site/Civil Engineering*
- *Geotechnical Engineering*
- *Surveying*

**LOCATION:**

*Jamaica, New York*

**CLIENT:**

*Beyer Blinder Belle Architects*
*Lehrer*

**ARCHITECT:**

*Beyer Blinder Belle Architects*
*Lubrano Ciavarra Architects*

**STRATEGIC PARTNERS:**

*Port Authority of New York and New Jersey (PANYNJ)*
*MCR Development*
*JetBlue*
*ARUP*
*Jaros Baum & Bolles*

The Trans World Airlines (TWA) Flight Center at JFK International Airport is undergoing a complete renovation. Originally opened in 1962 and shut down in 2001, the Eero Saarinen-designed New York City landmark is being transformed into a 505-bed hotel with two six-story buildings and a 40,000-SF conference center.

The anticipated LEED-certified building is expected to open in late 2018, making it the first on-site, full-service hotel at JFK International Airport.

The project poses the unique challenge of preserving an iconic landmark while creating a modern, world-class airport hotel that can accommodate thousands of travelers from around the world.

Langan is providing site/civil, geotechnical engineering, and surveying services. Responsibilities include: performing 3D laser scan surveys of interior and exterior areas, developing a Stormwater Pollution Prevention Plan, researching existing site conditions from available historic documents, corresponding with PANYNJ to obtain necessary approvals during a subsurface investigation program, and submitting final construction documents.

Langan's site/civil team also prepared a utility relocation package to advise the repositioning of all utilities, helping avoid issues during construction of the new facilities.

Additionally, our geotechnical engineers conducted a seismic evaluation of the project site and provided foundation recommendations for the hotel and conference center.

LANGAN

# LAGUARDIA AIRPORT

**SERVICES:**

- *Surveying Services*
- *Geotechnical Engineering*

**LOCATION:**

*East Elmhurst, New York*

**CLIENT:**

*Port Authority of New York and New Jersey (PANYNJ)*

*LaGuardia Airport, circa 1949*

Original construction of LaGuardia Airport dates back to 1929 on 105-acres of waterfront property owned by the Steinway (piano) family. Expansion at the location continued over the next 80+ years with the addition of airplane hangars, terminals, runways and support facilities. Now at 305-acres, LaGuardia Airport (LGA)–along with Newark Liberty and JFK International Airports–has become part of the world's largest airport networks.

Current modernization of LGA involves the demolition of several existing structures such as the central terminal building, concourses (A through D); parking structures, hangars, support structures, utilities, paved areas, etc. Modernization/redevelopment will involve the construction of a new terminal building, concourses, parking facilities, light rail system, and associated infrastructure.

Langan is providing both landside public and airside surveying services on an as-needed basis. These services include topographic and utility feature location and as-built surveys. The surveys were intended to provide design-grade existing condition information and include both surface and subsurface information. All of Langan's survey services were completed using PANYNJ survey control and survey/CADD standards and supplied in digital 3D format.

Langan's geotechnical services include review of 90+ years of historic data and reports, site visits, and a summary of the pre-existing piles and complex subsurface conditions for the client.

LANGAN

# STEWART INTERNATIONAL AIRPORT
# AIR TRAFFIC CONTROL TOWER AND BASE BUILDING

**SERVICES:**

- *Geotechnical Investigation*
- *Foundation Engineering*
- *Special Inspection During Foundation Construction*

**LOCATION:**

*Newburgh, New York*

**ARCHITECT:**

*Burns & McDonnell*

**STRATEGIC PARTNER:**

*VRH Construction*

The site is located within the campus of Stewart International Airport and has an approximate 53,000 SF footprint. New construction consists of a 111-foot-high Air Traffic Control Tower (ATCT), a one-story base building, and a separate emergency generator room. The tower is square shaped at the ground floor, approximately 25 feet on each site. The base building is rectangular shaped having a footprint area of about 5,500 SF. The emergency generator is a detached enclosure with an area of about 430 SF. The foundation system consisted of shallow footings bearing on the natural glacial till material.

The geotechnical engineering services provided by Langan included subsurface investigation, foundation recommendations and design, technical specifications and development of construction documents. Engineering services provided during construction include subgrade inspection, oversight during waterproofing installation, backfill placement and compaction.

LANGAN

# STEWART AIRPORT MASTER PLAN AND EIS

**SERVICES:**

- *SEQR Environmental Impact Statement*
- *Roadway and Intersection Analyses*
- *Wetland Mapping*
- *Wildlife and Plant Habitat Studies*
- *US Army Corps Wetland Permit Assessment*
- *Site Planning*

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**LOCATION:**

*Newburgh, New York*

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**CLIENT:**

*New York State*
*Department of Transportation*

Langan participated in a master plan for the development of 8,000 acres surrounding Stewart International Airport. As part of the planning process, Langan was responsible for the preparation of a report that included an environmental assessment. As a result of completing the planning and assessment stage, Langan was commissioned to provide a complete EIS for the development of 2,200 acres for Lockheed Air Terminal, the New York State DOT contract operators of the facility.

Proposed development includes construction of 7.0 to 10.1 million SF of industrial, distribution and office facilities, heavy aircraft maintenance facilities, water supply, sanitary sewage transmission lines and on-site treatment; and essential transportation facilities including both road and rail. Total estimated cost of facilities and infrastructure range from $300 million to $400 million.

The EIS thoroughly investigated: impacts on roads and interchanges, wetlands and required State and U.S. Army Corp permits, wildlife and plant habitats, earth, water, and ecological and atmospheric resources; community resources including land use, planning, infrastructure, economics and housing, zoning, and population. The project also included the impact analyses for nine major highway intersections (both existing and proposed):

- Route 207/300 Intersection
- Route 300/17K Intersection
- Route I-84/17K Diamond Interchange
- Route 17K/Drury Lane Intersection
- Route 17K/Ridge Road Intersection
- Route 17K/Barron Road Intersection
- Route 208/17K Intersection
- Route I-84/208 Diamond Interchange
- Route I-84/Ridge Road Interchange

LANGAN

# ENVIRONMENTAL DUE DILIGENCE/BASELINE ASSESSMENT
# WESTCHESTER COUNTY AIRPORT HANGAR D-1

**SERVICES:**

- *Environmental Due Diligence*
- *Site Superfund Status Analysis*
- *Baseline Site Investigation*

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**LOCATION:**

*Westchester County, New York*

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**CLIENT:**

*Morgan Stanley*

Langan was retained by Morgan Stanley to investigate environmental issues associated with leasing 26,000 SF of hangar and office space at the Westchester County Airport to house their corporate jet fleet. The hangar was formerly leased by Mobil Oil Corporation during which time spent solvents leaked into the ground beneath the hangar floor from a drum storage area. As a result, the hangar site was listed on the New York State Department of Environmental Conservation registry of Inactive Hazardous Waste Sites. Soil vapor extraction for the vadose zone, and chemical oxidant injection to degrade solvents in the groundwater, were selected as the site cleanup measures.

Langan established baseline environmental conditions for indoor air, and soil and groundwater quality around a facility fuel oil underground tank, and identified several other potential environmental liabilities. Asbestos and lead-based paint was identified in numerous locations in need of repair or abatement. Several components of the approved Superfund site cleanup would significantly disrupt Morgan Stanley's operations for a period of time.

Based on the Superfund documents reviewed by Langan and inspection of the facility, the integrity of the hangar floor drain system was brought into question. The data indicated that the drain system could be a potential secondary migration pathway for the solvent release to groundwater, a reasonable conclusion that had not been advanced in the Superfund documents. In this case, future accidental, or authorized operational discharges, however incidental, had the potential to exacerbate the subsurface conditions and compromise the success of the Superfund cleanup.

Langan provided a report with recommended actions to protect Morgan Stanley from being drawn into the Superfund cleanup activities or other airport-wide environmental conditions, such as unremediated jet fuel spills and deicing fluid contamination.

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# HANGAR 18 – MORRISTOWN AIRPORT

**SERVICES:**

- *Site/Civil Engineering*
- *Surveying*
- *Geotechnical Engineering*
- *Federal, State & Local Permits*
- *Construction Support Services*

**LOCATION:**

*Morristown Airport*
*Hanover, New Jersey*

**CLIENT:**

*Garden Air, LLC*


Langan was contracted by Garden Air, LLC, to perform site/civil, survey, and geotechnical engineering services and obtain the necessary Federal, State and local permit authorizations for the constructing of a new 30,000 SF aircraft hangar at Morristown Airport. The hangar will provide space to house six aircraft, including five corporate aircraft (2-Falcon 900's, 2-Hawker 700's and 1-Challenger) and one Bell 340 helicopter. The project also involves the inclusion of 5,600 SF of office space, a 23 space parking lot for client and employee parking and a large tarmac area for aircraft holding. The project was designed in accordance with the 1995 "Morristown Municipal Airport Master Plan" which recommended the construction of corporate hangar at this 2.4 acre, undeveloped site. Langan's engineering and natural resource personnel worked closely with the airport developer/manager, federal, state and local officials to ensure design conformance with all applicable codes and regulations and the timely construction and completion of this project.

This undeveloped tract of land, while perfectly located within the airport for a new aircraft terminal, was partially occupied by State regulated wetlands/waters and the 100 year floodplain. Accurate mapping data was supplied by the surveying group to provide topographic information in datums corresponding with available flood mapping. Boundary information was also provided to set proper building set-back limits. In accordance with New Jersey Department of Environmental Protection's "Freshwater Wetland Protection Act Rules" (NJAC 7:7A) and "Flood Hazard Area Control Act Rules" (NJAC 7:13), Langan's Natural Resources permitting and engineering staff were able to procure an Individual Freshwater Wetland Permit and a Stream Encroachment permit to enable the construction of the project. Langan also coordinated the purchasing of wetland and fill credits from a state approved Mitigation Bank. Langan's Natural Resources staff was also successful in demonstrating the projects qualification for a Categorical Exclusion (CE) in accordance with the Federal Aviation Administration's National Environmental Policy Act (NEPA) environmental review process.

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# MORRISTOWN AIRPORT – TAXIWAY AND RUNWAY IMPROVEMENTS

**SERVICES:**

- *NJDEP Land Use Regulation Program Permitting*

**LOCATION:**

*Hanover Township, Morris County, New Jersey*

**CLIENT:**

*DM Airport Developers, Inc.*
*Tri-State Planning and Engineering, PC*

Langan worked with a specialized airport design firm to permit FAA-required improvements to runways and taxiways at Morristown Airport that include the:

- Rehabilitation of Taxiways A and B;
- Reconstruction of Runway 13-31;
- Construction of drainage and grading improvements to the existing airfield drainage system associated with Taxiways A and B and Runway 13-31; and
- In-kind replacement of the edge lighting system along Taxiways A and B and Runway 13-31.

Langan obtained a New Jersey Department of Environmental Protection (NJDEP) Individual Freshwater Wetlands Permit (IP) for the impact of 4.86 acres of freshwater wetlands required for implementation of the project. The IP required the development of a detailed alternatives analysis to justify the disturbance of 4.86 acres of wetlands as well as a submission of a wetland mitigation proposal. A Stream Encroachment Permit was also obtained for these improvements, as the majority of the work is proposed within the NJDEP-regulated flood hazard area (regulatory floodplain). Key issues that were coordinated with the design firm included the minimization of environmental impacts and compliance with the State Stormwater Management Rules.

LANGAN

# NEWARK INTERNATIONAL AIRPORT – FIXED BASED OPERATIONS FACILITY

**SERVICES:**

- *Geotechnical Engineering*
- *Site Engineering*
- *Pavement Design*

**LOCATION:**

*Newark, New Jersey*

**CLIENT:**

*Butler Aviation*

Langan performed a subsurface investigation, provided foundation recommendations, and pavement design for their Fixed Based Operations (FBO) expansion at Newark International Airport. The 37± acre site, previously a swamp area, was surcharged during 1971 with 13 to 23 feet of hydraulically pumped sand from Newark Bay. The subsoils consist of the hydraulic sand, miscellaneous fills, peat, clayey silts with trace organics, natural fine sands and dense silt.

The proposed facilities consist of 4 airplane hangars, with office/maintenance garages, one 2-story terminal building, and 3 expansion hangar locations for future development.

The recommended foundation types were wood piles for all structures except the Maintenance Garage and Gas Station where an additional 15 foot surcharge for 2 months and shallow foundations was recommended. A 6 month surcharge and shallow foundations were also an alternate for the Terminal Building and Hangar D.

Either soil cement pavement or LCF rigid pavement was recommended for the taxiway pavement. Portland Cement rigid pavement was recommended for use in areas of potential concentrated fuel spillage, and asphalt concrete flexible pavement was recommended for the automobile parking and roadway areas.

LANGAN

# FIRST AVIATION SERVICES – TETERBORO AIRPORT NORTH FACILITY

**SERVICES:**

- *Geotechnical Engineering*
- *Subsurface Investigation*
- *Site/Civil Engineering*
- *Geotechnical, Environmental and Site/Civil Inspection During Construction*
- *Permitting*
- *Agency Approvals*
- *UST Closure*
- *Hazardous Material Investigation*

**LOCATION:**

*Teterboro, New Jersey*

**CLIENT:**

*First Aviation Services*



Langan provided geotechnical engineering, environmental engineering, site/civil engineering, and permitting for improvements at the existing Hangar 1 facility for First Aviation Services. The improvements included removal of an existing UST, expansion of the existing aircraft apron area, and planning for the replacement of the existing hanger with two new hangars and a terminal building. All work required close coordination with the Port Authority of New York and New Jersey, the airport owner, for approval of field work (investigations and construction) and final design approvals.

A wetland delineation and environmental evaluation was performed on the existing lease area. An environmental evaluation for Documented Categorical Exclusions Form B was completed in accordance with FAA and National Environmental Policy Act (NEPA) Guidelines and a Finding of No Significant Impact (FONSI) was obtained. Additionally, a Bergen County Soil Conservation Permit was prepared and approved.

A subsurface investigation was performed to evaluate the geotechnical and environmental conditions at the site. The environmental testing was used to establish a baseline environmental condition to be incorporated into a new lease with the PANYNJ. The geotechnical was used for preliminary foundation design for new hangars and terminal.

As part of New Jersey underground tank inspection and upgrade requirements, an existing waste oil UST needed upgrading. Langan prepared removal and remediation contract documents, and assisted with retaining a remediation contractor to remove the tank. The tank was successfully removed and impacted soil excavated and disposed. Following remediation activities Langan prepared tank closure documentation for submittal to NJDEP; the final closure and No Further Action letter was achieved after establishing a CEA and performing groundwater monitoring to show contamination levels were below NJDEP limits.

Finally a hazardous materials investigation was conducted on the existing First Aviation Services Hangars and Terminal (Hangar 1) as well as the adjacent “Sony” Hangar.

LANGAN

# FIRST AVIATION SERVICES – TETERBORO AIRPORT
# NEW HANGARS AND TERMINAL

**SERVICES:**

- *Topographic and Boundary Survey*
- *Geotechnical Engineering*
- *Subsurface Investigation*
- *Landscape Architecture*
- *Site/Civil Engineering*
- *Environmental Engineering*
- *Permitting*
- *Agency Approvals*
- *Geotechnical, Environmental and Site/Civil Inspection During Construction*

**LOCATION:**

*Lindbergh Drive, Teterboro Airport*
*Teterboro and Moonachie, New Jersey*

**CLIENT:**

*First Aviation Services*


Langan provided surveying, geotechnical and foundation engineering, environmental, landscape architecture, site/civil, and permitting for this 22-acre development. The development consists of three new 40,000 SF hangars, a new terminal building, a new support vehicle maintenance shop, and a fuel storage facility.

The survey group provided existing conditions mapping of the proposed site, including topography, drainage, runway survey, and preparation of base boundaries.

The site design featured a main entrance plaza with a drop-off and parking. The plaza incorporated landscape planting, specialty paving, decorative lighting and site furnishings. Langan designed the landscape planting and site lighting in accordance with PANYNJ requirements, including the use of native plant species suitable to the site's location in the New Jersey Meadowlands.

Langan performed a subsurface investigation to define the geotechnical and environmental conditions at the site. The geology of the site consists of a crust of stiff clay overlying very soft clay deposits; rock varies from 50 to 100 feet below the surface. By designing a system of shallow spread footings and strap beams to take advantage of the upper stiff clay, costly pile foundations were not required.

During construction, Langan provided daily on-site inspection during geotechnical and site/civil construction activities. Field modifications and interpretations were provided quickly, allowing the foundation and site/civil work to proceed even as the foundation and civil designs were being finalized. Langan's close interaction with PANYNJ engineers allowed the work to continue on the fast-track schedule.

Langan also provided a construction as-built survey used for the final certificate of occupancy on the site.

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# FIRST AVIATION SERVICES – TETERBORO AIRPORT SONY HANGAR

**SERVICES:**

- *Subsurface Investigation*
- *Wetlands Delineation*
- *Wetlands Permitting*
- *Bergen County Soil Conservation Permit*
- *NEPA Environmental Evaluation*
- *NJDEP Water Quality Certification*
- *UST Closures*

**LOCATION:**

*Teterboro, New Jersey*

**CLIENT:**

*First Aviation Services*


Langan provided geotechnical engineering, environmental engineering, site/civil engineering, and permitting for improvements for the proposed development of two airplane hangars and runway apron expansion. The improvements included removal of an existing UST, expansion of the existing aircraft apron area, and planning for the replacement of the existing hanger with two new hangars and a terminal building.

A wetland delineation and environmental evaluation was performed on the existing lease area. An environmental evaluation for Documented Categorical Exclusions Form B was completed in accordance with FAA and National Environmental Policy Act (NEPA) Guidelines and a Finding of No Significant Impact (FONSI) was obtained. Additionally, a Bergen County Soil Conservation Permit was prepared and approved.

A subsurface investigation was performed to evaluate the geotechnical and environmental conditions at the site. The environmental testing was used to establish a baseline environmental condition to be incorporated into a new lease with the Port Authority of New York and New Jersey, the airport owner. The geotechnical was used for preliminary foundation design for the new hangars and terminal.

As part of New Jersey underground tank inspection and upgrade requirements, an existing waste oil UST was found to be leaking. The tank was removed and impacted soil excavated and disposed of. Groundwater monitoring was performed for several months to show contamination levels were below or approaching New Jersey Department of Environmental Protection limits.

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# FIRST AVIATION SERVICES – TETERBORO AIRPORT SOUTH DEVELOPMENT AREA

**SERVICES:**

- *Permitting*
- *Agency Approvals*
- *Topographic and Boundary Survey*
- *Geotechnical Engineering*
- *Subsurface Investigation*
- *Site/Civil Engineering*
- *Environmental Engineering*
- *Geotechnical and Site/Civil Inspection During Construction*

**LOCATION:**

*Teterboro Airport*
*Teterboro & Moonachie, New Jersey*

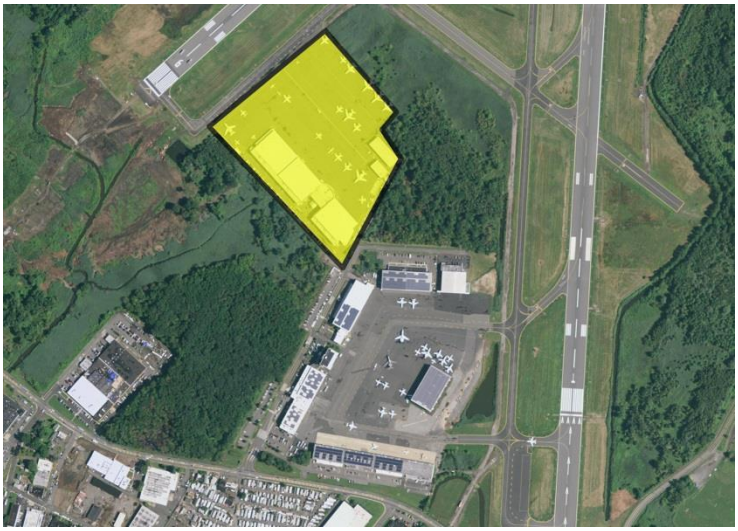
**OWNER:**

*Port Authority of New York and New Jersey (PANYNJ)*

**CLIENT:**

*First Aviation Services*

*Site previous to development*



Langan performed site/civil, environmental and geotechnical engineering services, and obtained the necessary federal, state, local and Port Authority of New York and New Jersey permits for construction of three new aircraft hangars, terminal and vehicle maintenance shops totaling over 170,000 SF. The project also included subsurface stormwater management facilities, a fuel storage facility, and 14-acres of pavement on this 24± acre site. Langan's engineering and natural resource personnel worked closely with the airport manager, federal, state and local officials to ensure design conformance with applicable codes and regulations to meet the tight project schedule.

The site is part of the extensive wetland area in northern New Jersey known as the Meadowlands, and was partially classified as federally regulated wetlands/waters and state regulated 100 year floodplain. The site was filled under United States Army Corps of Engineers (ACOE) and New Jersey Department of Environmental Protection permits prior to First Aviation Services (FAS) becoming the leasee; however, the permits specified outdated development plans. Langan successfully modified the ACOE permit, and received a new NJDEP permit for the work within six months of beginning site design. Langan also prepared an FAA Categorical Exclusion Form B for the site, eliminating the need for a full environmental impact statement.

Langan's natural resources staff was also successful in demonstrating the projects qualification for a Categorical Exclusion (CE) in accordance with the Federal Aviation Administration's National Environmental Policy Act (NEPA) environmental review process.

The stormwater management included the first NJ DEP permit to use a packaged treatment system to meet the EPA Phase II NPDES 80% suspended solids removal. Using the packaged system saved over $5 million by avoiding underground sand filter systems.

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# SAN FRANCISCO INTERNATIONAL AIRPORT
# TERMINAL UPPER LEVEL VIADUCT IMPROVEMENTS

**SERVICES:**

- *Geotechnical Consultation*
- *Construction Observation*

**LOCATION:**

*San Francisco, California*

**CLIENT:**

*San Francisco International Airport*

Langan provided consultation and construction observation during the installation of 225 micropiles for the seismic retrofit of the elevated loop road for the San Francisco International Airport. We also observed and evaluated performance and proof load tests on the micropiles and provided consultation regarding problems that arose during construction. In addition we estimated settlements for the lower roadway, which was supported on grade, and evaluated options for mitigating effects of settlement on the lower roadway.

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# SAN FRANCISCO INTERNATIONAL AIRPORT

**SERVICES:**

- *Geotechnical Engineering*
- *Environmental Services*

**LOCATION:**

*San Francisco, California*

**CLIENT:**

*San Francisco International Airport*


**Emergency Response Facilities #1 and #3**
Langan performed a geotechnical investigation for two, 1-story emergency response buildings that must remain operational after an earthquake, and ancillary facilities including pavements, electroliers, and underground utilities. Our engineers drilled borings and performed cone penetration tests to determine the potential for Bay Mud settlement, settlement during an earthquake, and liquefaction, and made recommendations for pile foundations, below-grade walls, structural slabs, and pavements.

**International Terminal Utility Tunnel**
Langan performed a study to estimate the relative displacement of a proposed tunnel during a maximum credible earthquake. Our engineers reviewed the available subsurface information and provided estimates of soil strains and deformation along the horizontal axis of the tunnel.

**Rail Transit Guideway**
The joint venture of Olivia Chen Consultants/Langan performed a geotechnical investigation for the rail transit guideway at San Francisco International Airport (SFIA). Six test borings were drilled to between 80 and 120 feet, and five cone penetration tests performed to depths of 42 to 61 feet. Samples of the recovered soil were tested for strength, grain size, Atterberg limits, moisture content, and density.

**North Access Road Dike Improvement – Spur Trail**
Langan performed a geotechnical investigation and provided design recommendations for slope protection along the North Access Road at SFIA. The work is part of the Spur Trail Public Improvements. The project provided immediate slope stabilization and allowed for future widening of the road. A permanent soldier pile and concrete lagging bulkhead were selected.

**Taxiways Pavement Design**
Langan performed field investigation and laboratory testing to evaluation the existing taxiways at SFIA with respect to B-777, B-747 and MD-11 aircraft loading. Existing pavement was analyzed using elastic mechanistic design procedures for asphalt pavements.

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# BURBANK BOB HOPE AIRPORT

**SERVICES:**

- *Phase I Environmental Site Assessment (ESA)*
- *Environmental Due Diligence*

**LOCATION:**

*Burbank, California*

**CLIENT:**

*Burbank-Glendale-Pasadena Airport Authority*

**AWARDS:**

*ENR Northern California Best Projects of 2014: Award of Merit (Airports/Transit)*



Burbank-Glendale-Pasadena Airport Authority had a 4.5 acre undeveloped parcel they wanted to potentially attain. The Site was located in Area 1 (Burbank-Hollywood Operable Units) of the San Fernando Valley Superfund site. The area is impacted by a regional dissolved volatile organic compound and chromium plume soil gas and groundwater plume. Before they attained the site, they needed due diligence services.

In order to help the Burbank-Glendale-Pasadena Airport Authority on this project, Langan provided environmental due diligence support. We performed a Phase I Environmental Site Assessment (ESA) to determine any recognized environmental conditions at the site. The ESA was performed in accordance with ASTM E 1527-05, which included a review of public records about the site (through environmental database searches and public records requests), a site reconnaissance, interviews with people familiar with the operations of the facility and interpretation of the data.

Langan prepared recommendations for Phase II ESA services to investigate the recognized environmental conditions, and continues to provide consulting services to the Authority.