

Case Study: Columbus US Land Port of Entry



Employee patio on the east side of the main building. Photo by Robert Reck.

SITES v2 (2019)

LOCATION: Columbus, New Mexico

AREA: 28.65 acres

PROJECT TYPE: Civic/Government Facility

FORMER LAND USE: Greenfield, Developed Port

TERRESTRIAL BIOME: Desert and Xeric Shrublands

LANDSCAPE / SITE BUDGET: \$34.5 million

COMPLETION DATE: July 2019

CLIENT: U.S General Services Administration/ Customs and Border Protection



Gabion wall and planters along the west side of the main building. Photo by Robert Reck.

PROJECT OVERVIEW

The Columbus US Land Port of Entry Expansion is the border crossing facility just south of Columbus, New Mexico, and north of Puerto Palomas, Mexico. It is New Mexico's only 24-hour border crossing facility. The original Port was constructed in 1989 and covered 16.79 acres. The expansion project restarted in 2014 and was needed to accommodate increasing vehicle and pedestrian traffic. The expansion includes the previously developed Port site and an additional 11.86 acres of previously undeveloped Chihuahuan Desert Grassland. The Port experiences heavy daily pedestrian traffic, primarily from students who cross the border to attend school in Columbus and Deming, NM, as well as private vehicle traffic and commercial traffic. In 2018, the Port saw 277,000 pedestrian crossings and 353,000 passenger vehicle crossings¹.

The safe and orderly movement of people and vehicles is the primary function of the Port facility. Beyond this function, the landscape design for the Port provides a shaded passage for pedestrians, an oasis-like patio for employees of the Port, and a striking arid landscape for vehicular travelers. This beautiful, high performance desert landscape is inspired by natural typologies that tell the story of water's transformational power. These typologies include desert washes and riparian landscapes, water harvesting terraces, and restored Chihuahuan desert grasslands and scrublands.



Private vehicle lanes, restored grassland, and pedestrian walkway. Photo by Robert Reck.

PROJECT TEAM

Architect: Richter Architects

Landscape Architect: MRWM Landscape Architects

General Contractor: Hensel Phelps

Landscape Contractor: Accent Landscape Construction

Civil Engineer: JQ Engineering

Electrical Engineer: IMEG

SITE CONTEXT

The site is located in the Chihuahuan Deserts Level III Ecoregion, 3 miles south of the Village of Columbus, New Mexico. The climate is dry, hot, and breezy. Winters are mild, with occasional snow. Summer temperatures are in the mid to high 90's (F)², but the altitude (4,000 ft) and dry air make summer days more comfortable than one would expect given the high temperatures. Average annual precipitation is 9.38 inches ². Most precipitation occurs as thunderstorms and showers during the July to September 'monsoon' period. Springtime is often windy, and during dry years dust storms can be severe, sometimes lasting for days. Minimum temperatures in winter are below freezing at night, but winter days are generally mild and sunny. Average snowfall is 2.7 inches ². Wind primarily blows from the west.

The previously undeveloped portion of the site (16.8 acres) was undisturbed grassland with a few Honey Mesquite shrubs (*Prosopis glandulosa*). The site is at a low point in a 35-square-mile drainage basin. Soils are clayey with little to no infiltration. The existing port included about two dozen shade trees that appeared to have stunted growth. There are views of open grassland to the east and the Florida Mountains to the northwest. The area to the west of the site includes several commercial buildings and parking lots which drain to a retention pond just outside the southwest corner of the site.



Chihuahuan desert grasslands, the communication tower for the Port, and the Florida Mountains in the background.

Photo by Aaron Zahm.

PROGRAM ELEMENTS

- Increase capacity of commercial and non-commercial inspection
- Improve traffic circulation
- Provide adequate space at all buildings
- Provide for staff and visitor parking
- Improve emergency vehicle access
- Improve site drainage



*Private vehicle lanes and pedestrian walkway entering the U.S.
Photo by Robert Reck.*

CHALLENGES AND OPPORTUNITIES

It was a challenge to incorporate the light-industrial inspection equipment needed for a border crossing facility into the site without visually detracting from the significance of entering the United States. Additional high-security requirements of the Port dictated the heights and placement of plants and constructed features to maintain sight lines.

Addressing the security and inspection needs of the port while providing clear and efficient passage for multiple users (pedestrian, private vehicle, commercial, pedestrian, public transportation) and employee parking and circulation was an additional challenge.

The existing Port building experienced occasional flooding, so there were known drainage issues to be addressed. Due to existing elevations and the international border it was not possible or acceptable to discharge runoff from the site. However, this challenge also held the opportunity to increase plant health and decrease irrigation demand through on-site retention and use of water harvesting features.

Existing soils had little to no natural infiltration, so compost sponges, soil amendments, and vegetation were added to improve infiltration rates in water harvesting and landscape areas.

The high volume of vehicular and pedestrian traffic created an opportunity to showcase the beauty of a native plant palette and educate visitors on sustainable features through interpretive signage.



*A desert wash carries roof runoff through the landscape.
Photo by Robert Reck.*

SUSTAINABLE FEATURES

The lowest point of the site has been transformed into a desert wash, including desert riparian vegetation, which creates an ecological and aesthetic amenity out of a requirement for on-site retention of large volumes of stormwater.

All roof runoff from the main building is directed to a runnel along the south side of the building. The runnel directs water to a series of planted water harvesting terraces and depressions. The terraces are formed by gabion walls, which are filled with concrete salvaged on-site from the original port.

Water harvesting basins are located throughout the site. These basins are planted with desert riparian species and include compost soil sponges to increase plant health and infiltration rates. Flush curbs used throughout the site allow all runoff to flow into one of the water harvesting basins.

All landscaped areas received soil amendments and most areas were seeded with native grassland species. Native and drought adapted plant species were used exclusively.

All vegetative waste generated on-site is either left on the ground to compost in place, or is chipped and re-used as mulch.



The runnel collects roof runoff, distributing it to water harvesting terraces. Photo by Aaron Zahm.



Restored grasslands on water harvesting terraces. Photo by Aaron Zahm

ENVIRONMENTAL, SOCIAL, AND ECONOMIC PERFORMANCE BENEFITS

Environmental Benefits:

Any successful project in a desert needs to provide shade. This project did so through location of trees and shade structures along walkways. Within 10 years of planting, 13,360 square feet of walkways and driving surfaces will be shaded by trees, and an additional 37,610 square feet are shaded by overhead canopies. High Solar Reflectance Index (SRI) materials for all roofs and paved surfaces further mitigate surface temperatures.

Restoring grasslands and creating riparian environments maintains and improves the habitat benefit of the site. Before the renovation, approximately 520,000 square feet of the site was previously undisturbed desert grasslands. The renovation design restored nearly 550,000 of desert grasslands. Seed and container plants from over 50 species of plants native to the region create habitat value.

Use of native and low-water-use plant species and water harvesting features significantly reduces irrigation demand, which saves millions of gallons of potable water every year. A state of the art responsive irrigation system further reduces irrigation demand. According to the EPA WaterSense budget tool, the initial landscape irrigation needs are 76% below the location-specific baseline. After plant establishment, only select trees and shrubs near the building will be permanently irrigated, reducing outdoor water use to 97% below the WaterSense baseline value. This calculation represents an average monthly irrigation demand of about 140,000 gallons.

Stormwater runoff from all impervious surfaces on the site flows to water harvesting elements (see 'Sustainable Features'). Approximately 2.5 million gallons of stormwater runoff is directed to planted water harvesting landscaped areas annually, which keeps plants healthy while reducing the need for irrigation with potable water. Stormwater harvesting features are sized to retain runoff volume from a 95th percentile storm event on-site.

All vegetative waste is chipped and reused on site, along with composted food waste generated in the building. On-site generation of compost and careful plant selection mean that chemical fertilizers are not needed for the site.

The sustainable features of the Port have a unique opportunity to educate the hundreds of thousands of visitors on the environmental benefits of native plants, water harvesting, and Chihuahuan desert ecology. Interpretive signs along the main pedestrian walkways explain these site elements.



Restored grasslands east of the main building. Photo by Robert Reck.

Social Benefits:

The landscape of the Port creates a comfortable passage for pedestrian visitors by providing shaded walkways and clear pedestrian routes indicated by concrete pavers and signage. The port is an interface between two countries, so it is especially important to provide a place that is welcoming and easy to navigate.

The employee patio provides an inviting outdoor gathering place. The building protects the patio from harsh western sun and the predominant winds. Ample seating at benches and tables, shade from a canopy and trees, and an expansive view to the east make the patio an attractive place to spend time outside during most months.

By showcasing native plants and landscape typologies, the Port landscape is a place where employees and visitors can experience an increased sense of place and connection to the Chihuahuan Desert.

Economic Benefits:

Inclusion of native and low-water-use plants decreases maintenance and fertilizer needs, which reduces the cost of maintenance. Trees and shade structures located near walkways and parking lots will increase the lifespan of concrete and improve human health by blocking solar radiation. On-site retention of stormwater decreases occasional flooding in the area, while also decreasing the cost of treating and delivering potable water for irrigation by 2-3 million gallons per year. Selection of efficient electrical equipment reduces annual kWh for outdoor use by 36% annually. All concrete and asphalt from the original port was salvaged and re-used in the expansion project.



Salvaged concrete reused for gabion fill material. Photo by Robert Reck.

LESSONS LEARNED

Pre-construction soil testing showed soil pH levels above 8.0. Initially this was a cause for concern, but research and soils testing from undisturbed areas showed that desert grasslands in the vicinity were thriving with soil pH of 8.5 or higher. However, even with an understanding of local soil characteristics, the imported and disturbed soil had pH levels above 9.0 that required amendment to decrease pH, increase nitrogen, and improve micro nutrients.

The poor infiltration of the soil did not allow salts to be flushed with irrigation. Instead, careful attention had to be paid to avoid inadvertently adding more salts through amendments. Soil amendments also contributed to the long-term reestablishment of a healthy soil micro-biome to reduce pH.



Shaded walkway leading to main pedestrian checkpoint. Photo by Robert Reck.

REFERENCES

1. Villagran, Lauren. "Inspiring and Dignified Experience': NM Border Crossing touted as safer, Welcoming Entry." El Paso Times. 9/16/2019. <https://www.elpasotimes.com/story/news/2019/09/05/us-safe-border-welcome-new-mexico-columbus-port-entry/2212864001/> . Accessed 10/24/19
2. Western Regional Climate Center. "Columbus, New Mexico: Period of Record Monthly Climate Summary." Desert Research Institute. 2019. <https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?nmcolu> . Accessed 10/24/19