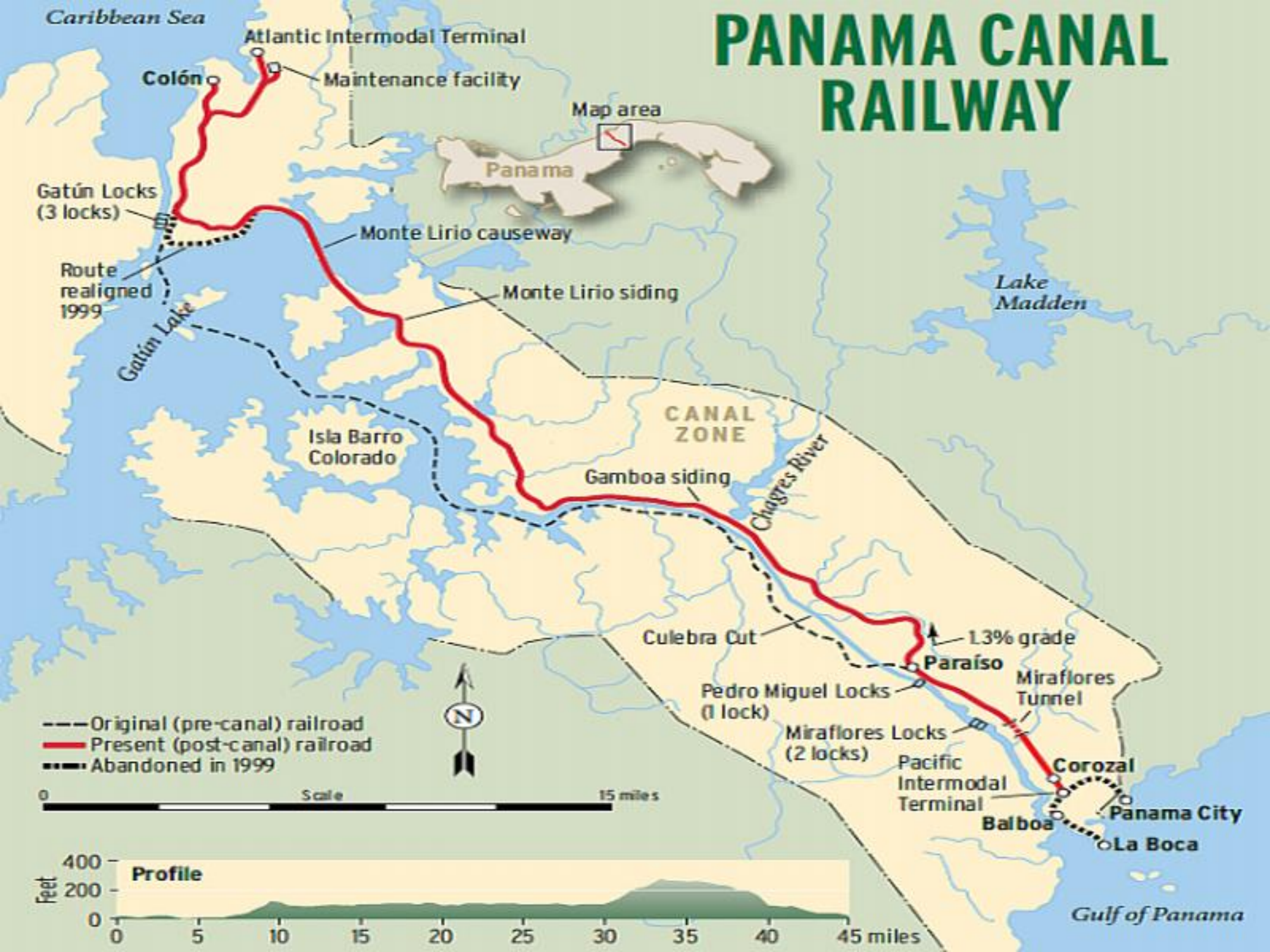


# PANAMA CANAL RAILWAY



Caribbean Sea

Atlantic Intermodal Terminal

Colón

Maintenance facility

Map area

Panama

Gatún Locks (3 locks)

Monte Lirio causeway

Lake Madden

Route realigned 1999

Gatún Lake

Monte Lirio siding

Isla Barro Colorado

CANAL ZONE

Gamboa siding

Chagres River

Culebra Cut

1.3% grade

Paráiso

Miraflores Tunnel

Pedro Miguel Locks (1 lock)

Miraflores Locks (2 locks)

Pacific Intermodal Terminal

Corozal

Balboa

Panama City

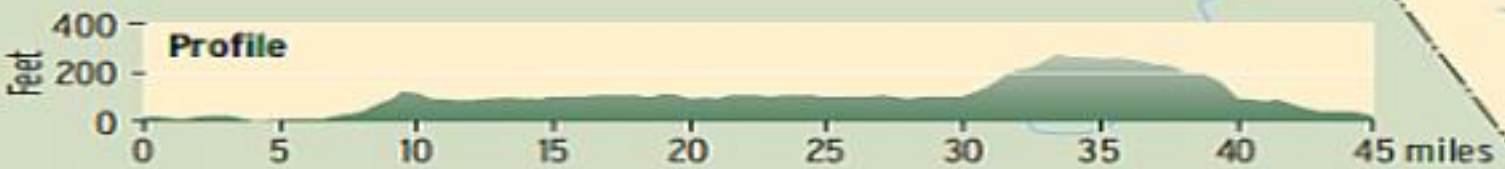
La Boca

Gulf of Panama

- Original (pre-canal) railroad
- Present (post-canal) railroad
- ... Abandoned in 1999



0 Scale 15 miles



# Panama Canal Railway

From Wikipedia, the free encyclopedia

The **Panama Canal Railway** is a railway line that runs parallel to the Panama Canal, linking the Atlantic Ocean to the Pacific Ocean in Central America. The route stretches 47.6 miles (76.6 km) across the Isthmus of Panama from Colón (Atlantic) to Balboa (Pacific, near Panama City). It is operated by Panama Canal Railway Company (reporting mark: PCRC), which is jointly owned by Kansas City Southern and Mi-Jack Products.<sup>[2]</sup>

The Panama Canal Railway currently provides both freight and passenger service.

The infrastructure of this railroad (formerly named the **Panama Railway** or **Panama Rail Road**) was of vital importance for the construction of the Panama Canal over a parallel route half a century later. The principal incentive for the building of the rail line was the vast increase in traffic to California owing to the 1849 California Gold Rush. Construction on the Panama Railroad began in 1850 and the first revenue train ran over the full length on January 28, 1855.<sup>[3]</sup> Referred to as an *inter-oceanic railroad* when it opened,<sup>[4]</sup> it was later also described by some as representing a "transcontinental" railroad, despite only transversing the narrow isthmus connecting the North and South American continents.<sup>[5]</sup><sup>[6]</sup><sup>[7]</sup><sup>[8]</sup>

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## History of earlier isthmus crossings and plans

While the Camino Real trail, and later the Las Cruces trail, built and initially maintained by the Spanish, allowed some cargo and passengers to be carried across the Isthmus of Panama for over three centuries, by the 19th century it was becoming clear that a cheaper, safer, and faster alternative was required. As railroad technology developed in the early 19th century and given the cost and difficulty of constructing a canal with the available technology, a railway seemed the ideal solution.

President Bolívar of La Gran Colombia (Venezuela, Ecuador, Panama, Colombia) commissioned a study into the possibility of building a railway from Chagres (on the Chagres River) to the town of Panama City. This study was carried out between 1827 and 1829, just as railroads were being invented. The report stated that such a railway might be possible. However, the idea was shelved.

In 1836, US President Andrew Jackson commissioned a study of proposed routes for interoceanic communication in order to protect the interests of Americans travelling between the oceans and living in the Oregon Country. This resulted in the United States acquiring a franchise for a trans-Isthmian railroad; however, the scheme was a victim of the business panic of 1837, and came to nothing.

In 1838 a French company was given a concession for the construction of a road, rail, or canal route across the isthmus. An initial engineering study recommended a sea-level canal from Limón Bay to the bay of Boca del Monte, 12 miles (19 km) west

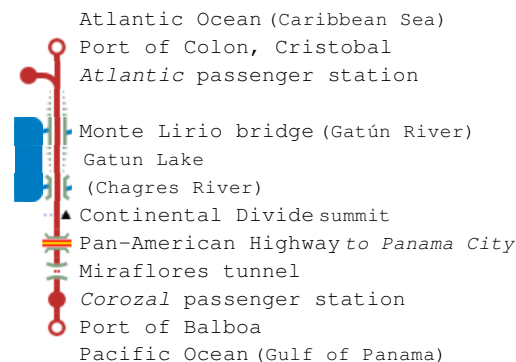
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## Panama Canal Railway Company



Current Panama Canal Railway line (interactive version) [1]

Legend



An intermodal train led by two Panama Canal F40PH's through Colón, Panama.

<b>Locale</b>	Isthmus of Panama
<b>Dates of operation</b>	January 28, 1855–Present
<b>Track gauge</b>	4 <span> </span> ft 8 <span><sup>1</sup><span>⁄</span>2</span> <span> </span> in (1,435 <span> </span> mm) standard gauge
<b>Previous gauge</b>	5 <span> </span> ft (1,524 <span> </span> mm)
<b>Length</b>	47.6 <span> </span> mi (76.6 <span> </span> km)
<b>Headquarters</b>	Panama City, Panama
<b>Website</b>	<span>http://www.panarail.com/home.html</span>

of Panama; but the scheme again collapsed for lack of technology and funding needed.

Following the US acquisition of Upper California and the Oregon Territory in 1846 and the prospective movement of many more settlers to and from the West Coast, the United States once again turned its attention to securing a safe, reliable, and speedy link between the Atlantic and Pacific oceans. In 1846 the United States signed a treaty with Colombia (then the Republic of New Granada) by which the US guaranteed Colombian sovereignty over Panama and was authorized to build a railroad or canal at the Panamanian isthmus guaranteeing its open transit.<sup>[9]</sup> In 1847, a year before gold was discovered in California, Congress authorized subsidies for the running of two lines of mail and passenger steamships, one in the Atlantic and one in the Pacific. The Atlantic lines ran from New York, Havana, Cuba, and New Orleans, Louisiana, to Panama's Chagres River on the Caribbean Sea at a \$300,000 subsidy. The proposed Pacific line ran with three steamships from Panama City, Panama to California and Oregon in the Pacific at a \$200,000 subsidy. None of the steamships in the Pacific was built before the mail contract was let.

In 1847, the actual east-west transit across the isthmus was by native dugout boats (and later by modified lifeboats) up the often dangerous Chagres River, and then by mules for the final 20 miles (32 km) over the old Spanish trails. The trails had fallen into serious disrepair after some 50 years of little or no maintenance and up to 120 inches (3 m) of rain each year in the April-December rainy season. A transit from the Atlantic to the Pacific or vice versa would usually take four to eight days by dugout canoe and mule. The transit was fraught with dangers and disease.

William H. Aspinwall, the man who had won the bid for the building and operating of the Pacific mail steamships, conceived a plan to construct a railway across the isthmus; he and his partners created a company registered in New York, the Panama Railroad Company, raised \$1,000,000 from the sale of stock, and hired companies to conduct engineering and route studies. Their venture happened to be well-timed, as the discovery of gold in California in January 1848 created a rush of emigrants wanting to cross the Isthmus of Panama and go on to California. The first dual paddle steamer plus three masts powered steamship used on the Pacific run was the \$200,000 *SS California*.<sup>[10][11]</sup> It was 203 feet (62 m) in length, 33.5 feet (10.2 m) in beam, and 20 feet (6.1 m) deep, with a draft of 14 feet (4.3 m), and grossed 1,057 tons; when it sailed around the Cape Horn of South America, it was the first steamship on the west coast of South and North America. When it stopped at Panama City on January 17, 1849, it was besieged by about 700 desperate gold seekers. Eventually, it managed to leave Panama City for California on January 31, 1849, with almost 400 passengers, and entered San Francisco Bay, a distance of about 3,500 miles (5,600 km), on February 28, 1849—or 145 days after leaving New York. There, nearly all its crew except the captain deserted and were stranded for about four months until a new supply of coal and a new (much more expensive) crew could be hired. The trip between California and Panama was soon very actively traveled as it provided one of the fastest links between San Francisco, California, and the East Coast cities—about 40 days' transit. Nearly all the gold that left California went over the fast Panama route. Several new and larger paddle steamers were soon plying this new route.

## 1855 Panama Railroad

### Construction

In January 1849, Aspinwall hired Colonel George W. Hughes to lead a survey party and pick a proposed Panama Railroad roadbed to Panama City. The eventual survey turned out to be full of errors, omissions, and optimistic forecasts, which made it of very little use. In April 1849, William Henry Aspinwall was chosen head of the Panama Railroad company, which was incorporated in the State of New York and initially raised \$1,000,000 in capital. In early 1850, George Law, owner of the Pacific Mail Steamship Company, bought up the options of the land from the mouth of the Chagres River to the end of Navy Bay in order to force the directors of the new Panama Railroad to give him a position on the board of the company. Since there were no harbor facilities on the Atlantic side of the Isthmus, they needed to create a town with docking facilities to unload their railroad supplies there. Refusing to allow Law onto the board, the directors decided to start building harbor facilities, an Atlantic terminus, and their railroad from the vacant site of Manzanillo Island. Starting in May 1850, what would become the city of Aspinwall (now Colón) was founded on the 650 acres (2.6 km<sup>2</sup>) on the western end of a treacherously marshy islet covered with mangrove trees, known as Manzanillo Island.

The board solicited bids from construction companies in the United States to build the railroad. George M. Totten and John C. Trautwine initially submitted one of the winning bids. After surveying the railroad's proposed course and the probable construction difficulties and uncertainties, they withdrew their bid. Totten agreed to become the chief engineer on the railroad construction project, working for a salary instead of as a general contractor. A new town on the Atlantic end of the railroad would have to be built on swampy ground that was often awash at high tide. The mangrove, palms, and poisonous manchineel (*manzanilla* in Spanish) trees and other jungle vegetation had to be chopped down, and many of the buildings in the new town had to be built on stilts to keep them above the water. As more worker housing was needed, abandoned ships brought to the mouth of the Chagres River as part of the California Gold Rush were towed near the island and used for temporary housing. A steam powered pile driver was brought from New York. Docks were constructed on pile-driven timbers, more and more of the island was stripped of vegetation, and elevated living spaces, docks, warehouses, and the like were constructed. Before the railroad construction could get fully started, the island was connected to the Panamanian mainland by a causeway supported by pile-driven timbers. The first rolling stock consisting of a steam locomotive built by William Sellers & Co.,<sup>[12]</sup> and several gondola cars arrived in February 1851. The required steam locomotives, railroad cars, ties, rails, and other equipment were unloaded at the newly constructed docks and driven across the track laid across the about 200 yards (180 m) causeway separating the island from the mainland. This causeway connected the Atlantic terminus to the railroad and allowed the ties, iron rails, steam engines, workers, backfill, and other construction material to be hauled onto the mainland. Later, passengers and freight would go the same way. As the railroad progressed, more and more of the island was filled in, and the causeway was expanded to permanently connect the island to the mainland; its island status disappeared and the town of Aspinwall was created.<sup>[13]</sup>

In May 1850, the first preparations were begun on Manzanillo Island, and the start of the roadway was partially cleared of trees and jungle on the mainland; but very quickly, the difficulty of the scheme became apparent. The initial 8 miles (13 km) of the proposed route passed through a jungle of gelatinous swamps infested with alligators, the heat was stifling, mosquitoes and sand flies were everywhere, and deluges of up to 3 yards (2.7 m) of rain for almost half the year required some workers to work in swamp water up to four feet deep. When they tried to build a railroad near Aspinwall, the swamps were apparently endlessly deep, often requiring over 200 feet (60 m) of gravel backfill to secure a roadbed. Fortunately they had found a quarry near Porto Bello, Panama, so they could load sandstone onto barges and tow them to Aspinwall to get

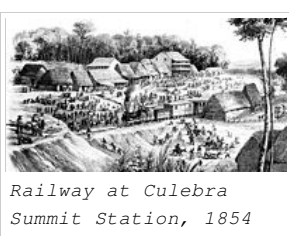


The backfill needed to build the roadbed. Built as the steam revolution was just starting, the only power equipment they had were a steam-driven pile driver, steam tugs, and steam locomotives equipped with gondola and dump cars for carrying fill material; the rest of the work had to be done by machete, axe, pick, shovel, black powder, and mule cart. As more track was laid, they had to continually add backfill to the roadbed as it continued to slowly sink into the swamp. Once about 2 miles (3.2 km) of track were laid, the first solid ground was reached, at what was called then called Monkey Hill (now Mount Hope). This was soon converted to a cemetery that housed almost continuous burials.

Cholera, yellow fever, and malaria took a deadly toll, and despite the continual importation of large numbers of new workers, there were times when the work stalled for simple lack of alive and semi-fit workers. All supplies and nearly all foodstuffs had to be imported from thousands of miles away, greatly adding to the cost of construction. Laborers came from the United States, the Caribbean Islands, and as far away as Ireland, India, China, and Australia.<sup>[14]</sup>

After almost 20 months of work, the Panama Railroad had laid about 8 miles (13 km) of track and had spent about \$1,000,000 to cross the swamps to Gatun. The project's fortunes turned in November 1851—just as they were running out of the original \$1,000,000—when two large Paddle steamers, the *SS Georgia* and the *SS Philadelphia*, with about 1,000 passengers were forced to shelter in Limón Bay, Panama, due to a hurricane in the Caribbean. Since the railroad's docks had been completed by this time and rail had been laid 8 miles (13 km) up to Gatún on the Chagres River, it was possible to unload the ships' cargoes of emigrants and their luggage and transport them by rail, using flat cars and gondolas, for at least the first part of their journey up the Chagres River on their way to Panama City. Desperate to get off the ships and across the Isthmus, the gold seekers paid \$0.50 per mile and \$3.00 per 100 pounds of luggage to be hauled to the end of the track. This infusion of money saved the company and made it possible to raise more capital to make it an ongoing moneymaker. The company's directors immediately ordered passenger cars, and the railway began passenger and freight operations with about 40 miles (64 km) of track still to be laid. Each year it added more and more track and charged more for its services. This greatly boosted the value of the company's franchise, enabling it to sell more stock to finance the remainder of the project, which took over \$8,000,000 and 5,000–10,000 lives to complete.<sup>[15]</sup>

By July 1852, it had finished 23 miles (37 km) of track and reached the Chagres River, where a massive bridge had to be built. The first wooden bridge they built failed when the Chagres rose by over 40 feet (12 m) in a day and washed it away. They started work on a much higher 300-foot-long (91 m) massive iron bridge, which took over a year to finish. In all, over 170 more bridges and culverts had to be built.



Railway at Culebra Summit Station, 1854

In January 1854, excavation began at the summit of the Continental Divide at the Culebra Cut, where the earth had to be cut down from 20 feet (6 m) to 40 feet (12 m) deep over a distance of about 2,500 feet (760 m). Several months were spent digging this cut. Later the Panama Canal would require years to cut it deep enough for a canal. The road over the crest of the continental divide at Culebra was finally completed from the Atlantic side in January 1855, 37 miles (60 km) of track having been laid from Aspinwall (Colón). A second team, working under less harsh conditions with railroad track, ties, railroad cars, steam locomotives, and other supplies brought around Cape Horn by ship, completed its 11 miles (18 km) of track from Panama City to the summit from the Pacific side of the Isthmus at the same time. On a rainy midnight on January 27, 1855, lit by sputtering whale oil lamps, the last rail was set in place on pine crossties. The final spike was held in

position, and chief engineer George Totten, in pouring rain with a nine-pound maul, drove the spike that completed the railroad. The next day the first locomotive with freight and passenger cars passed from sea to sea. The massive project was completed.<sup>[16]</sup>

Upon completion the road stretched 47 miles, 3,020 feet (76 km), with a maximum grade of 60 feet to the mile (11.4 m/km, or 1.14%). The summit grade, located 37.38 miles (60.16 km) from the Atlantic and 10.2 miles (16.4 km) from the Pacific, was 258.64 feet (78.83 m) above the assumed grade at the Atlantic terminus and 242.7 feet (74.0 m) above that at the Pacific, being 263.9 feet (80.4 m) above the mean tide of the Atlantic Ocean and the summit ridge 287 feet (87 m) above the same level.<sup>[17][18]</sup> The gauge was 5 ft (1,524 mm) in 53 lb/yd (26 kg/m),  $\Omega$ -shaped rail. This gauge was that of the southern US railway companies at the time. In the U.S., this gauge was converted in May 1886 after the American Civil War.<sup>[19]</sup>

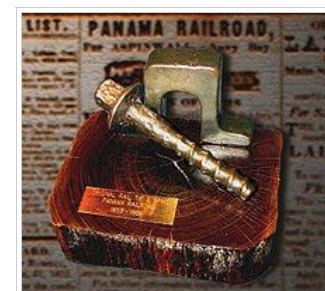
They now had the job of making things permanent and upgrading the railway. Hastily erected wooden bridges that quickly rotted in the tropical heat and often torrential rain had to be replaced with iron bridges. Wooden trestles had to be converted to gravel embankments before they rotted away. The original pine railroad ties only lasted about a year before they rotted away and had to be replaced with ties made of lignum vitae, a wood so hard that they had to drill the ties before driving in the screw spikes. The line was eventually built as double track.

The railroad became one of the most profitable in the world, charging up to \$25 per passenger to travel over 47 miles (76 km) of hard laid track. Upon completion, the railway was proclaimed an engineering marvel of the era. Until the opening of the Panama Canal, it carried the heaviest volume of freight per unit length of any railroad in the world. The existence of the railway was one of the keys to the selection of Panama as the site of the canal. In 1881 the French *Compagnie Universelle du Canal Interocéanique* purchased controlling interest in the Panama Railway Company. In 1904, the US government under Theodore Roosevelt purchased the railway from the French canal company. At the time, railway assets included some 75 miles (121 km) of track, 35 locomotives, 30 passenger cars, and 900 freight cars. Much of this equipment was worn out or obsolete and had to be scrapped.

## Financing

The railway cost some \$8 million USD to build (eight times the initial estimate in 1850) and presented considerable engineering challenges, passing over mountains and through swamps. Over 300 bridges and culverts needed to be built along the route.

It was built and financed by private companies from the United States. Among the key individuals in building the railway were William H. Aspinwall, David Hoadley, George Muirson Totten, and John Lloyd Stephens. The railroad was built and



Example of the original construction 53 lb/yd (26 kg/m) inverted "U" rail, "screw" spike, and lignum-vitae hardwood tie used to build the Panama Railroad after 1855

originally owned by a publicly traded corporation based in New York City, the Panama Rail Road Company, which was chartered by the State of New York on April 7, 1849, and the stock in which would eventually become some of the most highly valued of the era. The company bought exclusive rights from the government of Colombia (then known as Republic of New Granada, of which Panama was a part) to build the railroad across the isthmus.



Certificate for 100 Shares of stock in the Panama Rail Road Co (Cert #16669) dated at New York, August 18, 1871

**A GREAT ENTERPRISE.**

That great enterprise, the inter-oceanic or Panama Railroad across the Isthmus, is completed, and the rough Atlantic is now wedded, with an iron band, to the fair Pacific. The connection thus established, between these mighty waters, carries the mind back to the time when—

“Stout Cortez, with his eagle eyes,  
Stared at the Pacific—and all his men  
Looked at each other with a wild surmise,—  
Silent, upon a peak in Darien.”

What a long stride forward has the world taken since that time! The silent sea then gazed upon by Cortez, is now white with the commerce of all nations; upon its shores a great people have established their government and free institutions, and the islands dotted so thickly upon its bosom, have become the home of civilized and Christianized man.

The first train went over the road from Aspinwall, to Panama on the 28th of January. Its arrival at Panama was viewed with as much surprise by the native population, as Cortez exhibited on beholding the Pacific for the first time. One of the Panama papers says—

“On the arrival of the train near Panama, it was met by a large proportion of the native population, who were anxious to behold the fire-eating steed with his train of carriages. On the approach of the train, they seemed stupefied with amazement; but when the engineer opened his steam whistle, their wonder was changed to fear—and some of the women and children were so entirely bewildered and horrified that they started for the woods, screaming at every jump. The impression upon the entire population, on the appearance of the train at the city, was of the most exciting character, and after the first paroxysm of wonder was over, the people crowded about the train so close as scarcely to leave room for it to move upon the track.”

The transit trip can now be made daily, in from five to six hours, and but a short time will probably elapse before trains will run regularly in four hours.

Newspaper account of the opening of the Panama Railroad, January 28, 1855, from *The Portland (Maine) Transcript* [Newspaper], February 17, 1855 [transcription available]

The railway carried significant traffic even while it was under construction, with traffic carried by canoe and mules over the unfinished sections. This had not been originally intended, but people crossing the isthmus to California and returning east were eager to use such track as had been laid. When only 7 miles (11 km) of track had been completed, the railway was doing a brisk business, charging \$0.50 per mile per person for the train ride and increasing to \$25 per person when the line was finally completed. By the time the line was officially completed and the first revenue train ran over the full length of its grade on January 28, 1855, more than one-third of its \$8 million cost had already been paid for from fares and freight tariffs.

The fare for first-class passage was set at \$25 one way, one of the highest rates in existence for a 47 miles (76 km) ride. High prices for carrying freight and passengers, despite very expensive ongoing maintenance and upgrades, made the railroad one of the most profitable in the world. Engineering and medical difficulties made the Panama Railway the most expensive railway (per unit length of track) built at the time.

**Death toll**

It is estimated that from 5,000 to 10,000 people may have died in the construction of the railroad, though the Panama Railway company kept no official count and the total may be higher or lower. Cholera, malaria, and yellow fever killed thousands of workers, who were from the United States, Europe, Colombia, China, and the Caribbean islands, and also included some African slaves. Many of these workers had come to Panama to seek their fortune and had arrived with little or no identification. Many died with no known next of kin, nor permanent address, nor even a known last name.

**Cadaver trade**

Disease and exhaustion took a heavy toll on workers, in part because the connection between mosquitoes and malaria would not be discovered for another 40 years. The disposal of unidentifiable bodies was a boon to the PCRC, mostly paid for by medical facilities. Medical schools and teaching hospitals needed cadavers to train budding physicians and paid handsomely for anonymous bodies pickled in barrels shipped up from the tropics. The PCRC itself sold the corpses abroad, and the income generated was sufficient to maintain the company's own hospital. A journalist reported sighting the chief doctor at the Panama Railroad Company's hospital

conscientiously bleaching skeletons of dead workers, in hopes of compiling a skeletal museum of all the known races working on the railroad.

**Shipping Lines**

The Panama Railway also operated a significant shipping line, connecting its service with New York and San Francisco. It ran a Central American line of steamships linking Nicaragua, Costa Rica, San Salvador, and Guatemala to Panama City.<sup>[20]</sup> The shipping service was greatly expanded when canal construction began. Ships included the SS *Salvador*, SS *Guatemala*, SS *Cristobel*, and SS *Ancon*, which became the first two ships to cross the completed canal in 1914.



Map of the Panama Railroad, 1861



International connections to the Panama Railroad, 1861



Panama Railroad opens; freight tariffs, 1855 [transcription available]



Panama Railroad Regulations & Schedule, 1861 [transcription available]

**1904-12 rebuild: Panama Canal building and afterward**

In 1904 the United States took over the license to build and operate the canal. The choice to use locks and an artificial lake (Gatun) meant that the old railway route from 1855 had to be changed because it followed the Chagres River valley, which would be flooded by the lake. Also, the railway would be extended and altered continuously for the building process.

**Canal construction years**

The construction of the Panama Canal was envisioned by John Frank Stevens, chief American railroad construction engineer, as a massive earthmoving project using the extended railroad system. Many tracks were added temporarily to transport the sand and rock from the excavation. Stevens used the biggest and most heavy-duty equipment available. The French equipment was nearly all judged obsolete, worn out, or too light duty, and nearly all their railroad equipment was not built for heavy-duty use. Some of this French equipment was melted down and converted into medals presented to men working on the Panama Canal. Also, since the 1855 route followed the Chagres valley (which would become Gatun Lake), the route had to change. The new railroad, starting in 1904, had to be massively upgraded with heavy-duty double-tracked rails over most of the line to accommodate all the new rolling stock of about 115 heavy-duty locomotives, 2,300 dirt spoils railroad cars, and 102 railroad-mounted steam shovels brought in from the United States and elsewhere. The steam shovels were some of the largest in the world when they were introduced. The new permanent railroad closely paralleled the canal where it could and was moved and reconstructed where it interfered with the canal work. In addition to moving and expanding the railroad where needed, considerable track additions and extensive machine shops and maintenance facilities were added, and other upgrades were made to the rail system. These improvements were started at about the same time the extensive mosquito abatement projects were undertaken to make it safer to work in Panama. When the mosquitoes were under control, much of the railroad was ready to go to work.

The railway greatly assisted the building of the Panama Canal. Besides hauling the millions of tons of men, equipment, and supplies the railroad did much more. Essentially all of the hundreds of millions of cubic yards of material removed from the required canal cuts were broken up by explosives, loaded by steam shovels, mounted on one set of railroad tracks, loaded onto rail cars, and hauled out by locomotives pulling the spoils cars running on parallel tracks. Most of the cars carrying the dirt spoils were wooden flat cars lined with steel floors that used a crude but effective unloading device, the Lidgerwood system. The railroad cars had only one side, and steel aprons bridged the spaces between them. The rock and dirt was first blasted loose by explosives. Two sets of tracks were then built or moved up to where the loosened material lay. The steam shovels, moving on one set of tracks, picked up the loosened dirt and piled it on the flat cars traveling on a parallel set of tracks. The dirt was piled high up against the one closed side of the car. The train moved forward as the cars were filled until all cars were filled. A typical train had 20 dirt cars arranged as essentially one long car. On arrival of the train at one of the approximately 60 different dumping grounds, a three-ton steel plow was put on the last car (or a car carrying the plow was attached as the last car) and a huge winch with a braided steel cable stretching the length of all cars was attached to the engine. The winch, powered by the train's steam engine, pulled the plow the length of the dirt loaded train by winching up the steel cable. The plow scraped the dirt off the railroad cars, allowing the entire trainload of dirt cars to be unloaded in ten minutes or less. The plow and winch were then detached for use on another train. Another plow, mounted on a steam engine, then plowed the dirt spoils away from the track.<sup>[21]</sup> When the fill got large enough, the track was relocated on top of the old fill to allow almost continuous unloading of new fill with minimal effort. When the steam shovels or dirt trains needed to move to a new section, techniques were developed by William Bierd, former head of the Panama Railroad, to pick up large sections of track and their attached ties by large steam-powered cranes and relocate them intact, without disassembling and rebuilding the track. A dozen men could move a mile of track a day—the work previously done by up to 600 men. This allowed the tracks used by both the steam shovels and dirt trains to be quickly moved to wherever it needed to go. While constructing the Culebra Cut (Gaillard Cut), about 160 loaded dirt trains went out daily and returned empty—or about one train every 90 seconds.

The railroads, steam shovels, steam-powered cranes, rock crushers, cement mixers, dredges, and pneumatic power drills used to drill holes for explosives (about 30,000,000 pounds (14,000 t) were used) were some of the new construction equipment used to construct the canal. Nearly all this new equipment was built by new, extensive machine-building technology developed and built in the United States by companies such as the Joshua Hendy Iron Works. In addition the canal used large refrigeration systems for making ice, extensive large electrical motors to power the pumps and controls on the canal's locks, and other new technology. They built extensive electrical generation and distribution systems, one of the first large-scale uses of large electrical motors. Electricity-powered donkey engines pulled the ships through the locks on railroad tracks laid parallel to the locks.

### Permanent railroad

New technology not available in the 1850s allowed massive earth cuts and fills to be used on the new railroad that were many times larger than those done in the original 1851-55 construction. The rebuilt, much improved, and often rerouted Panama Railway continued alongside the new canal and across Gatun Lake. The railroad was completed in its final configuration in 1912, two years before the canal, at a cost of \$9 million—\$1 million more than the original. After World War II, few additional improvements were made to the Panama Railway, and it declined after the US government handed over control to the government of Panama in 1979.

Except for dedicated railroad sections, such as the concrete factory, the broad 5 ft (1,524 mm) gauge was used. This gauge was also used for the locomotives along the locks ("mules"). When the gauge for the railroad was changed in 2001, the mules kept the broad gauge.

### 2001 reconstruction

In 2001, the railroad was reopened after a large project to upgrade the railway. On June 19, 1998, the government of Panama had turned over control to the private **Panama Canal Railway Company** (PCRC), a joint venture between the Kansas City Southern Railroad and privately held Lanigan Holdings, LLC. The rebuilt project carries shipping containers as a complement to the Panama Canal in cargo transport. Two container handling terminals were created: on the Atlantic side, near Manzanillo International Terminal (Colón), and the Pacific Intermodal Terminal near Balboa harbour. There are passenger stations in Colón (called Atlantic Passenger Station) and Corozal railway station, 4 mi (6 km) from Panama city. No other stations exist.

### Tracks

The renovation project involved new layings of ballast, sleepers, and tracks. The gauge was changed into 4 ft 8<sup>1</sup>/<sub>2</sub> in



Colón between 1910 and 1920

(1,435 mm) standard gauge, and the rails were replaced with 136 lb/yd (67.46 kg/m) continuously welded rail. A shortcut was added in the route, to the effect that the track no longer touches the Gatun locks. The line is now single track with some strategically placed sections of double track (near Gamboa and Monte Lirio). The floor of the old Miraflores Tunnel had to be lowered to accommodate the extra height double-stacked containers. A maintenance shop was built near Colón that can also receive the container loading portal cranes (which are also owned and operated by PCRC).

## Rolling stock

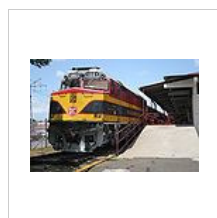
In 2001, most rolling stock was replaced too. The railroad has kept a fleet of several historic passenger cars in service, including PCRC #102, which is a vintage dome car first built for the Southern Pacific Railroad in 1938.

As of August 2009, the railway's motive power consists of ten former Amtrak F40PHs, five EMD SD60s and two EMD SD40-2s from the Kansas City Southern Railroad, and one GP10. The locomotive numbering scheme begins with 1855, honoring the year in which the original Panama Railroad was completed.

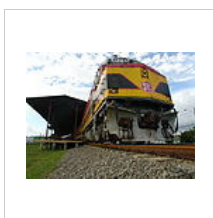
### Roster

Model	Quantity	Acquired	Numbers
EMD GP10	1	2001	1855
EMD F40PH	10	2001	1856-65
EMD SD40-2	2	2008	1866-67
EMD SD60	5	2008	1868-72

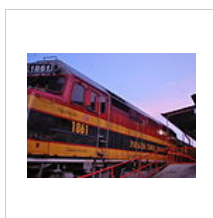
## Gallery



EMD F40PH in *Southern Belle* livery in Colón.



A Panama Canal Railway passenger train parked along the platforms of Colón station.



An early morning passenger train at the Panama City railroad station.



"Mule" locomotives on Panama Canal locks



Panama Canal #1861 at the head of a passenger train within the Colon yards.

## Passenger Service and Freight Capacity

As of 2012, two passenger services are offered every Monday to Friday. The Corozal (Panama City)-Colón train leaves at 7:15 a.m., and the return train leaves at 5:15 p.m., with a traveling time of one hour.<sup>[22]</sup>

While the main purpose of the train is as a commuter rail for those living in Panama City and working in Colón, it has also become a popular tourist excursion. It travels the historic route that crosses the country between coastal cities and passes through the lush jungle and along Lake Gatun, which makes up a substantial section of the canal network. As it was used during the construction of the canal it runs parallel and offers views of the canal. The rail cars are classic in nature with first class amenities, bar service as well as second level viewing areas and outdoor viewing. It thus has a variety of ticket levels from monthly reserved seats to one way purchases.<sup>[23]</sup>

For freight services—that is, transporting containers across the isthmus—the initial capacity allows for 10 trains to run in each direction per 24 hours. With the current rail configuration, this could be extended to a maximum of 32 trains per 24 hours. A train is composed of double-stack bulkhead-type rail cars, typically containing 75 containers, a mix of 60 × 40' and 15 × 20' containers. The basic capacity is around 500,000 container moves a year (approximately 900,000 TEU), with a maximum capacity of 2 million TEU per year.<sup>[24]</sup>

Freight trains are loaded and unloaded in the railway terminals by portal cranes, serving a 300 ft (91 m) long track that can be expanded into six tracks. Containers are transported to and from nearby dock container stacks by truck on a dedicated road.

As of 2013, the railroad was handling about 1,500 containers per day. The Panama Canal carries some 33,500 containers each day.<sup>[25]</sup>

## See also

- History of rail transport
- Rail transport in Panama
- Railroads of Haiti - Short note about Panama Railroad Company.



- Transcontinental Railroad
- Transportation in Panama
- Tramways of Panama
- Panama Metro

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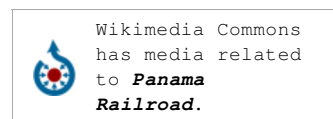
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## External links

- Panama Canal Railway Company (<http://www.panarail.com/>) - Official Site
- The Panama Railroad (<http://www.panamarailroad.org/>) - An unofficial page on the Panama Railroad.
- Panama Railroad: Stock Certificates ([http://cpr.org/Museum/Ephemera/Panama\\_Railroad\\_Stock\\_1868.html](http://cpr.org/Museum/Ephemera/Panama_Railroad_Stock_1868.html)) - An 1855 Newspaper Report of its Opening; 1861 & 1913 Maps; Early Harper's





## External images

Engravings; and 1861 Schedule.

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Categories: Panama Canal | Railway companies of Panama | Railway lines in Panama | Kansas City Southern Railway | Portages  
History of Panama | Railway lines opened in 1855 | Standard gauge railways in Panama | 5 ft gauge railways in Panama

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