

Description of the San Diego Trolley

**SAN DIEGO TROLLEY
IMPLEMENTATION PROCESS
EVALUATION**

Working Paper Number 7

San Diego



ASSOCIATION OF
GOVERNMENTS



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Description of the San Diego Trolley

Following an 18-month analysis of transit alternatives, the MTD Board of Directors made a determination that the San Diego Trolley was a feasible project in June 1978. Final design engineering was initiated in January 1979, the first construction contracts were awarded in December 1979, and revenue service was initiated in July 1981.

PLANNING AND APPROVAL

The San Diego Metropolitan Transit Development Board (MTDDB) was created in 1975. California Senate Bill 101, the legislation creating MTDDB, directed that the planning and design of exclusive mass transit guideways be pragmatic, low cost, and incremental in nature. Based on this direction, principles were adopted by the Board at the initiation of the Guideway Planning Project, which provided direction for conduct of the project study. These principles, adopted on December 27, 1976, are as follows:

- o The selected corridor should extend a long distance and offer high speed operation.
- o The guideway system capital cost should be low.
- o The guideway system should be primarily at-grade and primarily within exclusive right-of-way.
- o The transit system operating costs should be low, and the guideway system should attempt to meet operating costs out of fares (although this is not a prerequisite for system feasibility).
- o The project should measure the impact of the proposed transit system on residential growth.

The feasibility determination came at the conclusion of the 18-month Guideway Planning Project. This project was conducted in two phases. Phase 1 was initiated in December 1976 and involved evaluation of candidate corridors based on the Regional Transportation Plan, subsequent technical studies, and policy guidance by the MTD Board of Directors. Phase 2 began in April 1977 and involved further screening of corridors, selection of a corridor for a starter guideway segment, and a technical assessment of transit alternatives within the selected corridor. Several project objectives were considered in evaluating the transit alternatives, including:

- o Making better use of existing transportation facilities.
- o Using existing financial resources more productively.
- o Providing an effective alternative to the automobile.
- o Improving the attractiveness of public transportation.
- o Making public transportation accessible to all.
- o Making a positive contribution to the quality of life.

The purpose of the Guideway Planning Project was to determine guideway feasibility and select a corridor alignment which would represent an initial guideway element of an overall public transit improvement program. Selection of the South Bay corridor came in the early stages of the Phase 2 study. In the analysis leading to the selection of the corridor limits, a broad array of planning and engineering data was assembled. Included were analyses of available guideway alignments within the corridors, probable environmental, social and economic impacts, station location studies, and order-of-magnitude cost and patronage estimates. The dominant considerations for the selection were low cost, high prospective ridership, and minimal environmental impact.

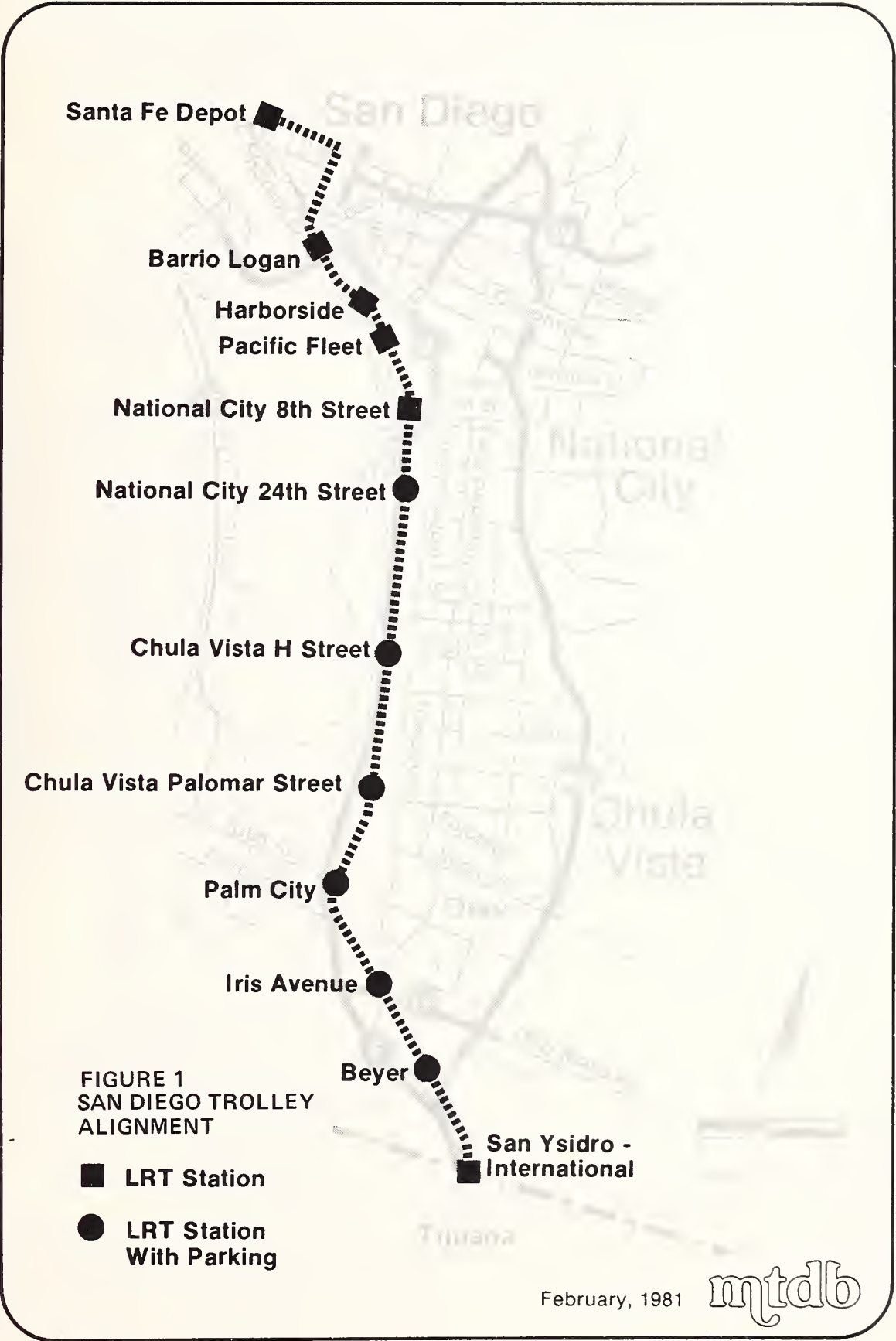
Ultimately, the major factor that led to the selected project alignment was the availability of the San Diego & Arizona Eastern (SD&AE) Railway. On September 10, 1976, a severe storm passed through the east part of San Diego County washing out major portions of the SD&AE Railway between Division and Plaster City. In 1978, the Interstate Commerce Commission (ICC) denied the parent company's request from Southern Pacific Transportation Company to abandon rail service on the line. MTDB then negotiated a purchase price for the railroad of \$18.1 million, and the ICC approved sale in October 1979. Actual purchase took place November 1, 1979.

The project approval process was initiated in June 1978, when the MTD Board of Directors made a determination that the Trolley project in the South Bay corridor was a feasible project. Unfortunately, this action coincided with the passage of State of California Proposition 13 (Property Tax Initiative) which slowed the approval process. The San Diego City Council finally approved the project and an areawide transit financial plan in October 1978. In March 1979, MTDB received final project and financial plan approval from CALTRANS and the California Transportation Commission.

SYSTEM CHARACTERISTICS

The Trolley was designed to use a combination of exclusive right-of-way and mixed street operation. The Trolley travels a total of 15.9 miles (25.3 KM) through central San Diego, National City, Chula Vista, Otay, and south San Diego (see Figure 1).

The majority of the system operates on the existing rehabilitated rail facilities of the SD&AE Railway. The main line of the SD&AE Railway extends along the east side of Interstate 5 and Harbor Drive from the International Border at San Ysidro to just south of San Diego Centre City at Commercial Street.



Because the SD&AE Railway was built as a single track system designed for freight operations only, light rail transit operations required that the existing track and roadbed be upgraded. All grade crossings are protected by automatic crossing gates. Although service was initiated as a single track operation, a double track system will be operating a year after transit service begins.

The guideway operates on existing streets for a distance of 1.7 miles (2.7 KM) in Centre City. The LRT vehicles travel at-grade on an exclusive, reserved path essentially in the center of the street. Eventually, C Street from Kettner Boulevard to 10th Avenue will be developed as a pedestrian and transit way. However, during the initial phase of the guideway operations, automobile traffic is permitted on C Street. Preferential signalization is used to minimize interference with auto traffic at intersections.

The light rail transit system is designed to provide for intra-community transit as well as connections between communities. The stations are spaced to offer high accessibility to the guideway by maximizing access for pedestrians, cyclists, local transit users, and motorists. In Centre City San Diego, the train stops four times along C Street and three times along 12th Avenue. There are eleven suburban stations.

Major bus transfer facilities are provided at three suburban stations and parking is available at six of the eleven suburban stations. Approximately 2,000 free parking spaces are distributed among the stations. All stations have pedestrian and/or bus access. Bicycle storage facilities are also provided.

In Centre City, the LRT stops in zones protected from bypassing traffic. The Centre City Trolley stops shown in Figure 2 are:

- o Santa Fe Depot, near the intersection of Kettner Street and C Street.
- o Civic Theatre, between 2nd Avenue and 3rd Avenue on C Street.
- o Gaslamp, between 5th Avenue and 6th Avenue on C Street.
- o San Diego Square, between 7th Avenue and 8th Avenue on C Street.
- o City College, at the intersection of 12th Avenue and C Street.
- o Market Street, Southbound - on 12th Avenue between Market Street and G Street; Northbound - on 12th Avenue between Island Avenue and Market Street.
- o Imperial, at the intersection of Imperial Avenue and 13th Street.

The eleven suburban stations are shown in Figure 1 and described below:

- o Barrio Logan, located at Crosby Street and Harbor Drive. Bus transfers can be made to Coronado and Southeast San Diego.
- o Harborside, at 28th Street and Harbor Drive, serves National Steel and Shipbuilding and other industrial sites.
- o Pacific Fleet, at 32nd Street and Harbor Drive, serves 32nd Street Naval Base.

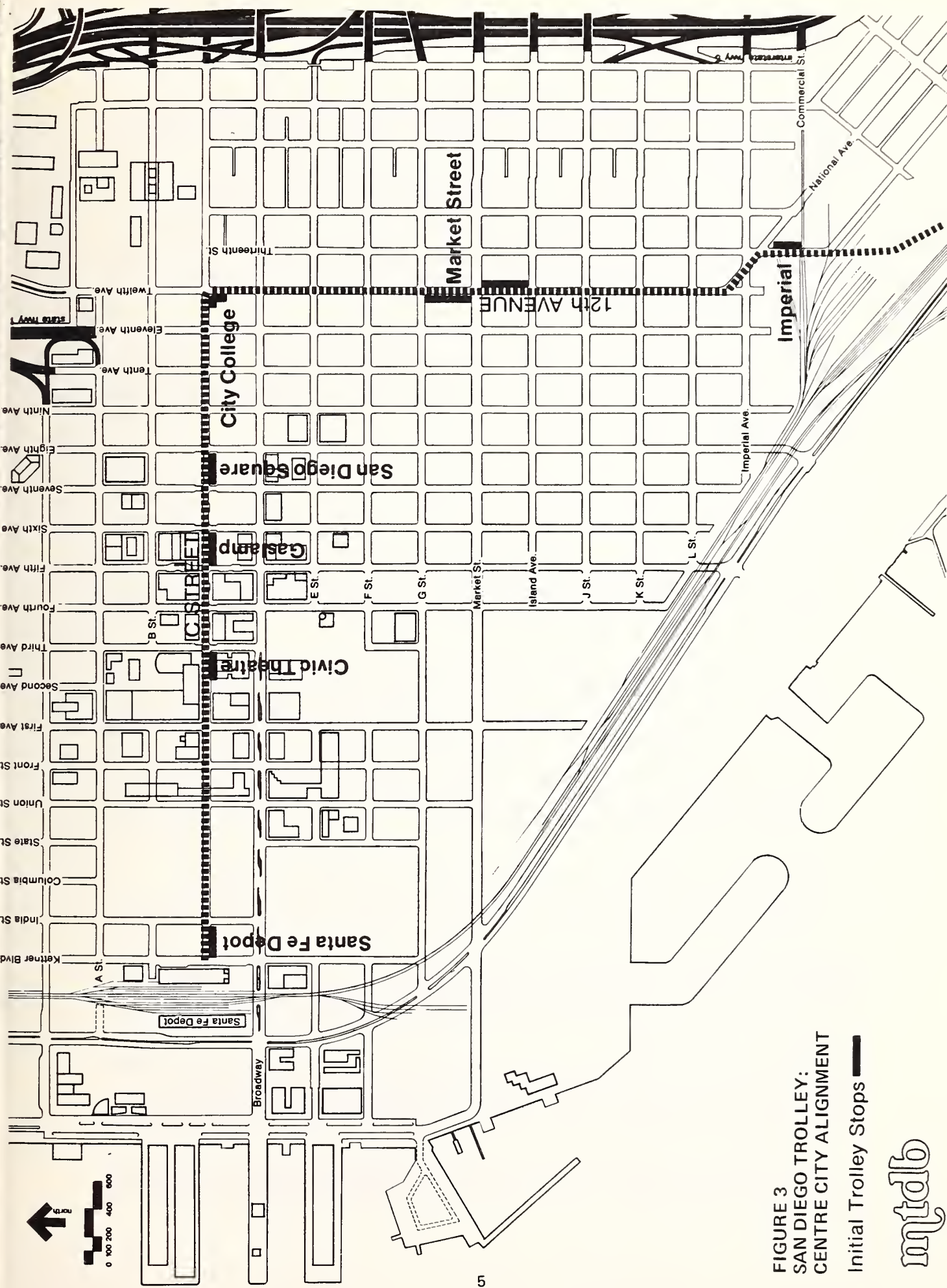


FIGURE 3
 SAN DIEGO TROLLEY:
 CENTRE CITY ALIGNMENT

Initial Trolley Stops —



- o National City 8th Street, on 8th Street near Harbor Drive, serves 32nd Street Naval Base and North National City. Bus transfers to National City.
- o National City 24th Street, on Wilson Avenue near 24th Street, serves residential, commercial and industrial areas of National City. The station provides direct access to State highway Route 54, Bonita, and communities within the Sweetwater River area. There are 180 parking spaces available and a bus storage area for nine (9) vehicles.
- o Chula Vista H Street, on H Street near Interstate 5, serves the central business district and northern neighborhoods of Chula Vista. The station provides direct access to Rohr Industries and Chula Vista Shopping Center. Bus transfers to Chula Vista, including Southwestern College can be made. There is parking for 300 automobiles and a 7-bay bus transfer facility.
- o Chula Vista Palomar Street, on Palomar Street at Industrial Boulevard, serves Otay, southern Chula Vista, and Castle Park. There are 370 parking spaces at the station and a 7-bay bus transfer facility.
- o Palm City, located on Palm Avenue at Hollister Street, serving Imperial Beach, Palm City, and Nestor. Local bus transfers to Imperial Beach and Coronado. The Palm City station has the largest parking lot on the line with 470 spaces.
- o Iris Avenue, on Iris Avenue at Howard Avenue near Highway 117, serves the rapidly growing residential and industrial community of South San Diego. Local bus service is available. There is parking for 330 automobiles at this station and a 4-bay bus transfer facility.
- o Beyer, located between Seaward Avenue and Beyer Boulevard, serves the San Ysidro community. Local buses serve the community. There are 170 parking spaces at this station.
- o San Ysidro-International Border, located directly north of the International Border on San Ysidro Boulevard serves travelers crossing the border, as well as the local community. Local bus service is available.

Guideway stations are modest, low level platforms with a waiting shelter, benches, and light standards. Transit schedule and fare information are provided on large, easy-to-read graphics. Transit system regulations are posted in conspicuous locations. Public telephones and trash receptacles are provided.

The design of the stations gives special attention to the needs of people with low mobility. The entire light rail transit system has been designed to be accessible to elderly and handicapped passengers.

A fleet of 14 articulated light rail (LRT) vehicles are used to provide transit service. Each car can carry 200 passengers and trains of two

or three cars are normally used. The Duwag U2 LRT vehicles are a proven standard design. The vehicles are electrically powered, receiving a current from overhead catenary or wires by means of a pantograph. This is a distinguishing feature of a light rail vehicle. Approximately eleven transformer substations are transmitting 600 volts of direct current power.

The LRT system uses a self-service, barrier-free, fare collection method. Self-service ticketing machines are located at each station and can be used by the passengers to purchase a single-ride ticket or validate a multi-ride ticket. No fare payment or ticket collection is made aboard the LRT vehicle. However, passengers are subject to inspections by roving transit personnel to assure they have a valid proof of payment. This technique speeds service since passengers may board through all doors and drivers are not required to supervise fare collections.

In addition to the single and multi-ride tickets, proof of payment can also be shown by a valid monthly transit pass or transfer from a connecting bus.

SYSTEM OPERATIONS

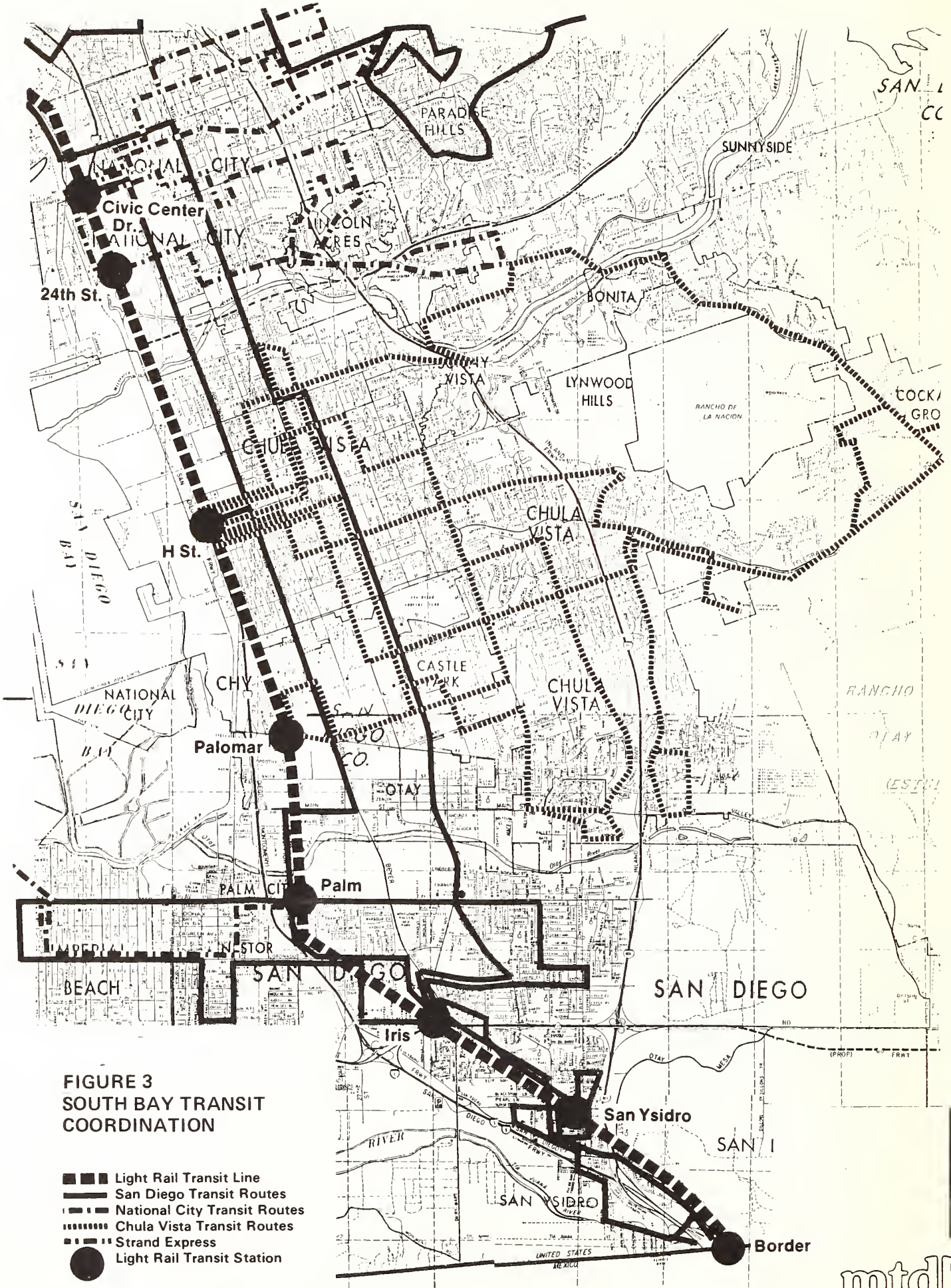
The Trolley operates seven days per week. Trains are currently scheduled at 20-minute headways between 5:00 AM and 9:45 PM. Eventually, the guideway will also operate between 10:00 PM and 1:00 AM at 30-minute headways.

The time required to travel between Centre City San Diego and the International Border is approximately 42 minutes. The overall average system speed through Centre City is nine miles per hour. Along the railway portion of the right-of-way the trains average 25-30 miles per hour. Numerous efforts to minimize operational conflicts are incorporated into the guideway system. The running time from end to end is approximately twice as fast as the previous bus service. Overall system speed will increase to 35-38 MPH when double-tracking is complete, or approximately 36 minutes travel time from the border to the Santa Fe depot.

The light rail transit system is a community collector and distribution system. The guideway system distributes passengers to local transit routes. Currently, bus service in the Study Area is provided by San Diego Transit Corporation, National City Transit Corporation, Chula Vista Transit Corporation, and the Strand Express. Existing bus service was restructured to produce an integrated transit network in the study area, as shown in Figure 3.

MTDB's light rail line is designed to operate as an integral part of the areawide transit system. LRT users are permitted transfer privileges between other transit services in the area. A common monthly pass is also available as a user service.

On April 20, 1981, the MTD Board adopted the initial Trolley fare structure, as shown in Table 1.



**FIGURE 3
SOUTH BAY TRANSIT
COORDINATION**

- ■ ■ Light Rail Transit Line
- San Diego Transit Routes
- - - National City Transit Routes
- · · · · Chula Vista Transit Routes
- · · · · Strand Express
- Light Rail Transit Station

TABLE 1
1981 TROLLEY FARES

One Way Fare	\$ 1.00
One Way Elderly and Handicapped	.40
Reduced Downtown Area Fare	.25
"Ready Ten" - Ten Trip Ticket	7.50
Regional Monthly Pass	31.00
Regional Monthly Elderly & Handicapped Pass	15.50
Transfer Charge from LOCAL or URBAN Services	.20
Transfer Charge from METRO (Express) Services	Free
Transfer Charge for Elderly and Handicapped	Free

FORECASTED PATRONAGE

The actual characteristics of patronage movements on the guideway are subject to numerous factors including the type and level of feeder bus services, guideway linkage to other express transit corridors, guideway service levels, and International Border crossing travel demands. Total guideway patronage forecasts range from 28,000 to 30,000 daily in 1995. The seven Centre City stops represent a major portion of guideway activity, ranging from 50%-68% of the daily patronage.

The trip purpose distribution of forecasted guideway ridership reveals that home-work trips predominate over other trip types, representing 37% to 42% of all guideway usage (excluding border crossings). Prior to Trolley service, approximately 15% of the border crossing travelers using San Diego Transit were destined to a work location, with shopping the primary border crossing activity.

Peak hour guideway patronage is expected to represent approximately 10% of the daily usage. As most other rail systems in the United States experience much higher peaking characteristics (15.0 to 20.0% peak hour versus all-day), this relatively low peak hour demand reflects the flat all-day distribution of border crossing travel (7.0% peak hour versus all-day).

COSTS AND FUNDING

The light rail project is being developed in two phases. The original Phase 1 project included all those activities required to implement a 15.9-mile single track LRT system utilizing 14 light rail vehicles. Phase 2, which is scheduled for completion in December, 1982, involves the complete double-tracking of the LRT line, additional traction power equipment, and the purchase of 10 additional vehicles.

TABLE 2
SAN DIEGO TROLLEY CONSTRUCTION COSTS

<u>PHASE 1</u>	
Vehicles (14)	\$ 12,000,000
Construction & Other Procurement	
Contracts	35,300,000
SD&AE Purchases	18,100,000
Non-SD&AE Right-of-Way	4,000,000
Engineering & Construction	
Management	7,000,000
Interest on Fund Advances	9,000,000
Start-Up Activities	<u>700,000</u>
Phase 1: TOTAL	\$ 86,000,000
<u>PHASE 2</u>	
Double-Tracking	\$ 23,300,000
Additional Traction Power	3,100,000
Vehicle Purchases (10)	<u>9,600,000</u>
Phase 2: TOTAL	\$ 36,000,000
GRAND TOTAL:	\$122,000,000

Guideway operating costs are estimated to be \$3.7 million per year in 1981 dollars. Approximately 62% of this budget will go towards labor costs, as shown in Table 3.

TABLE 3
SAN DIEGO TROLLEY OPERATING BUDGET
FY82 PROJECTION

<u>Item</u>	<u>Projected Cost</u>
Personnel	\$1,700,000
Contractual Services*	753,000
Materials & Supplies	225,000
Utilities	607,000
Casualty & Liability Costs	300,000
Administrative Expenses	90,000
Leases & Rentals	<u>25,000</u>
TOTAL	\$3,700,000

*Includes the following services: track maintenance, ticket inspection, system security, revenue collection, informational service, vehicle interior maintenance, contract bus services.

The financial plan for the light rail system indicates that 87.5% of the capital expenditures for Phase 1 was derived from MTDB's State Constitutional Amendment (SCA 15) account. SCA 15 sets aside a portion of California's state gas tax for guideway development. In FY80, this funding source produced slightly over \$10 million. The remainder of Phase 1 funding was obtained from Transportation Development Act (TDA) monies. TDA monies result from 0.25% state sales tax proceeds.

The Phase 2 project is funded with California SB 620 Transit Guideway Program monies. These are state sales tax monies which have been transferred to the State Transportation Planning and Development Account to be used for transit purposes.

RAIL FREIGHT OPERATIONS

When the petition to abandon service on the SD&AE Railway was filed, MTDB embarked on a study to determine the feasibility of retaining rail freight operations through public ownership and possible joint use by freight and transit. When it became apparent that there existed a good possibility that such joint use was feasible, the MTDB requested and obtained a ruling from the State Transportation Board permitting acquisition of the SD&AE right-of-way.

There are three segments of the SD&AE located within the San Diego metropolitan area -- the Mainline, the La Mesa branch, and the Coronado branch. The Mainline is that portion extending from the International Border at San Ysidro to just south of Centre City San Diego which has been rehabilitated and electrified for passenger use. The La Mesa branch extends 15.5 miles from the intersection with the Mainline south of Centre City to the City of El Cajon. The Coronado branch extends along the west side of Interstate 5 from National City to Imperial Beach.

At the International Border, the tracks enter Mexico. The SD&AE Transportation Company, a private operator under contract to MTDB to operate the freight service, has an agreement with the Ferrocarril Sonora Baja California to operate over 44 miles of their tracks. The railroad re-enters the United States in eastern San Diego County and extends to Plaster City in Imperial County.

In the process of rehabilitating the Mainline and constructing light rail facilities, provisions were made to facilitate freight service. This was accomplished by extending freight leads to accommodate clusters of shippers off the Mainline, providing a series of ladder tracks to sort and store cars crossing the International Border, and building a freight maintenance facility just north of the International Border. Complete double tracking of the Mainline, although primarily to improve operating efficiencies of the LRT service, will also simplify joint transit/freight operations.

There will be one Mainline freight operating daily between Imperial County and San Diego County. There is also a daily local switching movement, working trackage along the Mainline, as well as the Coronado

branch. In addition, a daily local freight operates along the La Mesa branch between San Diego and El Cajon.

A record of carload trends between May 1980 and February 1981 is shown in Table 17. Although the storm-damaged portion of the railroad has been restored in east San Diego County and Imperial County, through routing between Imperial and San Diego Counties has not been restored due to two, more recent, railroad bridge washouts in Tijuana, Mexico. Carload shipments should increase when through routing is restored.

TABLE 4
FREIGHT CARLOAD TRENDS
SD&AE RAILROAD

	<u>2/81</u>	<u>1/81</u>	<u>11/80</u>	<u>10/80</u>	<u>9/80</u>	<u>8/80</u>	<u>6/80</u>	<u>5/80</u>
Switch Revenue Only	72	72	59	78	65	75	69	78
Mexico to Mexico To the Port and A.T.S.F.	323	278	248	288	191	107	33	66
Other	406	545	531	141	216	520	753	670*
	320	857	553	353	337	293	359	--
TOTAL CARS:	1,121	1,752	1,491	880	809	995	1,214	

*Line Haul Revenue, Loss of Service due to Mexican Bridge damage.

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