**Where it all began:** This photograph of the Gulf Freeway overpass at Calhoun shows the exact location of the dedication ceremony for the first freeway segment in Houston, which took place on September 30, 1948. This photograph was taken one month later on November 3, 1948. (Photo: National Archives 30-N-48-1436)

# Building the System

It was a warm autumn evening in late September 1948. A crowd of politicians, dignitaries, guests, and curious onlookers began to congregate at an unusual location—a place most had never been before. Many surely sensed it was an important event for Houston, but few realized how dramatically it would transform the way they lived and the way their city would grow and sprawl. It was the introduction of a new concept in transportation that had been tried elsewhere and had now reached Texas, and in the spirit of Texas was declared to be done bigger and better than anywhere else. On that night, the crowd gathering on the freeway overpass would witness the dedication and official opening of the first segment of the Gulf Freeway.

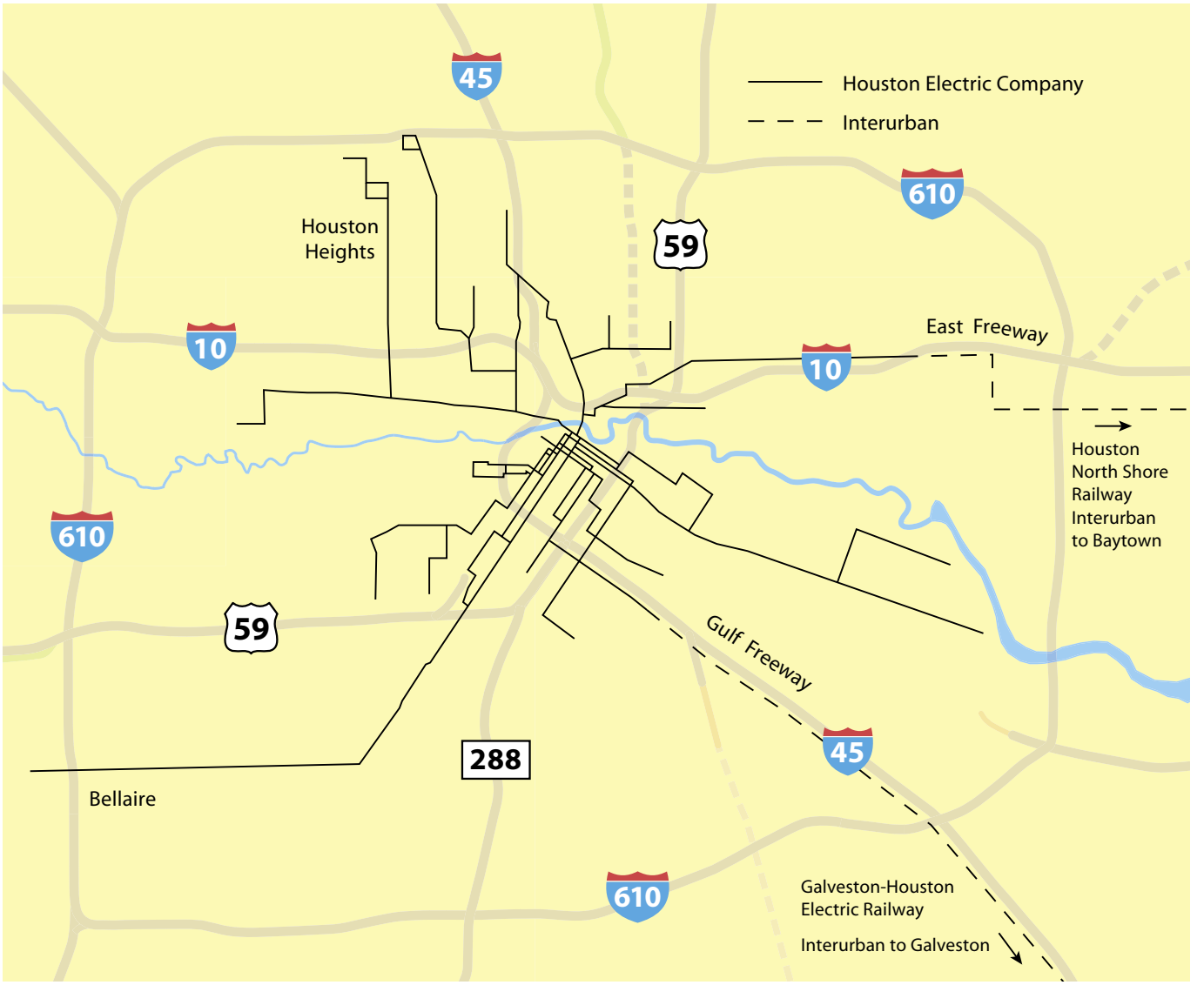
After the usual statements by the officials, Mayor Oscar Holcombe threw a circuit breaker to illuminate the freeway lighting, and a brand-new stretch of freeway emerged from the darkness. The scene was rife with symbolism, as the freeway would light the way to a new future for Houstonians. Just eight years before, the very location of the freeway had been an electric railway providing transit service for Houstonians. Now private automobiles lined up for a half-mile in both directions from the dedication point, awaiting the official green light to proceed on the freeway. Motorists kept the freeway busy into the evening as they took their first drive on the new concrete wonder.

This scene would repeat itself in cities all across the United States. An automobile-hungry society, technological advances, rapidly increasing standards of living, and government policies combined to make the postwar American city a freeway metropolis. But only in a few cities would the freeway metropolis reach the greatest proportions: Los Angeles, New York City, Chicago, Dallas–Fort Worth, and Houston. Among the nation's leading freeway cities, no other city has demonstrated Houston's sustained and ongoing commitment to an ever-expanding and improving freeway system. Houston has built one of the world's most impressive freeway systems. As with any history, it is a drama with leaders and visionaries, victories, defeats, crises, controversies—and continuously evolving visions of the future.


**Cruising in style:** Car 420 shown above was part of a batch of 20 deluxe streetcars purchased for Houston's electric railways in 1927. The electric railway system reached its peak in 1927 with 90 miles (144 km) of track. This 1928 photo shows a streetcar passing in front of the City Auditorium on Texas Avenue. Jones Hall for the Performing Arts, which opened in 1966, was later constructed at this location. (Photo: HMRC MSS 334-486)

# Before the Freeways

On the eve of the freeway era in 1948, Houston was ill-equipped to handle the large number of automobiles that were starting to appear on its roadways. The founders of Houston, the Allen brothers, laid out a high-quality grid system for the city in 1836, but the growth of the city soon exceeded the bounds of the original grid and a "cancerous ring of haphazard growth took shape" around the originally planned city. Houston's streets were extended from the periphery of the city in a generally unplanned manner and efforts to provide a high-quality, planned street system were unsuccessful. Houston's electric streetcar system served the area well and helped fuel suburban growth from 1890 through the 1920s, but the system went into steep decline in the 1930s and was fully replaced by buses in 1940. After World War II, Houston was facing rapidly increasing automobile ownership with a poorly planned street network designed for the pre-automobile era. An extensive freeway system would soon become a necessity.[1]




**Houston's electric streetcar system at its 1927 peak:** The streetcar system was very compact, fitting almost entirely within today's Loop 610. The only routes extending substantially outside Loop 610 were the interurban railways—the Galveston-Houston Electric Railway along the Gulf Freeway and the Houston North Shore Railway near the East Freeway. Suburban track was most prevalent on the northwest side of downtown, serving the Heights neighborhood. (Map adapted from *Houston Electric*[2])


**Houston's streets bustle with streetcars:** For 49 years electric-powered streetcars navigated the streets of Houston on the tracks of the Houston Electric Company. This 1920s view looks north along Travis Street, near the hub of streetcar activity on the north side of downtown. (Photo: HMRC MSS 200-311)

### Streetcars

Houston's first streetcar service was a simple, mule-drawn car that began service in 1868 and by the end of the year had ceased operation. The first sustained service began on May 2, 1874, with a mule-powered system that traveled at less than 10 miles per hour (16 km/h). By 1890 the successful streetcar system had approximately 30 miles (48 km) of track and was spurring rapid residential development in the suburbs along its rail lines. The first electric streetcar was put into service on June 15, 1891, and by 1892 the electric streetcar system had 35 miles (56 km) of track on which 13 routes operated. Suburban real estate development further accelerated, with new subdivisions being built around new rail lines. One of Houston's best-known neighborhoods of the era, the Heights, was built around a streetcar route that opened in 1892. The streetcar system suffered some financial difficulties in the 1890s, but resumed its growth after the turn of the century and expanded to reach its peak of 90 miles (144 km) of track in 1927.

The streetcar first faced competition from rubber-tired vehicles in 1914 when the first "jitney" carriers appeared. A jitney was a private vehicle similar to a taxi carrying passengers for a fee, but operating on a somewhat fixed route. By March 11, 1915, 656 jitneys were operating in Houston. The jitneys were a serious financial threat to the streetcar operator, Houston Electric Company. A city ordinance in 1915 imposed a license fee on jitneys, thinning the ranks to 125 by the end of 1915, much to the relief of Houston Electric. The beginning of the end for streetcars in Houston occurred on April 1, 1924, when the first bus entered service in Houston. The streetcar company, Houston Electric, also operated the buses and found them particularly suited to providing new service in developed sections of the city, express service to outlying residential areas, and feeder routes from areas with low population density. The bus was especially attractive to real estate developers, who could establish service to their new subdivisions at a low cost.

One by one, the streetcar lines were replaced by bus service. The Bellaire streetcar line, which had always been a financial loser and whose track had substantially deteriorated, was the first to be replaced in September 1927. The Great Depression, which began in 1929, reduced streetcar and bus patronage from 42 million fare-paying passengers in 1929 to 26 million in 1932. The weakened financial position of Houston Electric accelerated the transition to less capital-intensive buses. The abandonment of streetcar


**The beginning of the end of streetcar service:** The first bus was placed into operation in 1924, beginning the conversion to buses that gained momentum in the 1930s and was completed in 1940. This circa-1926 photo shows an early bus model with an electric streetcar passing in the background. (Photo: HMRC MSS 200-358)

**Key dates in Houston streetcar history**

| | |
|---|---|
| **1874** | First sustained mule-powered streetcar service begins. |
| **1891** | First electric streetcars enter service. |
| **1924** | First bus service. |
| **1927** | Peak extent of streetcar system with 90 miles (144 km) of track. |
| **1936** | Widespread conversion to buses begins. |
| **1940** | Houston Electric Company ends streetcar service. |
| **2004** | Electric streetcars return to Houston with light rail on Main Street. |

lines and replacement by buses began moving at full speed in 1936 when six streetcar routes were replaced. The Galveston-Houston Electric Railway ceased service in 1936, although the track within Houston continued to operate as the Park Place streetcar line.

On April 12, 1940, Houston Mayor Oscar Holcombe announced that he had reached an agreement with the Houston Electric Company for the termination of streetcar operations. The Houston Electric Company would be authorized to abandon all streetcar operations, and the city of Houston would be responsible for removing the remaining 42 miles (67 km) of track and refurbishing city streets. In return, Houston would receive a $50,000 payment and, most importantly, the prize that Mayor Holcombe was seeking: the right-of-way of the Park Place streetcar line. Holcombe's pet project was the construction of a new superhighway to Galveston—on the route of the former electric railway.[3]

At 1:32 A.M. on Sunday, June 9, 1940, Houston's streetcar era came to a close as the last regularly scheduled streetcar pulled into the maintenance facility. In August, Houston City Council requested bids for the removal of streetcar rails and the demolition of the Galveston-Houston Electric Railway concrete overpass over railroad tracks at Calhoun Road. The stage was set for the freeway era, but it wouldn't happen right away.[4]

## Houston and Los Angeles Compared

Houston's electric railway system was dwarfed by the electric railways of southern California. The Los Angeles Railway Company, which served the city of Los Angeles, had 385 miles (616 km) of track in 1924, far more than

**Houston vs. Los Angeles:** This view of the Hollywood Freeway through Cahuenga Pass north of downtown Los Angeles illustrates some of the differences between Houston and Los Angeles in the pre-freeway and early freeway eras. The electric railways of southern California dwarfed Houston's streetcar system, both in track mileage and area served. The Hollywood Freeway had a rail corridor in its median until 1952. Freeways and electric railways coexisted in Los Angeles for 22 years. (Photo: National Archives 30-N-44-1296)

Houston's 90-mile peak. Even more impressive was the Pacific Electric Railway, which connected the cities spread out across the Los Angeles Basin and San Fernando Valley. It had more than 1,100 miles (1,760 km) of track in 1925. Prior to the freeway era, electric railways in the Los Angeles region had enabled the region to accommodate a large amount of sprawl. In contrast, Houston's electric railway system was very compact, fitting almost entirely into the 5-mile (8 km) radius of today's Loop 610.[5]

In Houston there was no overlap of the streetcar and freeway eras. Houston's electric streetcar service was shut down in 1940, 8 years before the opening of the first freeway in 1948. In Los Angeles, freeways and streetcars coexisted for 22 years after the opening of the Pasadena Freeway in December 1940, with the last streetcar line remaining in service until March 1963. The Hollywood Freeway at Cahuenga Pass had streetcar tracks in its central median until 1952. Once the freeway era began, Houston and Los Angeles went down similar paths, building extensive freeway networks.

### The 1942 Street Plan

Houston in 1942 was not a city designed for large numbers of automobiles. With rapidly increasing private automobile ownership in the United States and Houston, this was recognized as a serious problem and prompted the development of the 1942 *Major Street Plan for Houston and Vicinity*. The first effort to impose a street plan in Houston was part of a general city planning report in 1913. However, the 1942 document reported "no record of consistent efforts to carry out this plan." A second major street plan was published in the comprehensive 1929 *Report of the City Planning Commission*, but fell victim to the financial crisis of the Great Depression. Due to the lack of a City Planning Commission with enforcement power from 1929 to 1935, structures were built and other development occurred in the path of thoroughfares contemplated in the 1929 plan, rendering much

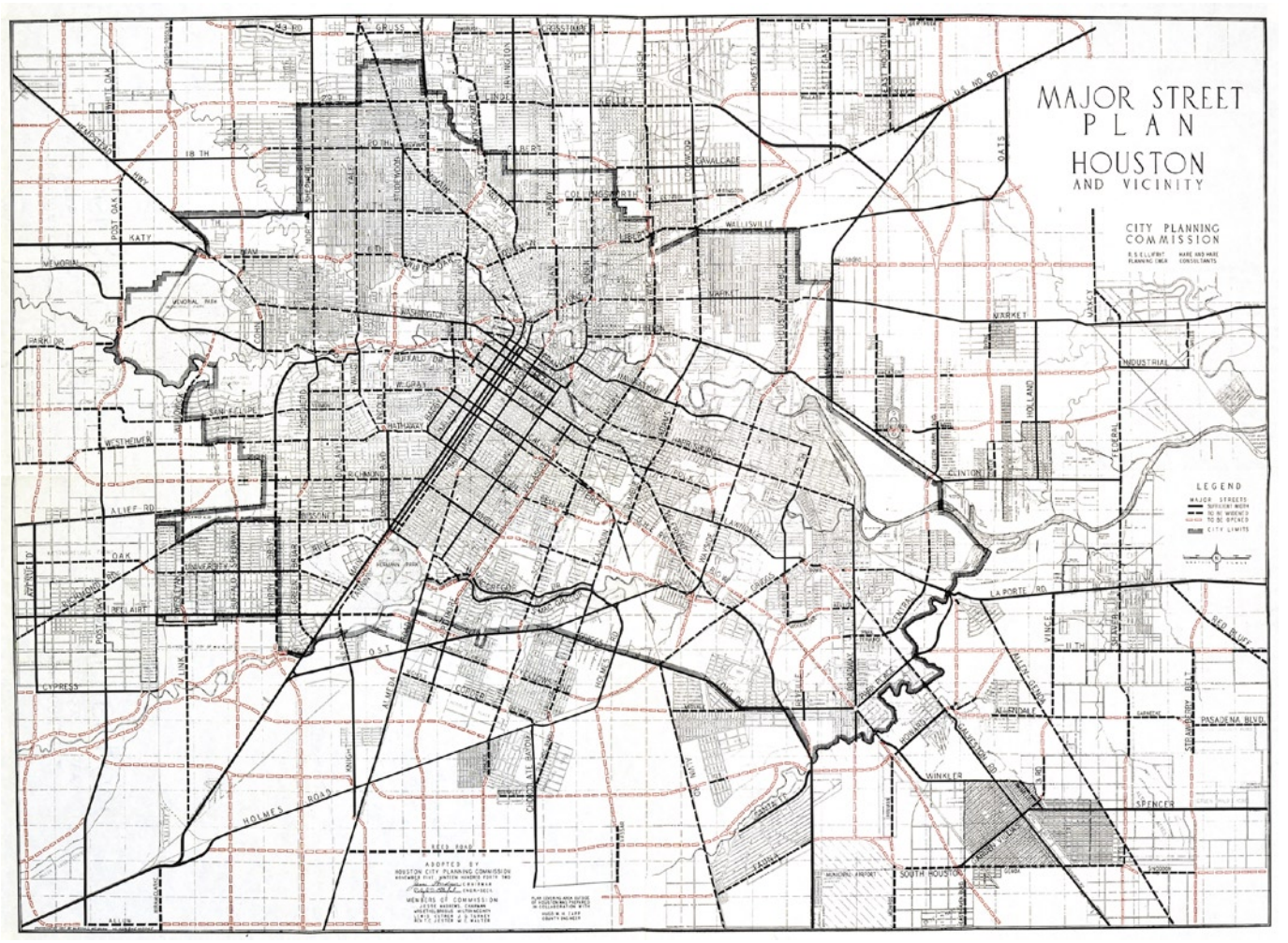
**The "deathtrap":** This 1920s photo shows Allen Parkway, then called Buffalo Drive, passing underneath a railroad trestle. The 1929 *Report of the City Planning Commission* stated that "this deathtrap on the most heavily travelled drive in the city should be removed without delay." The Allen Parkway rail crossing was typical of the poorly planned street conditions that existed during the early automobile era and persisted until after World War II, when better plans were developed and, more importantly, implemented. (Photo: HMRC MSS 157-111)

of it "impracticable." The 1942 report warned, "Dead-end streets, jogs, offsets, and narrow rights-of-way in many parts of Houston give evidence of what has happened in the past and what will happen in the future unless there shall be adherence to a plan for the general framework—a Major Street Plan."[6]

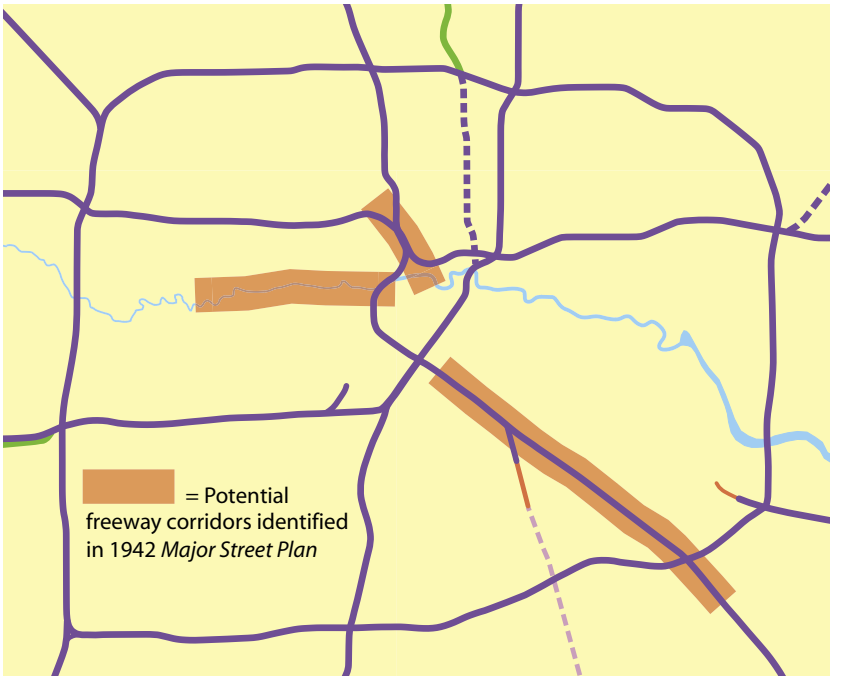
The 1942 plan presented a comprehensive, new thoroughfare plan for Houston, but it did not include freeways. However, the report did recognize that freeways would be necessary in the future and identified three corridors where freeways would be feasible. Limited-access highway facilities were later built on all three locations. The corridor of the former Galveston-Houston Electric Railway would become the Gulf Freeway, the corridor along Buffalo Bayou west of downtown would become Memorial Parkway, and the corridor along White Oak Bayou north of downtown would become the North Freeway. The 1942 report seemed to suggest that freeways could be constructed only where wide, structure-free corridors with few intersecting streets already existed. Most likely for financial reasons, the authors of the report did not consider the clearance of urbanized areas for freeways to be a viable option.

**Key dates in Houston pre-freeway road planning**

| | |
|---|---|
| **1836** | The Allen brothers found the city of Houston and lay out a grid system for central Houston. |
| **1913** | The first development plan is published, but its road recommendations are largely ignored. |
| **1929** | The City Planning Commission releases a comprehensive report which is not implemented because of the Great Depression. |
| **1940** | The City Planning Commission is reestablished and strengthened after three previous dissolutions. |
| **1942** | The *Major Street Plan for Houston and Vicinity* is published, recognizing the need for freeways but not officially designating any freeways. |
| **1943-1946** | TxDOT designates freeways in Houston. |
| **1955** | The city of Houston's *Major Thoroughfare and Freeway Plan* becomes the first official local plan to include the freeway system. |




**Freeway-less plan:** The *Major Street Plan for Houston and Vicinity* published in 1942 was the first major update to Houston's street plan since 1929. The planned street network for Houston is shown above. The plan attempted to correct the largely haphazard and unplanned growth in the street network that had occurred in the previous decades. The 1942 plan did not include freeways, but recognized the need and identified three corridors that were good candidates for freeways.




**Ideal freeway corridors:** The three freeway corridors discussed in the 1942 plan are superimposed on today's freeways in this map. Two of the corridors became freeways, and the third became Memorial Parkway, a limited-access facility.

**Streetcars return to Houston:** After a 64-year absence, streetcars will return to Houston streets in 2004 on the $325 million, 7.5-mile (12 km) light rail line. Construction began in 2001 after substantial controversy and litigation. This photo shows tracks being laid south of downtown on Main Street. (Photo: November 2002)

**The ribbon cutting:** As Houston's freeway system took shape in the 1950s and 1960s, ribbon cuttings were a frequent event as officials celebrated one new freeway opening after another. This ribbon cutting took place on the Galveston Causeway on July 26, 1961. (Photo: TxDOT)

# Putting the Freeway System on the Map

The era of the freeway was waiting for its time. In the 1930s, plans for superhighways had been dashed by the Great Depression. In the early 1940s, World War II precluded freeway construction not directly related to the war effort. Houston's 1942 *Major Street Plan* was very modest in terms of freeways, recognizing the future need but not putting any routes on the official planning maps.

But local officials had seen the future in the 1930s, and it was a freeway future. Houstonian Ross Sterling, chairman of the Texas Transportation Commission from 1927 to 1930, initiated efforts to build the Gulf Freeway in 1930. Mayor Oscar Holcombe took the lead in promoting the Gulf Freeway in the late 1930s, and planning for the Gulf Freeway continued during World War II. But it would be the 10-year period after World War II that would define Houston's freeways, and Houston itself.

## Early Efforts

August 14, 1945: V-J Day. Japan had surrendered, and World War II was over. The nation's resources could be directed toward peacetime activities, and highway construction was near the top of the list. The freeway routes that officials in Houston had contemplated during the wartime years would now begin to develop into an overall system.

The planning for Houston's freeway system was somewhat behind the efforts of other cities. The first comprehensive freeway plan for Los Angeles had been proposed in 1937, and Los Angeles completed its first freeway, the Pasadena Freeway, in December 1940. In New York, Robert Moses had already constructed an extensive parkway system in the greater New York City area prior to World War II. Detroit, Michigan, was another early leader. However, there seemed to be very little influence from other cities on the development of Houston's plans. None of the cities in the vanguard of the freeway movement were as geographically suited for the new type of plan that would take shape in Houston: the loop and radial system.[7]

The key players in the early development of Houston's freeway system were the city of Houston, the Houston office of TxDOT,[*] the Houston Chamber of Commerce, and to a lesser extent, Harris County. Each of the players took specific roles in the process. This freeway construction partnership built Houston's original freeway system and would generally stay intact over the following decades, although the influence of certain players would wax and wane over time.

The first task was to define the needed freeways and their general alignments. The city of Houston and the TxDOT Houston office worked together to perform this task. In the early years, the city of Houston took charge of the process with Planning Director Ralph Ellifrit, Mayor Oscar Holcombe, and the Houston Planning Commission taking the lead. TxDOT acted in more of a consultative role.

When the needed routes were identified, the Houston Chamber of Commerce Highway Committee took responsibility for the crucial political tasks in the process. This included building public support, leading the pro-freeway efforts of the business community, obtaining state approval of the proposed freeway routes, and securing funding.

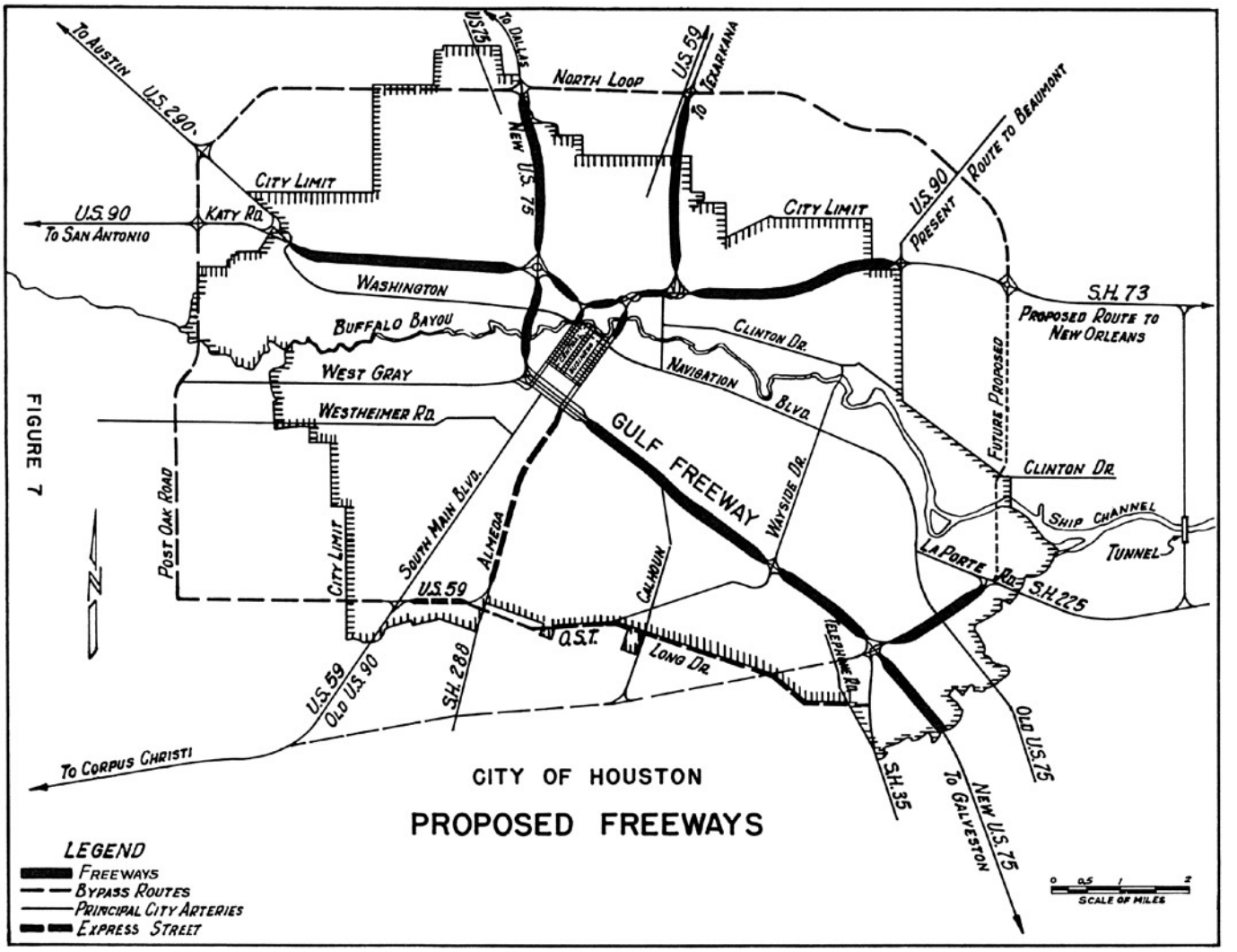
Once the freeway routes were adopted into the state highway system, exact alignments were approved by the Houston office of TxDOT, often in coordination with the city of Houston and Harris County. The city of Houston and Harris County then established "building lines,"[†] which prevented construction on property in the path of proposed freeways. Until 1956 the city of Houston and Harris County were responsible for all right-of-way acquisition costs, a burden which was substantially shifted to state and federal agencies in 1956 and 1957. TxDOT was fully responsible for the final step in the process, detailed design and construction.

In October 1943, the Texas Transportation Commission[*] officially designated Houston's first freeway—US 75 south of downtown, now the Gulf Freeway. In May 1945, the commission approved the US 75 route (now IH 45) along the western and southern edges of downtown, the US 59 Eastex Freeway from downtown to Loop 137 (now Loop 610), and a short section of SH 225, the La Porte Freeway, east of the Gulf Freeway. In October 1946, the commission approved the addition of the US 90 Freeway (now IH 10) across Houston, and the northward extension of the US 75 Freeway from downtown to the city limit.[8]

At this point, Houston's freeway system consisted of five spokes converging on downtown, plus the SH 225

[*] The present-day acronym for the Texas Department of Transportation, TxDOT, is used for all references to the highway-building agency of the state of Texas, which was the Texas Highway Department from 1917 to 1975 and the State Department of Highways and Public Transportation from 1975 to 1991. Similarly, the Texas Transportation Commission refers to both the present-day commission and its predecessors.

[†] "Building lines" defined the right-of-way for planned freeways in the Houston region and were established by the city of Houston and Harris County. If property was within the building lines for a freeway, the property owners generally could not receive permits to improve the property, and if improvements were made after building lines were established, the improvements would not be entitled to compensation.



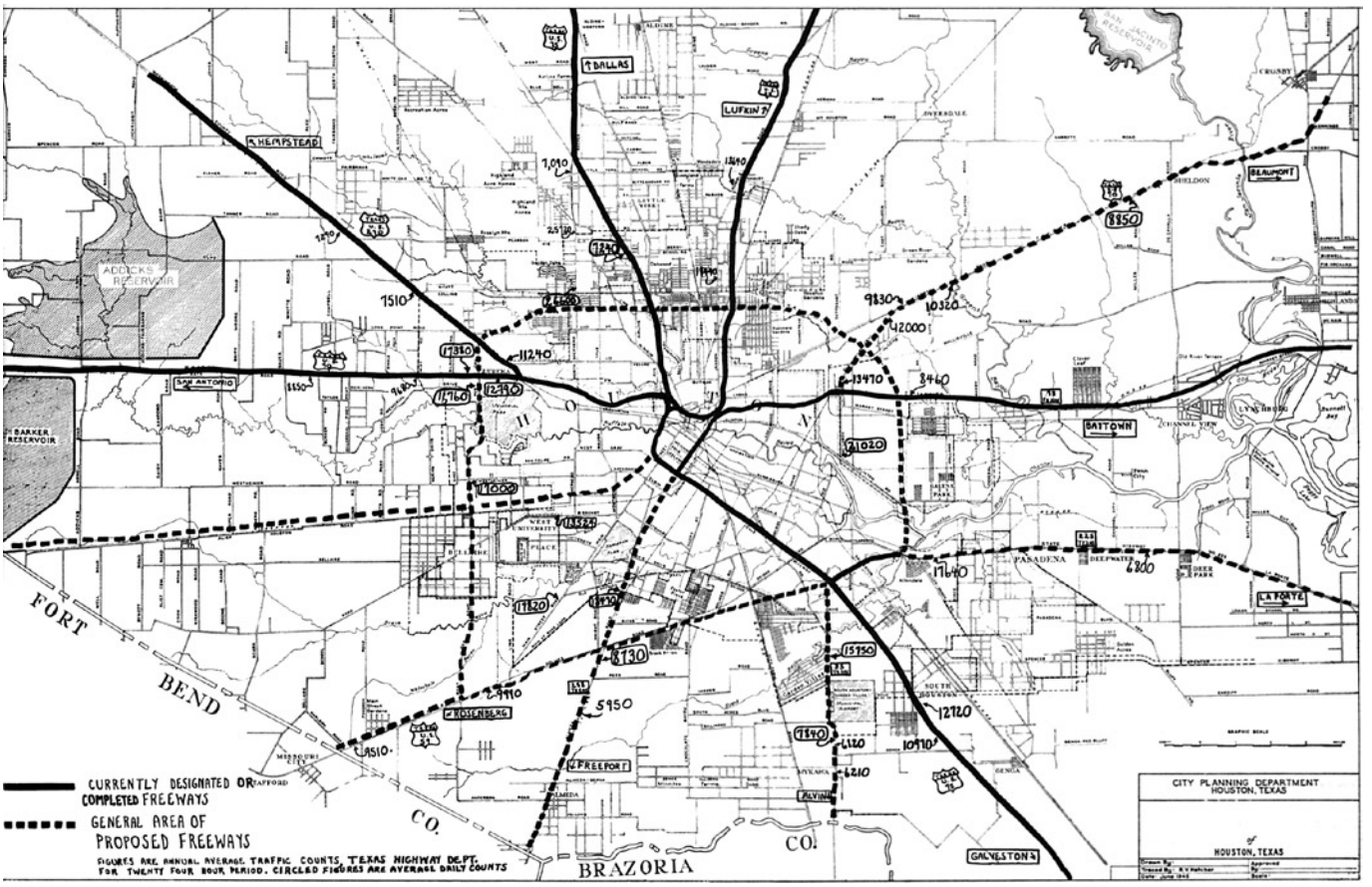

**The first freeway plan, 1947:** The first plan was actually more of an ad-hoc collection of the freeway routes that had been approved by the Texas Transportation Commission. The plan consisted of five spokes converging on downtown Houston and a spur on the Gulf Freeway that connected to SH 225 in southeast Houston. The Houston office of TxDOT developed a plan for constructing these routes in late 1947, and this map was drawn in 1949.[9]

spur route off the Gulf Freeway. The North Loop, approved as the US 90 bypass route in June 1942, was still planned as an arterial street. These approved routes served as the basis of a highway construction plan formulated in late 1947. Most of this work came under the jurisdiction of the TxDOT Houston Urban Project Office, which was headed by William James Van London, generally known by his initials W. J. The Urban Project Office was established in 1946 and was responsible for TxDOT projects generally within the city limits of Houston, which at the time were located near present-day Loop 610. The TxDOT Houston District Office was responsible for projects outside Houston. Van London managed the design of Houston's first freeway, the Gulf Freeway, and was the first person to have a big influence on the design and construction of freeways in Houston.[10]

### The Master Plan

In the early 1950s local officials began to formulate a more comprehensive freeway plan for Houston. This effort resulted in a plan that was presented to the Texas Transportation Commission in July 1953. The freeway system was taking shape, but it was still a work in progress, with final route determinations to take place in 1954. The 1953 plan showed a freeway along the full length of the Westpark-Alief Road corridor and a freeway along US 90A. These two routes were later replaced by the Southwest Freeway. The 1953 proposal showed the South Loop along Holmes Road. Both the Northeast and Northwest Freeways were shown on preliminary alignments. Near Hobby Airport in southeast Houston, the plan included a freeway which was removed from the final version. In September 1953, the Texas Transportation Commission officially approved freeway status for US 59 (the Southwest Freeway), SH 288 (the South Freeway), and the eastward extension of SH 225 toward La Porte. In December 1953, the commission officially approved US 290 (the Northwest Freeway) into the freeway plan.[11]

In late 1953 the City of Houston Planning Department staff was busy refining the freeway plan, including the




**The developing master plan, 1953:** This map was included in a booklet summarizing the presentation Houston officials made to the Texas Transportation Commission in July 1953. Houston officials were requesting the commission to adopt the proposed new routes shown by dashed lines into the state highway system. The Southwest, South, and La Porte Freeways were approved in September 1953. This original plan included many features that were dropped from the final plan.

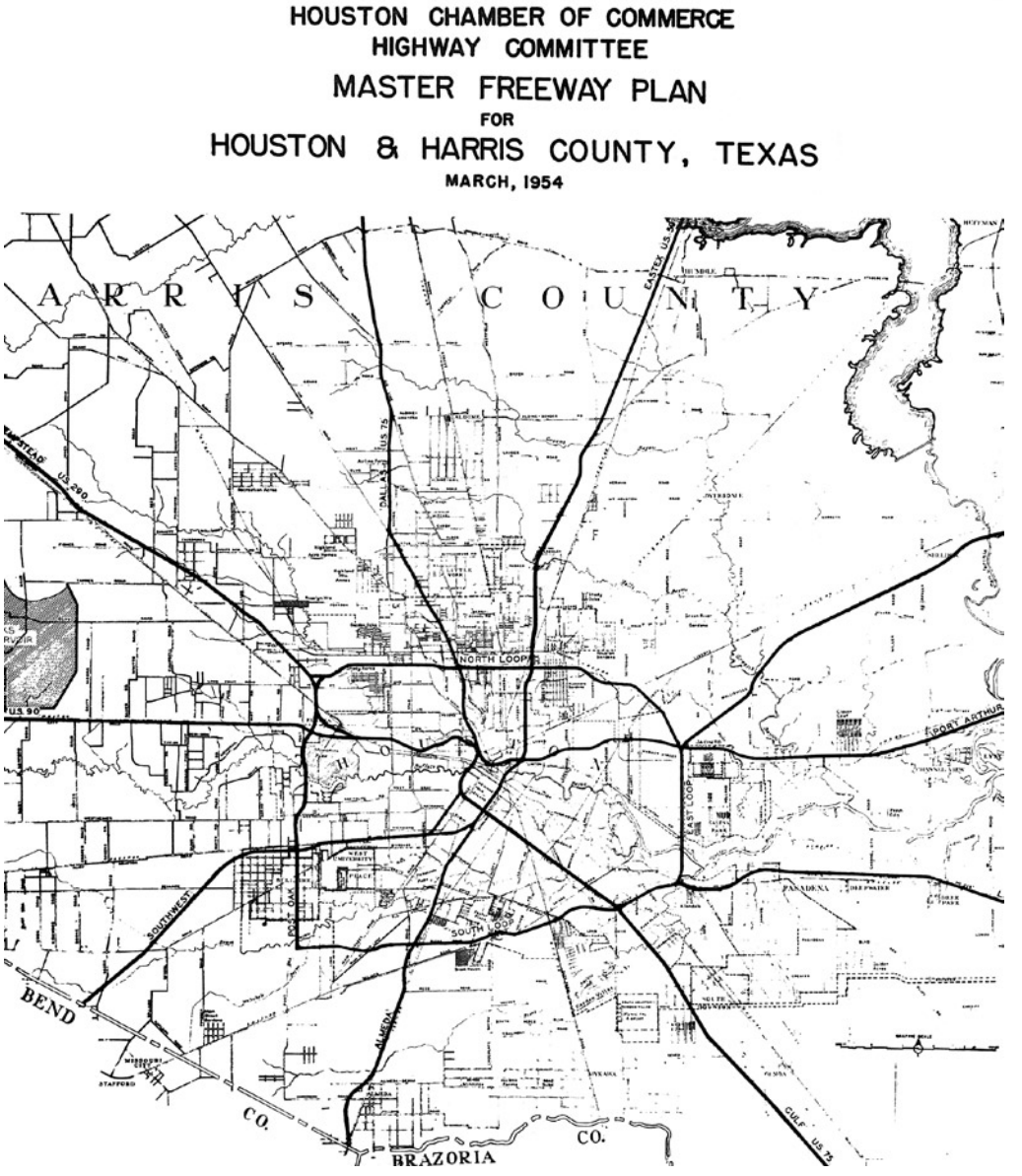
alignment of the Southwest Freeway and the South Loop. A revised alignment for Loop 610 was presented to the Texas Transportation Commission in September 1954 and officially accepted in October. By the end of 1954 Houston's core freeway system had been defined. A few adjustments were made to the routes in the plan, but for the most part the plan was complete. The 1955 edition of the city of Houston's *Major Thoroughfare and Freeway Plan* was the first to show the full freeway system.[12]

The 1954 Annual Report of the Houston City Planning Commission, published in early 1955, described the cooperation that produced the freeway plan: "Success in connection with the planning and development of the freeway system has been largely due to the splendid coordination of all agencies involved. From the beginning, the State Highway Department, the City and County governments, and the Highway Committee of the Chamber of Commerce have worked closely and unselfishly. The Highway Committee has worked as a coordinating agency and has organized the important presentations which have been made to the Highway Commission regarding expansion and development of the freeway system."

Probably the most influential individual in the development of the freeway plan was Ralph Ellifrit, who served as director of Houston's Planning Department from 1940 until 1963, except for a three-year absence for military service during World War II. In a 1979 interview looking back on his career, Ellifrit stated, "We actually had more influence on the location of our freeways than almost any other city, as opposed to the highway department. In fact, we were way out ahead of them and had the whole system planned before [the highway department began its efforts]." Some in TxDOT may not fully agree with Ellifrit's recollection, but a review of project files shows Ellifrit taking the lead in defining the freeway system again and again, especially in regard to alignment decisions undertaken in cooperation with the Houston office of TxDOT. Harris County played a role in freeway alignment decisions outside the Houston city limits, but was a secondary player to the city of Houston in the early years of the development of the freeway system.[13]

### Getting the Construction Machine into Gear

The plan was made. The routes were approved. Now it was up to the city of Houston to acquire the right-of-way so TxDOT could begin construction. State law in 1955 required local entities to pay 100% of the right-of-way cost for freeways and other state highways, but the city of Houston lacked sufficient financial resources to pay for the cost on its own. Houston had reached the limit of




**The final plan, March 1954:** The general alignments of the core freeways in Houston's freeway system were finalized in late 1953 and early 1954. Ralph Ellifrit, director of the City of Houston Planning Department, led efforts to define the alignment of the South Loop and the Southwest Freeway during this period. Only the South Freeway would sustain a major realignment after 1954. (Source: Greater Houston Partnership)

the bonds it could issue and simply could not obtain more money for right-of-way acquisition.

Right-of-way acquisition came to a stop around April 1955, and Houston Mayor Oscar Holcombe explained that it occurred "because the city just hasn't had the money." Harris County stepped forward to take over the responsibility for freeway right-of-way acquisition in 1955. Harris County formulated a plan to pay for right-of-way with a special auto license fee—an extra $4 on the existing $12 fee. Voters approved the "wheel tax" on September 17, 1955, and it appeared that the freeway construction program would get back on track. However, the state attorney general ruled the wheel tax unconstitutional three months later, before any bonds backed by the tax could be issued. On May 2, 1956, the Supreme Court of Texas upheld the attorney general's decision. Without money for right-of-way acquisition, construction funds designated for Houston were at risk of being shifted elsewhere.[14]

The crisis deepened in July 1956 when a $15 million county bond issue requiring two-thirds voter approval failed by a slim margin. Local officials went to Austin in late July to request one more chance to come up with the money for right-of-way. A second election for $15 million in county bonds was called for September 8, 1956. The bond issue passed easily. The crisis was over, but the freeway construction program had sustained a setback. Texas Transportation Commission chairman Marshall Formby remarked that there had been a "crippling of the overall highway program" during the period.[15]

Fortunately major relief was on the way to cash-strapped

localities in Texas and nationwide. The Federal-Aid Highway Act of 1956 was signed into law by President Dwight Eisenhower June 29, 1956, and became effective July 1. The act provided for 90% federal payment of right-of-way costs on the federal Interstate Highway System, with the states paying the remaining 10%. Harris County would no longer need to make any contributions to right-of-way costs for Interstate 45, Interstate 10, and Loop 610. However, the full right-of-way cost for the extensive US and state route freeways would still be substantial. Relief from that burden would come from the Texas legislature in May 1957 with bill HB 620, which required the state of Texas to pay for no less than 50% of the right-of-way cost on non-interstate freeways. The TxDOT Houston Urban Project Office immediately set up a new department to purchase right-of-way. In September 1957, the Texas Transportation Commission authorized the expenditure of $43 million on the interstate system in Houston, with $19 million allocated to right-of-way acquisition and $24 million allocated to construction.[17]

> "We actually had more influence on the location of our freeways than almost any other city, as opposed to the highway department. In fact, we were way out ahead of them … ."
>
> Ralph Ellifrit, director of the City of Houston Planning Department, 1940–1963[16]

While agencies were struggling to acquire right-of-way, the freeway construction program was sputtering along, prompting criticism about the slow progress. The *Houston Chronicle* published a multipart series on the problems of Houston's freeway and road construction programs in September 1957. The interagency cooperation that existed in the early 1950s had diminished and a communications breakdown between TxDOT, the city of Houston and Harris County was slowing progress. In what could be described as a Houston freeway summit meeting, Houston Mayor Oscar Holcombe and his key staff went to Austin in October 1957 to meet with TxDOT head Dewitt Greer to discuss the problems and find a solution. All agreed that better communication and coordination were needed. A month later top Harris County officials met with TxDOT to iron out the county-state problems. Slowly the bureaucratic dysfunction was corrected and the Houston freeway construction program started to gain momentum.[18]

Right-of-way crises were not yet over, however. By September 1958, Harris County had used up just about all of the $15 million in right-of-way bonds approved in September 1956. Officials called another $15 million bond election for November 4, 1958. The bond issue fell short of the two-thirds majority needed for passage. Officials quickly called a special election for December 4, 1958, for another vote on the bonds. Without passage of the bonds, construction money earmarked for Houston would have been diverted elsewhere, due to lack of available right-of-way. The bonds passed with a better than 5-to-1 margin on the second try. With funding difficulties overcome, the only thing holding back the freeway program in the late 1950s was the time required to purchase the large number of right-of-way parcels needed for the freeways. County and state officials strengthened their right-of-way acquisition departments to handle the huge job, and by 1959 acquisition was proceeding much more quickly. As the calendar reached 1960, all hurdles had been cleared. The stage was set for the great freeway construction era of the 1960s.[19]

The freeway system would be an expensive undertaking, local authorities were soon to find out. In 1957 the freeway system in Harris County was estimated to cost $435 million, which included $88 million for right-of-way. To put those numbers into perspective, total expenditures for the budget of the state of Texas for fiscal year 1958 were $1.02 billion. Federal funding for highways nationwide under the 1956 Federal-Aid Highway Act totaled $1.518 billion for fiscal year 1958. The freeway system would be built as funding became available. A 20-year construction period was expected.[20]

### The Visionary and the Pragmatist

Just as the freeway era was beginning to ramp up in the mid-1950s, the two men who would manage Houston's program through the golden age of freeway construction were appointed to their positions. In March 1955, Albert C. Kyser became head of TxDOT's Houston Urban Project Office. By that time, the scope of the Urban Project Office had been redefined to cover Loop 610 and the freeways inside the loop, including the extensive downtown interchange complex. Kyser filled the position previously occupied by the retiring W. J. Van London, who had presided over the construction of Houston's first freeways, the Gulf and Eastex Freeways. Also in 1955, Wiley E. Carmichael became head of TxDOT District 12, which covered all highways in Houston and the eight surrounding counties, but normally excluded the area under the jurisdiction of the Urban Project Office.* Kyser was the visionary who built Houston's freeways to be among the best in the United States and the world. Carmichael, in contrast, was a pragmatist who built minimal freeways—the smallest and most basic designs he could get by with.

Design deficiencies of the first generation of Houston's freeways were certainly well known by the mid-1950s. Kyser's approach to the next generation of freeways was not incremental improvement. His freeway designs were a huge leap forward to designs that are still modern by today's standards. Kyser first demonstrated his forward thinking in January 1956 when he announced that all future Houston freeways would have interior emergency shoulders and median barriers. Freeways under Kyser's juris-

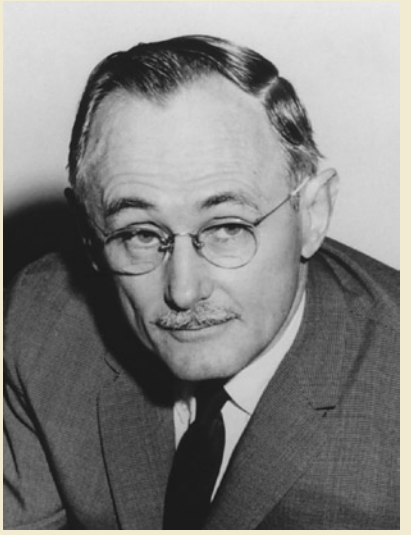
* The limits of the Urban Project Office and District 12 were not strict, with each office occasionally participating in projects in the other's territory.

# The Freeway Builders

The development and implementation of Houston's freeway plan from the early 1940s through the 1960s was a large and sustained effort, with many business leaders and city, county, and state officials all making important contributions. Three individuals stand out as the most influential.

**William James Van London, 1893-1957**

William James Van London, known as "Van" to his colleagues and W. J. to the general public, presided over the early development of the Houston freeway system. Van London joined TxDOT in 1921 and started work in Houston in 1938. Soon after arriving in Houston, Van London was developing preliminary plans for the Gulf Freeway, the first freeway in Houston and Texas. In 1946 Van London became head of the Houston Urban Project Office, which had jurisdiction over Houston's urban freeways. Van London served as chief engineer for the Gulf Freeway, which opened in October 1948, and also contributed the development of Houston's freeway master plan in the early 1950s. He retired from TxDOT in March 1955. (Photo: TxDOT)

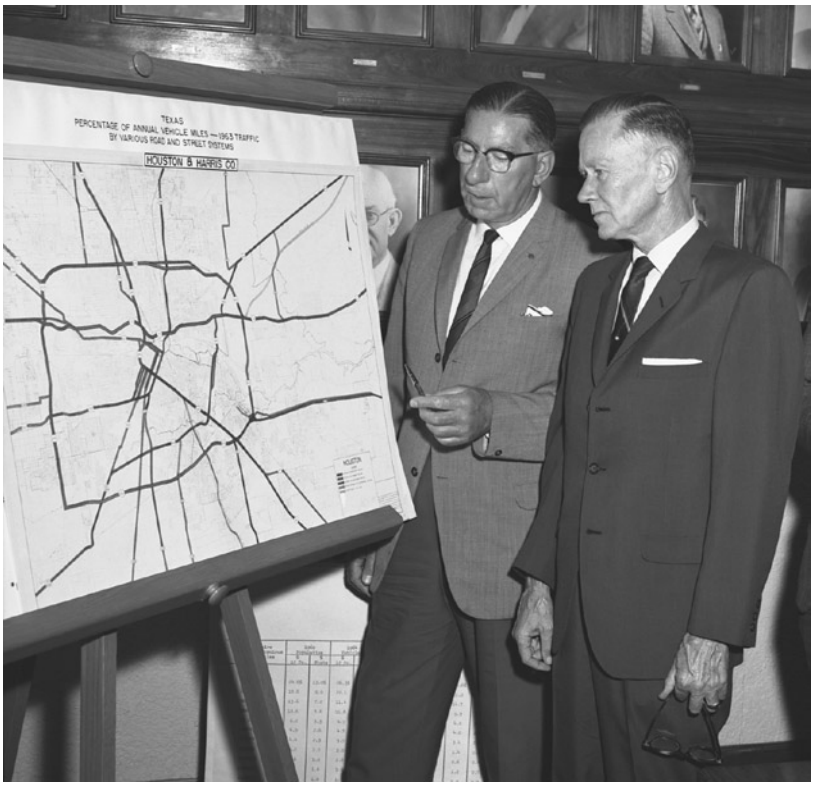


**Ralph Ellifrit, 1909-1999**

Ralph Ellifrit served as the director of planning for the city of Houston from 1940 until 1963, except for a three-year absence from 1943 to 1946 for service in the army. Ellifrit and the City Planning Commission took a leading role in defining the alignments of most of Houston's freeways and identifying new freeways to be added to the system. Houston has never had any zoning or land-use planning, but the well planned freeway system stands out as the greatest accomplishment of Houston's planning efforts in the post-World War II era. (Photo: HMRC RG-D5-1182)

**Albert C. Kyser, 1907-1984**

Albert C. Kyser was the visionary and mastermind behind the design and construction of Houston's freeway system. Kyser, who was generally known by his initials A. C., joined the highway department in 1934 and the Houston district in 1938, working under W. J. Van London. Upon Van London's retirement in March 1955, Kyser was appointed head of the Houston Urban Project Office, which was responsible for Loop 610 and all the freeways inside Loop 610. Kyser's freeway designs propelled Houston into the ranks of the nation's top freeway cities. Among his design accomplishments were freeways with larger traffic-carrying capacity, four-level freeway-to-freeway interchanges, the downtown Houston central interchange complex, the incorporation of safety features into freeways, and the South Freeway dual-freeway design. Kyser retired in July 1972. (Photo: TxDOT)




**Inspecting Houston's freeway system:** A delegation from Australia visited Texas in 1965 as part of a worldwide highway study. Pictured at right is Dewitt Greer (1902-1986), who is regarded as the father of the modern Texas highway system and served as head of TxDOT from 1940 to 1968. At left is J. A. L. Shaw, commissioner of the Department of Main Roads in Sydney, New South Wales, Australia. The Australians looked to California and Texas for design standards for highway and bridge construction. In New South Wales, rural interests had a disproportionately large influence in highway funding decisions, making it difficult to obtain funding for needed freeways in Sydney. Shaw must have been a little envious of the impressive urban freeway systems taking shape in Houston and cities across the United States. (Photo: TxDOT)

diction were designed to include the latest highway safety features, many of which were developed at the Texas Transportation Institute. The freeways under design at the time, notably the West Loop and the Southwest Freeway, would have 8 to 10 main lanes, continuous frontage roads, and modern geometrics. Four-level stack interchanges became the standard at freeway-to-freeway intersections, with cloverleaf interchanges banished to the scrap heap of obsolete freeway designs. Freeways were designed to minimize neighborhood impacts by being depressed below grade or elevated. In the early 1960s Kyser developed the "dual freeway" design* for the South Freeway, a design which has few equals in North America. Design work for the downtown interchange complex was finalized by Kyser's design team, including the sprawling US 59–SH 288 interchange south of downtown.[21]

> "Creative, progressive, innovative, forward-looking, one of the best, not afraid to change, and an engineer's engineer."
>
> Dewitt Greer, father of the modern Texas highway system, describing A. C. Kyser in 1972.[23]

It was Kyser's relentless pursuit of bigger, better, and more modern freeway designs that set him apart from other engineers and brought Houston one of the nation's better-designed freeway systems. Kyser's visionary designs often "brought him into conflict with some of the divisions in Austin," according to TxDOT head Dewitt Greer, referring to the more conservative design groups in Austin who were hesitant to approve Kyser's plans. Kyser would then go straight to Greer's office to get approval. "Every time he showed up, I knew he was going to ask for another million," Greer recollected in 1972. "And, although I was prepared to resist, what he had in hand was almost irresistible—and nine times out of ten he got what he wanted. A. C. Kyser is extremely creative and ingenious and he is always looking for innovation to inject into his work." Greer made these remarks at a freeway dedication in May 1972, just prior to Kyser's retirement in July.[22]

During this period Wiley Carmichael (1912-1996) was building the freeways outside of Loop 610, as well as all the roadways on the state highway system in the counties surrounding Houston. Carmichael was generally a by-the-book engineer, building the minimal facilities to get the job done. Just outside Loop 610, Houston's radial freeways were generally reduced to six main lanes and frontage roads. Although it was probably not anticipated in the 1950s, the largest traffic volumes in Houston's freeway system would occur on the radial freeways just outside Loop 610—exactly where Carmichael built the minimal six-lane facilities. In retrospect, Carmichael can legitimately be faulted for not acquiring more right-of-way on critical urban freeway segments to enable future expansion. The issue of right-of-way width for the Katy Freeway outside Loop 610 was a point of dispute between Kyser and Carmichael, with Kyser urging the acquisition of more right-of-way and Carmichael advocating a minimal right-of-way width. Carmichael would get his way, but west Houston would pay a heavy price for his lack of foresight.[24]

To be fair, there was a limited amount of resources

* The dual freeway consists of an outer freeway for local traffic and an inner freeway for express traffic. The South Freeway (SH 288) was designed as a dual freeway, but only the outer freeway was constructed. A wide inner median is reserved for a potential future 6-lane express freeway. For more information, see the South Freeway history on page 184.

# Transportation Planning in Houston

The history of transportation planning in Houston descends deep into the underworld of cryptic acronyms, mind-numbing regulatory procedures, and bureaucracy that seems to evolve and mutate faster than a cold virus. But the ultimate product of the process is one of the most important elements of building a freeway system: the official local transportation plan. For readers ready to delve into this arcane world, the history of transportation planning in Houston follows.

The formulation of Houston's core freeway network in the early 1950s was a quick and decisive process. Engineers and planners identified the needed freeways and the best freeway alignments. Political officials worked to secure funding, and the freeways moved forward to construction as soon as money became available. But the relative simplicity of early freeway planning soon gave way to more formal planning procedures.

The 1953 Central Business District Parking Survey and accompanying origin-destination survey were the first studies geared toward better transportation planning. In 1959 TxDOT provided the leadership in the creation of the first regional transportation planning agency, the Houston Metropolitan Area Transportation Study (HMATS). Starting in 1959, HMATS performed Houston's first comprehensive traffic studies. The studies were the first in Houston to use digital computers for analysis. HMATS published several reports, including *Freeway Phase* in 1961 which recommended the addition of new freeways.[25]

Federal regulation of the transportation planning process first began with the Federal-Aid Highway Act of 1962. The act required all urban areas with a population over 50,000 to have a continuing and comprehensive transportation planning process, carried on cooperatively by states and local communities—the "3C" process. HMATS was reorganized in 1964 to meet federal requirements and was renamed the Houston-Harris County Transportation Study. H-HCTS was officially launched on February 1, 1965. The Galveston County Urban Transportation Study was created in 1964. These two organizations produced major planning reports through the rest of the 1960s up to 1970. The two planning organizations combined in 1970 to form the Houston-Galveston Regional Transportation Study (H-GRTS). TxDOT remained the lead agency in H-GRTS, with local governments acting in a supporting role. Decision-making authority was assigned to a committee of elected and government agency officials.[26]

The 1973 Federal-Aid Highway Act strengthened local planning by introducing the concept of the Metropolitan Planning Organization. The MPO was responsible for regional planning decisions and received funding from the Federal Highway Trust Fund to conduct its operations. The Houston-Galveston Area Council (HGAC) was designated as the MPO for the Houston-Galveston urbanized area. The H-GRTS structure was adapted to meet the new federal requirements, and H-GRTS operated as a partner with HGAC. HGAC has served as the Houston region's MPO since 1973. HGAC provides guidance on a wide range of regional issues, not just transportation.

Transportation decision-making authority has resided with a group of elected and government officials in a committee structure that has evolved over time. The technical work involved in the planning process has been performed by H-GRTS and the transportation planning department of HGAC. HGAC updates the long-term transportation plan on a regular basis, with major reviews occurring every three to five years. By the 1990s, federal regulation and increased interest in regional cooperation shifted more authority to HGAC. HGAC's public visibility increased during the 1990s with its public involvement efforts.

The complexity of transportation planning increased dramatically with the 1990 revisions to the Clean Air Act and the 1991 Intermodal Surface Transportation Efficiency Act. Today, the transportation planning process requires sophisticated computer programs for traffic and air-quality modeling. Meeting federal requirements requires a large staff, and the official long-term plan is subject to continuous review and revision. It generally takes about 5 years for a major highway construction project to work its way through the planning and approval process, and then another 5 to 20 years for construction.

**Key dates in Houston transportation planning**

| | |
|---|---|
| **1954** | The core freeway network is defined with a minimum of formal study. |
| **1959** | Houston's first comprehensive and formal transportation study is launched. |
| **1962** | The Federal-Aid Highway Act of 1962 mandates an ongoing planning process. |
| **1964** | Houston-Harris County Transportation Study and Galveston County Urban Transportation Study are formed. |
| **1970** | Houston and Galveston planning agencies merge. |
| **1973** | The Federal-Aid Highway Act of 1973 strengthens local planning efforts. The HGAC becomes the region's MPO. |
| **1990, 1991** | The Clean Air Act amendments of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991 increase the complexity of transportation planning. |

available for highway construction, and there was room for only one A. C. Kyser in Houston. Carmichael took the expedient course and stretched his money as far as he could. Whereas Kyser's job was focused almost entirely on urban freeways, allowing him to take a large role in design, Carmichael was responsible for a wide range of farm-to-market roads and lower-tier highways in the large eight-county area around Houston. Carmichael retired in 1973, one year after Kyser.

### Growth and Expansion

Houston in the 1950s was a boom town. Vehicle registration in Houston increased from 290,000 in 1949 to 607,000 in 1959. Officials were soon looking to expand the freeway system to accommodate anticipated future growth and suburban sprawl.[27]

The first substantial change to the freeway plan occurred in late 1959, when the South Freeway was realigned to a new location east of the originally planned route along Almeda Road. The first major addition to the freeway plan came on July 11, 1960, when Harris County Commissioners Court voted to designate the entire 87.5-mile (140 km) Outer Belt (now the Beltway 8-Sam Houston Parkway) as a full freeway. Harris County was responsible for the construction, and adoption into the state highway system was not pursued at the time. In 1961 two new freeways were added to the plan: the Harrisburg Freeway and the West Loop Extension. The Harrisburg Freeway was an extension of the La Porte Freeway, SH 225, into downtown Houston. The West Loop Extension was a southward extension of the West Loop which later became known as the Bay City Freeway and the Fort Bend Parkway. Officials began efforts to obtain state approval of the two freeways, but initial efforts were unsuccessful.[28]

The Grand Parkway first began to receive attention from planners in 1961. The Grand Parkway, a mega-loop around the metropolitan area estimated to be 130 miles (208 km) long at the time, was officially added to planning documents in 1965. A 1968 planning map published by the city of Houston showed the Grand Parkway as not only a freeway, but a broad corridor of parks and lakes around the periphery of Houston.[29]

The September 1961 announcement that the Manned Spacecraft Center (now the Johnson Space Center) would be located southeast of Houston prompted the Houston Planning Commission to initiate a study of the transportation needs of the southeast region. The report, completed in August 1963, recommended a new freeway along Red Bluff Road and a short section of Fairmont Parkway between Red Bluff Road and Beltway 8. The Red Bluff Freeway was in the city of Houston's *Major Thoroughfare and Freeway Plan* by 1966. The Red Bluff Freeway was planned as a Harris County project, and approval into the state highway system was not sought. Also in 1966, the Texas Transportation Commission designated US 90 in northeast Houston as a controlled access freeway.[30]

While all the previous 1960s freeway additions were conceived and promoted by local interests, TxDOT took the lead in the Alvin Freeway, SH 35. In May 1964 the Texas Transportation Commission authorized a study which returned its findings in late 1965. A full freeway was recommended on a new location from Alvin, 21 miles (34 km) south of Houston, to the Gulf Freeway near downtown Houston. The freeway was adopted into the state highway system by the commission in November 1967.[31]

With the addition of the Alvin Freeway, Houston's freeway plan reached its pre-1970s peak, about the same time freeway plans across the nation reached their peak extents. It turned out that adding new freeway routes to the master plan would be the easy part. Getting the new routes adopted into the state highway system would be more difficult. After ongoing efforts throughout the 1960s, the La Porte Freeway extension was finally accepted into the state highway system in 1969. The Outer Belt (now Beltway 8) was also accepted into the state highway system in 1969 when it became clear that Harris County would not have the resources to build the freeway. The Grand Parkway and West Loop extension would not be adopted into the state highway system in the 1960s.[32]

Actual construction was even more difficult than getting the freeways into the state highway system. The 1970s would not be kind to any of the freeways added to the master plan during the 1960s. The 1970s freeway construction crisis was about to begin, and by 1975 it appeared that none of the 1960s additions would ever be constructed. But the story has a happy ending for all the 1960s additions except the La Porte Freeway extension.

**Key dates in the history of the freeway plan, 1940-1970**

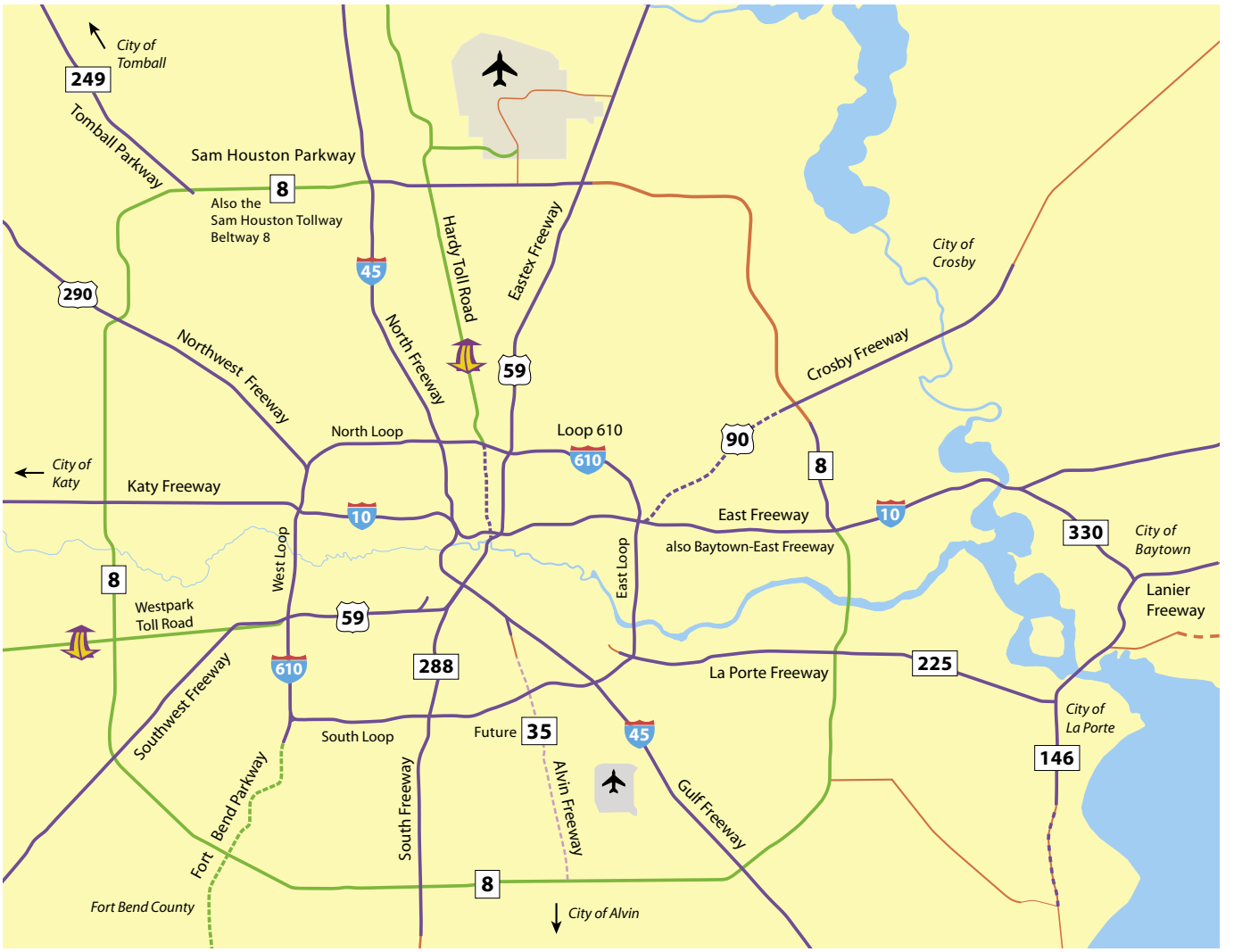
| | |
|---|---|
| **1943** | The first freeway, the Gulf Freeway, is officially approved by TxDOT. |
| **1946** | Five freeways into downtown Houston are approved by 1946. A construction plan is formulated in 1947. |
| **1953** | The first comprehensive freeway plan is presented to the Texas Transportation Commission. |
| **1954** | The core Houston freeway system is finalized. |
| **1955** | The 1955 edition of the city of Houston's *Major Thoroughfare and Freeway Plan* is the first to include the full freeway plan. |
| **1960** | Beltway 8 is designated as a full freeway. |
| **1961-1967** | The West Loop Extension, Harrisburg Freeway, Red Bluff Freeway, Grand Parkway, and Alvin Freeway are officially added to long-term plans. |

### Name That Freeway

When Houston's first section of freeway opened in 1948, it was nameless. This was immediately recognized as a problem, and Mayor Oscar Holcombe promptly called for a contest to name the freeway. After sifting through 13,000 entries, the judges named it the Gulf Freeway. Houston's second freeway, the Eastex Freeway, was named in a contest coinciding with the freeway opening in 1953. The master plan for the freeway system

| Route number | Name (year officially adopted) | Original, informal, or planning names | Previous names, proposed names (prop.), comments |
|---|---|---|---|
| *Interstate Highway System* | | | |
| **IH 45 South** | Gulf Freeway (1948) | Interurban Expressway | Named by contest |
| **IH 45 North** | North Freeway (1956) | | Dallas Freeway (prop. 1965) |
| **IH 10 East** | East Freeway (1956)<br>Baytown-East Freeway (1990) (in Baytown) | Port Arthur Short Line | Beaumont Freeway (prop. 1965).<br>East Freeway is more commonly used than Baytown-East Freeway. |
| **IH 10 West** | Katy Freeway (1965) | | West Freeway (1956-1965) |
| **IH 610** | the Loop (1956) | Defense Loop | Loop 137 (1942-1956).<br>610 officially designated in 1959. |
| *US Highway System* | | | |
| **US 59 North** | Eastex Freeway (1953) | Jensen Drive Expressway<br>North Side Expressway<br>Humble Expressway | Named by contest |
| **US 59 South** | Southwest Freeway (1956) | | Also the Lloyd Bentsen Freeway, but this designation is never used. |
| **US 90 East** | Crosby Freeway (1988) | | Northeast Freeway (1956-1988) |
| **US 290** | Northwest Freeway (1956) | Hempstead Freeway | Hempstead Freeway (prop. 1965) |
| *State Highway System* | | | |
| **BW 8** | Beltway 8 (1969)<br>Sam Houston Parkway (1986) | | Outer Belt (1952-1969).<br>Tollway main lanes are called the Sam Houston Tollway. |
| **SH 35** | Alvin Freeway (unofficial) | | |
| **SH 99** | Grand Parkway (1965) | Outer-outer loop | |
| **SH 122** | Fort Bend Parkway (1988) | West Loop Extension<br>Bay City Freeway<br>Blue Ridge Highway | |
| **SH 146** | Lanier Freeway (Baytown only) | | Named after Bob Lanier, chairman of the Texas Transportation Commission 1983–1987 and mayor of Houston 1992–1998 |
| **SH 225** | La Porte Freeway (1956) | Sterling Highway<br>Harrisburg Freeway (cancelled section) | Also called Pasadena Freeway inside the city of Pasadena |
| **SH 249** | Tomball Parkway (1988) | | |
| **SH 288** | South Freeway (1956) | Almeda Freeway | Brazosport Freeway (prop. 1965).<br>Named the Nolan Ryan Expressway in Brazoria County south of Houston. |
| *Tollways and Other Freeways* | | | |
| **None** | Hardy Toll Road (c. 1982) | | Named after previously existing road |
| **None** | Westpark Toll Road (c. 1999) | | Named after previously existing road |
| **None** | Red Bluff Freeway (1963) | | Named after previously existing road.<br>Freeway main lanes not built, now called Red Bluff Road. |
| **FM 1764** | Emmet Lowry Expressway (1989) | | Named after Texas City mayor who promoted the freeway |

was finalized in 1954, and the planned freeways were given informal, unofficial names. It soon became apparent that a formal freeway naming plan would be needed, rather than the existing practice of naming freeways as an afterthought or by their planning names. The so-called compass-point formal naming scheme was approved by Houston City Council in November 1956, based on the recommendation of City Planning Director Ralph Ellifrit. It assigned most freeways a name based on the geographic region it served, for example, the Southwest, Northwest, and South Freeways. In addition, each of the four sections of the loop was split into two sections; for example, the West Loop was split into the West Loop North and West Loop South. There was some discussion of the potential




**Freeways around the compass:** Houston's freeways are generally named after their geographical direction or the suburban city they serve. On its original formulation in 1956, the naming scheme was called the "compass-point" system since several freeways were named after compass directions. Only one freeway in the immediate Houston area is named after an individual—the Sam Houston Parkway, also called the Sam Houston Tollway.

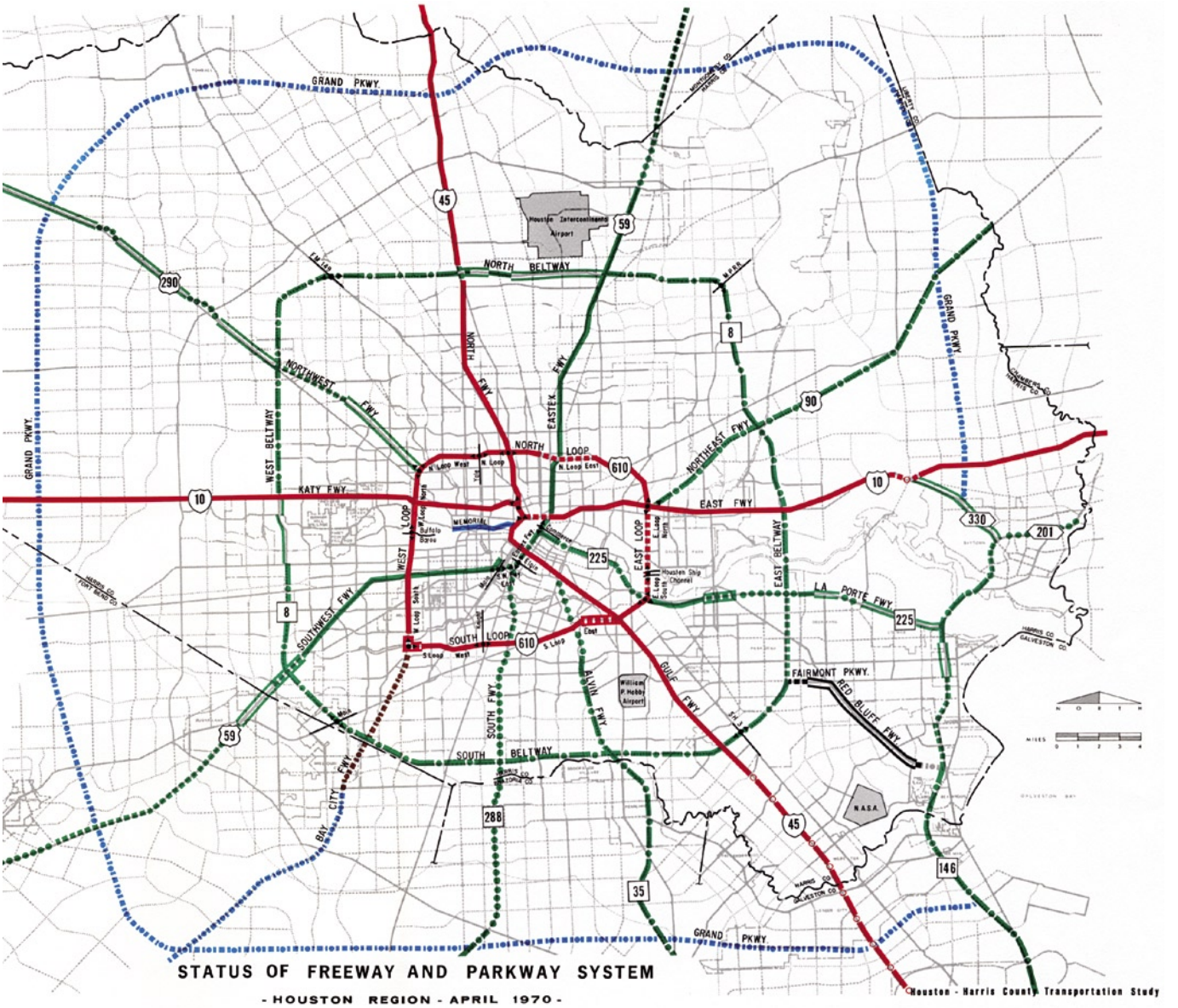
for motorist confusion in certain situations, such as going west on the East Freeway or north on the West Loop South.[33]

In 1965, TxDOT asked Houston City Council to rename five freeways to eliminate the compass-point names and instead adopt geographic names to prevent motorist confusion. The TxDOT proposal changed the North Freeway to the Dallas Freeway, the Northwest Freeway to the Hempstead Freeway, the West Freeway to the Katy Freeway, the South Freeway to the Brazosport Freeway, and the East Freeway to the Beaumont Freeway. City Council rejected all the proposals except the Katy Freeway proposal. Interstate 10 West was officially renamed the Katy Freeway, mainly because the original road along the corridor was known as Katy Road.[34]

After 1965 the compass-point naming system remained intact with only one exception: the Northeast Freeway was renamed the Crosby Freeway by Harris County in 1988. New freeways and tollways added to Houston's system since the 1960s have been named after the existing corridor roadway in the cases of the Westpark and Hardy Toll Roads, or by the geographic destination in the cases of the Tomball Parkway and Fort Bend Parkway. Only one freeway in the immediate Houston area has been named after an individual. In 1986 Houston City Council passed a resolution to name Beltway 8 the Sam Houston Parkway. Sam Houston served as the commander of the Republic of Texas Army in its 1836 victory over Mexico and as first president of the Republic of Texas. The city of Houston is named after him.[35]

Outside of Houston, the SH 201 freeway in Baytown was named the Lanier Freeway in honor of native Baytonian Bob Lanier, who served as chairman of the Texas Transportation Commission in the 1980s and mayor of Houston in the 1990s. In Texas City the FM 1764 freeway was named the Emmett Lowry Expressway in honor of the Texas City mayor who served from 1964 to 1989 and was instrumental in getting the freeway built.


**The Galveston County master plan, 1969:** Galveston County had an ambitious freeway plan as of 1969. This map shows two planned freeways that were later cancelled, the West Bay Freeway and the SH 146 freeway. The plan also shows three planned new crossings between Galveston Island and the mainland. Only one of the crossings, the Galveston to Bolivar crossing at the eastern end of the island, may still be built. (Source: *Galveston County Transportation Plan Volume 3*, 1969)




**The Houston freeway master plan, 1970:** The plan reached its peak extent in 1967 after the addition of the SH 35 Alvin Freeway. (Source: Houston-Harris County Transportation Study)


**Freeway parade:** After the narrow defeat of a critical bond issue for freeway right-of-way in July 1956, the Houston Chamber of Commerce launched an all-out campaign to ensure approval on a second vote on September 8, 1956. The Junior Chamber of Commerce organized an antique car parade to emphasize the need for “modern freeways.” This photo was taken at the 1400 block of Main Street. The bond issue passed easily on the second try with 80% of the vote. (Photo: Houston Photographic and Architectural Foundation Trust)

# Building Local Support

Planning Houston's freeway system wasn't just about transportation. It was also about the emergence of Houston as a major city—a city that had the scale and economic strength to build an extensive freeway system to match the nation's largest and richest cities. Houston's population base, economic output, and business infrastructure were far smaller than many other cities planning large freeway systems just after World War II. Houston's regional population was only about 20% as large as metropolitan Los Angeles, but the plans for Houston's freeways were big—big enough, business leaders hoped, to be a source of prestige and propel Houston into the ranks of the nation's top cities.

Building a big freeway system was expensive, and Houston had nowhere near the wealth of cities like New York, Los Angeles, Chicago, or San Francisco. It would take a large commitment of resources to build the freeways, and a substantial percentage of that money would need to be generated locally. Building local support for the extensive freeway program—and the taxes needed to fund it—became a top priority of political leaders and civic organizations in the 1950s.

Prior to 1956 the local role in freeway construction was substantial. There was no strong national program to build freeways. The state of Texas had an active highway construction program, but it did not proactively plan new urban freeways. The first task facing local authorities was to obtain state approval of the needed urban freeway routes. Once approval was obtained, the local money would need to start flowing. Local entities in Texas were responsible for 100% of the right-of-way cost for all new freeways prior to 1956 and 50% of the right-of-way cost on non-interstate routes after 1957. Often the right-of-way cost was higher than the construction cost due to expensive right-of-way clearances through urbanized areas. Getting the money to acquire the right-of-way was the key task for local authorities. Without available right-of-way, the federal and state construction money designated for Houston would go elsewhere. The Houston Chamber of Commerce led efforts to secure state approval of freeway routes and then generate the local funds for right-of-way acquisition.

### The Houston Chamber of Commerce

In the years after World War II, Houston's future was shaped by a group of businessmen, political leaders, and philanthropists who were determined to build Houston into a large, prosperous, and respected city. The main vehicle for building their vision of Houston was the Houston Chamber of Commerce.* The Chamber of Commerce was a very large organization, actively guiding and influencing nearly every aspect of Houston's development and growth. The 1950 annual report of the Chamber of Commerce included summaries from 22 major committees whose responsibilities encompassed nearly every aspect of business and civic affairs. The 1950 report stated that there had been 1,375 committee and subcommittee meetings during the year with more than 15,000 in attendance. One of the chamber's most active committees in the 1950s was the Highway Committee.

The Chamber of Commerce was very influential because its numerous committees were headed by some of the most prominent, well-connected individuals in Houston. The Highway Committee in the crucial years of the development of the freeway plan was headed by two very prominent Houstonians. William P. Hobby, former Texas governor and owner of the *Houston Post-Dispatch* newspaper, headed the Highway Committee from 1938 to 1953. The Highway Committee would maintain its prestige and influence with the February 1953 appointment of *Houston Chronicle* president John T. Jones, nephew of legendary Houstonian Jesse Jones, as committee chairman. The leadership of newspapermen in the Highway Committee ensured a steady flow of freeway-friendly press in the local newspapers. In the early 1980s another

| Population | 1950 | 2000 |
|---|---|---|
| Los Angeles County | 4,151,687 | 9,519,338 |
| Los Angeles Metro Area | 4,819,599 | 15,620,448 |
| Harris County | 806,701 | 3,400,578 |
| Houston Metro Area | 919,767 | 4,427,804 |

Data: U.S. Census. 2000 metro area population excludes Ventura for Los Angeles and Brazoria for Houston.

**Keeping up with the big boys:** Houston's population is only a small fraction of the Los Angeles region. In 1950, when freeway plans were being made, Houston was about 19% as large as Los Angeles. Even in 2000, the Houston metro area population had not reached the Los Angeles 1950 metro population. With a smaller population base and no wealth-producing industries comparable to Los Angeles' entertainment and aerospace industries, building Houston's freeway system required a strong local commitment.

* The Houston Chamber of Commerce joined with the Houston World Trade Association and the Houston Economic Development Council to form the Greater Houston Partnership in 1989.



**Highway appreciation:** Highway Week 1952 was a statewide event in Texas and, up to that time, was the largest effort to educate the public about the need for better highways and increased highway funding. In Houston, the Chamber of Commerce organized an extensive program for Highway Week, including the overhead banner on Washington Street shown above and the billboard on Navigation Boulevard shown at left. (Photos: TxDOT)

very influential Houstonian, John B. Turner Jr., became chairman of the Highway Committee and provided key leadership to launch Houston's second wave of freeway construction. Turner was president of Friendswood Development Company, a land development subsidiary of Exxon Corporation that was active in developing master-planned communities around Houston, including Clear Lake City and Kingwood.[36]

The Highway Committee of the Houston Chamber of Commerce performed the all-important political role in the development, implementation, and funding of the freeway plan. Up until about 1970, these efforts covered a wide range of political territory, from building public support at the grassroots level to working on national funding issues. At the public level, the Highway Committee focused its efforts on securing voter approval of freeway bond issues. Events such as Highway Appreciation Week were designed to educate the public about the need for better roads. The Chamber of Commerce was funded by the business community, and freeways were good for

business, especially in the construction, real estate, and land development industries. The Highway Committee coordinated the efforts of the business community to convey the pro-freeway message to political officials. At the local political level, the Highway Committee coordinated the efforts of the numerous agencies involved in developing the freeway plan, including the city of Houston, Harris County, TxDOT, and municipalities in the Houston region. The Highway Committee's efforts were crucial in the formulation of the original freeway plan in the early 1950s and in the formulation of the Regional Mobility Plan in 1982. At the state level, the Highway Committee was responsible for presentations to the powerful three-person Texas Transportation Commission. The Transportation Commission determines which freeway routes become part of the state highway system and which highway projects receive construction funding. The Highway Committee was also involved in legislative efforts relating to highway funding at the state and national levels. By the early 1990s the political role of the Chamber of Commerce in freeway development had greatly diminished.

### The Freeway as a Money-Maker

Starting in the late 1940s, road advocacy groups were analyzing data from the first freeways to measure the benefits and show that the benefits exceeded the costs. One of the first reports to appear was *Economic Evaluation of the Gulf Freeway*, published by the city of Houston in July 1949, less than a year after the opening of the first segment of the freeway. It listed many of the benefits of the freeway and provided detailed calculations on the time savings for motorists. It was calculated that the annual value of the time savings to motorists was $2,668,664. Based on the $11,000,000 cost for construction and right-of-way, this suggested that the freeway would pay for itself in time savings alone in about five years. It was reported that the total savings to motorists had reached $21,060,000 by March 1954. The 1949 study couldn't make firm conclusions about property value increases or reduced accident rates due to the short operational period of the freeway, but these benefits would be revealed by subsequent studies.[37]

A February 1954 report, *Texas Expressways*, published by the Texas Highway Department, reported that between 1945 and 1950 the value of land within the Gulf Freeway "zone of influence" increased by 103%, while land values outside the zone increased by only 50%. It was also recognized that freeways leading to downtown would enhance property values in the central business district, but this was a difficult value to quantify. Improved safety was also a key selling point. In a report prepared for the observance of the 500 millionth mile of vehicle travel on the Gulf Freeway on February 18, 1954, TxDOT reported that the Gulf Freeway sustained only 2 fatal accidents per 100 million vehicle-miles of travel. This compared to the national rate of 6.9 for all traffic arteries, 5.7 on the Pennsylvania Turnpike, and 7.0 on the New Jersey Turnpike.[38]

Armed with the statistics for time savings, property value increases, and improved safety, Chamber of Commerce Highway Committee chairman John T. Jones led the campaign to promote support for the freeway system and the needed funding. The campaign slogan: Freeways don't cost—they pay!

### Highway Week 1952

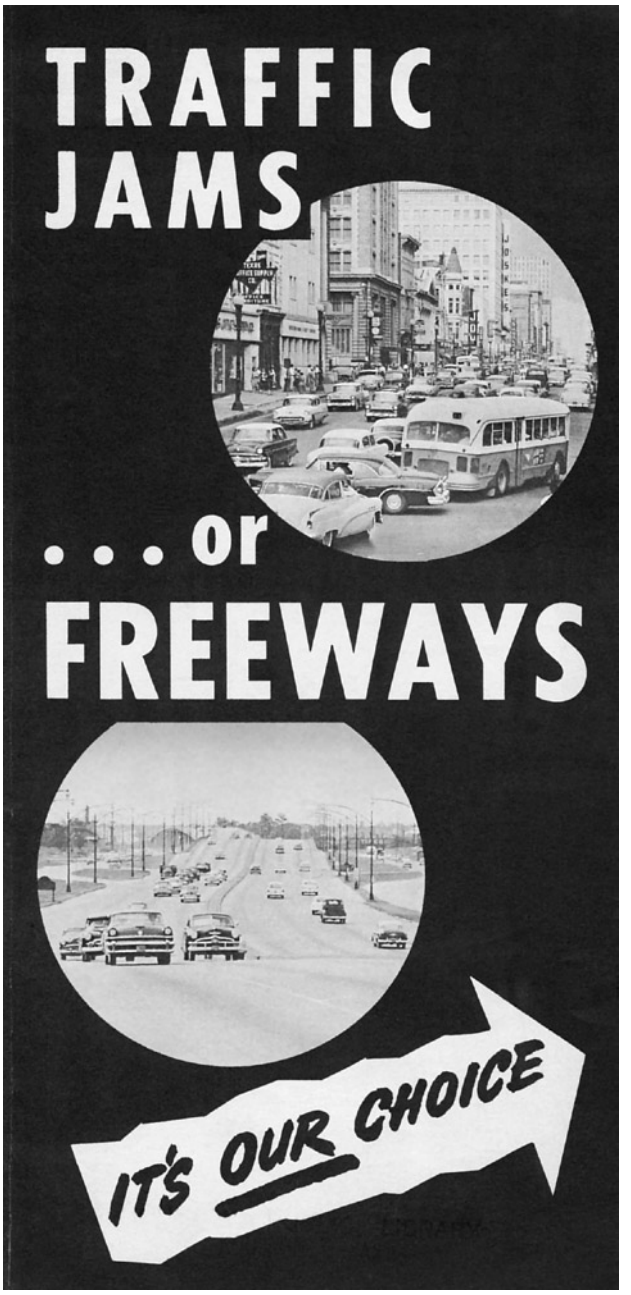
Promoters of a modern highway system realized that a large and expensive public works program was needed to build the system, and strong public support was crucial for funding and implementing the program. Highway Week 1952 was the first large-scale public information event in Texas to promote a major investment in the highway system. The statewide event was conceived and promoted by the Texas Good Roads Association, and Texas Governor Allan Shivers signed a proclamation designating January 27 to February 2, 1952, as Highway Week. The publication of the Texas Good Roads Association, *Texas Parade* magazine, reported that road boosters were "chomping at the bit … to let loose the biggest statewide road celebration in Texas history to observe the 35th anniversary of the founding of the Texas Highway Department."[39]

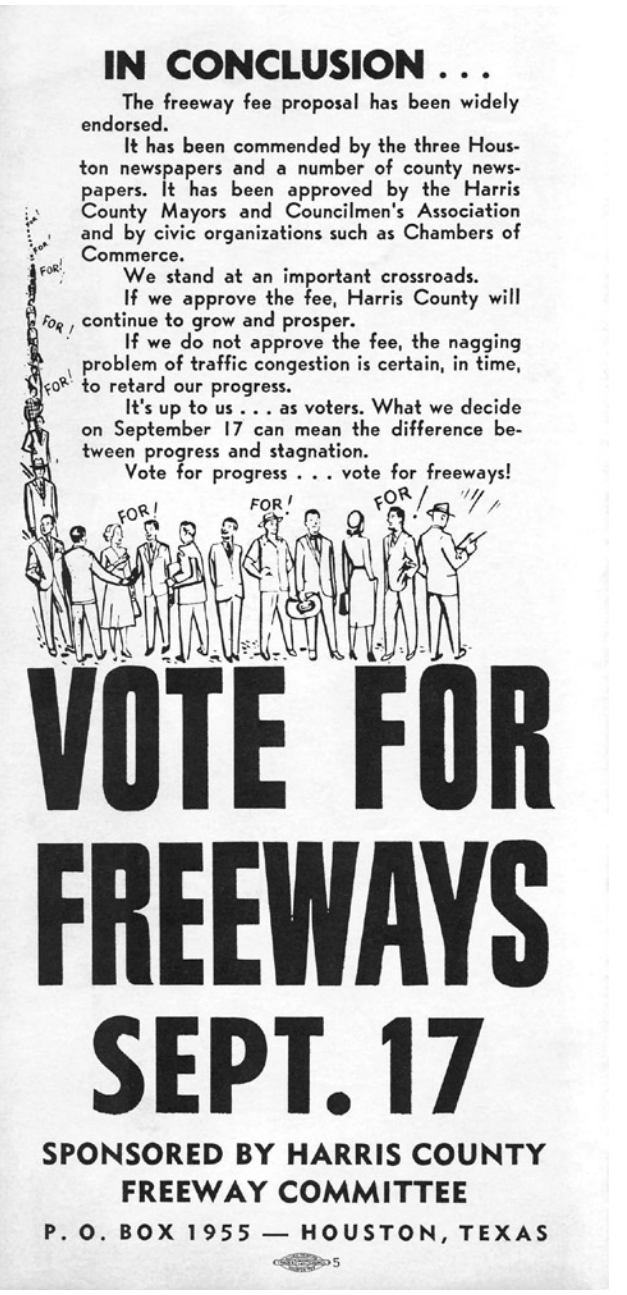
Houston would lead Texas with the most extensive observance of Highway Week. The Houston Chamber of Commerce formed a special subcommittee for the observance and enlisted the participation of 35 civic clubs. The Chamber of Commerce installed street banners and billboards emphasizing the need for more and better highways. Movies depicting highway problems were shown at local civic club meetings and broadcast on local television. Displays of large road-building machinery were set up around the city. The major Houston newspapers featured a special highway section on January 28. For the Houston Chamber of Commerce, it set the stage for the many public support campaigns that would take place during the 1950s to promote the passage of bond referendums and highway-related fees.

### Paying the Bills

After the right-of-way funding crisis during 1955 and 1956, Harris County was practically solely responsible for local freeway right-of-way acquisition costs. Harris County depended exclusively on bond issues for raising money. There was no question that Houston had a pro-freeway electorate in the 1950s, but there was one complication. According to the Texas constitution, county bond issues for roads and highways required a two-thirds majority for passage. Passage of county bond issues would have been a near-certainty had only a simple majority been required, but the two-thirds requirement made the local funding process an ongoing challenge.

Assuring passage of a critical Harris County bond issue in 1956 required an all-out effort by the Chamber of Commerce. The bond issue failed by a slim margin, but was quickly brought back for a revote because state highway construction funds were about to be diverted elsewhere. Executives of Houston's 200 largest businesses




**The wheel tax:** In 1955 Harris County proposed an automobile registration fee to pay for freeway right-of-way. The "wheel tax" was placed before voters on September 17, 1955, and the images above show the first and last pages of a brochure promoting passage of the fee. Voters approved the fee, but the fee was ruled unconstitutional a few months later, setting the stage for bond elections that would require extensive pro-freeway campaigns in the following years. (Source: HMRC)

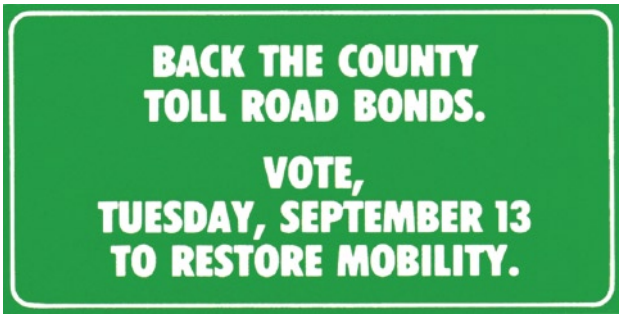
and industries were contacted and asked to brief their employees on the importance of the bonds. The Junior Chamber of Commerce organized antique automobile parades for downtown and the suburbs to draw attention to the antiquated state of Houston's roads. In the days preceding the election, "freeway caravans" with scores of workers fanned out across the city to distribute literature. The bonds passed with 80% of the vote on the second try.[40]

In 1958 another critical county bond issue for freeway right-of-way failed by a slim margin. A group called the Citizens Freeway Bond Committee worked with the Chamber of Commerce to coordinate grassroots efforts to pass a second vote on the issue. Efforts were successful, with 84% of the voters approving the bonds on the second try.[41]

With those two bond issues, the freeway construction program was able to proceed at full speed. But bond issues would be needed regularly, and in 1963 a major bond issue was once again rejected, this time by an overwhelming margin, and was not brought back for a revote. A key bond vote occurred in January 1966 to authorize funds for the South Freeway, the Southwest Freeway connection to


**Bottleneck busters:** The Houston Junior Chamber of Commerce placed this portable billboard on the Southwest Freeway just before the downtown exit to remind motorists to vote for road improvement bonds on January 29, 1966. The bond issue included funds to pay for the local portion of right-of-way acquisition costs for the extension of the Southwest Freeway to connect with the Eastex Freeway. The bond issue passed. (Photo: *Houston Chronicle*, January 26, 1966)

the Eastex Freeway, and the first major work on Beltway 8. The Chamber of Commerce led the pro-bond campaign and the bond issue was approved. In 1970 the state constitution was changed to require only a simple majority for county road bond approval. Since achieving a simple majority was a near certainty in Houston, the era of extensive bond election campaigns was brought to an end. Of course, there were new challenges awaiting the freeway system in the 1970s.




**Creating the toll road authority:** The approval of $900 million in bonds to create the Harris County Toll Road Authority on September 13, 1983, was the beginning of a seismic shift in transportation planning in Houston. Tollways would steadily gain importance over the next 20 years. The image above came from a brochure printed to promote passage of the bonds. Houston was near the peak of its transportation crisis in 1983, and the possibility of restoring mobility resonated with voters, with the bond issue receiving 69.7% of the vote. (Source: HMRC)


**Washington, D.C., 1965:** In the mid-1960s anti-freeway protests were becoming more prevalent and vocal across the United States. Plans for a central city freeway network in Washington, D.C. made the nation's capital a hotbed of anti-freeway protest. In response to the growing protest, the 1968 Federal-Aid Highway Act imposed the first comprehensive regulations to govern the planning of new freeways. Anti-freeway protest would continue to increase into the 1970s, affecting just about every city in the United States, including Houston. The anti-freeway movement reached Houston in 1970 when residents in the path of the planned Harrisburg Freeway organized to stop the freeway. Three other projects in the early 1970s also ignited some controversy, but overall Houston had relatively little anti-freeway protest. Houston never experienced an anti-freeway street demonstration, such as the Washington, D.C. protest shown above. Protest in Houston was contained within the public hearings, which often became quite heated. (Photo: Washington, D.C. Public Library, Washingtonian Collection)

# Crisis

December 2, 1968: The builders of the nation's highways gathered in a gray, chilly Minneapolis, Minnesota, for the annual convention of the American Association of State Highway Officials (AASHO).* Delegates were greeted by a harsh editorial in the *Minneapolis Tribune* accusing state highway departments of being poor local planning agencies and urging them to move decision-making authority to the urban level. The state highway officials didn't need another unfriendly press report to get them stirred up, however. Many were already incensed about the new wave of regulations that were coming out of Washington in response to the Federal-Aid Highway Act of 1968. State highway officials felt that the Federal Highway Administration's new rules went way beyond the intent of Congress. In fact, the federal government was now telling the nation's highway builders what they could and couldn't do. Federal interference was increasing dramatically, and the state highway departments were becoming compliance agencies. Truculent delegates lashed out at the congressional leaders responsible for the new legislation, but congressional leaders and officials from the Federal Highway Administration held their ground, telling the fuming state highway officials that the world was changing, and state highway departments would need to change too.

For the previous nine years, state highway departments had been living in the golden decade of freeway construction. But the clock was ticking ever so quickly to January 1, 1970, a date which would mark the beginning of a very difficult period for freeway construction. Numerous factors were converging to decimate the nation's freeway construction program, particularly in urban areas. On one front, environmental, neighborhood preservation, minority representation, and energy consumption issues were poised to stop freeway after freeway. On another front, spiraling inflation and stagnant fuel tax receipts were beginning to choke off funding for highway construction.

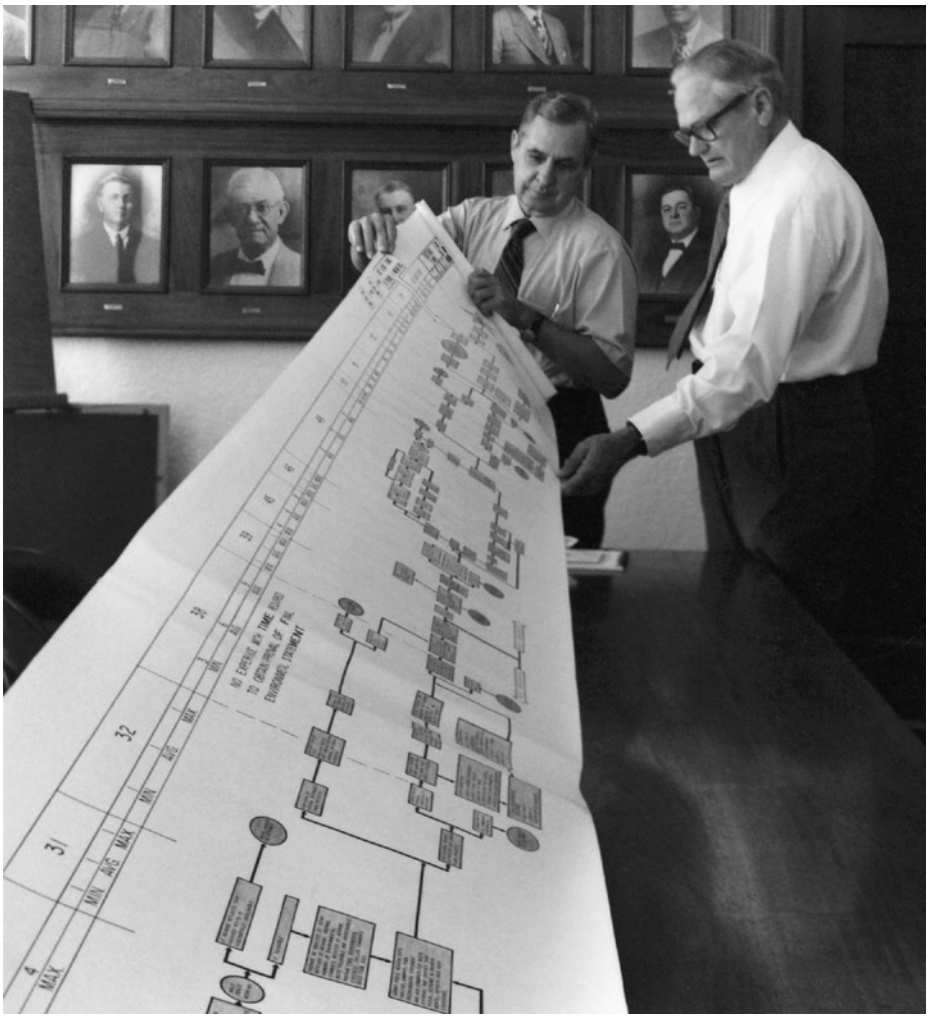
While most large cities across the United States were dealing with these two challenges, Houston had a third factor that escalated its crisis to a level beyond anything other cities were facing: an unprecedented population, construction, and commercial boom fueled by the energy shortages of the 1970s. This three-pronged attack on Houston's transportation system would plunge Houston into possibly the worst transportation crisis any city in the United States has experienced in the post-World War II era.

## The Changing Regulatory Climate for Urban Freeways

Federal regulation of transportation planning first began with the Federal-Aid Highway Act of 1962, which mandated a comprehensive and ongoing local planning process. Requirements for public involvement in the planning process were expanded by the Federal-Aid Highway Act of 1968, which was finalized in August. On October 25, 1968, the Federal Highway Administration first published a preliminary set of new regulations that provided the public with a much stronger voice in the location and design of highways. The new regulations required state highway departments, in public hearings, to give full consideration to a wide range of factors, including social, economic, and environmental effects. At least two public hearings would need to be held during project development, rather than the existing practice of having one hearing, and any individual dissatisfied with a state decision could appeal the decision to the Federal Highway Administration, delaying project approval. The new regulations were prompted by widespread complaints from civic, conservation, and other groups that highways had disrupted communities or disregarded scenic and other environmental considerations. State highway officials would have to dedicate substantial effort to comply with federal rules, and would be forced to spend more time and effort holding public hearings to ensure a continued flow of federal money.[42]

Anger at the state level over the federal government's intervention in their highway construction affairs initially boiled over at the AASHO meeting in Minneapolis. In December 1968 and January 1969, states continued their efforts to have the regulations withdrawn or delayed. The Texas Transportation Commission was vocal in its opposition and commission chairman Jack Kultgen testified at hearings in Washington, D.C. Texas officials felt that restrictive regulations were a response to abuses that had occurred in other states and situations that existed in the urban northeast. "We do not believe that an all-encompassing set of regulations which would provide solutions for a minority of cases should become an obstacle which

* The organization was renamed the American Association of State Highway and Transportation Officials (AASHTO) in 1971.



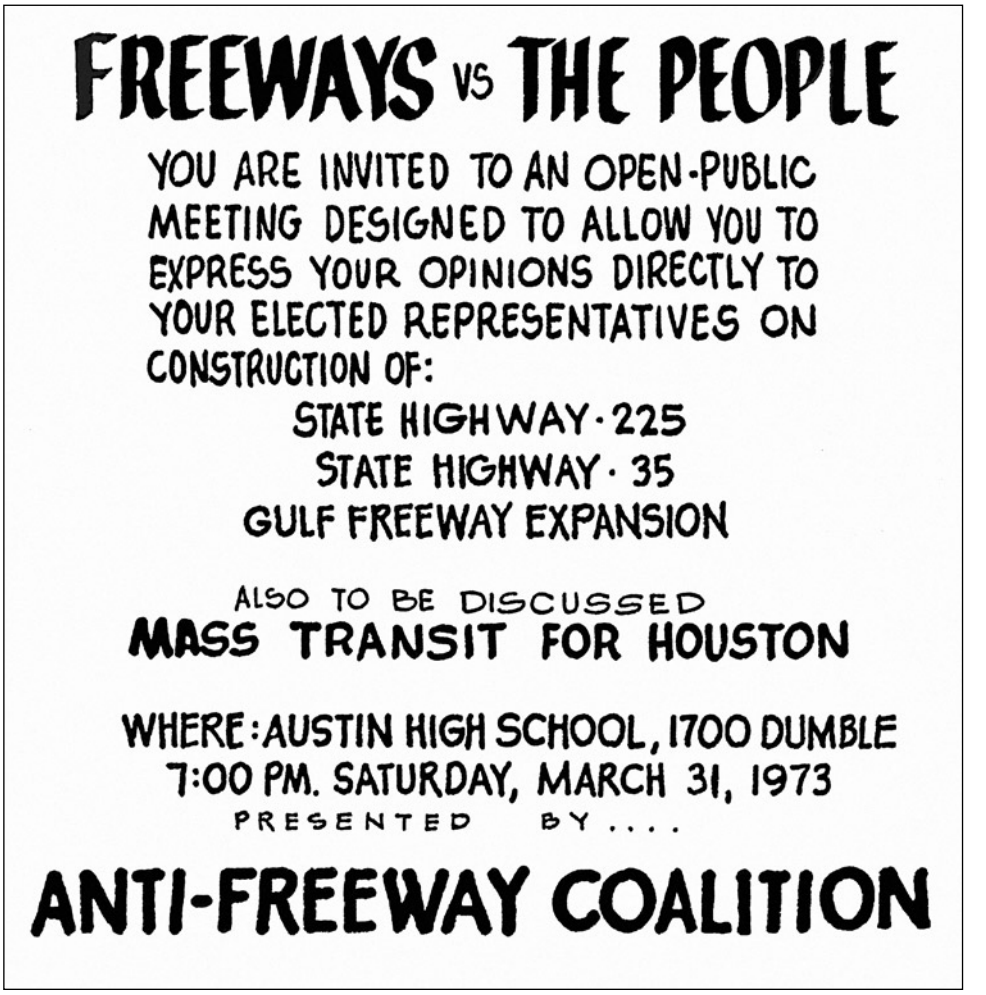
**The regulatory maze:** TxDOT officials unroll the freeway approval flowchart—15 feet of twists and turns through the oppressive federal bureaucracy. This view starts at month 31 on the flowchart. The flowchart was formulated in 1971 to illustrate the huge difficulty that freeway projects faced in trying to negotiate the myriad of regulations imposed by the federal government, especially the National Environmental Policy Act of 1969 and the Federal-Aid Highway Acts of 1968 and 1970. The flowchart was featured in a congressional hearing in 1971 and received widespread press coverage. At left, Bannister L. DeBerry, TxDOT head 1973-1980; at right, James C. Dingwall, TxDOT head 1968-1973. (Photo: TxDOT)

could substantially delay, if not completely curtail, further construction and reconstruction of highways in our state." But if state highway officials were upset about an extra public hearing and the potential for delay, they were totally unprepared for the regulatory bomb that would hit them in less than a year.[43]

On January 1, 1970, President Nixon signed the National Environmental Policy Act of 1969 (NEPA) into law. Included in the broad reach of NEPA were requirements for environmental impact statements for major federal actions having a significant effect on the environment. This included federally funded highway projects. Environmental impact statements were comprehensive, costly studies that could take years to complete, and the vagueness of the early regulations ensured that many disputes would end up in court. The Federal-Aid Highway Act of 1970 further reinforced the requirements for a full consideration of the social, economic, and environmental effects of federally funded highways. Numerous other federal laws added to the complexity of highway construction.[44]

Perhaps even more disturbing to the nation's road builders were the profoundly anti-automobile statements and policy directives coming out of the federal Department of Transportation, which had been formed in 1966. Secretary of Transportation John Volpe took the lead in vilifying the automobile. "More and more, the hallowed right to jump into our cars and drive anywhere we please is being tallied against other community and individual values—the need for elbow room, clean air, stable neighborhoods, more park land, and many others." "America must now accept the fact that the private automobile will not forever be the absolute monarch of our core cities." Other spokesmen for the U.S. Department of Transportation were making similar statements: Dependence on the automobile had created a host of social problems in the nation's cities. Highways had gone just about as far as they could go in central city areas, and alternative means of transportation had to be found. With approximately 12,000 new motor vehicles being added in the United States every day, the nation was at risk of turning into a giant parking lot. There was discussion of halting all construction of major highways in urban areas so cities could step back and implement full-scale land-use and transportation planning.[45]

By late 1970 the U.S. Department of Transportation had announced a new emphasis in its work: moving people—rather than vehicles—on urban freeways and streets. Volpe stated that efforts would be made to "encourage the greatest use of buses in preference to individual automobiles." With the new directives from federal legislation and department leadership, the bureaucrats at the Federal




**The freeway as the enemy:** Anti-freeway protest in the early 1970s in Houston focused on three projects: the SH 225 La Porte Freeway extension into downtown (known as the Harrisburg Freeway), SH 35 (the Alvin Freeway), and the expansion of the Gulf Freeway. The Anti-Freeway Coalition was a rather informal group that formed in February 1973 after the first public meeting on the Gulf Freeway expansion. It appears to have disbanded nearly as quickly as it formed. (Source: TxDOT documents for public hearing held on February 12, 1973)

Highway Administration in Washington, D.C. responded as they knew best: with more regulation.[46]

Freeway construction would never be the same. In fact, the new regulations forever doomed most urban freeway construction projects requiring extensive right-of-way clearance. A few cities in the nation would have the political climate to continue ongoing, large-scale freeway construction and expansions—Houston would be one. But doing so would not be an easy task.

In 1971 top officials at TxDOT headquarters in Austin charted the tortuous route a planned highway project would need to take through the federal bureaucracy. The 15-foot long (4.6 m) chart showed a nearly incomprehensible maze with all forms of twists and turns through the bureaucracy—and plenty of opportunities for detours, blind alleys, and dead ends. The chart, it was reported, "resembled a complex set of hieroglyphics or a medieval tapestry." It received national attention and was even featured in congressional hearings in Washington, D.C. In 1956, when large-scale construction on the Interstate Highway System began, a 34-month delay from the start of preliminary planning to the start of construction was standard. By 1961 the delay had reached 44 months. In 1972 the delay was 78 months—six and a half years. Albert C. Kyser, who managed Houston's urban freeway construction from 1955 to 1972, commented in May 1972, "It will be increasingly difficult for the state to build new freeways. That is, freeways where we have not already acquired the right-of-way. Public hearings are fine, but the procedures and red tape are too cumbersome. It used to be that if we had a problem we could resolve it here or in Austin—now it has to go all the way to Washington." James C. Dingwall, head of TxDOT in 1972, spoke about the impact of the federal regulations in a 1972 address, "We in the highway field find every bulletin, policy, and procedure memorandum, or what-have-you stemming from the federal level only to add to the proliferation of red tape, compound the already abundant confusion and, incidentally, escalate the cost."[47]

### The Anti-Freeway Movement

Nationally, protests against freeways had been seen since the beginning of large-scale freeway construction in the 1950s. One of the better-known controversies of the early freeway era concerned the construction of the Cross-Bronx Expressway in New York City. In spite of intense opposition and huge engineering challenges, New York City's master builder and power broker Robert Moses was able to push the freeway through one of the nation's most densely populated urban areas in the period from 1948 to 1963. The city of San Francisco had its "freeway revolt" in 1959, banning the construction of additional freeways

within the city. But for the most part, large urban freeway projects requiring extensive displacements advanced unimpeded until the mid-1960s.[48]

By 1964, however, there were signs of trouble in freeway paradise—Los Angeles. A member of the California State Highway Commission resigned over the approval of the Long Beach Freeway* (Interstate 710) extension through South Pasadena, stating, "You must be aware of how freeways are going to affect people." The *Los Angeles Times* published an editorial on December 8, 1964, about the future of freeways, saying, "There is still time to plan the freeways of the future, but we are running out of community and aesthetic resources." The Houston newspapers took note of the trouble in paradise; it was an omen of things to come. The city of Houston's wavering commitment to freeways was already beginning to become evident in the mid-1960s. In January 1965 Roscoe Jones, City of Houston Planning Director, expressed concerns about freeway construction, saying, "We shouldn't slow down our freeway building program. But there's a limit to how many we can build. Eventually, vital parts of the city will have to be destroyed for more freeways." The departure of Ralph Ellifrit as City of Houston Planning Director in December 1963 marked the beginning of the decline in the city of Houston's role in freeway and thoroughfare planning. Whereas the city of Houston and its City Planning Commission had once been the most proactive government agency in promoting freeways, it took on a more passive role under the mayoral tenure of Louie Welch from 1964 to 1974. Although Welch was generally supportive of freeways, a top TxDOT official from the era remarked that he "wouldn't stick his neck out for a freeway." In the 1970s the city of Houston also reduced its commitment to the planned major thoroughfare system for the Houston region. The lack of a well-planned, high-capacity thoroughfare system would put an increased traffic load on the freeways.[49]

> "We shouldn't slow down our freeway building program. But there's a limit to how many we can build. Eventually, vital parts of the city will have to be destroyed for more freeways."
>
> Roscoe Jones, City of Houston Planning Director, January 12, 1965

By the late 1960s the protest era had arrived and freeways were one of the targets. The broad public support the highway construction program had enjoyed was now being fractured by vocal anti-freeway efforts. While previous anti-freeway protests were more isolated and focused on specific projects, a new national trend was now emerging—the anti-freeway movement. Three groups were particularly influential in the anti-freeway movement: neighborhood preservation groups, environmentalists, and minority groups. These groups had been empowered by new legislation and regulations in the late 1960s and early 1970s, and now had legal and regulatory tools that allowed a vocal minority to have a decisive impact on freeway-related decisions. The anti-freeway movement was active nationwide by the early 1970s, and its wide reach was described in the 1971 book, *Superhighway-Superhoax*, written by Washington, D.C. resident Helen Leavitt. Several other scathing anti-freeway books followed.[50]

By the early 1970s urban freeway projects across the nation were falling like a row of dominoes, and by the mid-1970s urban highway planners were sifting through the wreckage of their freeway plans. Boston's inner loop was cancelled in December 1971. Washington, D.C.'s inner city freeway network was largely wiped off the map and replaced by a mass transit system. Numerous planned expressways in New York City were cancelled, including the Lower Manhattan Expressway. Closer to Houston, a dense inner-city freeway network was cancelled in Dallas. The planned Riverfront Expressway was deleted in New Orleans. The list went on and on. Practically every large and medium-size city was affected. But perhaps no city was hit as hard as Los Angeles. The freeway capital of the world would see its grand plans for an unbelievably dense freeway grid largely reduced to what had been completed by 1970. Only a few new freeways would move forward in Los Angeles after 1970. Funding issues also played a very large role in the collapse of the Los Angeles freeway plan.

### The Anti-Freeway Movement in Houston

Houston's freeway construction program was generally free of controversy until 1970. Major right-of-way clearances through urbanized areas began in the early 1950s and continued through the late 1960s with minimal or negligible opposition. The only rumblings came from residents in the city of Bellaire in 1954 in opposition to the alignment of the West Loop 610, and from residents of the Memorial Bend subdivision in 1962 in opposition to the alignment of the West Belt. In both cases, the freeways moved forward on the originally planned alignments, and Bellaire, in particular, went on to become one of the more desirable neighborhoods in Houston.

Almost as soon as the calendar reached 1970, the climate began to change. Four freeway projects became the focus of opposition: the planned extension of the La Porte Freeway into downtown Houston, an expansion of the Gulf Freeway, the planned alignment of Beltway 8 through Jersey Village, and a section of the planned

* The Long Beach Freeway extension remained highly controversial and was put on hold in the 1970s due to opposition from the city of South Pasadena. The project came back to life in the 1990s due to the critical need to close the gap in the Los Angeles freeway system. A record of decision was issued by the federal government in April 1998, authorizing the California Department of Transportation to proceed with the project. An unfavorable court ruling in July 1999 put the project in limbo again. As of 2003, the prospects for constructing the freeway were highly uncertain.

**June 2005 Update:** On December 30, 2003, the Federal Highway Administration suspended support for the Long Beach Freeway extension project. This development combined with budgetary constraints means that the project is almost certainly dead.


Alvin Freeway. In all four cases, localized groups were protesting the impact of the freeway projects on their neighborhoods.

In May 1970 the Houston TxDOT office received its first taste of well-organized freeway opposition. A group of predominantly Hispanic residents along the corridor of the La Porte Freeway extension, more commonly called the Harrisburg Freeway, organized a meeting to launch their opposition effort. What set this group apart was the dedication and commitment of its leader, area resident Richard Holgin. Holgin became the symbolic David in a classic David versus Goliath battle. For the following four years Holgin relentlessly opposed TxDOT's efforts to get the freeway approved and built. Prospects for the freeway became tenuous as the 1970s financial crisis hit TxDOT, but Holgin's efforts were probably a decisive factor in the ultimate fate of the freeway. At the end of the battle Holgin had succeeded in doing what no one else had ever done in Houston, and no one has done since: prompting the cancellation of a planned urban freeway. The story of the Harrisburg Freeway is covered in full detail starting on page 198.

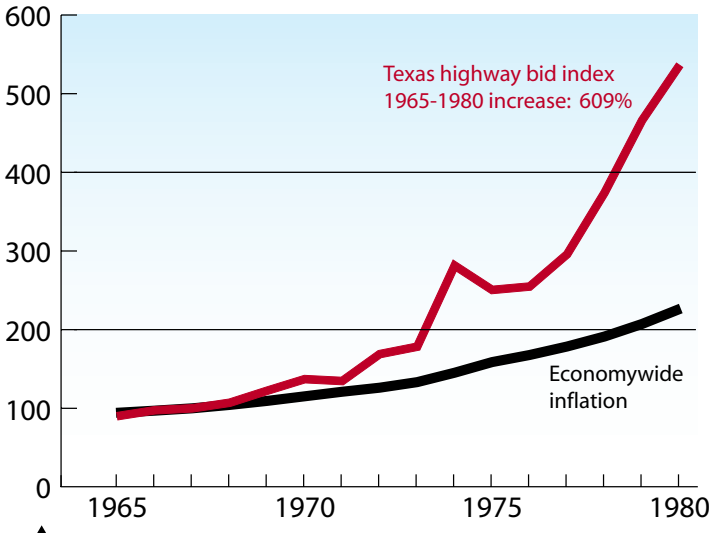
In 1973 controversy arose over the three other projects. Opposition to the Gulf Freeway expansion focused on the displacement of homes in the predominantly black, low-income neighborhood adjacent to the freeway. The opposition was vocal but did not succeed in stopping the Gulf Freeway expansion, which moved forward to construction approximately 10 years later due to funding shortfalls during the 1970s. Controversy over the alignment of Beltway 8 through Jersey Village began in 1973 and continued through most of the 1970s. Residents were ultimately successful in rerouting Beltway 8 around their neighborhood, and the tollway with frontage roads was completed in 1990. The Alvin Freeway sustained considerably less opposition than the other projects, with controversy focusing on the alignment through the site of Law Park, at that time a largely undeveloped tract of land. The freeway alignment through the park site was approved with mitigation measures, but the budgetary crisis of the 1970s caused the freeway to be placed on long-term hold. As of 2003 the freeway remains an item for long-range planning, with no construction planned for the near future.[51]

Overall, the anti-freeway movement in Houston was weak compared to most cities in the United States. It consisted of localized efforts against freeway projects rather than a widespread anti-freeway sentiment, and Houston remained one of the most consistently pro-freeway cities in the nation. Nevertheless, the early 1970s anti-freeway movement did result in the cancellation of the Harrisburg Freeway. Houston's greatest setback in terms of freeway planning would not occur until 1992, however, when anti-freeway forces stopped a planned expansion of the West Loop.

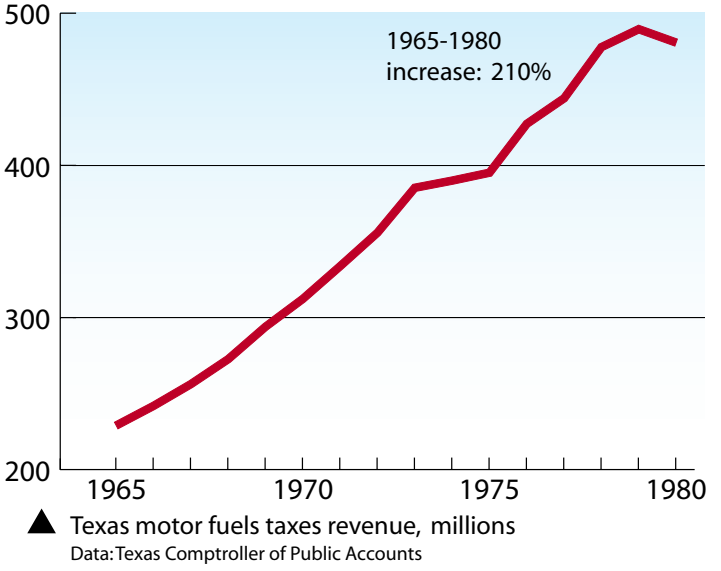

## Funding: The Devastating Blow

Even as citizen opposition had cancelled or delayed projects in Houston, the vast majority of planned freeways and improvement projects faced no opposition. But the 1970s brought an even more potent freeway-killer to Houston which had a much greater impact on plans for the system than citizen opposition. Money for new freeways was shrinking. Rapidly escalating highway construction costs and stagnant revenue from fuel taxes combined to dramatically reduce the purchasing power of available highway construction funds.

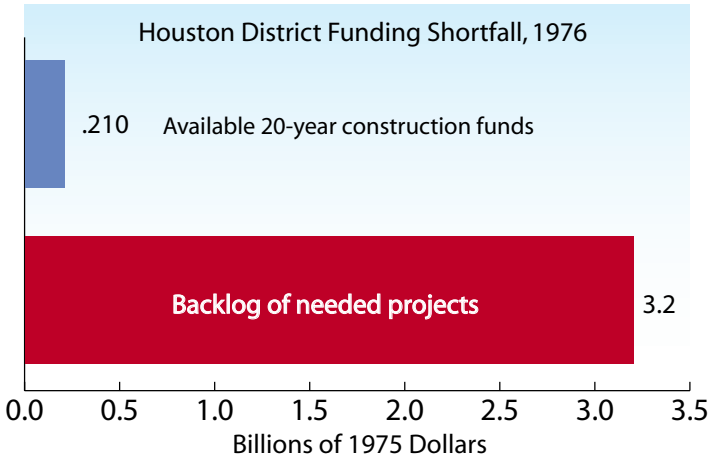
Revenue from the motor fuel excise taxes on gasoline and diesel fuel is the principal source of funds for highway construction. The federal motor fuel excise tax was created in 1932 to provide funds to help offset the federal budget deficit that had developed during the Depression. The revenue from the original 1-cent tax was not earmarked for highway construction. After a period in 1933 during




**Highway construction costs were skyrocketing, far exceeding the overall inflation in the national economy…**




**…while revenues from Texas motor fuels taxes were growing about one-third as quickly…**




Data: *Responding to the Changing Environment*, TxDOT, 1976

**…leading to a huge shortfall in funding.**

which the tax was 1.5 cents per gallon, the tax returned to 1 cent per gallon on January 1, 1934. On July 1, 1940, the fuel tax rate was increased to 1.5 cents per gallon and then to 2 cents per gallon on November 1, 1951.[52]

The year 1956 brought the single most important event in the history of highway construction in the United States: the Federal-Aid Highway Act of 1956 and the accompanying Highway Revenue Act of 1956, signed into law by President Dwight Eisenhower on June 29. The National System of Interstate Highways had been created in the Federal-Aid Highway Act of 1944 and a route map was approved in 1947, but legislation prior to 1956 did not provide a federal commitment to build the system. The 1956 act designated the highway network as the National System of Interstate and Defense Highways and provided financing for the construction of the entire highway network, with planned completion by June 30, 1972. The federal fuel tax was increased to 3 cents per gallon to provide funding for construction. Most significant, however, was the establishment of the Highway Trust Fund. A percentage of the proceeds from various highway-user taxes, including 100% of the gasoline tax, was to be deposited into the Highway Trust Fund. The funds were dedicated solely to financing the federal-aid highway program. In 1959 President Eisenhower sought a 1.5-cent increase in the fuel tax, but settled for a 1-cent increase which took effect on October 1, 1959, raising the total federal tax to 4 cents.[53]

In Texas the state gasoline tax began with a 1 cent-per-gallon tax in 1923. Seventy-five percent of the revenue from the tax was dedicated to highways and 25% was earmarked for public schools. This ratio of revenue distribution became part of the Texas Constitution in 1946. The state fuel tax was increased to 4 cents per gallon by 1929 and reached 5 cents per gallon in 1955. In 1959 the combination of federal and state fuel taxes in Texas was 9 cents per gallon. From that point on, the real value of the fuel tax would be continuously eroded by inflation, especially in the 1970s when inflation began to run rampant.[54]

Starting in 1965, inflation accelerated throughout the United States economy. The gross domestic product deflator, the widest measure of inflation, began its upward climb in 1966 after remaining below 2% annually from 1959 to 1965. From 1966 to 1975, economywide inflation rose steadily and reached an annual rate of 9.3% in 1975, with a 68% rise in the 10-year period from 1965 to 1975. Similarly, the consumer price index rose 70.6% from 1966 to 1975, reaching a peak of 11% in 1974. Highway construction cost, as measured by the Federal Highway Administration's highway bid price index, surged upward much more quickly than the overall inflation rate in the period, increasing by 125% nationally and by a devastating 279% in Texas. In 1974 alone, the Texas highway bid price index increased an astonishing 57.9%. This staggering increase was partially offset by a decrease of 11% in 1975. But the construction cost index didn't tell the full story. The time and expense to bring projects to the construction phase had increased dramatically as

well. Highway departments were now required to perform comprehensive environmental studies and public involvement programs. Large staffs were needed to guide projects through the new regulatory bureaucracies.[55]

Inflation in itself is not necessarily a problem if funding keeps pace, but the receipts from the federal and state fuel taxes were increasing at a much slower rate than the increase in construction costs. In the same 1965–1975 period, receipts from the four-cent federal fuel tax increased by only 69.1%.[56]

In Texas, receipts from the state motor fuel taxes increased by only 72.5%. Some of the growth was due to a strong population growth of 21.1% during the period. Until 1973 gasoline consumption and associated fuel tax revenue had been increasing at the rate of 6 to 7% per year. However, revenue growth slowed dramatically with the energy crises of the 1970s. Because of the Arab oil embargo in 1973, state gasoline tax revenue actually fell 10% in the first two months of 1974 as compared to 1973, and the annual increase from 1973 to 1974 was 1.2%. As Americans purchased smaller, more fuel-efficient automobiles, the growth rate of fuel tax receipts dropped even more. Federal regulations requiring automakers to increase the fuel efficiency of their vehicles and the newly enacted 55-mile-per-hour (88 km/hr) national speed limit further reduced gasoline consumption. The Texas state gasoline tax of 5 cents per gallon was among the lowest in the nation and had not been raised since 1955.[57]

In 1975 the funding crisis became critical and drastic action was necessary. TxDOT had reached its peak employment level of about 20,500 employees in 1972. Employment had dropped to 19,500 by 1975, but far greater reductions were needed to correct the budgetary imbalance. The department head count was reduced 28% to 14,000, with about 3,000 employees being laid off. "It was painful," recalled Bannister L. DeBerry, TxDOT head at the time who authorized the mass work force reductions with a letter to district managers. "That was the hardest thing I had ever done, to sign that letter." In a November 1975 presentation to the Texas House Ways and Means Committee, TxDOT representatives warned that the future of the state's highway construction program was in "serious jeopardy" and that by 1980 the department would have no funds for new highway construction. As a further blow to the morale of the state's highway builders, in 1975 the name of the Texas Highway Department was officially changed to the State Department of Highways and Public Transportation, suggesting a possible shift of focus toward mass transit.[58]

In order to shore up the deteriorating finances of TxDOT, the Texas legislature began to supplement the TxDOT budget with revenue from the general fund in 1977. This was possible during the period of budgetary surplus resulting from the 1970s oil boom, but was not a long-term solution.

### Shared Company—the Mighty Succumb

The funding crisis was a nationwide phenomenon and no states were spared. The mightiest freeway construction machine the world has ever known, the California Division of Highways of the 1960s, was decimated by funding shortfalls and a changing political climate. Governor Jerry Brown entered office in January 1975 and set out to dismantle the world-leading highway construction program that his father, Governor Pat Brown, had built during his years in office between 1959 and 1967. In response to "critical financial problems" in July 1975, the California Department of Transportation (successor to the Division of Highways, known as Caltrans) placed a freeze on all new highway construction and halted nearly all land acquisition for freeway right-of-way. Plans were announced to eliminate 3,300 department positions. California could not even afford to provide its 10% share of construction costs for the federal Interstate Highway System. It was estimated that by 1978 or 1979 Caltrans would not even be able to meet its basic maintenance needs and obligated financial commitments. Caltrans weathered the crisis, but for practical purposes it abdicated its role in building new freeways. In the future, it would be up to localities to raise their own money to build new freeways. Several areas of California launched their own programs in the 1980s, including Orange County, San Diego County, Riverside County, and to a lesser extent Santa Clara County.[59]

The world's freeway capital, Los Angeles, was hit especially hard. In November 1975 the California Highway Commission approved an $843.5 million budget for the 1976-1977 budget year, including only $240 million for new construction—the smallest new construction outlay since 1958. Only $58.1 million—about 152 million in 2003 dollars—was allocated for the huge Los Angeles region. There was a spate of official freeway cancellations in the Los Angeles area in the period. The halt of new freeway construction in 1975 left numerous missing links, gaps, and unusable sections of completed freeway. On September 14, 1975, the *Los Angeles Times* reported on the uncertain future of Los Angeles freeways. 680 miles (1088 km) of the planned 1,540-mile (2,464 km) freeway system had been completed, but it was "increasingly doubtful that the system would ever get much beyond 700 miles." A Caltrans official stated, "This is it. There no longer is any money. Sure, there will be a few more miles built, just to fill in the gaps, but our freeway system is here … well, it's seen its heyday." For the most part, the Caltrans official was correct. Los Angeles would recover from the crisis and close most of the gaps in its freeway system over the following years. The embattled Interstate 105, now known as the Century Freeway, was even built. But the era of new freeway construction in the immediate Los Angeles area was over. In the future Los Angeles would focus its efforts on retrofitting a carpool lane system onto the median shoulders of its existing freeways.[60]

### Standing By While the Fuel Tax Shrank

An increase in the fuel tax would have been the most effective way of obtaining additional revenue for highway construction to help keep up with inflation. But there would be no fuel tax increase at the national level or in Texas for the entire 23 year period from 1959 to 1982. This was somewhat surprising since an increase in the federal fuel tax to encourage conservation was discussed and actively promoted by various interests, including President Jimmy Carter, for most of the 1970s. It would take Mr. Anti-tax himself, President Ronald Reagan, to finally sign into law an increase in the fuel tax in 1982.

Soon after the Arab oil embargo of 1973 there were growing calls for an increase in the gasoline tax as a measure to promote conservation. In 1974 Congress' Joint Economic Committee was recommending an increase of 30 cents per gallon—about 91 cents in 2003 dollars—and President Ford's top advisers were recommending an increase of at least 10 cents per gallon. In November 1974 President Ford acted against the wishes of his advisors and publicly announced his opposition to any fuel tax increase, stating, "We are not going to have [a higher gasoline tax] as long as I am in the White House." In terms of highway construction funding, the proposed taxes would not have provided much relief from the highway construction cost inflationary spiral, since proposals would have diverted the proceeds to various nonhighway uses, including mass transit, conservation subsidies, alternative energy development, and national debt reduction.[61]

In 1975 the leadership of the Democrat-controlled Congress pressed ahead with plans for a large increase in the fuel tax—up to 23 cents per gallon, depending on national consumption levels. The proceeds of the proposed 3-cent base increase were to be dedicated to the development of alternative energy sources. An additional tax up to 20 cents would be levied based on the level of gasoline consumption. Both tax increases were overwhelmingly defeated by the House in June 1975 with a 345-72 vote against the 20-cent tax, handing a major setback to House leadership.[62]

President Jimmy Carter entered office in January 1977 and began to formulate an energy policy. In June 1977 he proposed a 50-cent-per-gallon standby gasoline tax that would be triggered if consumption in a given year increased over consumption in the previous year. The proposal was rejected by the House Ways and Means Committee. An amendment to increase the fuel tax by 5 cents per gallon, with the proceeds equally divided between highways and mass transit, was brought to a full vote on the House floor and was rejected by a margin of 339-82 in August 1977. Clearly, there was no willingness in Congress to raise the already high fuel prices Americans were paying. Carter would make one last effort to push through a gasoline tax increase in 1980. Calling it an import fee, he sought to impose a 10-cent-per-gallon gasoline tax. Congress passed a bill prohibiting Carter from imposing the fee. Carter subsequently vetoed the bill which prohibited the fee. Congress then proceeded to override President Carter's veto by a vote of 335-34 in the House and 68-10 in the Senate. It was the first time since 1952 that Congress had overridden a Democratic president's veto.[63]

At the end of 1980, the federal gasoline tax stood at 4 cents per gallon, exactly where it stood in 1959. In the meantime, nationwide highway construction inflation had reduced the value of the 1959 dollar to just 23 cents.[64]

In Texas, a 2 cent increase in the state gasoline tax was included in a tax bill passed in the 1971 legislative session. Governor Preston Smith objected to the size of the tax bill and was particularly critical of the gasoline tax increase. In order to ensure the governor's approval of the tax bill, the Texas House and Senate promptly voted to remove the gasoline tax increase from the bill. The Texas gasoline tax would remain at 5 cents per gallon until 1984.[65]

Overall, political support for the highway system started its decline in the 1960s and continued its downward trend through the 1970s. Bill Ward, head of the TxDOT Houston Urban Project Office from 1972 until 1984, described the decline of political support in the Houston area during the period as consistent and steady—a "linear" decline, he called it. It seemed that several factors were coming into play in the political landscape. Highway construction was a long-term investment, requiring a substantial investment of money in the near term to provide benefits and economic development over the long-term horizon. In the short term, however, there would be disruptions and possible public protest, often receiving disproportionately large press coverage.

Of course, politicians hate negative press coverage and being thrust into controversial situations. A more expedient route for politicians was to focus limited resources on less controversial programs that would provide instant gratification for constituencies, such as housing subsidies, social programs, or increased social security benefits. Some politicians were sympathetic to environmental causes, and choking off funding was a very effective way to stop highway construction. Other politicians were focused on preventing tax increases in the inflationary environment of the 1970s, especially in consideration of the rapidly rising cost of gasoline. The constituencies that had strongly supported freeway construction in the 1950s and 1960s had, for the most part, achieved their objectives. They had their freeways, so they turned their attention to other issues. Anti-freeway interests stepped forward to fill the void left by the departed pro-freeway constituencies and very effectively disseminated their messages through the press, which was often very sympathetic to protest causes. The underinvestment in the nation's highway infrastructure would eventually produce another crisis, but it was something that the next generation of politicians and voters would have to deal with. Because of Houston's astronomical growth during the 1970s, the transportation crisis would occur very quickly.

### Taking a Slice Out of the Trust Fund

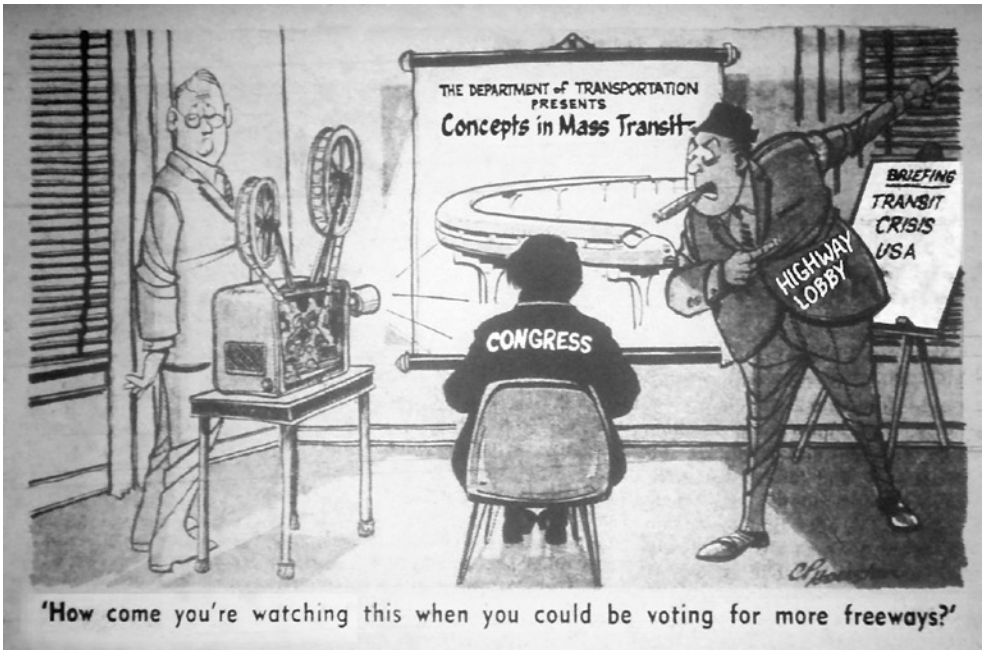
The federal Highway Trust Fund was the recipient of a small river of money generated by the various motor vehicle-related excise taxes. The highway construction program was one of the few federal programs to have its own dedicated revenue source. But in Washington, D.C., no money is safe forever. Other political interests with their own agendas would cast an envious and covetous eye on the money in the Highway Trust Fund. The highway lobby and its supporters in the United States Congress had been successful in protecting the Highway Trust Fund from any major threats through the 1960s. In 1968 President Johnson withheld payments from the fund as an anti-inflationary measure, but normal spending was soon resumed. The real threat to the Highway Trust Fund was diversion—taking the money and spending it on something other than highways. And the threat would be the proverbial enemy from within.

Public transportation in the United States was in a period of transition. Historically, public transit operators had been private firms that relied on fare box revenue to sustain operations, make capital investments, and earn a profit. But as Americans switched to private automobiles after World War II, the demand for public transportation declined sharply, leaving the private transit operators with a shrinking revenue stream—one that could no longer sustain capital investments and, by the 1960s, often could not even sustain operations. By the late 1960s practically all private transit firms had become bankrupt, were taken over by government agencies, or were certain to go out of business in the near future. It was clear that public transportation could be viable only as a taxpayer-subsidized, government operation.

In 1970 Houston Mayor Louie Welch realized that a city takeover of Houston's private bus operator, Rapid Transit Lines, would soon be needed. Welch appealed for federal mass transit assistance in front of a House Banking Subcommittee in Washington considering mass transit legislation. Mayor Welch testified, "The problems of congestion in cities of urban sprawl like Houston are not the same as those in more densely populated cities, but those problems are just as acute in our cities. The revenue from the fare box will not be sufficient to provide the essential capital, and financial assistance must be received from other sources." Like municipalities all over the nation, Houston was facing a new and expensive public service obligation. Even Houston wouldn't be shy about lining up for federal transit subsidies. Of course, the demands from older, financially strapped cities in the Northeast would be even stronger. Cities were desperate for money to help pay for the new transit obligation, and they didn't care where the money came from—even if it meant raiding the Highway Trust Fund.[66]

In 1972 Welch began to push for the city of Houston to take ownership of Rapid Transit Lines. On April 17, 1974, the city of Houston finalized the purchase. The city found itself with a barely functioning operation with aging equipment, maintenance facilities dating back to the streetcar era, and an unhappy work force that would soon go on strike.[67]

Throughout the 1960s interest in urban mass transit had been steadily increasing. By 1963 virtually all major cities in the United States were studying rapid transit requirements for the future. The Houston Chamber of Commerce, which had been a key driving force in the development and construction of Houston's freeway system, stated that its top transportation priority for 1967 was to "encourage immediate steps by public officials to determine the need for a rapid transit system for the area." In 1968 the Chamber of Commerce established a new committee, the Urban Transit Committee, which



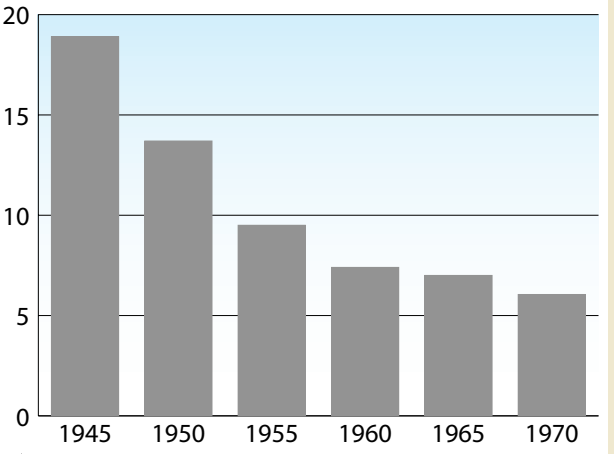

**Targeting the Highway Trust Fund:** In the late 1960s pro-highway interests began to have to defend the Highway Trust Fund. Opposing interests, notably mass-transit proponents and environmental groups, felt that the nation's transportation policies placed too much emphasis on highways and were seeking to divert trust fund money to mass transit. This 1968 cartoon illustrates the view that the highway lobby wielded excessive influence in national transportation policy. The federal Department of Transportation under John Volpe supported and promoted trust fund diversion. In 1973 pro-transit interests achieved their objective when federal highway legislation authorized the diversion of Highway Trust Fund money to mass transit starting in 1975. The trust fund diversion further exacerbated the nation's highway construction funding crisis. (Source: *Houston Chronicle*, September 22, 1968)

# The Mass Transit Crisis

The highway construction crisis developed very quickly, with highway construction going from a relatively strong position in the late 1960s to a crisis situation by 1975. But urban mass transit had been in decline since the end of World War II, and by 1970 the condition of urban transit had deteriorated to a crisis point. The rising use of the private automobile caused a huge reduction in the market for transit services. Transit patronage in 1970 was one-third the level of 1945.[68] Privately owned transit operators could not justify investments in transit services. Equipment became obsolete, service deteriorated, and transit fares went up, further accelerating the switch to private automobiles and the vicious cycle of decline in mass transit. The last year transit operations in the United States showed a profit was in 1962. Deficits of urban transit systems grew dramatically in the late 1960s, reaching $332 million in 1970—1.26 billion in 2003 dollars.[69] The bankruptcy of the Penn Central Railroad in June 1970 was indicative of the direction of the private passenger rail and transit industry in the United States. Government agencies took over big-city commuter rail lines abandoned by private firms, but small towns weren't so lucky. About 300 urban transit companies operating in 1950 had gone out of business by 1970.[70] The major national news magazines—*Newsweek*, *U.S. News and World Report*, and *Business-week*—all featured the mass transit crisis on their covers in 1971 or 1972.

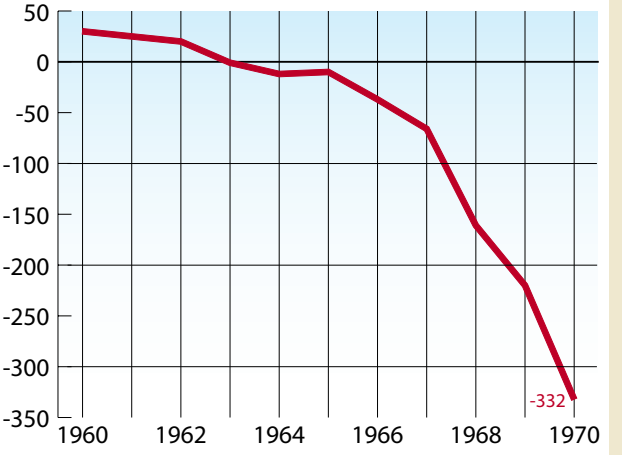
> "City rapid transit systems are in trouble nearly everywhere."
>
> *U.S. News and World Report*, January 19, 1970

Many large urban cities such as New York, Chicago, and San Francisco were already subsidizing urban transit with state and local funds by 1970, but as the cost of building and operating transit systems escalated, cities all across the country were looking for help. Federal assistance for urban mass transit began with the Urban Mass Transit Act of 1964, but funding had been relatively low. The first legislation providing large-scale federal assistance was the Urban Mass Transportation Assistance Act of 1970, which authorized $10 billion (38 billion in 2003 dollars) in federal funding over 12 years, with funding coming from general federal government revenue. But cities wanted more. The federal Highway Trust Fund became the target for obtaining additional funding. The issue of using Highway Trust Fund money was so contentious that it prevented agreement on a new federal-aid highway bill in 1972. The Arab oil embargo of 1973 made mass transit look more attractive, and after a long stalemate in congressional conference committee, the Federal-Aid Highway Act of 1973 authorized the use of Highway Trust Fund money for mass transit. The spigot had been opened for federal government transit assistance and subsidies, which in the long run would be funded almost exclusively by money from the Highway Trust Fund.




▲ Transit Revenue Passengers, Billions

Data: *Business Week*, June 3, 1972; original data, American Transit Association




▲ Profit of all urban transit systems (public and private), millions

Data: *U.S. News and World Report*, April 26, 1971; original data, American Transit Association

would "participate in studies of the movement of people in an urban environment by modes other than roads and highways." In a dramatic change from past policy, Big Oil also started to publicly state its support for diversion of Highway Trust Fund money to mass transit. In February 1972 Thomas D. Barrow, President of Humble Oil, the predecessor to today's ExxonMobil, expressed Humble's support for transforming the Highway Trust Fund into a transportation trust fund and allowing local entities to use the money for roads or transit.[71]

In 1972 Secretary of Transportation John Volpe made his move to bust the Highway Trust Fund and dedicate a portion of it to mass transit. Under the plan, federal mass transit funding would begin in 1974 and reach $2.25 billion in 1976. For comparison, total federal aid for highway construction in 1976 was approximately $6.27 billion. The United States Senate easily approved an amendment authorizing the transfer of $800 million in funds to transit,

**Houston area freeway cancellations** (also see map on page 66)

| | | |
|---|---|---|
| **1974** | Harrisburg Freeway<br>(SH 225 La Porte Freeway extension inside Loop 610) | Permanently cancelled; deleted from all planning documents by 1992. |
| **1975** | West Loop Extension, also called the Bay City Freeway<br>(now called the Fort Bend Parkway Toll Road) | Reinstated in 1988; construction underway in 2003 as a tollway. |
| **1976** | Grand Parkway | Reinstated in 1984; first section opened in 1994. |
| **1983** | SH 146 in Galveston County | Freeway permanently cancelled; a 2002 study recommended highway upgrades. |
| **Late 1980s** | West Bay Freeway in Brazoria and Galveston Counties<br>(also called the GAP Parkway) | Appears to be permanently cancelled in 2003, but could be revived as a toll road. |

**Freeways placed on long-term hold in the 1970s**

| | | |
|---|---|---|
| **1976** | Alvin Freeway, SH 35 | Short section opened in 2000; entire corridor under study in 2003. |
| **1976** | Crosby/Northeast Freeway, US 90 | Freeway outside Beltway 8 opened in 1991; section inside Beltway 8 scheduled to be built prior to 2010. |
| – | Red Bluff Freeway main lanes | Main lanes never formally planned; could be built as a tollway if demand warrants. |

which was about 13% of the $6.26 billion in Highway Trust Fund receipts for 1974. Through intense effort and political procedural maneuvering, the highway lobby was able to prevent trust fund diversion in the House version of the highway bill. A conference committee could not formulate a compromise bill and deferred action until 1973. That year, President Nixon and the new Secretary of Transportation Claude Brinegar both stated their support for diverting highway funds to mass transit. The Senate version of the new federal highway legislation once again included provisions to use Highway Trust Fund money for mass transit, and just as in 1972 the House version kept the Highway Trust Fund intact. A conference committee attempted to resolve the differences between the Senate and House versions of the federal transportation legislation, but the committee remained in a stalemate, meeting after meeting. Pressure was building to reach a compromise to avoid a major disruption of federal funding for highways.[72]

> "[In 1977], not a single mile of freeway or expressway was opened for traffic."
>
> Houston-Galveston Regional Transportation Study newsletter, January 1978

Finally, after 14 meetings and more than two months of negotiation, a compromise was reached, allowing final approval of the Federal-Aid Highway Act of 1973. The Highway Trust Fund would remain intact in 1974. But starting in 1975, highway funds would be diverted to mass transit and in 1976 cities would have the authority to cancel planned interstate highway construction and divert the money to rail transit facilities. The Highway Trust Fund had been busted. In Houston there were no major diversions of funds previously set aside for freeways, but the loss of funds to transit further shrunk the federal highway funding pie, exacerbating the crisis that existed nationwide.

### Houston Feels the Effects

Like all other places in the United States, Houston felt the effects of the highway construction funding crisis. On May 5, 1974, the *Houston Chronicle* reported how the inflationary spiral was impacting Houston's freeway construction program. The cost of six major freeway projects, valued at $91.3 million in 1968, had increased an average of 60% between 1968 and 1974 to $145.8 million. Another set of four projects had risen from $11.8 to $23.8 million, a 101% increase. The article also reported that a 25% cost increase had occurred in 1973 alone. These increases mirrored the escalation of the Texas highway bid price index.

New freeway construction in Houston slowed to a trickle in the 1970s. Progress on the major unfinished radial freeways, the Northwest and South Freeways, was very slow or nonexistent. The Houston-Galveston Regional Transportation Study (H-GRTS) reported in its January 1976 newsletter, "During 1975, a total of 6.5 miles of new freeway facilities were opened to traffic, about par with the average rate during the last 5 years." However, an average of only 2.9 miles (4.6 km) per year were being opened in the urban areas of Harris County. The freeway completion rate was "a far cry from the construction rate experienced during the sixties, which saw an average of 18 miles of freeways and expressways being completed annually."

In 1976 TxDOT head Bannister DeBerry warned, "The crisis is upon us. It is real and it is serious." In response to the developing crisis, TxDOT hired the management consulting firm McKinsey & Company to analyze statewide revenue and needs, and make a recommendation on allocation of dwindling resources. The TxDOT Houston Urban Project Office under Bill Ward played a supporting

**Traffic jam capital of the United States:** In the early 1980s Houston's traffic congestion reached crisis proportions and Houston was generally recognized as having the most congested freeway system in the United States. This 1982 photograph looks east along the Katy Freeway (IH 10) with the Loop 610 interchange in the background. (Photo: Texas Transportation Institute)

role in the development of the report. The report began with a summary of the grim funding situation. In the Houston region, available funding over the following 20 years would cover only 7% of the region's backlog of needed highway projects. The report provided a blueprint for sustaining TxDOT and improving its operational efficiency in the changing environment, but its recommendations gutted the Houston freeway program. Recommended for cancellation were the Harrisburg Freeway, Alvin Freeway, and Beltway 8. The Northwest and South Freeways were downsized, to be built as highways rather than freeways for most of their length. Other long-term freeway projects, such as the widening of the North and Eastex Freeways, were put on hold indefinitely. In general, the report urged TxDOT to focus on smaller, less expensive projects which still provided substantial transportation benefits. McKinsey also recommended lowering TxDOT's freeway design standards, turning the clock backward to an era of smaller, less modern freeways. McKinsey had really just told TxDOT that it was going to have to live within its means. The McKinsey report was adopted, but it would not be the final word.[73]

Official planning documents began to reflect the harsh new reality of lowered transportation funding. The Harrisburg Freeway had already been put on hold in 1974, partly in response to neighborhood opposition, but budgetary issues would ultimately kill the freeway by 1976. The Grand Parkway was deleted from long-term plans in 1976. The January 1977 newsletter of H-GRTS stated that, at the current rate of construction, "it would take 45 years to complete the system as planned." Progress on Houston's freeway system hit rock bottom in January 1978 when the H-GRTS reported that in 1977 "not a single mile of freeway or expressway was opened for traffic." The West Loop extension, also known as the Bay City Freeway and later reincarnated as the Fort Bend Parkway, was deleted in 1978. Two other freeways in Galveston County, the SH 146 Freeway and the proposed West Bay Freeway, were not officially cancelled in the 1970s, but it became doubtful that the freeways could ever be built. The SH 146 Freeway in Galveston County was officially cancelled in 1983, and the West Bay Freeway, which was never more than a line on planning maps, disappeared from long-term planning documents by the late 1980s.

A potentially greater risk for the long-term viability of Houston's freeway system was the skyrocketing cost of right-of-way and the intense development occurring around Houston. In order to preserve critical right-of-way for future needs, TxDOT had to make large expenditures to purchase land. This further cut into construction funds. The high cost of right-of-way for Beltway 8 in the booming suburban areas around Houston was putting the entire project at risk for cancellation.

> "Immobility is a vexing fact of Houston life. It now figures heavily in business and personal decisions, the large and small. Everyone is seeking a way to cope with the need to get from point to point."
>
> *Houston Downtown* magazine, January 4, 1982

**Most congested cities in the United States, 1984**

1. Houston
2. New Orleans
3. New York
4. Detroit
5. San Francisco
6. Seattle
7. Los Angeles
8. Boston
9. Charlotte
10. Atlanta

Data: *U.S. News and World Report*, September 7, 1987

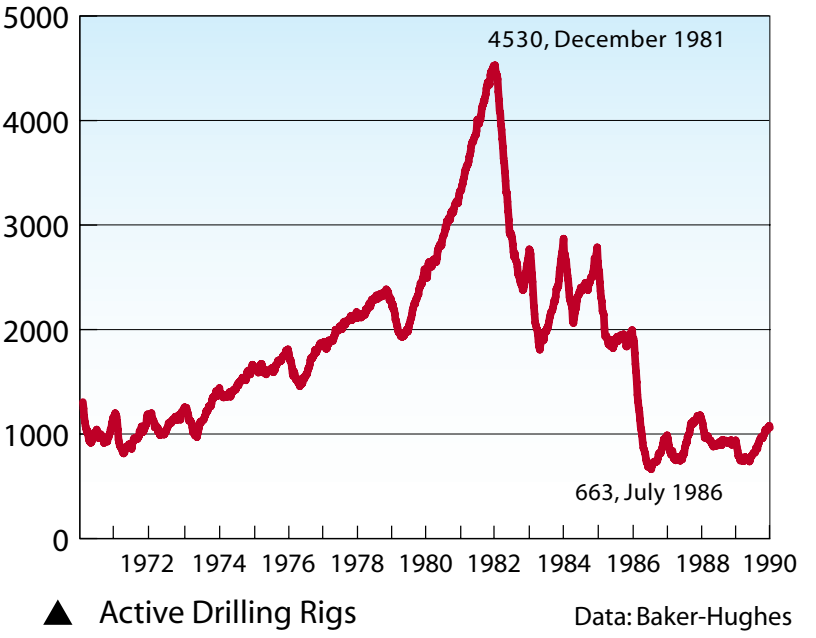
### Skyrocketing Demand for Freeways

When the energy supply shocks of the 1970s occurred, the national economy was hit hard. But there was one big winner: the energy industry. Houston in the 1970s was a petroleum city, so Houston's economy boomed as the high price of oil fueled an unprecedented expansion of drilling in the United States. The count of drilling rigs in the United States, which hovered around 1,000 in the early 1970s, began its upward trend in the mid-1970s and reached a record of 4,530 drilling rigs the last week of 1981. Population in the Houston metropolitan statistical area increased from 1.9 million in 1970 to 2.8 million in 1980. The downtown skyline was transformed. "Edge cities" sprouted around the periphery of Houston, providing impressive suburban skylines. Demand for transportation facilities in Houston was skyrocketing.

All the new arrivals in Houston brought automobiles—lots of them. The number of registered vehicles in Harris County increased from 1.1 million to 1.9 million during the 1970s, a 71% increase that added an average of 220 new vehicles to Houston's roads daily. In 1979, near the growth peak, it was estimated that 375 new vehicles were hitting Houston's roads daily. While all the new autos were pouring into Houston, capacity of the freeway system was barely growing. A mismatch of supply and demand was rapidly developing.[74]

Houston achieved its pre-crisis peak mobility in 1970 with the relatively new freeway network providing a high level of congestion-free mobility. But the 1960s freeway system and the few enhancements that were added in the 1970s were no match for the additional demand that came in the 1970s. Whereas Los Angeles had built most of its freeways with 8 or 10 traffic lanes in the 1960s, Houston's planners had not been as forward-looking. Surely they never anticipated the phenomenal growth that Houston would experience, and as always, financial resources for building freeways were limited. As of 1970 Houston had only one sustained length of 10-lane freeway, the Katy Freeway (IH 10) between downtown and the West Loop. Some freeways had 8 main lanes, including the Southwest Freeway inside Loop 610, the East Freeway inside Loop 610, and Loop 610. All other freeways generally had 6 main lanes, and the Eastex and East Freeways outside Loop 610 had only 4 main lanes.[75]

As traffic congestion became worse, even more disturbing was the prediction of a 1979 Rice Center study on Harris County mobility and congestion issues. Based on funding and population trends at the time, it concluded that traffic congestion would be a permanent and chronic




**The 1970s boom:** The number of active drilling rigs in the United States is a good indicator of the level of activity in the energy industry and the health of Houston's economy. The steady climb in the rig count through the 1970s and into 1981 was mirrored by the boom in Houston's economy. The boom brought an influx of people and automobiles to Houston, an estimated 375 new cars per day in the late 1970s, overwhelming Houston's freeway system. The subsequent bust in the energy industry was even more dramatic than the boom.


*Houston Post*, May 30, 1984

condition in Houston. The vice president of the Rice Center stated, "Experience has shown us that, once the major freeways in a city become congested, they never become uncongested. That's what Houston faces. There will be congestion in Houston through the turn of the century and beyond." [76]

Houston had been working its way up the list of most traffic-congested cities in the United States through the 1970s. Ranking cities for traffic congestion is somewhat of an art, dependent on the criteria used and subject to available data, which usually varies from city to city. The Texas Transportation Institute produces one of the better-known reports for urban congestion, the *Urban Mobility Report*, which was first published in 1981. Rankings are provided in 14 categories. Los Angeles is the long-running traffic congestion champion, earning the number one ranking for all years since 1981 in 4 categories. In 7 categories, Los Angeles has been number one for all years except from 1983 to 1985 when Houston displaced Los Angeles in one or all of the years. In the remaining 3 categories Los Angeles has shared number one rankings with Houston and other cities.

But Houston was ranked as the undisputed most congested city on other lists. A comprehensive report by *U.S. News and World Report* ranked Houston as number one in traffic congestion in 1984. And given the inherent imperfection in any congestion measure, Houston was clearly among the most congested cities in United States and almost certainly the worst congested during the early 1980s.[77]

### Moving the Gridlock to the Airways

As Houston's freeways and streets were approaching gridlock, another transportation crisis began to develop—in the air. Houston's business executives were finding that the best way to beat Houston's traffic was to avoid it entirely by flying above it in helicopters. The river of petro-dollars fueling Houston's boom provided plenty of money to pay for the helicopters, and the Gulf of Mexico offshore drilling industry required constant personnel shuttles to and from the offshore drilling rigs. The number of helicopters based in the Houston region increased from 103 in 1977 to 315 in 1982. In 1981 it was estimated that 780 helicopters were operating within a 300-mile (480 km) radius of Houston. In 1982 the *Houston Post* reported, "A spokesman for the Federal Aviation Administration said the Houston area, with its 800 or so based helicopters, is easily the nation's center for helicopter activity." Armadillo Airways began a helicopter shuttle service between west Houston and the city's airports in 1980.[78]

In addition to backed-up streets around their neighborhoods, Houstonians now faced the relentless thunder of the nation's largest fleet of helicopters crisscrossing the city at low altitudes. It became a serious quality-of-life issue, especially for neighborhoods near the hub of helicopter activity in the Galleria/Uptown commercial district along the West Loop. As one frustrated Houston resident explained at a 1981 public hearing, "What little quality of life is left in this city will be totally destroyed without a noise abatement rule." In March 1981, Houston Mayor Jim McConn formed a committee to study the helicopter problem and recommend regulations to mini-


**A helicopter on every roof:** The severe traffic congestion in the late 1970s and early 1980s helped contribute to an unprecedented helicopter boom in Houston. Allison/Walker Interests, a developer of suburban office buildings, used a helicopter to visit project sites around the Houston area. "If we had to drive to every one of our projects, we'd spend all day on the road," remarked the company's chief pilot in 1982.[79] (Photo: HMRC RGD6)

mize the impact on neighborhoods and reduce the risk of accidents. Houston was entering uncharted territory when it attempted to regulate helicopter activity in December 1981. The Federal Aviation Administration (FAA) rejected Houston's plans in June 1982, saying that the city of Houston had overstepped its authority into areas of regulation that belonged to the federal sector. Houston was the nation's first city to attempt extensive regulation of helicopter operations. The FAA wanted to ensure that Houston would become a prototype for other cities that were considering helicopter regulation. Fine-tuning of the regulations continued, with the FAA, helicopter interests, and neighborhood groups all participating in the process. In December 1983 Houston City Council adopted a revised ordinance. However, all the fuss over the helicopter invasion would soon be forgotten as the imminent oil bust would eliminate the demand for helicopter service.[80]

**Key dates in the 1970s crisis**

| | |
|---|---|
| **1968** | Federal regulations dramatically increase and give expanded powers to small but vocal groups opposing freeways, making it more difficult to build new freeways. |
| **1970** | The National Environmental Policy Act of 1969 is signed into law, requiring environmental impact statements for federally funded highway projects. Building new freeways becomes even more difficult. |
| **1971** | The Texas State Legislature rescinds a planned increase in the fuel tax. |
| **Early to mid 1970s** | Highway construction costs escalate dramatically, increasing 58% in Texas in 1974 alone. Fuel tax revenues stagnate. |
| **1975** | TxDOT initiates large-scale workforce reduction, including 3,000 layoffs. |
| **1976** | A comprehensive study recommends a downsizing of new freeway plans in Texas. |
| **1974–1978** | The Harrisburg Freeway, West Loop Extension, and Grand Parkway are cancelled. Other freeways are put on hold. New freeway construction is reduced to a trickle. |
| **Late 1970s –early 1980s** | Houston's population boom brings the city's freeway system to near gridlock. |


EXIT 757
Gessner Rd
1 MILE
Bunker Hill Rd
McCARTHY
SENTRA

# The Second Wave

Getting politicians to take decisive action on an issue that doesn't involve national security or public safety isn't easy. And when new taxes are involved, it can be nearly impossible. But politicians always have their noses in the wind, sniffing for paths of political gain or expediency. By the early 1980s the air around Houston was thick with discontent. Traffic congestion had reached crisis proportions, and politicians would need to take action if they wanted to keep their jobs. Reaching a consensus wouldn't be easy and required another bruising round of the freeway versus rail debate, but in the end the freeway prevailed and the confrontation of the crisis would begin.

Houston's response to the traffic crisis was strong and decisive. If it was a war to be fought, Houston was bringing overwhelming force into battle. Some of Houston's brightest minds in business, transportation, and government would formulate a unique solution emphasizing cost-effectiveness and results. It was a solution that would meet demand by increasing supply of both highways and transit. The second wave would establish Houston as one of the nation's most aggressive builders and expanders of freeways and would propel Houston into the elite of the world's freeway cities.

## The First Steps

Houston's freeway construction program had reached its low point in 1976 when the McKinsey report recommended a dismantling of the ambitious plans for the freeway system. The following year, state political leaders in Austin took steps to ease the immediate crisis and delay a day of reckoning. The first substantial action to reverse the decline took place in early 1977.

At legislative hearings in November 1975, a top TxDOT official testified that TxDOT would completely run out of funds for new highway construction by 1980 if the department's finances were not strengthened. In February 1976 Governor Dolph Briscoe and State Comptroller Bob Bullock were publicly stating that additional funds would be needed for the highway program. That task became a top priority in the 1977 legislative session. A bill to pump an additional $528 million (1.3 billion in 2003 dollars) into the highway program over two years cleared the legislature by early April. It was an unusually swift passage through the legislature, which usually completes most of its work in the days just before the end of the session in early June. The bill was designed to keep TxDOT even with inflation by funneling general tax revenue into TxDOT's budget when dedicated highway funds could not keep up with highway construction inflation. Governor Briscoe signed the bill into law April 12, 1977. The new funding reversed a steep decline in TxDOT's budget, which had been $832, $731, and $662 million in the years 1975–1977, respectively. For fiscal years 1978 and 1979 TxDOT funding was $922 million and $1.02 billion. The legislation would continue to pump between $130 and $150 million per year in general revenues into the TxDOT budget until its repeal in 1984. The injection of new funds brought TxDOT back to life, allowing the formulation of a new 20-year plan in December 1977. Planning resumed on previously moribund projects, including Houston's Beltway 8.[81]

Help was also on the way from the federal government. By the early 1980s, the high price for underinvestment in the nation's highway infrastructure was becoming evident. In August 1982, *Newsweek* featured the state of the nation's crumbling infrastructure on its cover, calling it "The Decaying of America." The report stated, "Aging and neglected, the nation's network of roads, bridges, sewers, and rails is nearing collapse." It was more than an embarrassment—it was a risk to the national economy. President Ronald Reagan had entered office in January 1981 with the intent to cut taxes and reduce federal aid to states, including cutting aid for highways and mass transit. But the ailing economy was the main issue of the day, perhaps giving President Reagan cover to call for a five-cent increase in the gasoline tax in November 1982. Senate and House leadership were immediately supportive, and Congress approved the Surface Transportation Assistance Act of 1983 on January 6, 1983, increasing the fuel tax from four to nine cents per gallon. It was the first increase in the federal fuel tax since 1959. The tax increase provided $295 million in new federal funds to Texas in 1983, which was about 22% of the 1982 TxDOT expenditures of $1.35 billion.[82]

*(Opposite page)* **Houston's first five-level stack interchange:** One of the key projects of Houston's second wave of freeway construction was the Beltway 8-Sam Houston Tollway—Houston's second loop. The Sam Houston Tollway features one of the nation's most impressive collections of modern stack interchanges, most of them with five levels. This April 1988 photo shows construction on Houston's first five-level stack interchange at the Katy Freeway and the west Sam Houston Tollway. This interchange will be Houston's most short-lived, as it will be demolished and reconstructed during the Katy Freeway expansion project, scheduled for 2003-2008. (Photo: *Houston Chronicle*)

### The Birth of a Toll Road Authority

Houston's effort to solve the traffic crisis began in the mid-1970s. One of the first local officials to make transportation a top priority was Harris County Judge Jon Lindsay. In 1974, at the age of 38 with no previous political experience, Lindsay stunned the local political scene by winning the election for the powerful position of county judge, defeating the incumbent Bill Elliot. Lindsay was somewhat of a rarity among elected officials—he was a civil engineer. Harris County had been one of the key driving forces in the development and construction of Houston's freeway system in the 1950s and 1960s. An engineer was now at the helm of the region's most aggressive road-building entity. Lindsay was positioning Harris County to step forward and once again take a leadership role in freeway construction.

> "Harris County is in the toll road business and County Judge Jon Lindsay is the man of the hour."
>
> *Houston Chronicle*, September 14, 1983, one day after the successful bond election to create the Harris County Toll Road Authority

Starting in 1975, Lindsay focused his efforts on rescuing Beltway 8. In 1975 and 1976 Lindsay led Harris County in requesting the Texas Turnpike Authority (TTA) to study parts of the Beltway as toll road projects. Both studies declared the projects infeasible, but Lindsay continued his efforts to save the project. By 1977 improved financial conditions at TxDOT allowed planning to resume on small portions of the Beltway. However, Lindsay was already beginning to realize that the county would need to take matters into its own hands if it wanted to see the Beltway constructed any time in the near future. He stated that Harris County should be responsible for the Beltway toll road rather than the TTA. In 1978 Harris County resumed right-of-way acquisition and corridor preservation efforts for the Beltway.[83]

In 1979 the Texas Turnpike Authority identified the Hardy Road corridor as a potential candidate for a toll road. The issue of further study of the Hardy corridor was considered by Harris County Commissioners Court in August 1980. With Lindsay absent, Harris County commissioners voted 4-0 to oppose the toll road due to large and vocal community opposition. When Lindsay returned to Houston, he put the toll road back on the agenda for another vote and brought two commissioners to his side, resulting in a 3-2 vote in favor of continued studies. With that vote Lindsay first took ownership of the Hardy Toll Road. As the project became increasingly embattled in the following years, Lindsay would almost single-handedly push the project forward to construction.

By mid-1982 the TTA was backing away from plans to construct the Hardy Toll Road due to opposition from the city of Houston, the Metropolitan Transit Authority, and elected officials. Lindsay was now the only person who could save the Hardy Toll Road. In August 1982, Lindsay instructed the county attorney to investigate if the county could create its own toll road authority. It turned out that special legislation would be needed. The legal authority for Harris County to form a toll road authority came with Texas legislative bill SB970, signed by Governor Mark White in June 1983.

Lindsay arranged a $900-million bond election for September 13, 1983, to launch the toll road authority. Winning the election was by no means assured. On June 11 Houston voters had soundly defeated the Metropolitan Transit Authority's plans for a billion-dollar heavy rail line. Opposition to the toll road authority was strong in predominantly minority, low-income areas in the vicinity of the controversial Hardy Toll Road on the north side of Houston. Support was strongest in the northern and western suburbs. The election hinged on which group could get its voters to the polls.

Lindsay's forces set up a sophisticated direct mail and phone bank operation to get their targeted voters to the voting booths. Opinion polls were used to identify pro-tollway voters. It was a grassroots effort, designed to get frustrated motorists to vote, and it worked. A strong turnout in suburban west Houston drove the toll road bonds to victory with 69.7% of the vote. For a bond issue, the election had an unusually high 13% voter turnout. A post-election analysis by the *Houston Chronicle* summarized the vote by saying, "Jon Lindsay is the man of the hour."[84]

### The Regional Mobility Plan

In the early 1950s the Houston Chamber of Commerce played a key role in gaining state approval and securing funding for Houston's freeway system. After a long period of relative dormancy, the transportation committee of the Chamber of Commerce came back to life to address the transportation crisis. In 1980 Roger Hord, director of the chamber's transportation department, initiated efforts in conjunction with the transportation committee. The committee was led by John B. Turner Jr., president of Friendswood Development, a land development company active in building master-planned communities around Houston. Turner was the strongest and most influential leader of the transportation committee since the 1950s. As a land developer, he was well connected with local business interests and government agencies. He focused his civic service on solving the transportation problem that was threatening the future of Houston.[85]

Hord and Turner began their efforts by developing a comprehensive list of transportation projects needed in the Houston area and obtaining endorsements for the projects from agencies in the region. As they identified projects, it became apparent that a more systematic approach would be necessary—one that included growth estimates, traffic projections, and cost-effectiveness measures. In 1981 Hord and Turner assembled a group of leading transportation professionals in the Houston area and developed a

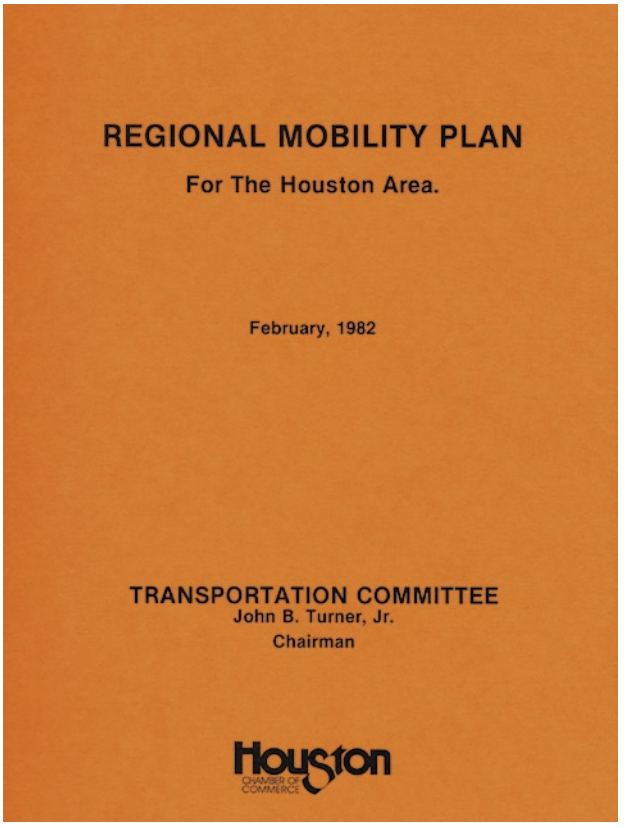
plan to solve Houston's mobility problem. In February 1982 the group released *A Regional Mobility Plan for the Houston Area*, the most comprehensive and sweeping proposal for updating Houston's transportation system since the freeway system was first proposed in the early 1950s. The Regional Mobility Plan would form the backbone of Houston's response to the traffic crisis.

The plan produced by the task force was intended to deliver the maximum amount of traffic relief for the money spent. The plan was a unique solution, tailored for Houston's low density, sprawl, and decentralized travel patterns. It emphasized increasing the supply of transportation facilities to meet increasing demand. The report limited the use of expensive options, like rail transit, only to situations where no other method could get the job done. It didn't fall victim to the transportation fad of the day, "heavy rail" mass transit, an extremely expensive system used in Atlanta's MARTA, Washington, D.C.'s Metro, San Francisco's BART, and many others.* More than anything else, the Regional Mobility Plan was a freeway plan. The plan had three key recommendations: expand existing freeways, build a comprehensive system of dedicated bus lanes into the freeway system, and build new facilities, both freeways and tollways.

The report recommended major expansion of nearly all the radial freeways. Elevated express lanes were recommended for the Katy, Southwest, North, West Loop, and Northwest Freeways. The Eastex, Gulf, and North Loop Freeways were also slated for expansions. In all, 170 miles (272 km) of freeways were recommended for widening. In addition, 184 miles (294 km) of new freeways and tollways were recommended for construction during the 15-year implementation period, and an additional 100 miles (160 km) of new freeways or tollways were proposed to serve anticipated future growth. The substantial mileage of new freeways in the plan was really just a build-out of the planned freeway network that existed in 1970, before cancellations and delays began. The only new facility not previously planned was the Hardy Toll Road.

The distinguishing characteristic of the Regional Mobility Plan was the comprehensive use of freeway transitways—barrier-separated lanes designed for buses and high-occupancy vehicles (HOV). The extensive use of transitways was a solution unique to Houston, bucking the national trend of building rail systems. In all, 128 miles (205 km) of transitway lanes were recommended. The plan included provisions for 30 miles (48 km) of "high-capacity transitway" but did not specify a technology, recommending that "more costly transportation technologies are added only when travel demands cannot be met by lower cost options."

Reaction to the plan was good. A representative of the Federal Highway Administration remarked, "It's a massive undertaking, but we have a massive problem." John Butler of the Texas Transportation Commission called the plan "the finest thing the Chamber [of Commerce]





**No flash, all substance:** The 1982 Houston Regional Mobility Plan was not flashy in its appearance or presentation, but its recommendations formed the blueprint for the major freeway expansion and construction program that would take place over the next 20 years. (Photo: Chuck Fuhs)

* "Heavy rail" transit typically uses a third rail for electrical power. The third rail is at ground level, next to one of the regular rails that the rail cars ride on. The electrified third rail necessitates a secure right-of-way for the track with no crossings. Light rail, in contrast, typically uses overhead wires for electrical power, allowing the tracks to be placed on city streets.

## Leaders of the Second Wave

Like the original construction of the freeway system, orchestrating the second wave of Houston's freeway construction was a broad, coordinated effort. Two individuals stand out as the most influential in Houston's second wave.

**Robert C. "Bob" Lanier, born 1925**

A native of Baytown just east of Houston, Bob Lanier became a successful banker and real estate developer after practicing law early in his career. His active role in politics led to his appointment as commissioner on the three-member Texas Transportation Commission in February 1983, and he became commission chairman in June 1983. Lanier's influence on transportation in Houston and in Texas is probably greater than that of any other individual in the post-1970s era. He played a key role in securing 5-cent increases in the state fuel tax in 1984 and 1986, tripling the tax from 5 cents to 15 cents and providing critically needed funding to modernize the Texas highway system. He directed increased resources to Houston to address the transportation crisis and compensate for prior underfunding of the region. After his service on the transportation commission, Lanier played an active role in transportation planning in Houston as chairman of the Metropolitan Transit Authority board. Lanier's emphasis on cost-effective transportation solutions led to his opposition to rail systems and the cancellation of plans for monorail when he became mayor of Houston in 1992. Lanier then turned his attention to non-transportation issues, including public safety and downtown revitalization. In 2002, Lanier was inducted into the Texas Transportation Hall of Honor. (Photo: TxDOT)

**Jon Lindsay, born 1935**

Jon Lindsay won the election for the powerful position of Harris County Judge at the age of 38 and began service in January 1975. As a civil engineer, Lindsay was a rarity in the political world. Through the remainder of the 1970s, Lindsay led efforts to keep Beltway 8 alive. In response to the inability of state resources to solve Houston's transportation problems, Lindsay worked to create the Harris County Toll Road Authority, which was officially launched with voter approval in 1983. Lindsay brought the Hardy Toll Road to construction almost single-handedly, and his toll road authority would go on to become one of the most important factors in the second wave of construction in Houston. Lindsay did not seek reelection in 1994 but was elected as state senator serving the northwest Harris County district in 1996. (Photo: office of Senator Jon Lindsay)

has embarked upon in some time." Other local officials and agencies were soon throwing their support behind the plan, even while there was some apprehension over the tax increases that would be needed. For the Chamber of Commerce, the plan served as an effective rallying tool to focus the efforts of local governments and business interests. The united, focused effort was particularly important for obtaining political support at the statewide level.[86]

The plan's recommendation for the 15-year implementation period did not include the Grand Parkway or the Fort Bend Parkway, two freeways cancelled in the 1970s. But those two freeways were not forgotten. Suburban interests worked to revive the cancelled freeways, and in 1984 the Grand Parkway was reinstated to Houston's long-term freeway plan. Also in 1984, Fort Bend County southwest of Houston began its efforts to revive the Bay City Freeway, which was renamed the Fort Bend Parkway. Years of study followed, and in 1988 the Fort Bend Parkway outside Beltway 8 was officially adopted into the state highway system. In the late 1990s plans were

formulated to construct the Fort Bend Parkway between Loop 610 and Beltway 8. The restoration of Houston's freeway plan was complete. Houston would realize nearly its entire pre-1970s freeway plan and would even go on to add new freeways and tollways. Only one section of freeway in the immediate Houston area, the La Porte Freeway inside Loop 610, remained cancelled. Two other freeways outside Houston in Galveston County, SH 146 and the West Bay Freeway, were deleted from long-term plans in the 1980s.

Even with its focus on cost-effective solutions, the Regional Mobility Plan wouldn't be cheap. It was projected to cost $16.2 billion over 15 years, approximately 27 billion in 2003 dollars. Only $6.9 billion was anticipated to be available during this period, leaving a gap of $9.3 billion. The plan was very direct in its financial approach, recommending a range of tax and fee increases to put the funding in place. To solve the problem, it was going to take money—and lots of it.[87]

Now Houston needed a political money man, someone who could push through tax increases and get money flowing into Houston. Fortunately, Houston's transportation messiah was just about to step forward.

### Needed: One Master Freeway Builder for Houston

When the time comes for decisive action, there's always the temptation to look back in history. When road-building is the subject, one name stands alone among the great urban freeway builders of the United States: Robert Moses, the master builder of New York. Starting in the 1920s, Moses (1888-1981) developed a political empire that enabled him to build most of the New York City and Long Island freeway system and the bridges connecting the city, as well as Long Island's park system and other large projects in New York state. With his political power, Moses had an extraordinary ability to get things done. He also had a disregard for the negative consequences of his projects, which would ultimately tarnish his standing in history. Moses' overuse of power would contribute to the implementation of mechanisms ensuring that no one would ever again have his power to build at will. But perhaps there was a new incarnation of Robert Moses, refined for the modern era and its limitations, waiting in the wings to step forward for another great building era. Would Houston have the good fortune of the next Robert Moses?

Robert Clayton "Bob" Lanier was born in 1925 in Baytown, about 30 miles (48 km) east of Houston, the third of three children. His father was a Methodist minister and later a refinery worker. The Lanier family struggled through the Depression in a small house with no indoor plumbing. Lanier wrote for the Baytown newspaper while in high school and planned to become a reporter. He studied English at the University of New Mexico and was a sportswriter for the college paper. After World War II service in the Navy, he put himself through the University of Texas law school by writing for the *Austin American-Statesman*. After graduation he joined the Baker & Botts law firm in Houston, one of the state's most influential law firms. After three years at the firm, Lanier started his own practice and began dealing in real estate.[88]

It was fitting and perhaps prophetic that Lanier's first real estate venture was the purchase of an apartment complex on the Gulf Freeway in the early 1960s. Shortly afterwards Lanier focused his efforts on real estate and rescuing distressed banks, selling the banks after returning them to profitability. Lanier was a fanatic about information, details, and number crunching. His ability to absorb information and use it to his advantage is credited as one of the major reasons for his success. At various times in his career, Lanier would take a strong interest in a certain issue and then learn everything he could about it. If he couldn't learn enough from books, Lanier would often bring world-renowned specialists and authors to Houston to discuss their works with him. Scientist Linus Pauling and economist Milton Friedman were among the visitors to his River Oaks home.

While Robert Moses had dedicated his life to building highways, infrastructure, and parks, Bob Lanier had spent his time building personal wealth. Having achieved business and financial success, Lanier started to take more interest in civic issues. By the early 1980s transportation was clearly the biggest challenge facing Houston. Perhaps it was the size and difficulty of the problem that attracted Lanier, or perhaps it was his real estate development background and his knowledge of the importance of transportation and freeways to Houston. Lanier was well connected in Democratic Party circles, making frequent donations to candidates and often holding fund raisers at his home. Lanier's support of winning Democratic gubernatorial candidate Mark White in the 1982 Texas governor's election proved to be a key event in the transportation history of both Houston and the state of Texas, launching Lanier into his first position of great influence in transportation.

### Mr. Chairman

As the calendar reached 1980, Houston recorded a full half-century of a transportation drought. For 50 years Houston did not have a representative on the three-person Texas Transportation Commission, the powerful commission that determines the allocation of highway funds in Texas. Houston's last representative, Ross Sterling, left the commission in 1930 when he became governor. The long wait for the next Houston commissioner ended in 1981 when Republican Governor Bill Clements appointed Houstonian John Butler to the commission. In 1982 Democrat Mark White defeated Clements and became governor. In February 1983 he appointed Bob Lanier to the Texas Transportation Commission, and in May 1983 Lanier became chairman. Houston had gone from zero representation to a two-thirds majority. Of course, the increased presence didn't translate directly into money for Houston, but the Lanier era of the Texas Transportation Commission would prove to be the most influential for


**Houston's freeways turn into an obstacle course:** The reconstruction and expansion program got underway in the early 1980s and launched the seemingly never-ending era of construction detours on Houston's freeways. This July 1985 view shows the Gulf Freeway at Lockwood, with northbound traffic diverted to an adjacent structure. On the other side of this overpass was the notorious "S" curve detour. The Gulf Freeway was Houston's first freeway to undergo a comprehensive rehabilitation with a fully integrated bus transitway. (Photo: Chuck Fuhs)

highway construction funding in Texas since the 1950s.

Lanier now turned his attention to transportation and began to learn about it with the same zeal he had applied to his other endeavors. Lanier would bring a bottom-line, results-oriented approach to transportation planning. The more Lanier looked at the numbers, the more he realized that highway construction was the best—and probably only—way to rescue Houston from its crisis.

First, Lanier collected data showing that Houston had been short-changed over the 66-year history of TxDOT. Houston had contributed 22 to 25% of state-generated revenue, but had received only 9 to 11% of the highway construction contracts. These statistics gave Lanier immediate justification to dramatically increase Houston's share of the pie. Houston was ready to build, with project plans complete and ready for immediate contract award. In 1983 approximately 33% of statewide construction funding was allocated to Houston. During the 1984–1993 period Houston received 26.4% of state highway construction funding.[89]

However, if Houston was going to get the needed support from the state for its Regional Mobility Plan, the highway funding pie would have to be made much larger. That meant an increase in the fuel tax, definitely not a popular idea among politicians, including Governor Mark White. The Texas energy economy was in a steep decline during this period, putting severe strain on the state budget. Many politicians were even looking to take money out of the TxDOT budget to cover shortfalls in other areas. During this crucial period Lanier worked to protect and strengthen the highway program. He managed to convince key political leaders, including Governor Mark White, that Texas needed an increase in highway funding—and that a decrease in funding could be devastating to the long-term economic future of the state. Lanier focused his efforts on building support for an increase in the fuel tax, not an easy task in an antitax state like Texas.

Transportation wasn't the only crisis brewing in Texas. Education reform was also in need of attention. The 1983 Texas Legislature failed to take action on the top two issues facing Texas, so Governor Mark White was forced to call a special session* in 1984 to deal with education and transportation. It was the critical moment for transportation funding in Texas. If a fuel tax increase could

* The Texas Legislature meets in its regular session for the first five months of every odd-numbered year. Special sessions are often called to complete business not finished in the regular sessions.

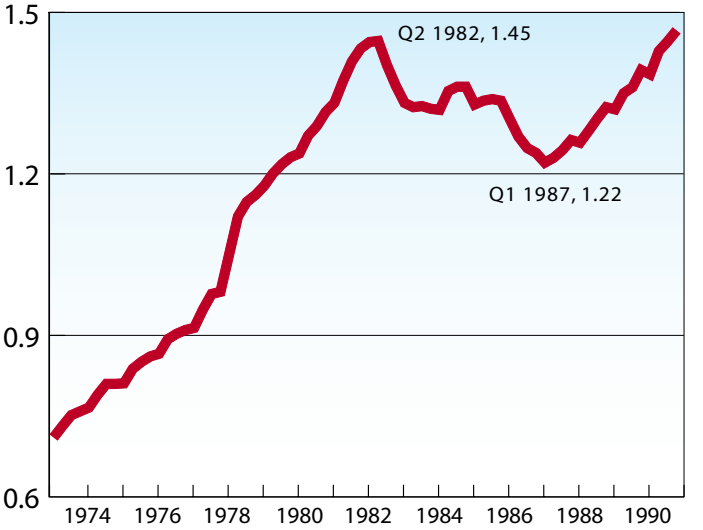
not be pushed through at the time of crisis, then maybe it could never be done. At the end of the session the Texas Legislature responded with money. In fact, it was a record tax increase for Texas. Included was a doubling of the fuel tax from 5 cents per gallon to 10 cents per gallon, the first increase in 29 years. 75% of the new revenue from the fuel tax would go to highways, with the remaining 25% constitutionally dedicated to education. In addition, motor vehicle registration fees were raised by $25. Bob Lanier played a key role in the enactment of the revenue increases.

On July 11, 1984, at the construction zone for the North Belt Freeway in Houston, Governor Mark White signed the highway funding bill into law. All the pieces were now in place for the second wave of Houston's freeway construction.[90]

Lanier continued his efforts to strengthen funding for highway construction in Texas. In 1986 a temporary additional 5 cent increase in the fuel tax was enacted by the Texas Legislature and Governor Mark White, who subsequently lost his bid for reelection in November 1986. In July 1987, after substantial political maneuvering on tax issues, Republican Governor William Clements approved a permanent extension of the fuel tax increase. Lanier's six-year term on the Transportation Commission ended on July 28, 1987. In just three years, the state fuel tax had been raised from 5 cents per gallon to 15 cents per gallon. 75% of the revenue generated by the fuel tax was constitutionally allocated to the state highway fund. The funding improvement would be critical for meeting the transportation needs of not only Houston, but the entire state of Texas.

### The Transportation Improvement Program

The second wave of construction was a three-pronged attack on Houston's congestion. First, the unfinished freeways, then consisting of only frontage roads in the suburban areas, would be completed. This included the La Porte Freeway, the Northwest Freeway, and the North Belt. Second, new facilities would be constructed, most of which had been on long-term planning maps since the 1960s. This included the Hardy Toll Road, nearly all of the Beltway 8/Sam Houston Tollway, the Crosby Freeway, the SH 249 Tomball Parkway, and the western section of the Grand Parkway. Two other all-new facilities, the Westpark Tollway and the NASA 1 bypass freeway, would later be added. Third, most existing freeways would be reconstructed and expanded, usually with the inclusion of a transitway. This included the North Freeway from downtown to Conroe, the Gulf Freeway from downtown to outside Beltway 8, the Southwest Freeway from downtown to Sugar Land, the Eastex Freeway from downtown to Kingwood, and sections of the East Freeway and Loop 610. Large-scale construction began in the mid-1980s, with intensive work continuing through the late 1990s.




▲ Harris County Employment, millions

Data: Texas Workforce Commission

**The bust:** This plot of total employment in Harris County in the 1980s shows the impact of the energy industry collapse. The energy boom reached its peak in 1982 when employment topped out at 1.45 million. Houston's economy then went into decline, culminating with a sharp drop in oil prices in 1986 and the collapse of Houston's economy. Houston's employment reached its low point in the first quarter of 1987, and it would take until 1990 to return to the pre-bust employment level. For the entire 1980s, employment in Harris County grew by only 18%, providing critically needed breathing room for the freeway system and time for capacity improvements to catch up to demand.

### Breathing Room

While political officials engineered a multipronged attack on Houston's transportation problem, increasing the supply of transportation resources, the other factor in the equation—demand—was providing relief. The mid-1980s would bring a devastating collapse to the energy industry, and oil-dependent Houston was hit particularly hard. The energy boom reached its peak in 1981 and 1982. In 1981 the price of a barrel of oil as measured by the average crude oil refiner acquisition cost reached $35.24—about $62 per barrel when measured in 2003 dollars. Prices stayed high in 1982, averaging $31.87 per barrel, or $53 per barrel in 2003 dollars. The number of drilling rigs operating in the United States, a good indicator of the amount of activity in the energy industry, soared to unprecedented levels in the early 1980s, reaching an all-time record of 4,530 active rigs the last week of 1981. The boom began a downward trend around 1983 and culminated in the collapse of oil prices in 1986, with average prices for the year dropping to $14.55 per barrel, $21 per barrel in 2003 dollars. The effect on the Houston economy was dramatic and devastating. Huge layoffs at energy-related firms were part of the daily news. When the bottom was hit in the first quarter of 1987, Harris County had lost 225,000 jobs since the peak employment of 1.45 million in the second quarter of 1982. Employment recovered in the following years, reaching 1.47 million jobs by the fourth quarter of

**Key Dates in the Second Wave**

| | |
|---|---|
| **1982** | The Houston Chamber of Commerce releases the Regional Mobility Plan. |
| **1983** | *February:* Bob Lanier is appointed to the Texas Transportation Commission.<br>*September:* Voters approve the creation of the Harris County Toll Road Authority. |
| **1984** | On June 11 Governor Mark White signs a transportation funding bill into law, raising the fuel tax from 5 to 10 cents per gallon. |
| **1986** | Fuel tax is increased to 15 cents per gallon. Houston's economy collapses as oil prices drop, reducing the growth of freeway demand. |

1989, but for the entire decade of the 1980s jobs in Harris County increased by only 18%. This slow growth provided the freeway system much-needed breathing room, time to catch up to demand that had so drastically exceeded supply in the 1970s and early 1980s.[91]

By the late 1980s Houston was dropping like a rock down the list of the nation's most congested cities. The combination of the freeway expansion program, new tollways, better mass transit, and moderated growth in demand provided a huge improvement in Houston's mobility.

Houston's decision to focus on buses and freeway transitway lanes was also making a strong contribution to improved mobility. In November 1993 the Federal Highway Administration reported, "Of the thirty-three metropolitan areas [studied], all except for Houston showed declines in the share of bus commuters between 1980 and 1990." Although the 3.65% of Houston workers traveling to work by bus was still below the 1990 national average of 4.89%, the increasing trend was unique in the United States.[92]

### Build Your Own Freeway

Another important factor in the 1980s freeway resurrection was the increased role of local real estate and land development interests in promoting the construction of new freeways. At the June 1984 special session of the Texas Legislature, a new state law was passed authorizing the formation of nonprofit transportation corporations. A transportation corporation was an entity funded by independent sources outside of TxDOT. It was responsible for performing all work up to the point of construction, including right-of-way acquisition, environmental studies, and engineering. TxDOT would then pay for the actual construction of the highway or freeway. In October 1984 Houston's first transportation corporation, the Grand Parkway Association, was authorized by the Texas Transportation Commission. The Grand Parkway Association was initially funded by west Houston real estate interests who were pushing for the construction of the western segment of the Grand Parkway. The Galveston-Alvin-Pearland transportation corporation was formed soon afterwards to promote the Galveston-Alvin-Pearland Parkway (the "GAP Parkway"), a resurrection of the West Bay Freeway. The commission authorized the Galveston-Alvin-Pearland transportation corporation to perform feasibility studies for the GAP Parkway in November 1985. In 1990 the Fort Bend Parkway Association was designated as a transportation corporation by the commission.[93]

Bob Lanier was a strong supporter of the transportation corporation concept. After all, if real estate and land development interests were going to be big beneficiaries of the new transportation facilities, it was certainly reasonable to expect them to provide financial assistance for their construction. Lanier viewed transportation corporations as a way to stretch available funding as far as possible by increasing private sector participation. The Grand Parkway Association was the most active transportation corporation in the Houston area, and probably in the state of Texas. In the 1980s the Texas Transportation Commission entered into several agreements with the Grand Parkway Association for construction of Grand Parkway segments in west and north Houston.[94]

The concept of the transportation corporation was well received by the interests who were seeking transportation facilities, and those interests were initially willing to provide funding to get the projects back into the development process. But as these projects progressed, the complexity and high cost of bringing a major transportation project to the point of construction became a problem. Securing right-of-way donations was the easy part, although it was generally not possible to obtain 100% of the required right-of-way through donations. Then, millions of dollars would be needed for environmental studies and engineering. Increasingly stringent environmental regulations were adding to the cost, and by the time the United States Congress approved the Intermodal Surface Transportation Efficiency Act of 1991, the costs of environmental studies had become so high that it was impossible to obtain the needed funds through donations. The Grand Parkway Association was able to move one segment of the Grand Parkway to construction, completing it in 1994, but the hopes of constructing additional segments had faded by the late 1980s. The association received large cash infusions from local government agencies in the 1990s to sustain its operations. The GAP Parkway faded quickly after a feasibility study was completed. That project had little merit from a transportation perspective and would have promoted development in environmentally sensitive and hurricane-susceptible areas. The driving force behind the Fort Bend Parkway was Fort Bend County Commissioner's Court, not the transportation corporation.

The transportation corporation era had largely run its course by the 1990s, but it did produce one big accomplishment: the Grand Parkway. Although only one segment was constructed, the Grand Parkway Association kept the project alive and ultimately, with government agency and TxDOT financing, would continue to move the entire project forward.

### Behind the Scenes

While Bob Lanier and Jon Lindsay publicly led the charge for an improved transportation system, many others worked behind the scenes to make the second wave happen. United States Congressional Representative Tom Delay, from Sugar Land southwest of Houston, provided key support at the federal level for Houston's highway construction program. The Harris County Toll Road Authority (HCTRA) was the pet project of Harris County Judge Jon Lindsay, who almost single-handedly brought the authority into existence with voter approval in 1983. However, HCTRA owes much of its operational success over the following 20 years to Wesley Freise, who served as executive director from 1985 to 2000. Freise negotiated agreements to provide innovative financing for the expansion of the toll road system, and he was instrumental in moving new projects forward, especially the Westpark Tollway. Under his management the authority consistently completed new construction projects on time and on budget. In recognition of his efforts, the Texas Transportation Institute inducted him into its Hall of Honor in April 2002.

Further out of the public view are Houston's engineering consultant and construction firms. They have played a key political role in building Houston's infrastructure, particularly in the post-1980 era. Engineering firms doing business with Harris County are some of the largest contributors to political campaigns, particularly in county elections. The *Houston Chronicle* has reported on the close relationship between contractors and politicians, and critics' charges that the system lacks accountability. The issue of business contributions to politicians extended to all aspects of county contracting and was not limited to road and tollway construction. The subject has even arisen as a potential item for campaign reform, receiving the attention of county judge and road-building advocate Robert Eckels in 1999 when he publicly supported a law that would have banned contributions from architectural, engineering, legal, and other professional firms doing business with the county.[95]

In spite of critics' complaints, the system has successfully delivered needed transportation infrastructure to Harris County, and the outstanding record of the Harris County Toll Road Authority stands as a testament that the system has worked in the public interest.

### The Unseen Power

Perhaps no good story is complete without an inconspicuous, intensely private figure who works behind the scenes, pulling strings and calling shots. Houston's freeways have such a character: James D. "Doug" Pitcock, the highly influential owner and president of Houston's leading highway contractor, Williams Brothers Construction.

Inspiring adulation, admiration, respect, fear, and scorn in Houston's construction industry, Pitcock (born 1928) has been one of the key players in Houston's freeway construction machine. Pitcock has been an active participant in building Houston's freeways longer than anyone else, joining Houston's construction industry in 1950 when plans for Houston's freeways were just tentative lines on a map. With the influence he gained through his connections and political contributions, he has been a valuable advocate for highway funding in Houston, statewide, and nationwide. He has served in dozens of high-level positions in industry associations at the local, state, and national level, including president of the Associated General Contractors of America in 1984. And perhaps most importantly, his construction firm has lowered the cost of freeway construction in Houston, allowing Houston to build more freeways with available funding.

**Tollway dealmaker:** Wesley Freise served as executive director of the Harris County Toll Road Authority (HCTRA) from 1985 to 2000. Freise is credited with the operational success of HCTRA and the negotiation of agreements that facilitated the expansion of the toll road system. His biggest deal was the transfer of ownership of the Beltway 8 Ship Channel Bridge to HCTRA in exchange for funding to help complete the south and southeast sections of the Sam Houston Tollway. (Photo: Tom Bailey Photography via HCTRA)

After receiving a degree in civil engineering from Texas A&M in 1950, Pitcock went to work in Houston's construction industry and joined Williams Brothers when it was founded in 1955. Pitcock has run Williams Brothers since its founding and obtained full ownership of the firm in 1991. His legendary work habits—he worked 11.5-hour workdays plus weekends at the age of 70 in 1998—helped propel Williams Brothers to the dominant position in Houston's highway construction industry. The year 1991 also marked the beginning of a difficult period for Williams Brothers, with controversies and long delays engulfing the firm's projects on the Fred Hartman Bridge and the Eastex Freeway. But by the late 1990s, Williams Brothers had corrected its long-running tendency for com-

**Freeway construction magnate:** James D. "Doug" Pitcock, shown in a 1991 photo, has been practically invisible to the public but has been very influential in developing and building Houston's freeway system since the 1950s. His construction firm, Williams Brothers, dominates highway contracting in Houston and has lowered the cost of freeway construction, enabling Houston to build more freeways with available funds. (Photo: Williams Brothers Construction)

pleting jobs behind schedule. Williams Brothers became more dominant than ever, winning approximately 38% of Houston-area construction contracts greater than $10 million completed between 1987 and 2002. Pitcock took the contracts he wanted and let the rest of the industry divide what remained. In 2001 Williams Brothers received numerous awards for its rapid completion of an emergency bridge repair of the Queen Isabella Causeway in south Texas near Brownsville (see page 350), and in 2003 the firm was gaining a reputation as being Houston's fastest highway contractor. Officials uniformly praise the quality of Williams Brothers' work. In 1998 the first public light was shed on Pitcock in a comprehensive article written by the *Houston Chronicle*.[96]

How is Doug Pitcock able to consistently bid so low on Houston's freeway construction jobs? The 1998 article provides some answers. Pitcock maintains very tight control of his company. Some people say he is "strict"; others might say he rules with an iron fist. He maintains a small central office staff and keeps overhead low. His volume provides economies of scale, allowing Williams Brothers to own concrete, asphalt, and prefabrication plants around the city. Pitcock strictly enforces safety policies, keeping workman's compensation costs well below industry averages. He is very aggressive in front-loading his bids; that is, earning a huge profit on tasks early in a project while sustaining losses on work near the end of the project. This front-loading brings in cash flow during the early phases of the project cycle. Perhaps most importantly, Pitcock answers to no one. He can bid aggressively without having to worry about shareholders scrutinizing profit margins.

Pitcock is perhaps one of the last of a certain breed—some would say a dying breed—of Houstonians. They are the singularly focused, relentlessly dedicated individuals who are intent on achieving success and building something great in Houston. These individuals are the essence of the Houston spirit—a form of raw entrepreneurship and business savvy that found a home in a city where the deal was king and the future was limitless. A little cowboy blood seems to flow through the veins of these Houstonians. Houston's freeway system has had the good fortune of receiving the benefits of the hard work of many great Houstonians, such as Oscar Holcombe and Bob Lanier. Doug Pitcock, in his own quiet way, has helped build Houston. Although few Houstonians outside of the construction industry have ever heard of Doug Pitcock, they drive on his completed projects every day. The mystery man behind Houston's freeway system has been a big asset to Houston's freeway construction program.

### The 1990s

During the 1990s the implementation of the freeway and tollway construction program continued. By 2003 the intent of the 1982 Regional Mobility Plan had largely been realized, although many details of the actual implementation differed from the 1982 plan. For example, no double-deck freeways were constructed.

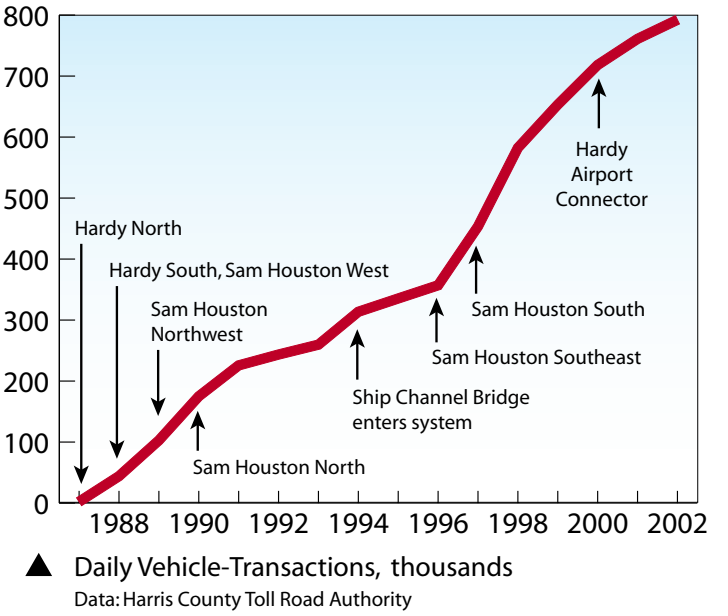
With the completion of so many large expansion and construction projects in the 1980s and 1990s, and the substantial improvements to mobility in Houston, the early 1980s transportation crisis was a distant memory. But the crisis was the key factor that helped bring more state money to Houston. With the crisis over, the Texas Transportation Commission turned its attention to other pressing needs across the state of Texas. Most other regions of Texas could legitimately claim to have urgent, unmet transportation needs. The term of Houston advocate Bob Lanier on the Texas Transportation Commission ended in July 1987. History shows that regional funding in Texas follows cycles, so there was really only one direction for the funding to go. The result was a steady downward trend in Houston's share of state highway construction funding through the 1990s.

After a peak of 33% in 1983, Houston's share of construction funding went into a steady decline, falling to 13.3% in 2001. Houston's "fair share" of state transportation funding is generally regarded to be at least 22%, based on population, vehicle-miles travelled, and motor vehicle registration fees. Reversing the downward trend became one of the top priorities of local political officials. They presented Houston's case to the Texas Transportation Commission in April 2001 and September 2002, and the entire political establishment in Houston was organizing to restore Houston's funding. The downward trend in funding was reversed in 2003 in conjunction with the

huge Katy Freeway expansion project.[97]

In the 1990s, the role of the Houston Chamber of Commerce as a lobbying organization for Houston-area transportation improvements was greatly diminished. The chamber's influence and power had always been directly related to the strength and influence of the business community. With the collapse of the Houston economy between 1986 and 1989, Houston business interests were severely weakened. Many of the key supporters of the Chamber of Commerce—real estate, land development, and banking interests—were forced into bankruptcy or disappeared entirely. The business community that had so strongly promoted Houston for the previous 50 years was struggling for its own survival. In 1989 the Chamber of Commerce joined with the Houston World Trade Association and the Houston Economic Development Council to form the Greater Houston Partnership. The Clean Air Act revisions of 1990 and the Intermodal Surface Transportation Efficiency Act of 1991 made transportation planning a highly complex and bureaucratic task. A detailed vision of Houston's transportation future like the 1982 Regional Mobility Plan was no longer within the scope of the Greater Houston Partnership. Transportation planning responsibility was more firmly entrenched in the transportation department of the regional metropolitan planning organization—the Houston-Galveston Area Council (HGAC). Political leaders ensured a pro-mobility, pro-freeway policy for the HGAC and its key policy-making committee, the Transportation Policy Council (TPC). Jimmy Schindewolf, an advisor of Houston mayor and highway advocate Bob Lanier, served as chairman of the TPC from 1994 to 1998. Harris County Judge Robert Eckels took the chairman position in 1998. The responsibility for lobbying shifted to individual political leaders. In the 1990s, Eckels was the most vocal and influential advocate of transportation investments in Houston.

The 1990s saw the emergence of the Harris County Toll Road Authority (HCTRA) as a major force in Houston-area highway construction. Rapidly increasing patronage of HCTRA's tollways by Houston motorists provided a strong revenue stream that easily covered bond payments and provided financing for tollway expansions and new facilities. Through the 1990s tollway patronage doubled every five years, reaching 792,000 vehicle-transactions per day in 2002. The financial strength of HCTRA in the mid to late 1990s allowed it to move forward with advance planning and construction for several projects. The South Sam Houston Tollway was completed in 1997, the Hardy Toll Road Airport Connector opened in 2000, and capacity improvements to the Hardy Toll Road were underway by the late 1990s. The Westpark Tollway began construction in 2001, and work was underway in 2002 to expand the Sam Houston Tollway to eight lanes from the Southwest Freeway to the North Freeway. Other projects in the advanced planning phase included the Harris County section of the Fort Bend Parkway, the Hardy Toll Road extension into downtown Houston, and a tollway on the Katy Freeway corridor. In June 2001, HCTRA released a map showing additional potential tollway projects for the long-term future—the "pooled projects" map.[98]




**Phenomenal success of Houston's tollways:** This plot shows the increase in vehicle-transactions on the Harris County toll road system since the first tollway opened in 1987. This success has positioned the Harris County Toll Road Authority to be a leader in building the next generation of Houston's transportation infrastructure.

The 1990s brought continued improvement and expansion of the transitway system on Houston's freeways, generally in conjunction with major freeway expansion and reconstruction projects. Houston Mayor Lee Brown, successor to Mayor Bob Lanier, was able to shift the priorities of the Metropolitan Transit Authority toward a light rail construction program. Houston's first light rail line on Main Street began construction in 2001 and is scheduled for operation in 2004. Future political events will determine if light rail will become the future focus of the Metropolitan Transit Authority, rather than the transitway system.

## Assessing Houston's Freeway System: A Critique

As the calendar reached 2003, it marked the 50th anniversary of the unveiling of Houston's first comprehensive freeway plan. The group of civic leaders who traveled to Austin in July 1953 to present the plan to the Texas Transportation Commission brought with them a blueprint for what would become the best loop and radial freeway system in the United States. But it was only the beginning of planning efforts that would continue for the next 50 years. So some questions naturally arise: How good is Houston's freeway system? What was done right? Where did Houston's freeways go wrong? How could Houston's freeways have been better?

The Houston freeway system report card will answer those questions. Giving a grade to a freeway system is no simple task. During the past 50 years, the American

city has continuously evolved, transportation patterns have shifted, political standing for highway construction has had its ups and downs, and the American economy has been transformed. Houston experienced one of the nation's greatest booms of the 20th century—and a severe bust. All the while, the freeway system was struggling to make progress. Tracing the progress over this long period of time is a lot like following a student from preschool through college. So the report card will focus on key categories and distinct periods of time, tally up the good and the bad, and assign a grade. It is a subjective approach, taking into account the ability of the freeway system to meet Houston's needs, the vision and innovation of Houston's efforts, and the quality of Houston's efforts in comparison to other cities. In the end, a final grade is assigned.

### Report Card Methodology

Rating a freeway system can be a highly complex task if formal, computed measures are used to compare freeway systems in different cities and assess the ability of a freeway system to meet a region's needs. The Texas Transportation Institute's annual *Urban Mobility Report* uses a methodology of computed measures to rate urban traffic congestion, but the multitude of complex metrics can cause a casual reader to lose sight of the big picture.

Instead, a subjective approach will be used. In assigning the grades, three factors are considered: the ability of Houston's freeway system to meet the region's needs, the amount of vision and innovation demonstrated in the particular category, and the performance of Houston in comparison to other cities. The grades are nonscientific and are the opinion of the author. The following symbols are used to rate the performance in specific categories.

| | |
|---|---|
| ✓ | Strength |
| ✘ | Weakness |
| ↔ | Mixed result |

## Planning

Over the last half century Houston's planning efforts are rated to be just slightly above average—a grade of C+. There have been periods of both strong and weak performance. The original formulation of the freeway plan was a period of strength for freeway planning. The City of Houston Planning Department under Ralph Ellifrit and the City Planning Commission deserve most of the credit for the strong planning during this critical early period.

Below-average planning performance occurred from 1955 to 1970 when Houston's freeway planning was poorly adapted to trends that became evident, especially the shift in growth to west and north Houston and the need for a more gridlike freeway pattern to serve suburb-to-suburb commute patterns. The city of Houston abdicated its leadership in freeway planning in the mid-1960s and would go on to practically abandon its freeway advocacy. Many major activity centers in Houston, such as the Texas Medical Center and the Uptown Houston District along the West Loop, do not have well-planned access to freeways. Improved access to major activity centers could have been accomplished with better interchanges and short spur freeways, but this kind of connectivity has historically not been part of Houston's freeway planning. During this period other cities, such as Los Angeles and Dallas-Fort Worth, were developing more aggressive plans.

Houston exhibited above-average planning through the 1970s crisis and the 1980s freeway resurgence. The freeway plan was only minimally damaged by the 1970s crisis, and in the 1980s new freeway routes were added. The transitway system was born and greatly expanded during this period. These strengths were offset by a continued adherence to the outdated loop and radial model, insufficient planning to relieve downtown bottlenecks, and the greatest planning failure in the history of Houston's freeway system—the cancellation of plans to widen the West Loop in 1992.

Houston finished the most recent period in freeway planning on a high note with one of the best planning efforts in the United States. With TxDOT in the lead, a series of corridor major investment studies defined the future of numerous Houston freeways, with managed-lane freeway designs being planned for two corridors. HCTRA has also become a regional planning leader with its toll road planning efforts.

The 1996 to 2005 era will likely mark the high point of TxDOT influence in planning. In 2003 the political leadership of Texas is attempting to shift both planning and financing responsibility for urban transportation infrastructure to the local level. In the future, planning leadership will need to come from Harris County, HCTRA, adjacent counties, and suburban areas.

Over the entire 50-year period there has been a trend in transportation planning in Houston: an increasing reliance on freeways. For the most part, this trend has benefits for an urban setting like Houston. In the case of mass transit, it was a logical and economical strategy to incorporate transit services into freeways. Freeways are efficient movers of traffic, and keeping vehicles on freeways and off local streets can be viewed as a plus. Freeways are very cost-effective in terms of the number of daily trips they serve.

Still, the focus on freeways has caused one element of Houston's transportation planning to be neglected: the regional arterial street network. Getting to or from the freeway is often a large part of any travel trip in Houston. In addition, as Houston continues to grow, new development will be located further from freeways. Houston's arterial street network is at best mediocre, and little progress is being made to improve it. Travel through Houston on arterial streets is generally not efficient. Houston can look to numerous other cities, such as Dallas-Fort Worth, Phoenix (Ariz.), and South Orange County (Calif.), to see how arterial street networks can be better integrated into a freeway system. The lack of a well-planned regional arterial street network has forced more traffic onto Houston's freeways, increasing the reliance on freeways.

To a certain extent, local governments have been able to shirk their arterial street responsibility because of the

## *Report Card: Freeway Planning in Houston*

| | | | |
|---|---|---|---|
| B | 1940-1955 The Original Plan | ✓ | The loop and radial system was a logical choice based on downtown-focused urban development patterns in Houston at the time. |
| | | ↔ | Development of the freeway plan was somewhat behind other major cities, but the quality of the final plan was not affected. |
| | | ↔ | The original plan included an extensive downtown interchange complex with excellent access to downtown. In the long run, the downtown interchange would need to predominantly serve through-traffic, not traffic originating or terminating downtown. |
| D+ | 1955-1970 Refinement | ✓ | Recognition of suburb-to-suburb commuting patterns with the addition of the Beltway as a freeway in 1960 and the Grand Parkway in 1965. |
| | | ↔ | Houston's plan was not as aggressive as other cities such as Dallas-Fort Worth and Los Angeles, but it remained a plan that could be reasonably constructed with available resources. |
| | | ✘ | During this period the need for a more gridlike freeway pattern for suburban areas should have been recognized. Suburban freeway planning should have been adapted to a grid pattern, including the addition of a freeway on or near SH 6-FM 1960. |
| | | ✘ | New freeways were added to south and southeast Houston rather than to the areas where growth was shifting to—west and north Houston. |
| | | ✘ | Additional radial freeways should have been added to serve future growth areas: Westpark corridor, the present-day SH 249 corridor, US 90A corridor, and FM 529. |
| | | ✘ | Spur routes should have been planned to provide connectivity to major activity centers such as the Texas Medical Center, Uptown-West Loop, and NASA. |
| B | 1970-1980 Crisis Management | ✓ | Beltway 8 is saved, primarily by Harris County. |
| | | ✓ | Transitway development begins. |
| | | ↔ | Damage to the freeway master plan is not as extensive as in other cities. |
| | | ✘ | The Grand Parkway, Fort Bend Parkway, and Harrisburg Freeway are cancelled. The future need for the Grand Parkway and Fort Bend Parkway remained, and those routes should have been retained. |
| | | ✘ | The city of Houston abandons freeway advocacy and reduces its commitment to the regional arterial street plan. |
| B | 1980-1995 Recovery | ✓ | One of the strongest recoveries in terms of freeway and tollway planning in the U.S. |
| | | ✓ | The Grand Parkway and Fort Bend Parkway are restored to long-term plans. |
| | | ✓ | New facilities are added: Hardy Toll Road and Tomball Parkway (SH 249). |
| | | ↔ | Although some progress was made, there is still no regional commitment to a high-quality arterial system to complement the freeway system. |
| | | ↔ | Regional planning moves toward a greater reliance on freeway frontage roads. |
| | | ✘ | The last chance to adopt a more gridlike pattern for suburban areas is lost. |
| | | ✘ | Cancellation of plans to expand the West Loop in 1992 is the greatest planning setback in the history of Houston's freeway program. |
| | | ✘ | Insufficient planning to relieve downtown bottlenecks. |
| A- | 1996-2005 Planning for Growth | ✓ | TxDOT leads planning efforts with major investment studies of several freeway corridors. Plans include enhanced integration of tollways and transit into freeways. |
| | | ✓ | HCTRA plans future tollways to meet regional needs. |
| | | ✓ | New tollways are added: Westpark Tollway, Fort Bend Parkway, Hardy Toll Road airport connector and downtown extension. |
| | | ✘ | Lack of a strong regional arterial plan causes increased reliance on freeways. Still no planning to reduce adherence to the loop and radial system configuration. |
| C+ | Overall Grade for Houston's Freeway Planning | | |

# The Loop and Radial System: Did Houston Take the Wrong Fork in the Road?

When the creators of Houston's freeway system were putting routes on the freeway planning maps in the 1940s and early 1950s, the American city was a very different place than it is today. Cities were focused on a vibrant core downtown, and suburban employment centers as we know them today didn't exist. This was particularly true in Houston since there were no large centers of activity competing with downtown. Galveston, 47 miles (75 km) to the south, did not influence freeway plans in the Houston area. A freeway system focused on downtown seemed logical for Houston, and planners developed a loop and radial freeway system for Houston. The radial freeways were designed primarily to serve commuter movements to and from downtown, and the loops served traffic that was crossing or going through the city.

Around the United States, many other cities—especially those with no geographic constraints—also planned freeway systems using the loop and radial concept. Two cities similar to Houston in population and geography, Atlanta and Washington, D.C., both adopted loop and radial systems. Many other cities adopted modified forms of the loop and radial system. In 1965 the *Houston Chronicle* reported on Houston's freeway plan, "Houston's freeways are of the loop and radial pattern [which are] considered by experts to be ideal."

The loop and radial system may have been ideal in the early freeway era, but it would spawn new development patterns and a transportation demand it could not efficiently serve: the suburb-to-suburb commute. Job migration to the suburbs was already underway by 1965 and would accelerate greatly afterwards. This was particularly true in Houston, with the development of large employment centers outside downtown getting underway in the late 1960s. These suburban employment centers would later become known as "edge cities," a term popularized by the 1992 book, *Edge City: Life on the New Frontier*. With the decentralization of employment, fewer and fewer trips originated and terminated downtown. Increasingly, commuters passed through downtown on their way from one suburb to another, or they used the loops to make the suburb-to-suburb commute.

The loop and radial system was having to serve transportation patterns it wasn't designed for, and in most cases, it broke down. Downtown interchange complexes couldn't handle the through-traffic load and became traffic choke points. Houston and Dallas both exemplified this problem. The loops and connections to the loops were receiving far more traffic than they were designed for. Sections of loops in Houston, Atlanta, Washington, D.C., and Dallas became legendary for traffic congestion. The loop and radial system was no longer ideal.

But the loop and radial system wasn't the only game in town. Another freeway system design that appeared in several cities in the early freeway era, the grid system, would prove to be far more ideal in serving decentralized travel patterns that would ultimately develop in nearly all cities. Grid systems provide a more direct travel route for the suburb-to-suburb commute, reducing the total vehicle miles travelled in a region. The system is less susceptible to choke points downtown and along loops. Grid systems also provide the key characteristic of network redundancy. If one link goes out due to an accident or construction, traffic can easily shift to efficient alternate routes. The cities that selected the grid system, or modified forms of it, generally already had a certain amount of decentralization in the 1950s. In metropolitan Los Angeles, cities were spread out across the L. A. basin and San Fernando Valley, largely the result of the Pacific Electric Railway and beach communities. Many twin-city metropolitan areas, such as Dallas-Fort Worth, Minneapolis-St. Paul, and New York-New Jersey, were more logically suited for a grid system or modified form thereof. Houston had no such luck.

Did Houston take the wrong fork in the road by selecting the loop and radial system? Yes. Was it reasonable or politically feasible for a city like Houston to adopt a grid system in the 1950s? No. After all, when Houston's core freeway network was defined in the early 1950s, the urbanized area of Houston was generally contained within the present-day Loop 610. The idea of building a grid system in the vast areas around Houston to serve edge cities of the future would have been a tough sell. Houston's influential, downtown-based business establishment surely wanted the freeway system to be focused on their real estate.

But when the impact of decentralized transportation patterns became evident in the 1960s, Houston could have adapted its system to be more gridlike in suburban areas. Yet Houston continued to adhere to the loop and radial model and did almost nothing to evolve the system toward a more gridlike pattern. The addition of a freeway on the SH 6-FM 1960 corridor would have greatly contributed to gridlike performance in suburban areas, but was never seriously considered. As time passed, increased suburban development closed the window of opportunity for constructing a suburban grid. Even in 2003, Houston's freeway planning still clings to the outdated loop and radial model.

Of course, Houston has responded to the need for suburb-to-suburb transportation capacity by the construction of two loops and active planning for a third. In terms of loop development, Houston is the national leader and is far ahead of similar cities like Atlanta and Washington, D.C. But the inherent flaws and inefficiency of the loop and radial system cannot be erased. The end result is that Houston will need more, wider freeways to meet its transportation needs.


**How Houston's freeway system could have been better:** This map shows some ways Houston's freeway system could have been better planned to meet modern-day needs. All these potential improvements were realistic and feasible if they had been planned at the proper time. Some of these routes were included in preliminary plans for Houston's freeway system in the early 1950s but were dropped from the final plan. Other enhancements likely were considered by planning officials. Financial limitations surely played a large role in curtailing plans for Houston's freeways. Also, freeways are often added to the regional plan as a result of lobbying by politically powerful groups. If a freeway did not have a powerful government or well-connected private entity behind it, it had less chance of becoming reality.

widespread presence of frontage roads. It is easier and less expensive for localities to rely on frontage roads than to fund and build high-quality arterial streets. Localities also want the numerous other benefits of frontage roads, including better freeway accessibility for motorists, business accessibility, and commercial buffers between freeways and residential areas. The net result is that Houston freeways have become not only transportation corridors, but also commercial strips, local traffic collector-distributors, and economic development tools. In Houston the freeway is required to do more than probably any other place in the world.

## Freeway Design

Once the planning is done, design comes next. Houston earns a B for its freeway design efforts over the last 50 years. Houston's pre-1960 freeways exhibited many design deficiencies but were typical of all freeways in the United States, so Houston is rated an average performer in freeway design in the 1945–1960 period. The adoption of a de facto policy for the pervasive use of frontage roads was the most significant development during this era. Frontage road development is counted as a plus for Houston's freeway design due to increased access and connectivity, although it would go on to have unintended consequences in urban growth and freeway performance.

For the era of freeway construction that built most of Houston's core freeway system from 1960 to 1985, Houston receives a C+. There are both great strengths and great weaknesses during this period. Some of Houston's freeways exhibit design characteristics that are among the best in the United States. The South Freeway corridor is among the best-designed freeways in the nation; the downtown interchange complex is one of the most

## *Report Card: Designing Houston's Freeways*

| | | | |
|---|---|---|---|
| C+ | 1945-1960 Early Freeways | ✓ | Frontage roads become a standard design feature of Houston's freeways. |
| | | ↔ | Houston's first freeways have many shortcomings, but so do freeways everywhere else. Houston's freeways are typical for the era. |
| C+ | 1960-1985 Construction of the Original System | ✓ | Many freeway segments are built to design standards that are comparable to the best freeways in the nation. The South Freeway is one of the best-designed in the U.S. |
| | | ✓ | Houston is a leader in the implementation of highway safety features. |
| | | ✓ | Multilevel stack interchange design is standard at freeway-to-freeway interchanges. |
| | | ↔ | One of the best downtown interchange complexes in the United States in terms of traffic originating or terminating downtown, the downtown interchange complex would later serve mostly through-traffic and was not adequately designed for that task. |
| | | ↔ | Frontage roads become pervasive, promoting greater access but also having unintended consequences, such as heavy commercial development along freeways. |
| | | ✘ | Insufficient capacity on most freeways, including severe underdesign of the radial freeways just outside Loop 610 and insufficient capacity on the Pierce Elevated (Interstate 45) downtown. |
| | | ✘ | Insufficient right-of-way is acquired on most radial freeways outside Loop 610. |
| | | ✘ | Poor lane balance on freeways, causing traffic-flow and safety problems. |
| | | ✘ | Frequent overpasses on main lanes on many freeways cause a roller-coaster effect, lowering traffic-flow potential and reducing driver sight lines. |
| | | ✘ | Poorly designed interchanges at key freeway-to-street intersections, including West Loop intersections and South Loop near the stadium complex. |
| A- | 1985-2003 Reconstruction and Expansion | ✓ | The extensive, successful, and cost-effective transitway system is integrated into the freeway system. |
| | | ✓ | Most of Houston's radial freeways are modernized and expanded to high design standards. |
| | | ✓ | The five-level stack becomes standard at freeway-to-freeway interchanges. |
| | | ✓ | Faults in original construction, such as poor lane balance, are corrected. Houston becomes the leader in high mast freeway lighting. |
| | | ✓ | The managed-lane freeway becomes part of freeway design in the late 1990s. |
| | | ✓ | Freeway durability improved, with 15-inch-thick (38 cm) concrete the standard. |
| | | ↔ | Standards for frontage roads are improved, but reliance on frontage roads for local distribution continues. |
| | | ↔ | Frequent overpasses with up-and-down grades remain typical of Houston's freeways, although geometrics are improved over original construction. |
| | | ✘ | Some reconstructed freeways still have insufficient capacity. |
| B | Overall Grade for Houston's Freeway Design | | |

extensive and modern in the United States. Multilevel stack interchanges are standard at freeway-to-freeway intersections, and Houston has always been a leader in the implementation of safety features.

But there was a dichotomy in Houston's freeway design largely resulting from the division of responsibility for freeway design. The Houston Urban Project Office, which existed from 1945 to 1984, was responsible for Loop 610 and the freeways inside the loop. This office typically produced top-quality freeway designs, often among the best in the United States. Outside Loop 610, TxDOT District 12 was responsible for freeway design. The original construction of freeways outside Loop 610 exhibited below-average design characteristics, especially in terms of freeway traffic-volume capacity and right-of-way planning. Poor lane balance was another characteristic of freeways constructed in this period, particularly at intersections with Loop 610. Lane balance is the use of auxiliary lanes and merging lanes to allow an orderly flow of traffic in transition zones. In practical terms, it means that when lanes of traffic enter a freeway, there should be plenty of distance to allow traffic in the new lane to merge

### You Can Land a Jumbo Jet on It

As Houston's freeway system has expanded over the years, the growth has been paralleled by the increase in freeway pavement thickness. Houston's original freeways were typically constructed with 8-inch-thick (20 cm) concrete. But a lot has changed since the 1960s. Traffic volumes are much larger and include more trucks, and trucks have become heavier with tires inflated to higher pressures. In addition, the ground beneath Houston has some of the worst soil for serving as a base for freeways—"expansive" clays that shrink, expand, and shift depending on moisture conditions. Ongoing research at the Texas Transportation Institute has identified strategies for improving the longevity of Houston freeway pavement.

In 2003 Houston freeways are built with 15-inch-thick (38 cm) concrete. How thick is 15 inches? Heavy duty runways at the busiest hub airports in the United States generally have concrete thickness in the range of 15 to 18 inches (38 to 46 cm). Depending on conditions at particular locations, thicknesses can exceed 20 inches (51 cm) on some runways. A new 9,400-foot (2,865 m) runway at Houston's Bush Intercontinental Airport is paved with 17-inch-thick (43 cm) concrete, and other runways at Bush Airport range between 17 and 19 inches (43 to 48 cm) thick. Runways at the Dallas-Fort Worth International Airport are typically 17 to 18 inches (43 to 46 cm) thick.

with the existing lanes. Poor lane balance was the cause of many congestion and safety problems, and remains a problem on freeways that have not been modernized. Design standards for Houston's freeways built up to the 1970s didn't call for lane balance, but a little common sense would have gone a long way in improving freeway performance.

In terms of freeway design, the benchmark for high quality in the 1960–1985 era is California. California's urban freeways typically have long sight lines due to smooth grades, frequent use of depressed and elevated sections through urban areas, and high traffic volume capacity. Some Houston freeways—especially inside Loop 610—met California standards, but most did not. Most Houston freeways were constructed at ground level with elevated overpasses at intersections. This contributes to a "roller-coaster" effect, causing poor sight lines and reduced traffic-carrying potential. Houston's geography has made below-grade freeway construction less of an option than it was in California or other regions. The perfectly flat, low-lying coastal plain of the Houston region makes depressed freeways particularly susceptible to flooding. Large pump stations are required to drain depressed freeways, and flooding is an all-too-frequent occurrence when heavy rainfall occurs. Still, sight lines could have been improved by raising intersecting streets over freeways more frequently.

Houston adopted new design standards with the freeway expansion and reconstruction program that began in the 1980s. The new design standards corrected most of the shortcomings of the original construction of Houston's freeways. Capacity was added, lane balance and geometrics were improved, freeway-to-freeway interchange design was advanced to the five-level stack, and transitways were incorporated into freeway design. Frontage road design, capacity, and service levels were improved, generally a plus but further contributing to a heavy reliance on frontage roads. With the ever-present financial, regulatory, and political limits to freeway construction, Houston did an excellent job of building modern freeways with high design standards. The 1980s freeway standard does not meet standards of the top quality designs such as the South Freeway, but some freeways, such as the reconstructed Eastex Freeway, rank among the better-designed in the United States.

In the late 1990s Houston began planning for its first managed-lane freeways. Managed lanes are special freeway lanes for use by transit-oriented vehicles (buses, vanpools, and carpools) and toll-paying single-occupant vehicles. The lanes are managed to maintain free-flow traffic conditions. The future use of managed-lane freeways will keep Houston in the forefront of freeway design.

### Freeway Political Leadership

Pro-freeway political leadership is critical to the implementation of a freeway construction program. Houston has seen periods of strong and weak leadership. Over the last 50 years Houston receives a B for the efforts of its political leadership in building the freeway system.

The city of Houston was a very strong leader in the early freeway era from 1940 to 1960. Mayor Oscar Holcombe, the City Planning Department, and the City Planning Commission propelled the city of Houston to its leading role in promoting the freeway system. The

## *Report Card: Freeway Leadership and Politics*

| | | | |
|---|---|---|---|
| B+ | 1940-1960 Building the System | ✓ | Mayor Oscar Holcombe was a strong freeway advocate. |
| | | ✓ | The Houston Chamber of Commerce provides key leadership. |
| | | ✓ | Strong political partnerships exist to pass freeway bond issues. |
| | | ✓ | The city of Houston shows strong leadership. The City Planning Department under Ralph Ellifrit and the City Planning Commission are most influential in the early development of the freeway system. |
| D+ | 1960-1975 Decline | ✓ | TxDOT remains proactive in regional transportation planning. |
| | | ✓ | Political leaders support freeway construction through the 1960s and continue to seek TxDOT acceptance of new routes. |
| | | ✗ | The city of Houston abdicates its leadership role in 1964 and by 1975 it abandons advocacy of freeways and reduces its commitment to the arterial street system. |
| | | ✗ | Starting in the late 1960s, real (inflation-adjusted) funding for highway construction drops dramatically at local, state, and federal levels of government. |
| | | ✗ | Many politicians, particularly those representing inner cities and environmental interests, are hostile or indifferent to freeways in the early 1970s. |
| A | 1975-1995 Strong Resurgence | ✓ | An era of great leadership, led by Bob Lanier and Jon Lindsay. |
| | | ✓ | Other leaders work in a less visible role, including Congressman Tom Delay and Doug Pitcock of Williams Brothers Construction. |
| | | ✓ | Jon Lindsay creates the Harris County Toll Road Authority. |
| | | ✓ | Houston Chamber of Commerce develops the Regional Mobility Plan in 1982 and leads the implementation of the plan. |
| | | ✓ | Dramatic funding increases at local and state levels |
| | | ✓ | Strong regional interagency cooperation began with the North Freeway contraflow lane in the 1970s and continued through the entire period. |
| B | 1996-2003 Steady Leadership | ✓ | Harris County Judge Robert Eckels leads regional transportation political efforts. |
| | | ✓ | Interagency cooperation continues and expands with the participation of HCTRA. |
| | | ↔ | The city of Houston remains indifferent on highway leadership issues during the tenure of Mayor Lee Brown but is supportive of regional planning efforts. |
| B | Overall Grade for Houston's Freeway Political Leadership | | |

Houston Chamber of Commerce also provided key leadership in the 1950s. The role of the city of Houston began to decline around 1964 with the administration of Mayor Louie Welch. The period from about 1965 to 1975 was an era of below-average leadership. No person or agency stepped forward to fill the vacuum left by the city of Houston.

Starting in 1975, a period of great freeway leadership began. Harris County Judge Jon Lindsay entered office in January 1975 and began to reverse the decline in Houston's freeway system. His creation of the Harris County Toll Road Authority in 1983 was an event of monumental importance for the future transportation infrastructure of Houston. Houstonian Bob Lanier was appointed to the Texas Transportation Commission in 1983 and led efforts during the most influential era for highway funding in Texas since the 1950s. The Houston Chamber of Commerce played a key role in the formulation and implementation of the 1982 Regional Mobility Plan. Regional cooperation among government agencies helped get things done, especially in regard to the regional transitway system.

The era of great leadership came to an end around 1995. In the following years some decline in Houston's freeway program occurred, but the efforts of Harris County Judge Robert Eckels and the proactive planning efforts of the TxDOT Houston office kept the period above-average in terms of leadership. In 2002 and 2003 there were signs of a potential strengthening in freeway leadership due to the increasing traffic problems in the Houston region. Still, it will be difficult, if not impossible, to repeat the leadership of the 1975-1995 period.

### Other Criteria for Grading Houston's Freeways

One area in which Houston has been a national leader is in the implementation of transportation plans. Virtually all of Houston's originally planned freeways will be

## *Report Card: Getting the Freeways Built*

| | | |
|---|---|---|
| A | ✓ | Houston will construct nearly all of its originally planned freeways, something few cities have been able to achieve. |
| | ✓ | Regional interagency cooperation has been key to implementation, particularly in the post-1975 era. |
| | ✓ | Innovative financing and toll financing have played a key role in building out the freeway system. |
| | ✓ | Houston freeways have been relatively inexpensive to construct, mainly due to a favorable construction environment in the state of Texas and also due to a competitive contractor environment in Houston. |
| | ↔ | Long delays have occurred in the construction and expansion of needed facilities. However, long delays are typical everywhere in the United States. |

constructed, an accomplishment that few large cities have been able to achieve. Houston's recovery from the 1970s highway construction crisis was one of the strongest in the nation. The impact of setbacks which occurred in the 1970s was reversed in the 1980s and 1990s with the restoration of cancelled routes to the master plan, increased funding, and tollway construction. The only major setback of the 1970s that was not reversed—the cancellation of the Harrisburg Freeway—did not have a big impact on the performance of the freeway system. The greatest setback to Houston's freeway system was the failure of plans to expand the West Loop in 1992. It is indicative of the success of Houston's implementation that the inability to expand an existing eight-lane freeway is the greatest setback to the system.

Houston has also excelled in the economical construction of freeways, providing an outstanding value for taxpayers. The low cost of freeway construction is largely a statewide phenomenon in Texas but has been especially true in Houston. Several factors contribute to the good value for taxpayers. Texas has a large highway construction program that supports a large and competitive contractor environment. For example, the large demand for precast bridge beams and retaining wall segments keeps multiple casting yards in business, fostering price competition. Houston's Williams Brothers Construction has been one of the most competitive construction bidders in Texas. Houston and Texas can use economical construction methods with precast components for bridges. California, for example, must use expensive cast-in-place concrete for its bridges due to the risk of earthquakes. Texas is a right-to-work (non-union) state, which helps keep labor costs reasonable. TxDOT staff and researchers at the Texas Transportation Institute are continuously working to get better material performance and improved safety for less cost. Property values in Texas are generally lower than national averages, making the acquisition of right-of-way more affordable than most places in the United States. Houston and Texas have always had a low to moderate level of taxation in comparison to most of the United States, so the low cost of construction has been especially crucial for the implementation of the freeway construction program.

In terms of operation and intelligent transportation systems, Houston has lagged somewhat behind other cities in the development of a traffic management system. After a closed-circuit television research program on the Gulf Freeway in the 1960s, there was little progress until the Houston Transtar Operations Center took shape in the 1990s. By 2003 Houston Transtar was recognized by the Federal Highway Administration as one of the best in the nation, receiving national awards in 2001 and 2002 for having one of the top traveler information web sites.

### The Final Grade

When the final report card is opened, Houston receives a B for its freeway system. Houston has a good system, but it could have been better.

It should be noted that probably no metropolitan area in the United States would receive an A by the criteria used to rate Houston. Other regions have excelled during certain periods in the last 50 years, but practically no region got everything right for the entire period. Perhaps Detroit, Michigan, is the best candidate for an A, but as one of the slowest-growing metropolitan areas in the United States in the last 50 years, Detroit's transportation system has been minimally challenged and really cannot be compared to the high growth metropolitan areas in the South and West.

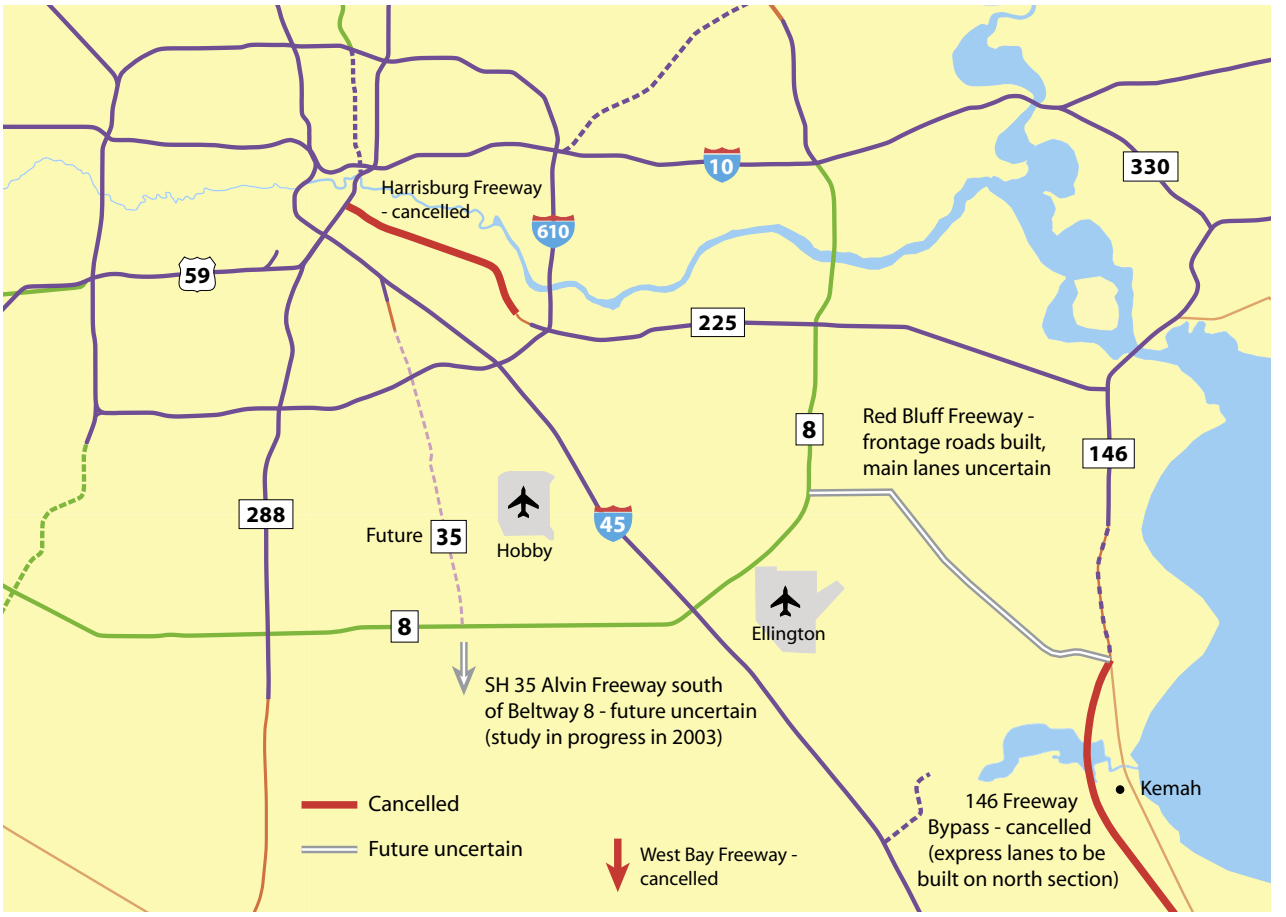
*The Final Grade*

B

***The greatest setback to Houston's freeway system:***
Cancellation of plans to expand the West Loop (1992)

### A Tale of Three Cities

Houston was not the only city developing big freeway plans up until the first freeway planning peak around 1970. Two urban areas comparable to Houston, Los Angeles and Dallas-Fort Worth, were also thinking big, aggressively planning dense freeway networks that included far more centerline miles than Houston. This was to be expected for Los Angeles, since its metropolitan area has about four times as many people as Houston. But the populations of Houston and Dallas-Fort Worth are very similar, so Dallas-Fort Worth could be credited with winning the battle




**Houston's cancelled freeways:** Houston's freeway plan has survived nearly entirely intact with only one cancelled section of freeway in the immediate Houston area, the Harrisburg Freeway. Southeast of Houston, the SH 146 Freeway Kemah bypass and West Bay Freeways were cancelled. Probably all remaining unbuilt routes will be constructed in the future.

of long-range freeway planning as of 1970.

Houston, however, distinguished itself in another way. When all is said and done, Houston will actually construct nearly all of its originally contemplated freeway network. Based on 2003 plans, Houston will sustain only one partial freeway cancellation within the immediate Houston vicinity: the Harrisburg Freeway section of the La Porte Freeway. The freeway plans of Los Angeles and Dallas, in contrast, didn't fare so well after 1970. Both plans were decimated by the 1970s antifreeway backlash and funding crisis, with planned freeways getting wiped off the map like a wholesale liquidation. Houston's plan was realistic—meeting the region's needs without being overly ambitious or disruptive. It stood the test of time, perhaps the greatest test of all.

### A Good Deal for the Texas Taxpayer

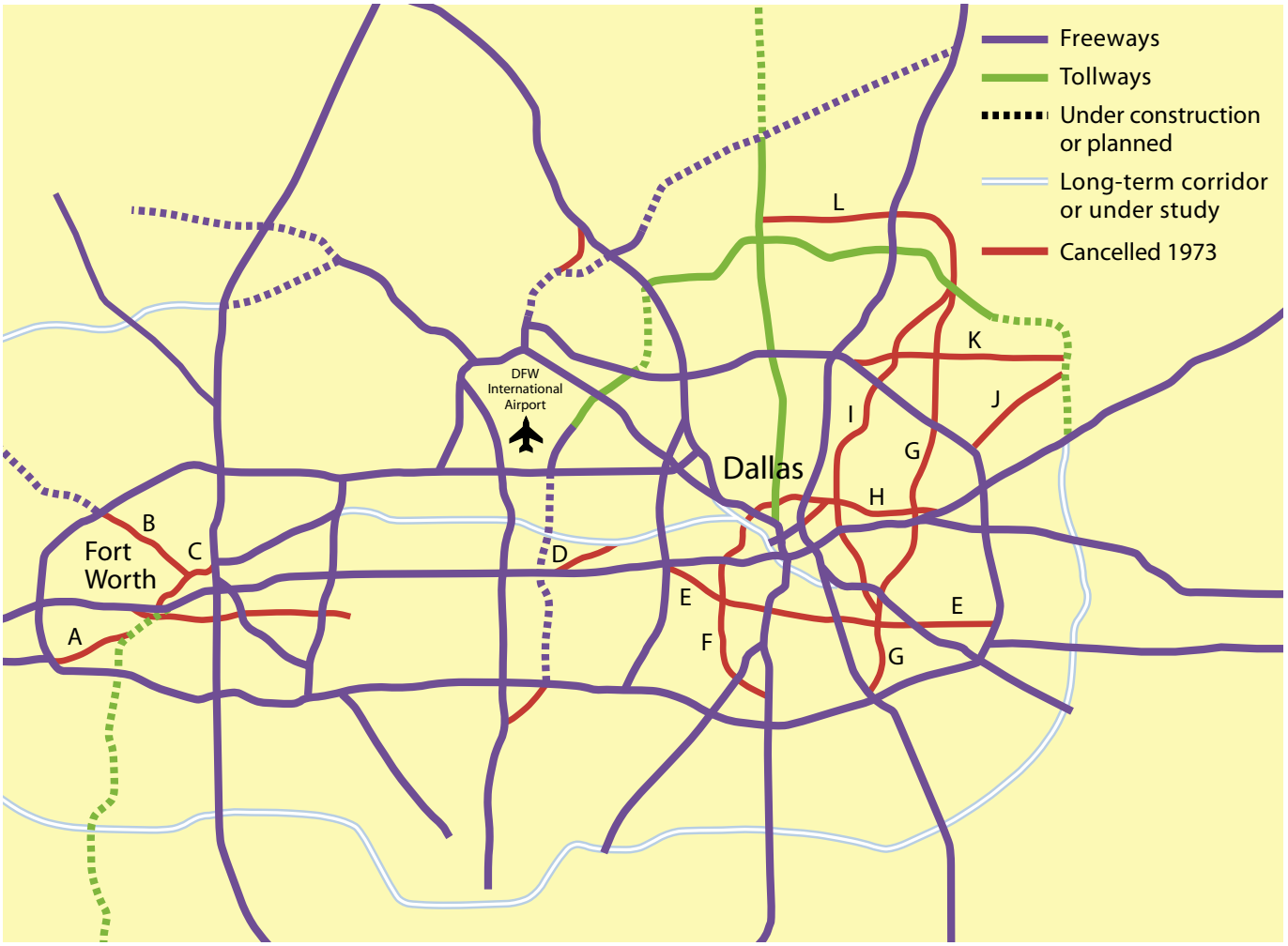
Houston's freeways have been relatively inexpensive to construct, especially compared to California. Here's why:

- A large highway program in Texas, supporting a broad and competitive contractor and supplier base
- Construction methods with heavy use of precast components, especially for bridges
- Labor laws in Texas—a right-to-work (non-union) state with reasonable labor costs
- Ongoing research at TxDOT and the Texas Transportation Institute for better value in freeway construction
- Relatively low property values in Texas, making right-of-way acquisition affordable

## Dallas-Fort Worth

250 miles (400 km) north of Houston is Houston's cross-state rival, the Dallas-Fort Worth metroplex.* In some ways, Houston and Dallas are like close Texas siblings. In other ways, they may as well be on different planets. As one adage says, Dallas is champagne, caviar, and BMWs, while Houston is beer, barbeque, and pickup trucks. But when it came to freeways, Houston and Dallas certainly kept an eye on each other, especially in the 1950s. In 1953 Dallas interests became keenly aware that Houston was pulling ahead in terms of freeway planning.

* The term metroplex refers to the entire Dallas-Fort Worth metropolitan area.




**Dallas-Fort Worth Cancelled Freeways**

| | |
|---|---|
| A | Fort Worth, south east-west freeway |
| B | SH 199 Freeway (later reinstated but cancelled again in 2000) |
| C | Northside freeway (later reinstated but cancelled again in 2000) |
| D | River Freeway (now known as the Trinity Parkway) connection to Interstate 30 |
| E | Oak Cliff east-west freeway |
| F | Oak Cliff north-south freeway |
| G | Garland north-south freeway |
| H | North Dallas east-west freeway |
| I | East Dallas north-south freeway |
| J | Interstate 635 to Loop 9 connection |
| K | Interstate 635 extension east freeway |
| L | Plano Loop |

**Dallas-Fort Worth freeway casualties:** The Dallas-Fort Worth regional freeway plan was updated in 1967 to include a dense inner-city grid to accommodate forecasts that future travel patterns would largely bypass the central business district of Dallas. As of the late 1960s, Dallas-Fort Worth had a more ambitious freeway plan than Houston with more centerline miles. This freeway plan was reaffirmed in 1971, but there was really no chance of ever constructing the inner-city routes due to the highway funding crisis of the 1970s and increased opposition to urban freeways. (Source: map adapted from *Dallas-Fort Worth Regional Transportation Study, Interim Report*, 1971)

Both the *Dallas Morning News* and the *Dallas Times Herald* published editorials in June 1953 stating that Harris County's ambitious plan should serve as a challenge to Dallas and the rest of the state. The *Times Herald* went on to say, "Harris County leaders are planning soundly for the future. For some reason, Dallas County cannot seem to get up the steam necessary to execute a master plan for handling its ever-mounting vehicle traffic. Harris County is stepping out ahead of us." The risk of falling behind Houston was enough to spur Dallas-Fort Worth into action. Dallas County would go on to implement a loop and radial plan very similar to Houston's. With Dallas' addition of its second freeway loop in 1964, both Houston and Dallas had radial, double-loop systems which focused on the central business district.[99]

In the mid-1960s, Dallas began to pull ahead of Houston in terms of freeway planning. The Federal-Aid Highway Act of 1962 required all cities with a 1960 population exceeding 50,000 to have a comprehensive, cooperative, and continuing transportation plan—the so-called "3C" process. Local authorities launched a transportation

study in 1964 to develop plans for projected 1985 traffic volumes. For the next three years the study team collected and analyzed data, then devised a plan. The final report was published in 1967.[100]

The report recommended a dramatic transformation of Dallas' freeway system from a radial system focused on the central business district to a grid system. There was nothing incremental or evolutionary about the new plan. It was a fundamental change in thinking about how to move traffic around Dallas. The planners formulating the recommendation had found that very few future trips had origins or destinations in the central business district, and the existing radial system could not funnel all the projected traffic through or around downtown. In order to implement the new grid system, the plan recommended five major new freeways for Dallas and numerous other connecting links in both Dallas and Fort Worth. Most of the proposed freeways cut through older residential areas near downtown. At the time new freeways could be built through established areas with little or no opposition, and the study team concluded that it was less costly to build new routes than to expand existing routes. The recommendations of the 1967 report were adopted into the region's long-term plan.

But 1967 was not a good time to launch such an ambitious transformation of the freeway system. The acceptance of new freeways in established urban areas was diminishing, and the protest era was gaining momentum. The new political environment made it very difficult to build new freeways. The 1967 plan was reaffirmed by the regional planning organization in 1971, but all the factors that worked against freeways nationwide—urban issues, environmental issues, and cost issues—would also be felt in Dallas. In 1973 the planned grid system was wiped off the planning map. The original radial system, most of which had already been constructed, remained. In the end, it was politically easier to improve existing freeways than to construct new freeways.[101]

Time would prove that the authors of the 1967 report were remarkably clairvoyant. Transportation patterns developed just as they predicted, with traffic largely passing through the central business district, rather than originating or terminating in it. The Dallas downtown freeway interchange complex, known as the Mixmaster, would become totally incapable of handling the through-traffic load. In 2003 studies are in progress to develop a plan to rebuild the Mixmaster to meet modern needs.

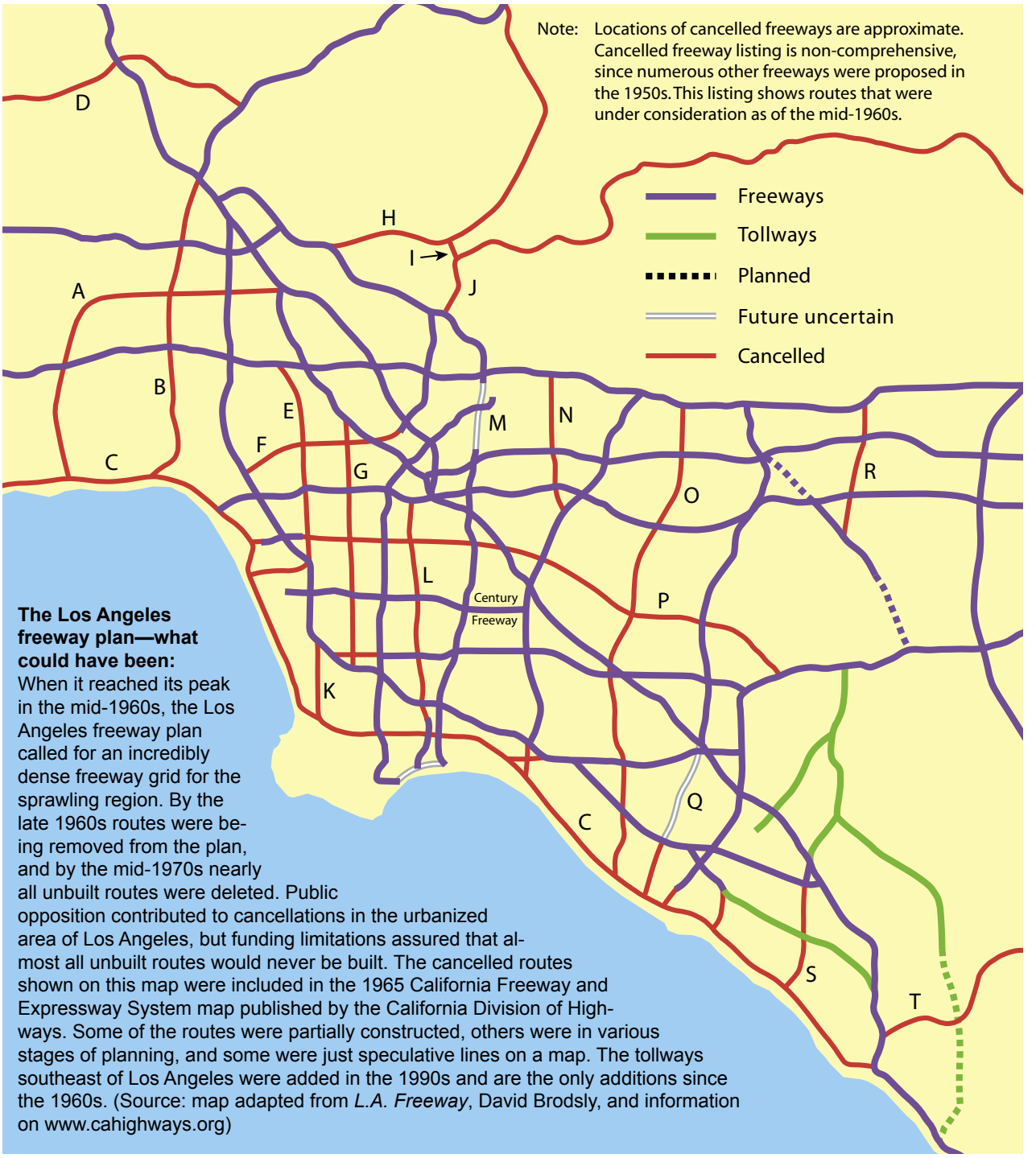
### Los Angeles

Perhaps the most interesting story of the rise and fall of a planned freeway network is Los Angeles. Los Angeles distinguished itself as the freeway capital of the world before its freeway construction program was curtailed in the 1970s. But what is most mind-boggling is the freeway system that could have been if a full build-out of the planned network had occurred.

The greater Los Angeles freeway system had its roots in four reports issued between 1937 and 1943. Although the planned freeway networks of the four reports would need to be reconciled, it was clear by 1943 that Los Angeles was going to have a large and sprawling freeway system. Los Angeles was 10 years ahead of Houston in preliminary planning, since Houston's first large-scale freeway plan was not formulated until 1953.[102]

After World War II, events would work in favor of expanding the planned freeway network for the Los Angeles region. In 1946 the Metropolitan Parkway Engineering Committee, an ad-hoc committee of various city and planning engineers from the area, released *Interregional, Regional, and Metropolitan Parkways*, the first unified plan that was officially endorsed by top officials. In 1947 the California State Legislature approved the Collier-Burns Highway Act, raising fuel taxes and fees to provide a reliable funding source for highway construction and allowing large-scale urban freeway construction to begin. The regional freeway plan was adjusted and expanded during the 1950s, reaching its peak around 1965. Freeways began to disappear from planning maps in the late 1960s. First, freeway cancellations were a mere trickle. But by the mid-1970s, especially 1975, freeways were being removed from the state highway system on a regular basis. By the late 1970s any thought of building new freeways in the immediate Los Angeles area was gone. Instead, officials focused efforts on completing the missing links in the system. Only one new freeway would be constructed, the Century Freeway, which was completed in 1993. It was able to move forward mainly because its right-of-way had already been cleared by the early 1970s. In 2003 it appeared unlikely that a critically needed missing link in the Los Angeles freeway system, the Long Beach Freeway (Interstate 710) extension, would ever be built. With one possible exception, a potential extension of the Route 57 Orange Freeway, every cancelled freeway from Los Angeles' original plan is permanently dead. By the 1990s freeway construction activity in the greater Los Angeles area had shifted to Orange and Riverside Counties, where officials were able to build new tollways and freeways through non-urbanized areas.

Similar to Dallas-Fort Worth, Los Angeles officials had correctly predicted future needs and planned a freeway network that would meet those needs. With the cancellation of approximately half of Los Angeles' planned freeways, the region was left with one of the nation's most inadequate freeway systems on a per-capita basis. Data from the Texas Transportation Institute's *Urban Mobility Report* for 2002 show just how heavily the freeways of the Los Angeles region are loaded with traffic. Based on data for the year 2000, Los Angeles averaged 23,400 vehicle miles traveled per day per lane-mile of freeway (DVMT/LM). Los Angeles had the highest freeway traffic load in the United States and was far ahead of the freeway loadings of 15,460 DVMT/LM in Dallas-Fort Worth and 15,310 DVMT/LM in Houston.




**The Los Angeles freeway plan—what could have been:** When it reached its peak in the mid-1960s, the Los Angeles freeway plan called for an incredibly dense freeway grid for the sprawling region. By the late 1960s routes were being removed from the plan, and by the mid-1970s nearly all unbuilt routes were deleted. Public opposition contributed to cancellations in the urbanized area of Los Angeles, but funding limitations assured that almost all unbuilt routes would never be built. The cancelled routes shown on this map were included in the 1965 California Freeway and Expressway System map published by the California Division of Highways. Some of the routes were partially constructed, others were in various stages of planning, and some were just speculative lines on a map. The tollways southeast of Los Angeles were added in the 1990s and are the only additions since the 1960s. (Source: map adapted from *L.A. Freeway*, David Brodsly, and information on www.cahighways.org)

**Listing of Cancelled and Uncertain Freeways in Los Angeles**

| | | | |
|---|---|---|---|
| A | Whitnall Freeway, CA 64 | K | Hawthorne Freeway, CA 107 |
| B | Reseda Freeway, CA 14 | L | Industrial Freeway, CA 47 |
| C | Pacific/Ocean Freeway, CA 1 | M | Long Beach Freeway extension, IH 710 |
| D | Santa Paula Freeway, CA 126 | N | Rio Hondo Freeway, CA 164 |
| E | Laurel Canyon Freeway, CA 170 | O | Huntington Beach Freeway, CA 39 |
| F | Beverly Hills Freeway, CA 2 | P | Slauson Freeway, CA 90 |
| G | CA 258, part of the Whitnall Freeway | Q | Orange Freeway extension, CA 57 |
| H | Route 118 Freeway | R | CA 142 Freeway |
| I | CA 249 Freeway | S | Laguna Freeway, CA 133 |
| J | CA 2 Freeway | T | CA 74 Freeway |

**Houston—high mast illumination capital of America:** This view of high mast light fixtures lined up along the West Loop in Bellaire is typical of most Houston freeways. Houston makes extensive use of high mast illumination along linear sections of freeway—probably more than any other place in the world. (Photo: November 2002)

# Building Better Freeways

One day in March 1968 researcher Ted Hirsch at the Texas Transportation Institute at Texas A&M University gathered a group of onlookers for the first test of a new highway safety device, the vehicle impact attenuator. The attenuator consisted of a bank of energy-absorbing barrels that was designed to be positioned in front of fixed objects along highways, reducing the force of impact on the vehicle and its occupants in the event of a collision.

One of the observers was Wiley Carmichael, head of the TxDOT Houston District. Carmichael was particularly interested in the results of the test. There had been a rash of fatalities involving collisions with concrete abutments on Houston's freeways, especially on the West Loop. Of the 99 fatalities on Houston's freeways between 1961 and 1968, 27 had occurred at concrete abutments. Between September 1965 and October 1968, three abutments on the West Loop were responsible for 8 fatalities.

The group watched as a test vehicle slammed directly into the attenuator at high speed. The vehicle was brought to a halt with practically no damage, never reaching the concrete abutment just behind the energy-absorbing barrels. As soon as he saw the test result, Carmichael told Hirsch, "I'm putting those on the West Loop." The Houston Urban Project Office went to work immediately to finalize the attenuator design, and in October 1968 the first attenuator assemblies were installed on the West Loop. Within weeks, the impact attenuator had received its first hit, preventing serious injury or fatalities.[103]

The crash impact attenuator consisting of 55-gallon drums was a very simple idea. But as inventors often say, the best inventions are the ones that seem obvious once you see them. Others, including researchers in California, had previously tried more sophisticated impact attenuation schemes that turned out to be impractical. The "Texas crash cushion," as it was called, was the first practical impact attenuator in the United States, and the West Loop installation in October 1968 was believed to be the first deployment of such a device on a highway. The Texas crash cushion or similar designs were adopted by most states shortly afterwards. Numerous other attenuator designs appeared on the nation's highways in the following years.[104]

The impact attenuators were just one of many safety improvements that were implemented on Houston freeways starting in the 1950s, mirroring the increasing national interest in safer highways and automobiles. Other important safety advances developed in Texas in the 1960s were a breakaway light pole and a national-standard breakaway sign. In one important element of safety, freeway lighting, Texas was among the research leaders in high mast illumination. Houston's freeway lighting program would go on to use high mast illumination more extensively than any other city in the United States, and probably the world.[105]

### Five Generations of Freeways

Just like anything else that is new, building the first freeways was a learning experience. Houston's first two freeways, Gulf and Eastex Freeways, were classified by TxDOT as first generation freeways. Although Houston's first generation freeways improved on the existing parkways of New York City and the Pasadena Freeway in Los Angeles, they still had their share of shortcomings. There were many lessons to be learned.

The first generation freeway didn't have a median barrier. The Gulf Freeway had a four-foot-wide median with curbs only, and first generation freeways often also had curbs on the right side of the roadway. Emergency shoulders were intermittent and almost never extended along bridges. Merging distances on entrance and exit ramps were short or practically non-existent. Geometrics were poor, with poor sight lines and roller-coaster grades.[106]

To be fair to the designers of the first generation freeway, nobody anticipated the huge traffic volumes, heavy trucks, and increasing speeds that would soon become prevalent on freeways. Engineers had no accurate traffic projections to work with, and the still-lingering Depression-era mindset had engineers trying to save money wherever they could. At the time, the first generation freeway was a huge improvement over what was previously available—congested city streets.

Following the national trend, freeway design improved rapidly in the 1950s. The second generation freeway came into being, correcting most of the problems of the first generation freeway and adding capacity to meet expanding freeway demand. In January 1956, the newly appointed head of the Houston Urban Project Office, Albert C. Kyser, announced that all future Houston freeways would have interior shoulders and a center guard rail. Later that year a median barrier was installed on the Gulf Freeway. Starting in the late 1950s, new freeways became substantially more modern and much safer. Geometrics were greatly improved, especially in terms of sight lines and ramp merging distances. Freeway corridors became much


**Deadly gore point:** Concrete abutments at exit ramp gore points were some of the most deadly hazards on Houston's early freeways. This abutment on the West Loop at the Katy Freeway was one of three West Loop gore points that were particularly hazardous, causing eight fatalities between 1965 and 1968. Between 1961 and 1968, 27% of the fatalities on Houston's freeways occurred at abutments such as this one. Eliminating these hazards became a top priority of the TxDOT Houston offices. In October 1968, the West Loop abutments were the location of the nation's first installation of practical impact attenuators—the "Texas crash cushion." The crash cushion was a bank of modified 55-gallon drums that was placed in front of the hazard. (Photo: *Houston Chronicle*, 1968)

Vehicle collisions occurred soon after the installation of the first crash cushions. During the weekend of October 11, 1968, two attenuators were hit. In one incident, the driver sustained a broken nose and the passenger sustained a broken collar bone. In the other incident, the vehicle was able to drive away from the scene. In December 1968 two vehicles struck an attenuator, and the only injury was a scratched knee. Collisions with attenuators became so frequent in the following months that officials felt further investigation was warranted. A remotely activated surveillance camera was installed at the attenuator on the exit ramp on the northbound West Loop at the Southwest Freeway. A driveway signal bell hose similar to the hoses used to alert attendants at full-service gasoline stations was placed in front of the attenuator to activate the camera, as shown in the lower left photo. The surveillance camera soon captured a collision. The lower right photo shows a vehicle moments after it hit the attenuator at an estimated speed of 70 miles per hour (112 km/h). Injuries to the vehicle occupants were minor. (Photos: Texas Transportation Institute)

**The first generation freeway:** This view of the Gulf Freeway shortly after its completion demonstrates two of the shortcomings of the first generation freeway: lack of a central guardrail and light fixtures placed close to the main lanes with no protective guardrail. Other shortcomings were short merging distances at on-ramps, poor geometrics, roller-coaster grades, and traffic-carrying capacity designed to meet forecasts that were much too low. (Photo: TxDOT)

wider, frontage roads became standard, and freeway-to-freeway interchanges used multilevel stack interchanges rather than cloverleafs.[107]

However, it would be many years before all traces of the first generation freeway would be erased from Houston. The Gulf Freeway was expanded and modernized in the 1980s, and the Eastex Freeway underwent a huge modernization and expansion in the 1990s. Interestingly, Los Angeles' original freeway, the Pasadena Freeway, remains in its near-original condition 63 years after it was opened in December 1940. No significant improvements are planned for the Pasadena Freeway as of 2003, and it is destined to become a historic monument to the birth of freeways in the world's freeway capital.

Whereas the transition from the first to second generation freeway was a dramatic improvement, future changes to freeways were more gradual and evolutionary. In 1966 engineers at TxDOT were contemplating the future of freeway design, prompting one researcher to state, "I believe we are actually in the transition period between the second and third generation freeways." The third generation freeway included wider rights-of-way and extra-wide medians to allow for future expansion, facilities large enough to accommodate peak demand at high service levels, improved geometrics and sight lines, more extensive use of structures such as braided ramps, and more durable pavement. Two new freeways under development in Houston in the 1960s, the South and Crosby/Northeast Freeways, were designed to the standards proposed for the third generation freeway. The most distinctive feature of the South and Northeast Freeways was their extra-wide right-of-way corridors, 400 to 500 feet (122 to 152 m). But the third generation freeway was emerging just as a very challenging era for highways in the United States was about to begin—the 1970s. The third generation freeway was more expensive than its predecessors and also had the potential for larger environmental impacts due to its larger size. The highway funding crisis of the 1970s resulted in the cancellation of numerous freeways, and the two surviving third generation freeways moved forward in slow motion. The completion of the South Freeway was delayed until 1984 and the first section of the Crosby/Northeast Freeway did not open until 1994. In the 1970s many standards for new freeways, especially right-of-way requirements, were rolled back to second generation standards, mainly due to financial constraints.[108]

> "Gradually, experience is teaching lessons in freeway building. Our newest freeways are far superior to the earlier ones."
>
> *Houston Chronicle*, September 26, 1962

A new design standard for Houston's freeways emerged


**The second generation freeway:** The second generation freeway began to take shape in the mid-1950s as engineers identified the shortcomings of the first generation freeway. Around 1960, the first freeways designed to second generation standards began to open in Houston. The second generation freeway was a huge leap forward, featuring more lanes, better geometrics, and improved safety. Most of Houston's freeway system was constructed to second generation standards, and the basic design characteristics continue to be used for new construction even in 2003 for facilities with low traffic volume, such as new tollways. The above view looks south over the West Loop at Westheimer in December 1964. The freeway featured eight main lanes, full inner and outer shoulders, and three-lane frontage roads in each direction. This view also shows the U-turn from the frontage road, which allows vehicles to bypass the traffic light and continue on the frontage road in the opposite direction. U-turns were standard on Houston's freeways beginning with the second generation. (Photo: TxDOT)


in the 1980s. The 1980s standard was not as grandiose as the third generation freeway, but it was larger than the second generation freeway and incorporated many new distinctive design features. The new standard was applied to existing freeways which were part of the comprehensive reconstruction and expansion program that began in the 1980s. The 1980s design template fully incorporated a reversible, barrier-separated transitway in the center of the freeway for buses and high occupancy vehicles. It featured 8 to 10 continuous general-purpose main lanes, continuous high mast illumination, five-level stack interchanges at freeway intersections, fully continuous frontage roads with improved service levels, more extensive use of braided entrance/exit ramps, carefully planned lane balance, and increased attention to environmental factors such as noise abatement. The preferred right-of-way width was 350 to 400 feet (107-122 m), which was achieved on the Eastex and suburban North Freeways after extensive right-of-way acquisition. In cases where right-of-way acquisition was too costly or infeasible, the 1980s template was applied to freeways on 300-foot-wide (91 m) rights-of-way, such as the Gulf and Southwest Freeways. The more cost-sensitive tollway projects constructed in the 1980s and 1990s were generally constructed to second generation freeway standards.

In the late 1990s, the next phase in the evolution of the Houston freeway began to take shape. Plans for the Katy Freeway expansion were initially formulated in 1998 and included four "special-use" lanes that were separate from


**The third generation freeway:** The ideas behind the third generation freeway began to take shape in the early to mid-1960s. It featured further improvements to geometrics and safety, more durable pavement, wider rights-of-way, and space reserved for future expansion. However, its high financial cost prohibited widespread implementation, particularly as the financial crisis of the 1970s arrived. Only two Houston freeways would be built to third generation standards: the South and Crosby/Northeast Freeways. The photo above shows the South Freeway, which features most of the third generation freeway design elements. This section of freeway opened in 1983. (Photo: September 2002)

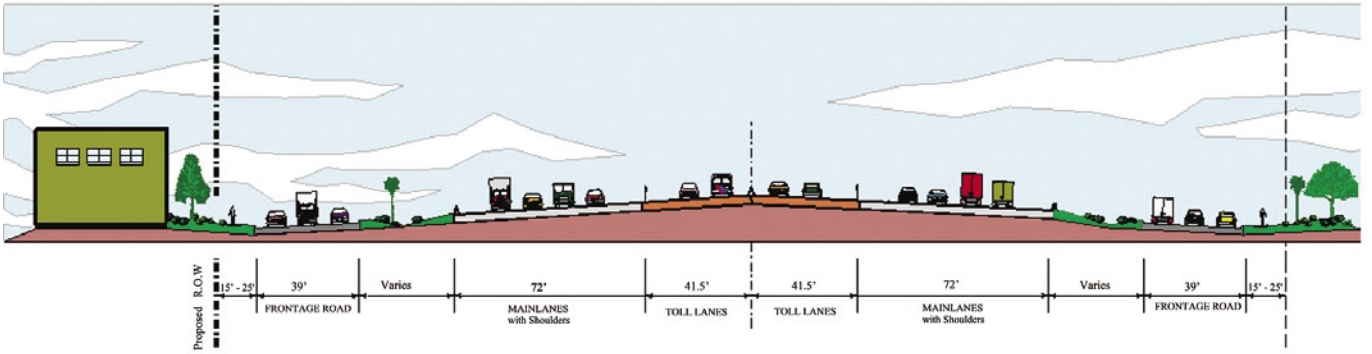
| Generation | Period Constructed | Examples | Characteristics |
|---|---|---|---|
| **First** | 1946-1959 | None remaining; original Gulf and Eastex Freeways. | 4-6 main lanes, poor geometrics, short merging distances, roller-coaster grades, poor safety design |
| **Second** | 1960-present | Most of Houston's freeway system was constructed to this standard. Remaining examples include the eastern half of Loop 610, the La Porte Freeway, the East Freeway, and the Sam Houston Tollway. Many second generation freeways have been upgraded to the 1980s design standard. | 6-10 main lanes, modern geometrics and grades, modern safety design, four-level freeway-to-freeway interchanges |
| **Third** | 1975-present | South and Crosby/Northeast Freeways. The remaining unbuilt section of the Crosby Freeway is the only third generation freeway that will be built in the future. | 6-10 main lanes, very wide right-of-way, wide median for expansion, outstanding geometrics |
| **1980s Design Standard** | 1980-present | Eastex, Southwest, North, and Gulf Freeways. Other freeways adhere to the general design characteristics but may not include all features, for example, the SH 249 Tomball Parkway. | 8-10 main lanes, central transitway, improved frontage roads, improved lane balance, 300-400 foot (91-122 m) wide right-of-way, high mast illumination, five-level freeway-to-freeway interchanges |
| **Managed-lane freeway** | 2004-future | Katy and Northwest freeway designs as planned. | 8-10 main lanes, 4 managed lanes, transit provisions |


**The 1980s freeway design standard:** This view of the North Freeway just north of Beltway 8 is an excellent example of the freeway design that became standard for freeway reconstruction starting in the 1980s. The freeway has 10 main lanes, auxiliary lanes for lane balance, a central transitway lane with connections to adjacent park-and-ride lots, continuous frontage roads generally having 3 lanes in each direction, and continuous high mast illumination. This section of freeway was reconstructed to the 1980s design standard in 1997. (Photo: James Lyle, TTI, June 2001)

the main lanes. The special-use lanes became known by the more generic term of "managed lanes" as the freeway design evolved during the next five years. When a final design was presented to the public in February 2003, it included a four-lane tollway in the center of the freeway. The use of "managed lanes"—lanes for buses, high occupancy vehicles, and toll-paying single-occupant vehicles—appeared to be a trend for the future. In September 2002 a major study of the Northwest Freeway recommended the addition of four managed lanes to the freeway corridor, in addition to expansion of the main lanes. The future of Houston freeways will not adhere to any fixed standard, however. Designs optimized for specific needs will prevail. Major freeways will be expanded to the 1980s standard and the emerging managed-lane design. Low volume freeways, such as the NASA 1 bypass freeway, will be much smaller and more consistent with the second generation freeway. Tollways will generally be smaller than major freeways and will also adhere to second generation freeway standards.

## Higher and Brighter

In 1959 the Houston office of TxDOT was about to begin construction on the IH 45 downtown interchange complex. Project engineer Dexter Jones was responsible for developing the lighting system for the new freeway. Until the early 1960s, the nationwide standard for highway lighting was the use of 30-foot-tall (9 m) lighting poles with 400 watt mercury vapor lamps. Jones worked through the design and soon discovered that the conventional fixtures wouldn't work well on the freeway, which featured 80-foot-wide (24 m) elevated structures in each direction. A large number of light fixtures would be needed, illumination uniformity would be poor, and cost would be high. The solution for a better lighting system was to use taller fixtures with more powerful lamps and space the lighting fixtures further apart. The IH 45 central interchange was successfully lighted in 1963 with 1,000 watt lamps mounted on 40-foot-tall (12 m) fixtures. It became clear to Jones that the future of highway lighting would be increased mounting heights with more powerful lamps: higher and brighter. The ultimate form of this concept—high mast illumination—would take shape during




**The managed-lane freeway:** This cross-section view shows a minimal implementation of the managed-lane freeway. The reconstructed Katy Freeway, scheduled for completion in 2008, will be Houston's first freeway to include managed lanes. Managed lanes are open to transit-oriented vehicles—buses, vanpools, and carpools—and to single-occupant vehicles that pay a toll. In the above view, the managed lanes are identified as toll lanes. Managed lanes are operated to maintain free flow of traffic during peak commute periods.

the 1960s in Texas and elsewhere. Although Houston would not be the first to implement high mast illumination, it would go on to use high mast illumination more extensively than any other place in the United States and probably the world.[109]

In 1965 Jones and the Houston Urban Project Office began a program to develop high mast illumination for Houston. Other research efforts were simultaneously underway at the Texas Transportation Institute, as well as other highway departments in the United States and Europe. Early work focused on highway interchanges. In September 1966, the Texas Transportation Institute installed a temporary telescoping high mast tower at the interchange of IH 35W and IH 820 in north Fort Worth. The tower was able to achieve a height of 120 feet (37 m). The ability of the high mast to light the interchange far exceeded researchers' expectations.[110]

By 1967 the Bureau of Public Roads no longer considered high mast illumination experimental. High mast illumination was reportedly already in use in Europe at the time. The first installation of high masts for highway lighting in the United States was a project with twenty-four 100-foot (30 m) tapered steel poles along IH 5 in Auburn, Washington, just south of Seattle, in 1968. Texas also completed its first two high lighting projects in 1968. Both projects used truss-assembled towers with fixed (non-lowerable) lighting assemblies. A project on IH 410 in east San Antonio featured twenty 100-foot (30 m) towers, and a project on IH 30 at the Texas-Arkansas border featured a 150-foot-tall (46 m) tower on the state line and four 100-foot-tall towers, two on the Texas side and two on the Arkansas side. In 1969, what was billed as the most advanced highway lighting system in the United States was completed on IH 635 in north Dallas. The installation featured thirteen 150-foot-tall masts with a winch system to raise and lower the light assembly, reportedly the first such winch system placed into service in the United States.[111]

Jones and the Houston office of TxDOT were holding back on Houston's first installation of high mast illumination. A little extra time was needed to perfect the winch system which raised and lowered the lights, and new types of lamps well suited for high masts would soon become available. In 1970 all the elements were in place for Houston's first high mast installation. Four 175-foot-tall (53 m) towers were installed at the interchange located at the southwest corner of Loop 610, where the South and

**Jersey barrier installation:** Houston's freeways were originally constructed with metal central guardrails, officially called the "non-yielding median rail" since they were designed to deflect vehicles rather than absorb an impact. The metal guardrail design also included a fence to screen headlight glare of oncoming traffic. The metal guardrails required excessive maintenance and were replaced by concrete "jersey" barriers starting around 1980. The view above shows installation of jersey barriers on the Katy Freeway just west of downtown in 1982. The construction crew installed the barrier and worked on their sun tans at the same time. (Photo: Chuck Fuhs)

| Types of highway lighting | |
|---|---|
| **Mercury vapor** | Blue-white light, used extensively in the United States on streets and highways from the 1940s until the 1970s. |
| **High-pressure sodium** | Amber light, used almost exclusively to light highways in the United States, including high mast illumination. |
| **Low-pressure sodium** | Yellow light, has lowest glare and highest efficiency and is the predominant lighting used on European highways. Extreme yellow color of light provides poor color rendition. |
| **Metal halide** | Modern version of mercury vapor provides white light with excellent color rendition and may become more prevalent on highways as efficiency and longevity improves. |

**Moonlight tower, Austin, Texas:** The last remaining example of the nation's first wave of high mast illumination in the 19th century can be found in Austin, Texas. Moonlight towers were built in cities around the United States and were first installed in Austin in 1895. Seventeen remain today. Moonlight towers are 165-foot-tall (50 m) vertical truss assemblies braced by guy wires with a ring of lights at the top. This moonlight tower is located a few blocks away from the TxDOT headquarters. It served as an inspiration for project engineer Dexter Jones, who led Houston's high mast illumination efforts in the 1960s and 1970s.[112] (Photo: June 2002)

West Loops meet. An installation with six 200-foot-tall (61 m) towers followed soon afterwards at the intersection of US 59 and IH 10 in downtown Houston. High mast lighting was gradually installed at interchanges all around Houston in the following years.[113]

### Moving Ahead of the Pack: High Mast Lighting of Linear Sections of Freeway

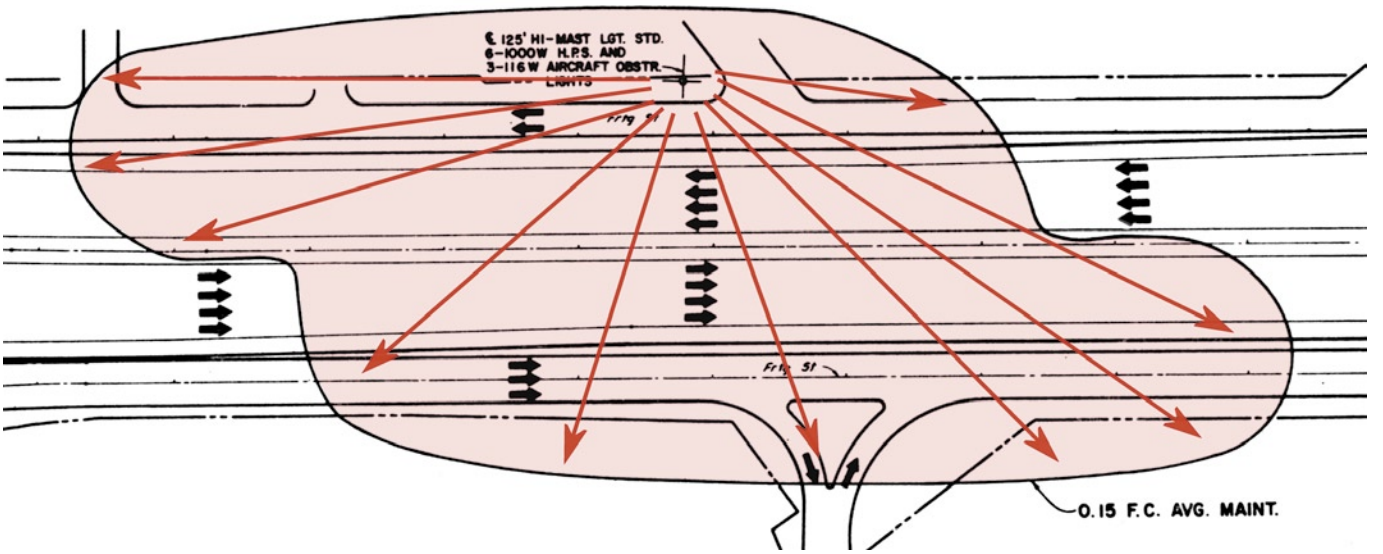
High mast illumination became common at interchanges in the United States in the 1970s. But conventional 40 and 50-foot (12 and 15 m) fixtures still ruled the linear sections of freeways between interchanges. In 1973 Houston first began to plan the construction of reversible, barrier-separated transitway lanes in the medians of freeways for use by buses and high occupancy vehicles. This would necessitate the removal of the metal guardrails in the freeway medians where the freeway lighting fixtures were located. Studies of lighting options for the transitway-equipped freeways showed that conventional fixtures wouldn't do a good job, especially with the continuous frontage roads along Houston's freeways and the usual corridor width of 300 to 400 feet (91–122 m). Continuous high mast illumination of linear freeway sections would be the solution.[114]

In April 1974, Jones and the Houston Urban Project Office launched a joint research program with the Texas Transportation Institute at Texas A&M University to determine the optimal configuration for high mast illumination of linear sections of freeway. The objective was to develop a glare-free system of lighting, something which could be called the holy grail of highway lighting. By the end of 1976, the team had found the optimal solution: the Z-pattern high mast freeway illumination system. The Z-pattern system provided light rays that always came from above or behind the motorist; at no time would the motorist be confronted with light shining into the line of sight. The standard mast height was 125 feet (38 m) but could reach 150 feet (46 m) in certain instances. The linear spacing was typically 700 feet (213 m). The lamp unit featured two large and four small floodlights, all carefully aimed to reduce glare.

Around 1979, Houston's first installation of high mast illumination on a linear freeway section was completed on the Gulf Freeway from downtown to Loop 610. The North Freeway followed soon afterwards. During the 1980s and 1990s, high mast illumination was added to most of Houston's freeways as the freeway expansion and reconstruction program reached full speed.

### Sky Glow

Not everyone was pleased with the proliferation of powerful floodlights along Houston's freeways. In particular, astronomers weren't happy. Light fixtures can send light rays upward into the atmosphere, where the light can be scattered by airborne particles and cause an effect called sky glow. The glow reduces the visibility of stars in the sky, effectively drowning out their dim light, and can adversely affect astronomers' nighttime observa-




**The Z-pattern high mast configuration:** The first generation of high mast lighting on linear sections of Houston's freeways, installed from 1979 to the early 1990s, featured the Z-pattern lighting configuration. The Z-pattern was designed to provide light from above and behind the driver so the driver would never look directly into a floodlight. (Graphic: *Z-Pattern High Mast Freeway Illumination*[115])

tions. Astronomers call sky glow "light pollution," a term that conveys a negative spin and aids their political efforts to enact legislation to curtail sky glow. The International Dark-Sky Association was founded in 1988 and has led efforts to curtail sky glow. By the early 1990s, TxDOT started to modify its lighting standards to reduce the contribution highway lighting makes to sky glow. To solve the problem, "cutoff" light fixtures are used on new lighting installations in Texas. Cutoff light fixtures greatly reduce the amount of light that is directed upwards into the atmosphere. This is normally accomplished by recessing the light source inside a metal housing and using a flat-bottomed transparent surface to direct the light towards the ground. In contrast, the hemispherical-shaped covers commonly found on street lights are not cutoff devices, since the hemispherical shape sends a certain percentage of light upwards. Cutoff fixtures have the added benefit of reducing glare since the light source is well shielded.[116]

The adoption of cut-off lighting marked the end of new Z-pattern high mast illumination installations in Houston. The floodlights used on the Z-pattern assemblies would send some of their light upwards into the atmosphere. In addition, properly aiming the Z-pattern floodlights could be difficult, and misalignments could exacerbate loss of light into the atmosphere. The new standard design for high mast illumination uses a ring of cutoff light fixtures, all pointed towards the ground. In the late 1990s foes of light pollution mounted an effort to pass a state law to mandate the use of cutoff lighting fixtures in state-funded installations. Their efforts paid off in 1999 when Governor George W. Bush signed a law regulating state-funded outdoor lighting and mandating the use of cutoff fixtures.[117]

The switch to cutoff lighting was generally accompanied by an increase in mast height. New installations of high mast illumination on linear sections of freeway in Houston in 2003 use 175-foot-tall (53 m) masts. The biggest and best implementation of high mast illumination is planned for the Katy Freeway expansion, scheduled for 2003-2008. Whereas all previous installations on linear sections of freeway have used a single row of masts, the Katy Freeway will have an unprecedented dual mast configuration with 175-foot masts along both sides of the freeway.

**Terms relating to control of artificial light**

**sky glow** - the scattering of artificial light by particles in the atmosphere, resulting in a luminance of the atmosphere at night.

**cutoff light fixture** - a light fixture that directs a very small percentage of its total light upward into the atmosphere. In Texas no more than 2.5% of the fixture light can be emitted above a plane at the lowest point of the light assembly.

**full cutoff light fixture** - a light fixture that directs no light upward into the atmosphere.

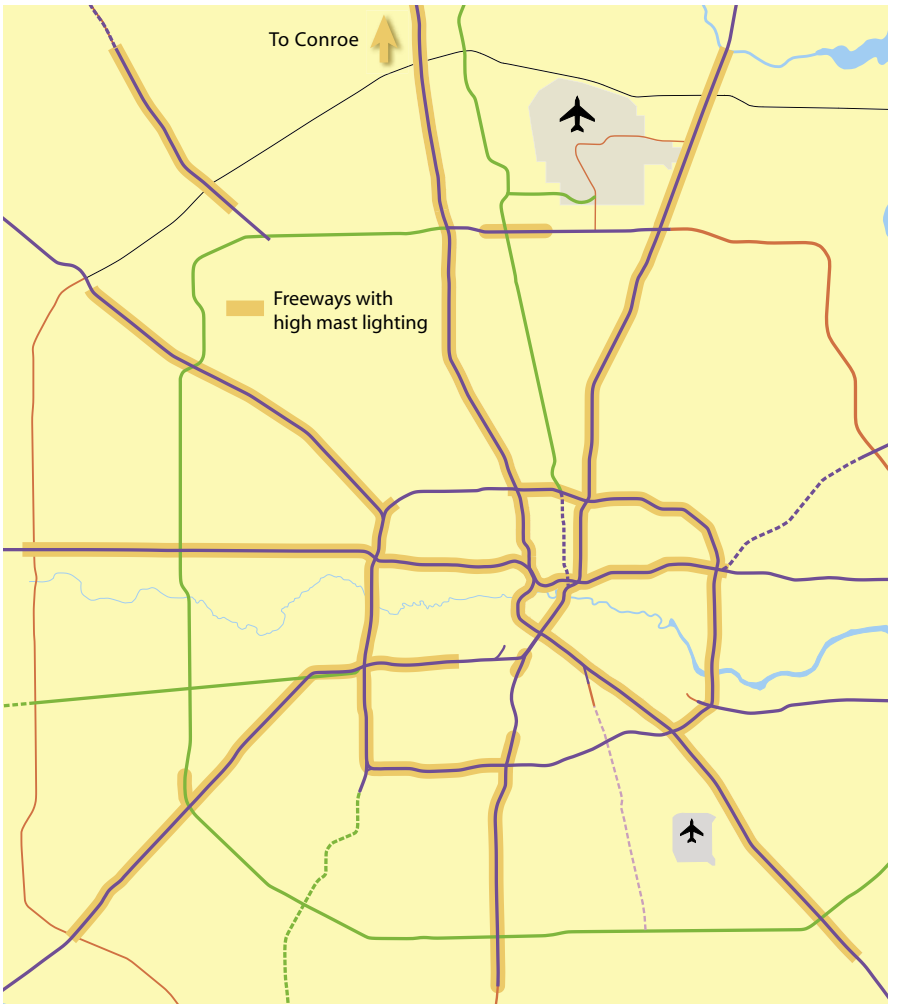
As lighting technology advances, Houston's freeway illumination will continue to improve. Perhaps in the future, metal halide lighting technology will become viable for high masts, replacing the high pressure sodium lights that are used today. Metal halide produces a white light which shows the lighted area in its natural color, in contrast to the yellowish cast imparted by high pressure sodium lamps. Metal halide lamps are used for indoor lighting because of their excellent color rendition.

## The Leader

If high mast illumination on linear sections of freeway is so great, why don't highway departments across the United States and the world use it more extensively? "It's a lot more expensive," says Mike Strech, executive


**High mast illumination:**
The above photo looking west along the Katy Freeway near Kirkwood shows the usual view that Houston motorists see at night—a long line of high masts to the distant horizon. This mast installation was part of the first generation of high masts in Houston and used the Z-pattern design with 125-foot-tall (38 m) masts. (Photo: November 2002)

Since the first installation of high mast lighting on a linear section of freeway in 1979, high mast illumination has been added to most of Houston's freeways. In 2003 new installations use 175-foot-tall (53 m) masts. High mast lighting and improved reflectivity of signs have eliminated the need to illuminate overhead signs on Houston's freeways.



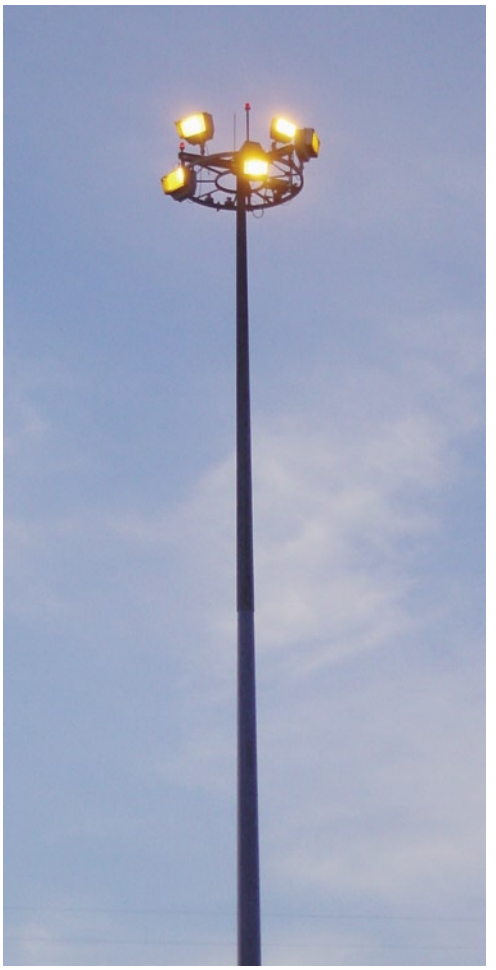
**Cutoff high mast lighting:** These masts on the Southwest Freeway north of Sugar Land use cutoff light fixtures. (Photo: June 2002)

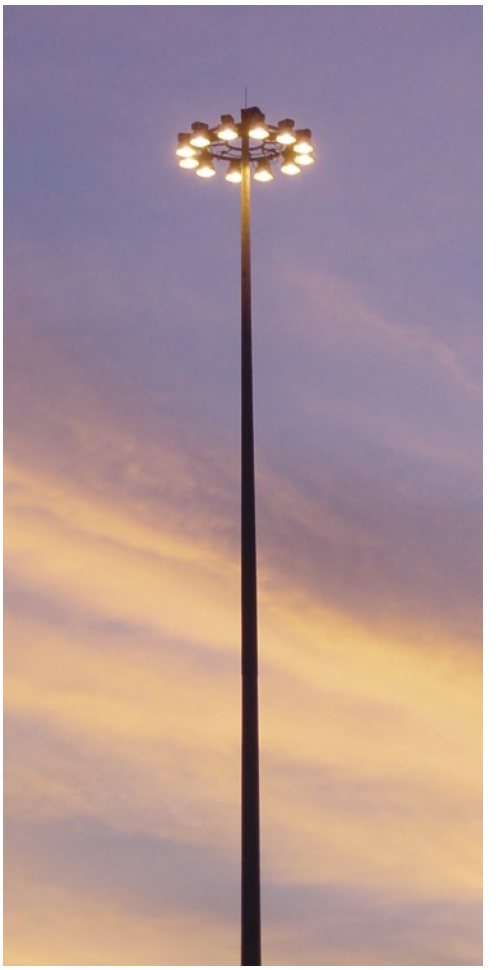
director of the Harris County Toll Road Authority (HCTRA). For HCTRA the most economical solution for lighting Houston's tollways is conventional 40 and 50-foot-tall (12 and 15 m) fixtures mounted on the center barrier of the tollway main lanes. HCTRA's situation is similar to most highway departments in the United States. It is responsible for lighting only its tollway main lanes, even when the tollways have state-owned frontage roads. Of course, most urban freeways outside Texas do not have frontage roads, so highway departments tend to use lighting designs similar to HCTRA's. On Houston's freeways, where frontage roads are widespread, TxDOT needs to find the most economical solution for lighting both the main lanes and the frontage roads. Lighting Houston's wide freeway corridors, typically 300 to 400 feet (91 to 122 m) wide, is an ideal task for high mast illumination.[118]

**Why Houston is the leader in high mast illumination**

- Wide freeway rights-of-way with main lanes and frontage roads which are more effectively lighted with high masts
- A commitment to safety and well-lighted highways
- Financial strength to afford high mast lighting
- Public and business support

In fact, a unique set of conditions is needed to support widespread use of high mast illumination on linear sections of freeway. In the United States these conditions exist on a large scale only in Texas, and they exist to the greatest extent in Houston. First, wide freeway corridors with frontage roads make high mast illumination a competitive engineering solution. Second, a commitment to highway safety and well-lit freeways is needed. Third, the region must have the financial strength to afford the added cost of high mast illumination. And fourth, the region must have public support for high mast lighting. In Houston there is generally good support for powerful lighting, especially among the commercial interests that line Houston's freeways. The result: Houston is widely believed to be the world leader in the use of high mast illumination. Aside from the safety benefits of well-lit freeways, driving Houston's freeways at night can be an impressive experience. Looking forward, the driver sees a long line of 125-foot to 175-foot-tall (38-53 m) masts receding to the distant horizon. Freeway lighting is uniform and consistent. Anyone with a view above ground level can see the paths of distant freeways by their high masts. The seemingly ubiquitous presence of masts along freeways is a distinctive feature of Houston's freeway system.





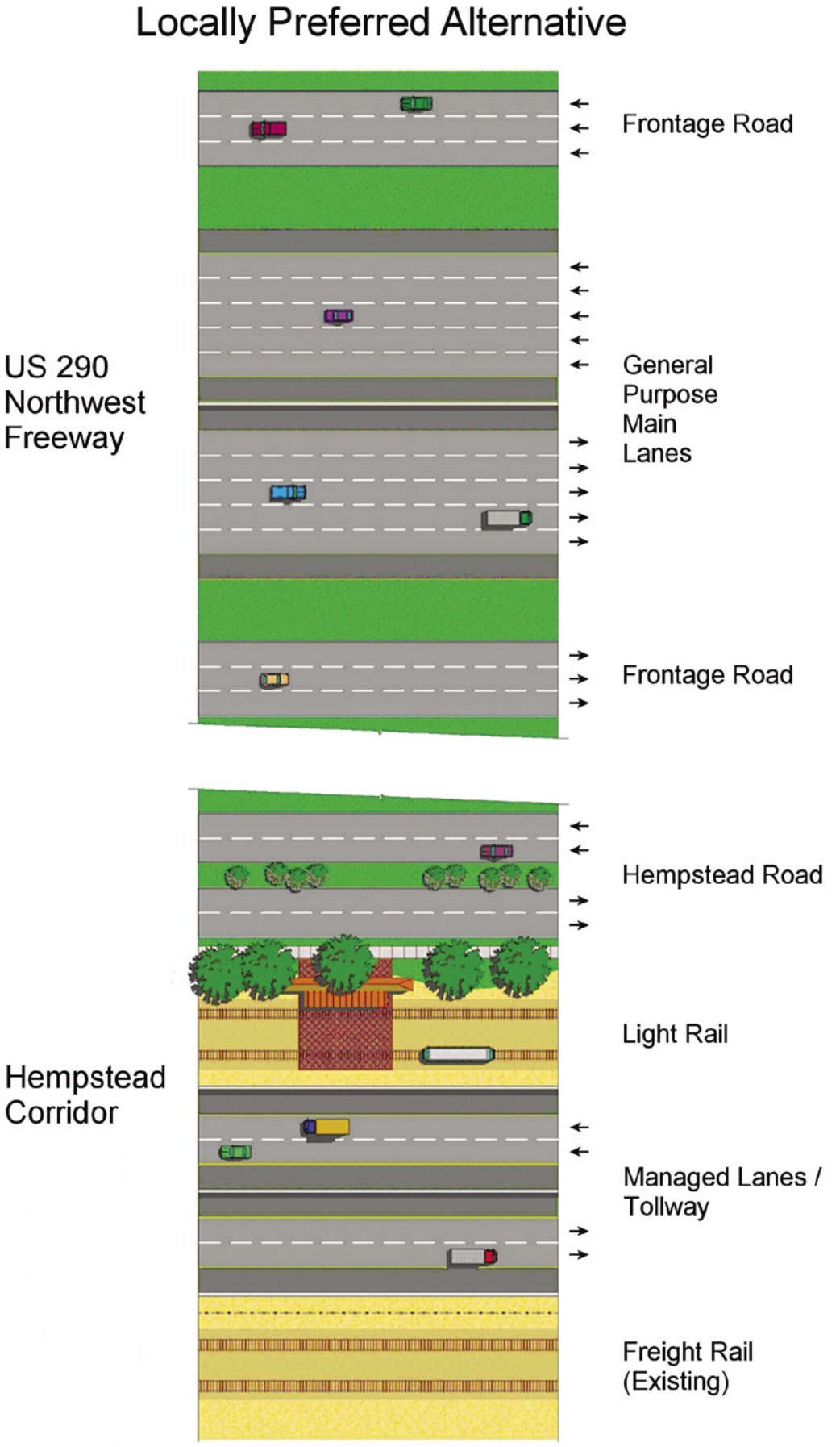
**Lighting the freeways, not the sky:** The left photo shows a typical high mast equipped with directed floodlights. Floodlights were used for the Z-pattern high mast illumination that was standard in Houston's first generation of high mast lighting. The floodlights were difficult to aim and had the potential to send light upwards into the atmosphere, contributing to the sky glow effect. Starting in the early 1990s, TxDOT began to use a ring of cutoff light fixtures that point toward the ground. The right image shows the arrangement of lights that is now standard for new installations of high mast lighting on Houston freeways. (Photos: July 2002)

**Key dates in high mast illumination**

| | |
|---|---|
| **Mid 1960s** | Research efforts begin in Texas and elsewhere. Reported installations in Europe. |
| **1968** | First high mast installation in the United States in Auburn, Washington. First high light installations in Texas using truss towers. |
| **1969** | First reported use of winch-controlled light assembly on IH 635 in Dallas. |
| **1970** | First high mast installation in Houston. |
| **1979** | First high mast installation on a linear freeway segment in Houston—the Gulf Freeway. |
| **1980s** | Widespread implementation of high mast illumination on linear freeway sections in Houston. |
| **Early 1990s** | New installations use cutoff light fixtures rather than directed floodlights. |
| **2003** | New mast installations use 175-foot-tall (53 m) masts. Katy Freeway expansion will have dual rows of 175-foot masts. |

It should be pointed out, however, that Houston's freeways are not the world's best lit. That honor is generally given to the freeways of Belgium, which are continuously lighted through both urban and rural areas with higher intensity light than is typically used in United States. High masts are used at interchanges only, however. Other regions in the world, particularly in Europe, also have strong freeway lighting programs.


**Freeway lighting in Belgium:** Belgium is generally credited with having the world's best-lit freeways. Approximately 90% of Belgium's freeways, both urban and rural, are fully and continuously lighted. Belgium formally adopted its policy of continuously lighting all freeways in the early 1960s. The photo above of the E40 freeway just east of Brussels, dating from the early 1970s, shows the lighting design that is most common on Belgian freeways: central fixtures with low-pressure sodium lamps. Low-pressure sodium lamps impart a strong yellow cast to the light. The more recent image at right provides a closer view of the typical lamp assembly. High mast lighting is used only at large interchanges. The above photo shows that Belgium's continuous lighting policy was well ahead of other needed highway safety improvements. Notice that this freeway has a very narrow median with no guardrail and the lighting fixtures are of a non-breakaway design with no collision protection. (Photos: upper courtesy of Dexter Jones; right, RTech, Belgium)




**Freeway corridor of the future:** The Northwest Freeway reconstruction plan was presented to the public in October 2002. The plan includes a moderate expansion of the freeway main lanes and frontage roads, but more significantly includes a parallel toll road and a high-capacity transit corridor. Houston's freeways will continue to be expanded and improved, but toll roads and transit will play an increasingly larger role in overall corridor planning.

# The Future of Houston's Freeways

Nothing is ever certain in the world of freeway planning and development. Turning a line on a planning map into a freeway or tollway is a very difficult task. Numerous factors can send even the best-made plans to the back burner or the scrap heap. And while the challenges of funding and special interest group opposition still remain potent, today's freeway builders face a new challenge that has the potential to be a show-stopper: increasingly stringent federal air quality regulations and antifreeway organizations seeking to use those regulations to stop freeways.

But one thing is certain. If Houston is able to proceed with plans that are in development in 2003, Houston will likely establish itself as the nation's leading city for building and expanding freeways and tollways in the 2003–2020 period. Perhaps only Dallas-Fort Worth and Phoenix will be investing in freeway and tollway transportation facilities at a rate comparable to Houston. Houston will strengthen its position among the top freeway cities in the United States and the world. The next chapter in the story of Houston's freeway system holds the promise of remarkable achievement, but getting to the planned freeway network of 2020 will be a challenge.

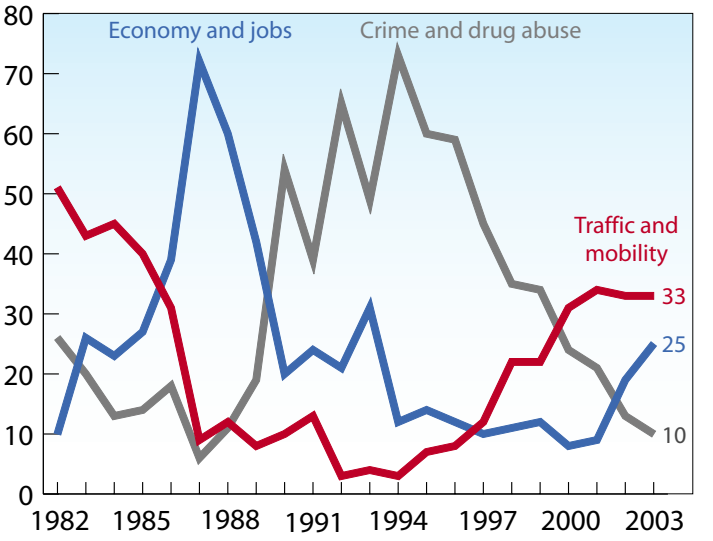
## The Traffic Cycle Returns

Houston's aggressive action in the 1980s to address the transportation crisis almost wiped traffic congestion off the local political radar screen. The Houston Area Survey, conducted by Rice University, is a comprehensive annual survey of the opinion of Houstonians on a wide range of issues. In 1982, the first year of the survey, 51% of those surveyed rated traffic congestion as the biggest problem facing Houston with crime a distant second at 26%. By 1986 traffic congestion had dropped to second place with 36%, and economic conditions moved up to first with 39%. By 1992 only 3% of survey respondents rated traffic congestion as the biggest issue facing Houston, while crime moved to first place with 65%. Traffic congestion began an upward trend in 1995 with strong economic and population growth fueling an increase in demand for transportation resources that outstripped the increase in supply. In 2000 traffic congestion once again became the most serious problem facing Houston, with 31% of respondents in comparison to 24% for the second item, crime. In 2003 traffic congestion held steady at the top position with 33%. Transportation was back on the political radar screen.

There was a noticeable increase in political efforts to secure highway construction funding starting in 2001, particularly in regard to Houston's share of state highway funding, which had dropped to 13% in 2001. City and county bond issues for road construction totaling $949 million passed with overwhelming margins in November 2001. As an issue at the top of the public's agenda, transportation was once again poised to receive the attention of political leaders. But just as it had in the past, the issue of transportation and how best to solve the problem would become the subject of controversy. It was time for another round in the battle of freeways vs. rail. This time, however, it appears that both freeways and rail will prevail, but tollways will emerge as the biggest winner.[119]

## Filling the Pipeline

Houston's previous waves of freeway construction had been guided by single, comprehensive documents that arrived with a bang and served as a rallying point for freeway-building efforts. Houston's first major freeway construction wave in the 1950s and 1960s was launched by the original 1954 freeway master plan. The second wave in the 1980s was launched by the 1982 Regional Mobility Plan. But the next wave will be different. The blueprint for the next generation of freeway improvements is the product of a new era—an era in which transportation projects on individual freeways are subject to years of analysis




▲ Biggest Problem Facing Houston  Data: Houston Area Survey

Percent who identified the issue as the biggest problem facing Houston

**At the top of the agenda:** In 2000 traffic congestion and mobility returned to the top of the list as the biggest problem facing Houston. The importance of transportation should ensure large investments in both freeways and transit in the near and intermediate future.

**Recent Major Investment Studies in Houston Managed by TxDOT**

| Year | Freeway | Limits | Recommendation |
|---|---|---|---|
| 1997 | IH 10 West<br>Katy Freeway | Downtown Houston to Brazos River | Expand freeway; add managed lanes from Loop 610 to SH 6 |
| 1999 | IH 45 South<br>Gulf Freeway | Beltway 8 to Galveston | Expand freeway; add non-barrier-separated HOV lanes |
| 1999 | US 59 South<br>Southwest Freeway | SH 6 to Fort Bend-Wharton County line | Expand freeway; add frontage roads |
| 2001 | SH 249<br>Tomball Parkway | Northwest of Houston, Pinehurst to Todd Mission | New freeway alignment north of Tomball |
| 2001 | SH 146 | Fairmont Parkway in La Porte to IH 45 at Texas City | Extend freeway; add express lanes; upgrade highway |
| 2002 | US 290<br>Northwest Freeway | Loop 610 to FM 2920 | Expand freeway; build new toll road on Hempstead Road corridor; preserve corridor for high-capacity transit |
| 2000-2004 | SH 99<br>Grand Parkway | Five sections of the planned loop | Define alignment for future freeway or tollway |
| Begins 2003 | SH 35 | IH 45 in Houston to SH 288 in Angleton | |
| Begins 2003 | SH 225 | Loop 610 to SH 146 | |
| Begins 2003 | SH 288 | US 59 (downtown Houston) to Angleton | |

and public input. The process is called a major investment study or corridor feasibility analysis and ultimately leads to a locally preferred alternative for transportation improvements. The recommended improvements are then adopted into the region's official long-range transportation plan.

Starting in the mid-1990s, a series of major studies on many of Houston's freeways began. The period from 1997 to 2003 was very influential in defining the future of Houston's freeways. One by one, the recommendations of these studies formed a new plan for Houston's freeways. In all cases, freeway expansions or new freeways were recommended. In a piecemeal fashion, Houston was getting a freeway plan that would be nearly as aggressive as the 1954 and 1982 plans (see table).

Plans of the Harris County Toll Road Authority (HCTRA) and Fort Bend County Toll Road Authority are not subject to the lengthy planning processes that are required for projects receiving federal money. The 1997–2003 period was equally influential for defining the future of Houston's tollway network. Several key projects moved forward, including the Westpark Tollway, Fort Bend Parkway Tollway, Hardy Airport connector, and Hardy Toll Road downtown extension. In 2001 HCTRA released a list of potential future toll road projects—the so-called "pooled projects." The list of projects will be considered on a case-by-case basis as demand develops, but nevertheless it forms a blueprint for an aggressive program over the next 20 years.

Since 1997 there has been an evolution in the approach to freeway corridor planning. With each passing year there seemed to be a movement to more diversified transportation corridors with both toll and transit facilities, in addition to expansions of general-purpose main lanes. The recommendation for the Northwest Freeway in 2002 exemplified this trend, with TxDOT recommending both a tollway and high-capacity transit facility—even without any commitment from agencies which would build those facilities. The North Freeway study, in progress in 2003, considered transit and toll road options before attempting to identify needed highway improvements.

It was almost as if TxDOT was transitioning into an empowerment agency—one that would empower local entities to take a larger share of the responsibility in future transportation corridors. In reality, TxDOT was saying that it couldn't do it alone. Building more mega-corridors around Houston like the $1.7 billion Katy Freeway project was not financially or politically feasible. TxDOT had shown strong leadership by launching the wave of studies for future improvements, but in 2003 it appeared to be repositioning itself as just one player on the team. Both HCTRA and the Metropolitan Transit Authority seem ready to step forward and assume larger roles.

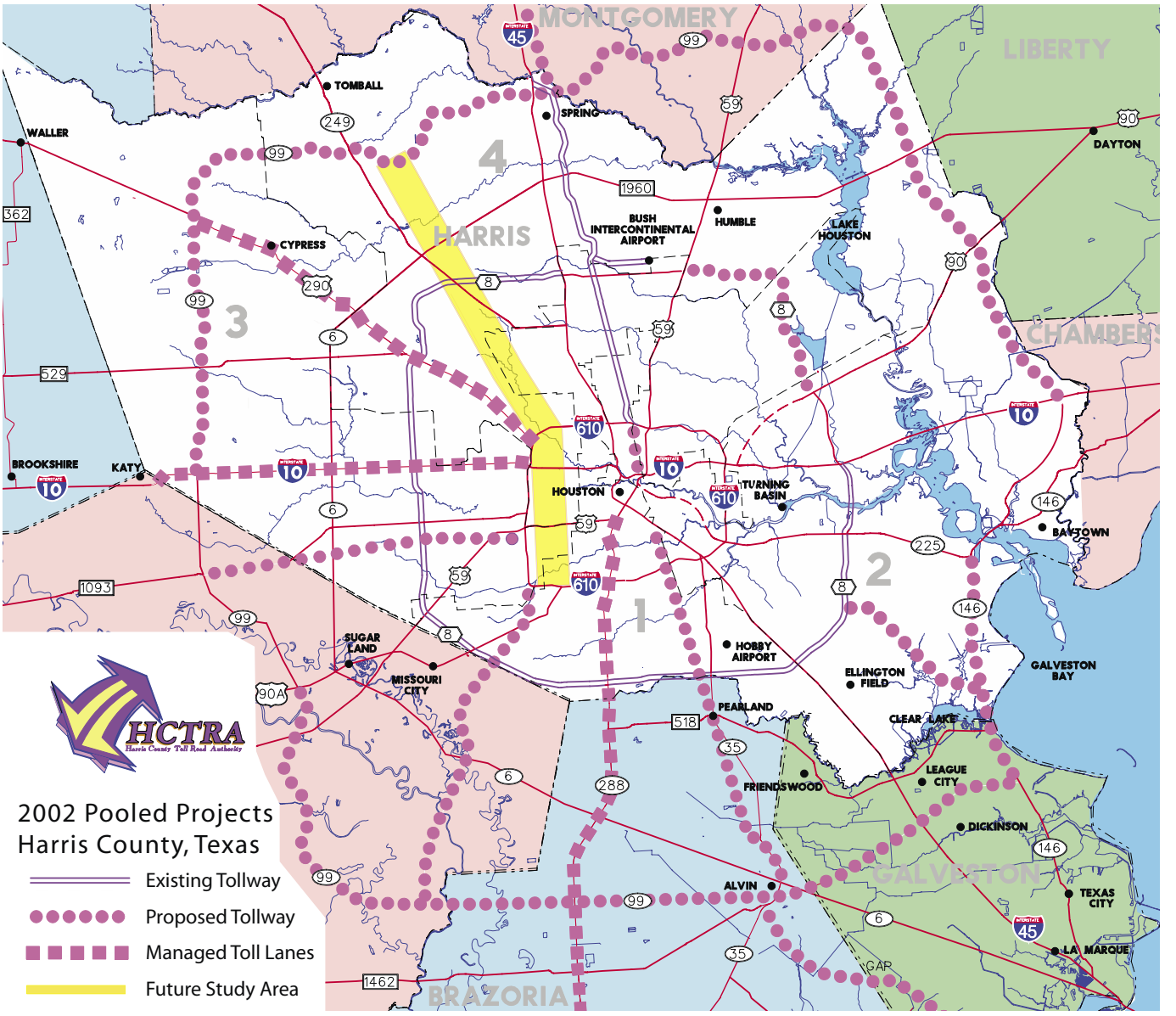
## The Plan

The official transportation plan for the Houston region is maintained by the Houston-Galveston Area Council (HGAC), the regional planning agency. Long-term plans are developed 20 years into the future. In mid-2003 the 2022 plan was the most recently approved plan, and the 2025 plan was in development. Any freeway project to be constructed with federal money must first be included in the official regional plan.

The 2022 plan includes the addition of 1,046 new free-

**June 2005 Update:** The corridors depicted in the future study area in the graphic below were no longer under study as of June 2005. The corridor north of Loop 610 was withdrawn from the regional transportation plan in May 2005 due to neighhorhood opposition and right-of-way issues. The section inside Loop 610 was dropped from active study in 2003 due to political opposition.






**Tollway planning:** In 2001 the Harris County Toll Road Authority (HCTRA) first released its "pooled projects" map, showing potential future toll road corridors in the Houston region. Three of the projects shown, the Westpark Toll Road, Katy Freeway toll facility, and Fort Bend Parkway Toll Road, are either under construction or about to begin in 2003. The northeast section of Beltway 8 will be constructed, but the other projects are speculative and may or may not be built. (Source: HCTRA)

way lane-miles (1,674 lane-km), 234 new tollway lane-miles (374 lane-km), and 226 new transitway lane-miles (362 lane-km). The numbers are certainly impressive, but perhaps the greatest achievement will be in the individual projects that make up the plan. The Katy Freeway expansion, if implemented as planned in mid-2003, will give Houston one of the nation's most impressive urban freeway corridors for a sustained distance. The Grand Parkway will establish Houston as the only major city to build most or all of a wide outer loop—Houston's third loop. Several new facilities are planned, mostly toll roads. The toll road system will be among the nation's more extensive, supplementing the large freeway system. Houston's downtown interchange complex will likely be improved, solidifying its position as one of the most extensive and modern in the United States.

If fully implemented, the long-range plan will solidify Houston's position among the world's top freeway cities. Although Houston will never equal the sheer number of freeway and tollway lane-miles in much larger cities such as New York and Los Angeles, Houston's freeway system will be among the most modern and up-to-date.

## Making the Plan Happen

Building and expanding a freeway system isn't something that just happens. It takes a sustained and dedicated effort by political leadership. Some of Houston's most influential political officials of the post–World War II era made freeways a top priority. In the 1980s and 1990s, Houston benefited greatly from its pro-mobility


**Major upcoming freeway construction, 2003-2008:** Houston's freeway construction program will gain momentum in the 2000s after a slowdown in the late 1990s. The above map shows future projects and projects that began in 2002. Ongoing construction that began prior to 2002 is excluded. The projects shown in the above map are all funded as of early 2003 and should be constructed in the 2003-2008 time period barring any funding or approval disruptions. Other new projects may move forward in this period, particularly new toll road projects. The centerpiece of the mobility plan is the expansion of the Katy Freeway, IH 10 West, with an estimated construction cost of $1.2 billion.

leadership, particularly Harris County Judge Jon Lindsay and Texas Transportation Commission Chairman and Houston Mayor Bob Lanier. Nonelected officials, especially Doug Pitcock of Williams Brothers Construction, have also played key roles.

But no one's influence lasts forever. In 2003 the era that had been so strongly influenced by Lanier, Lindsay, and Pitcock was in its twilight. If Houston is to fully implement its next wave of freeway construction, a new generation of pro-mobility leadership will be needed. It will be difficult, and perhaps impossible, for Houston to repeat the strong leadership it had in the past. In 2003 Harris County Judge Robert Eckels is the region's leading advocate for tollways and freeways. Eckels has provided excellent pro-mobility leadership for the region, but one person alone cannot repeat the legacy of the 1980s and

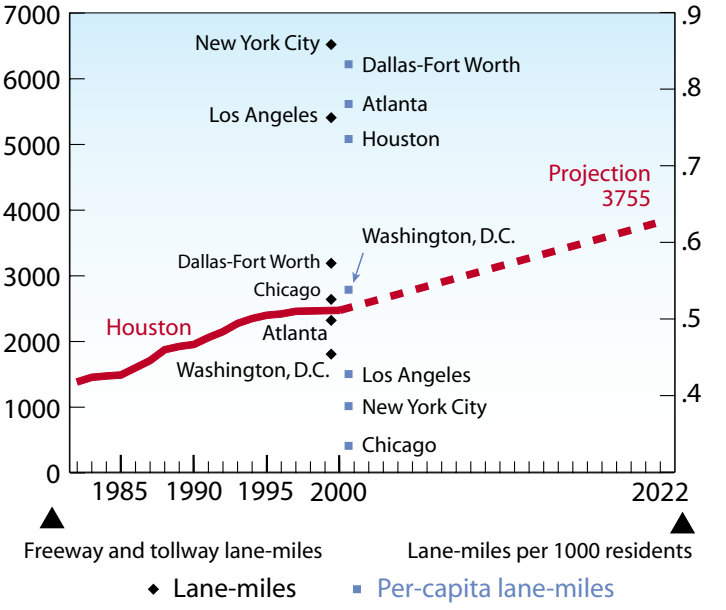
1990s. Without Eckels, Houston's mobility program could have been seriously impaired between 1997 and 2003. A pro-mobility political environment is not something that should be taken for granted.

To be sure, Houston's freeways have a tremendous amount of political inertia behind them. The county governments of Harris County, Fort Bend County southwest of Houston, and Montgomery County north of Houston have been essential in maintaining the strength of Houston's pro-mobility political environment. Pro-mobility suburban communities, the Houston business establishment, and the political influence of the construction and engineering consulting industries have also played key roles in sustaining the strength of Houston's freeway and tollway program.

And then there's the subject of money. The ups and downs of Houston's freeway program have been closely tied to funding. The 1970s highway construction bust and subsequent traffic congestion crisis were largely the result of greatly diminished funding. The second wave of construction in the 1980s was the result of increased funding. Implementing the planned program for the next 20 years will require additional sources of revenue. The first step being pursued by local officials is to raise Houston's share of state funding to its "fair" level, which is generally regarded to be about 22%. That step is relatively painless since it does not involve new taxation. Revenue from the Harris County toll road system will help cover the shortfall and enable the construction of new tollways, possibly as a substitute for new freeways. Fully implementing the plan, however, will require an enlargement of the highway construction funding pie. This could be accomplished with increases in federal funding, but most likely it will be achieved only by an increase in the state fuel tax or a new source of locally generated revenue. The political climate in Texas in 2003 does not appear to permit any tax increases, and an increase in the fuel tax seems highly unlikely in the near future. But as the existing 20-cent state tax is continuously eroded by inflation, at some point an increase may become necessary and politically feasible.

In 2003 the political leadership of Texas is attempting to steer Texas down the path of toll funding for its future highway construction program. There is also an effort to shift financial responsibility for urban transportation facilities to the local level through regional mobility authorities. Constitutional amendments passed by voters in November 2001 provided the state of Texas with new options in toll road and bond funding of highways. It appears that these programs will have little impact in Houston, since the Harris County Toll Road Authority is already aggressively building and planning new toll facilities where they are financially and politically feasible. Still, financial contributions from TxDOT to potential future toll roads, particularly the Grand Parkway, could make some marginal projects viable.

History shows that transportation crises often provide the impetus for new highway construction funding. It happened in the 1950s when the rapidly expanding use of private automobiles prompted new federal funding. It happened in the 1980s when Houston's traffic congestion crisis led to increases in state taxes dedicated to highway funding and the establishment of the Harris County Toll Road Authority. Will it take another crisis to bring funding up to adequate levels? The answer to that question is probably yes, but there's always hope that political leaders will be proactive in preventing a future traffic congestion crisis before it occurs.




Data: Texas Transportation Institute Urban Mobility Study, Houston-Galveston Area Council

**Freeway cities:** This plot shows the projected increase in lane-miles on the Houston freeway and tollway system. Houston ranked fifth in lane-miles in 2000, the latest data available from the Texas Transportation Institute (TTI). The TTI lane-mile data tends to lag behind new additions, and the large additions of lane miles in Houston in the late 1990s on the Eastex Freeway, North Freeway, and Sam Houston Tollway are not reflected in the data. By 2003 Houston has surely overtaken Chicago and will continue a strong upward trend in lane-miles with ongoing freeway expansions and tollway construction. On a per-capita basis, Houston is in the top three with Dallas-Fort Worth and Atlanta.

One thing is clear for the future. The challenges to freeway construction will be greater than ever. The risk of a major disruption resulting from federal regulations is an ongoing threat. When a political environment has been so strongly pro-freeway, the chances of political weakening are greater than the chances of strengthening. Awaiting the next generation of pro-mobility leadership are the most difficult regulatory environments, funding challenges, and sophisticated antifreeway efforts that Houston's freeways have ever faced.

## The Anti-highway Regulatory Environment

The anti-highway and anti-freeway mechanisms built into federal regulations are substantial, but perhaps none looms as large as clean air regulations imposed under the Clean Air Act of 1970 and its 1990 revisions. The federal regulations that implement the Clean Air Act are highly

complex, and the threat imposed by noncompliance is systemwide, potentially affecting nearly all projects in the area, not just individual projects. If compliance with federal standards is not achieved, federal transportation funds can be withheld, striking a severe blow to the region's freeway construction program. Atlanta, Georgia, was declared to be in a "conformity lapse" with federal air quality regulations in January 1998 and its highway development program was placed under sanctions. Federal transportation funds were frozen, although many grandfathered and exempt projects still continued. Atlanta's highway construction program was subsequently curtailed and most of its planned outer loop, the Outer Perimeter, was cancelled, leaving only the uncertain northern arc section in long-term plans.[120]

Air quality is a highly complex issue involving a large array of factors. This includes the wide variety of pollution sources, six major categories of pollution, weather conditions, and chemical processes that are subject to ongoing research. For Houston, the problem is ground-level ozone. Houston was declared to be a "nonattainment" region for ozone based on data collected from 1987 to 1989, indicating that Houston was not in compliance with federal regulations. Houston was one of five regions in severe nonattainment of ozone standards and had the highest ozone levels among these regions. Only Los Angeles, classified as an extreme nonattainment region, had higher ozone levels during the benchmark three-year period.[121]

Houston and the four other severe nonattainment regions were given 17 years to meet federal standards, with a deadline of 2007. The federal government applies a uniform standard to all regions without regard to the particular characteristics of each region. Houston is in an especially difficult position because of its extensive refining and petrochemical industries, ongoing population and economic growth, and hot summer weather. Fair or not, Houston must comply to ensure an uninterrupted flow of federal transportation funds.

Reducing ozone is a difficult task. Ground-level ozone is formed by a series of complex atmospheric chemical reactions primarily involving sunlight and the ozone precursors: nitrogen oxides and volatile organic compounds. Ozone typically forms during periods of elevated temperatures, bright sunlight (with minimal cloud cover), low wind speeds, and moderate-to-high concentrations of nitrogen oxides and volatile organic compounds. Nitrogen oxides are formed almost entirely by high-temperature combustion. Vehicle engines are a source of nitrogen oxides, with cars and trucks accounting for 30% of the nitrogen oxides in the Houston area. Volatile organic compounds are chemicals that vaporize easily, such as the components of gasoline and solvents. Cars and trucks account for 26% of Houston's volatile organic compound emissions.

Ozone-reduction efforts through the 1990s resulted in a gradual downward trend in ozone levels, in spite of substantial population and economic growth during the period. However, the trend was not sufficient to bring Houston into compliance by 2007. In 1998 it was determined that a 65% to 85% reduction in nitrogen oxide emissions was needed. Drastic action became necessary. In 2002 speed limits on Houston freeways were reduced to 55 miles per hour (88 km/h) and a vehicle emissions testing program was implemented. The speed limits were soon increased due to public opposition to the low speed limits and minimal contribution to air quality improvement. The ozone reduction program will be carefully monitored and refined as the deadline nears. Compliance with federal air quality regulations is the biggest challenge facing Houston, and Houston's political leadership has worked hard to find a solution.

Other federal regulations relating to the environmental impact of freeways have generally slowed Houston's freeway projects but have not stopped them. With enough persistence and political support, the projects can usually move forward. Perhaps the best example of a freeway which struggled to overcome the anti-freeway mechanisms of the regulatory environment is the Fort Bend Parkway Tollway. Local officials tried to build the facility for 40 years, and during the 1990s federal environmental regulations slowed the progress of the project. But persistence paid off, and the tollway had its ground breaking in May 2003.

### The Opposition

Federal regulations also serve as an effective tool for anti-freeway forces. Environmental groups tend to oppose all new highway construction, wherever it may be. They have attempted to use federal air quality regulations to pursue their larger agenda of curbing urban sprawl and reducing use of automobiles. In 2001 the Sierra Club and Environmental Defense filed a lawsuit to force adherence to strict limits for nitrogen oxide emissions and remove certain highway construction projects from the area's plan, including the Grand Parkway, Fort Bend Parkway, Westpark Tollway, and Katy Freeway expansion. The Environmental Protection Agency ultimately approved the region's smog reduction plan in October 2001, preserving the region's highway construction program. But the challenges of federal air-quality regulations to Houston's freeway system are far from over in spite of the near-unanimous political support and strong public support for ongoing infrastructure improvements, as evidenced by road bond election results.[122]

A prominent figure in anti-freeway efforts in Houston is environmental attorney James B. "Jim" Blackburn. When environmental groups or localized groups opposing highway projects need legal assistance, they turn to Blackburn. In many cases, the threat of litigation has altered plans or prompted additional studies, satisfying the concerns of the opposition. Blackburn has not yet scored a legal victory that seriously impacts Houston's freeway system, but he will no doubt continue his efforts. In 2003 he represented interests opposing the Katy Freeway expansion, initiating litigation to stop or alter the project. Other groups working to promote new forms of development, such as the

new urbanism style of development which gained much publicity during the 1990s, oppose Houston's freeway construction program.*

The battle between roads and rail once again came to life in 1998 when anti-rail Mayor Bob Lanier left office and was succeeded by pro-rail Mayor Lee Brown. Houston voters rejected rail in 1973 and 1983, and Lanier nixed a planned monorail when he entered office in 1992. Mayor Brown put rail on the agenda once again, and this time the outcome of the battle was different—rail won. It was a small victory, but a hard-fought one. Brown was able to move the seven-mile (11 km), $325 million light rail project on Main Street forward without a public vote by using available cash funds. Rail opponents filed lawsuits to stop the project and obtained a restraining order preventing construction, but a court ruling on March 8, 2001, cleared all legal hurdles and allowed construction to begin. By a 54-46% margin in November 2001, voters rejected a proposition that would have forced a referendum on the project, which was about 25% complete. In 2001–2003 the Metropolitan Transit Authority conducted studies to define the alignment of potential future light rail lines.[123]

The future of rail in Houston will depend on a planned public vote in November 2003 and the priorities of future mayors. Still, the ridership of "successful" rail lines is so low that even the extensive system advocated by rail proponents will have a negligible effect on demand for Houston's freeway system. Dallas's 44-mile (70 km) light rail system, touted as a huge success, was carrying 59,360 passenger-trips per weekday in March 2003. Since most major urban freeways serve between 200,000 and 300,000 vehicles per day along their busiest sections, 59,000 passenger-trips per day on an entire system represents a negligible transportation impact. The high cost of rail systems, however, consumes a large amount of financial resources available to a region. Los Angeles invested approximately $2.5 billion in its 507-mile (811 km) Metrolink commuter rail system during the 1990s. In 2002 the commuter rail system was carrying 34,000 passengers per day. Atlanta's vaunted Marta rail system, with 219,000 daily passenger-trips in 2000, could not prevent the region from going into air-quality nonconformance in 1998. The Atlanta region has sustained substantial increases in traffic congestion and controversy about its urban sprawl in spite of its rail system. For comparison, Houston's freeway transitway system was carrying 121,086 daily passenger-trips in December 2002, with 40,185 on buses and the rest in carpools and vanpools. The capital investment for this level of transit patronage was far lower than for rail systems.[124]

The lessons from large, low-density cities that are investing in rail indicate that rail systems do not lessen the demand or need for freeways. Even though the transportation benefits of rail systems in low-density cities are marginal in spite of their huge price tags, proponents have been very successful in getting them built all over the United States. In Houston, light rail proponents now cite economic development as a key reason for building light rail, in addition to potential transportation benefits. As Houston continues its strong population growth, densification of the inner loop area will occur, possibly even fostering an urban environment that is less freeway-dependent. Light rail in Houston may very well carve out a niche serving a future dense inner-loop population.

### Future Trends: the Tollwayization of Houston

Whatever happens in the future of Houston's freeways, many present trends are likely to continue. Funding will continue to fall short of needs. Available funding will tend to go where it is wanted the most—where strong political constituencies want the money and actively seek it. For the most part, this will be in suburban areas outside Beltway 8. Recent and planned construction on the Katy Freeway, North Freeway near the Woodlands, and Southwest Freeway at Sugar Land exemplify this trend. Freeway improvements inside Loop 610 will become increasingly rare.

Tollways will become the salvation of Houston's transportation system. The strong patronage of the toll road system will provide a revenue stream critical for Houston's transportation future, allowing the construction of new tollways and the expansion of existing tollways. The Harris County Toll Road Authority will become a partner in regionally important mobility projects. HCTRA's financial contribution to the Katy Freeway expansion exemplifies this trend.

Transportation facilities will continue to evolve and exhibit a wider variety of designs. Tollways will typically be small, without frontage roads when built on new alignments. Many new and upgraded freeways will adhere to the standard Houston freeway template with transitways and frontage roads. Major corridors will become more diversified with the inclusion of toll lanes and transit in addition to regular freeway lanes. There will be some movement away from frontage roads, particularly on new tollways and the Grand Parkway, but the frontage road will still remain the defining and distinguishing characteristic of Houston's freeway system.

* New urbanism promotes denser neighborhoods with narrower streets, houses on smaller lots, and inclusion of jobs and essential services within walking distance of homes so that car ownership is not a necessity. Many new urbanism communities resemble neighborhoods that were constructed before the era of widespread automobile ownership. A few neighborhoods with new urbanism characteristics have been constructed in Houston.