

REGULAR MEETING OF THE CITY COUNCIL:

Austin, Texas, September 15, 1932.

The Council was called to order by the Mayor. Roll call showed the following members present: Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; absent, Councilman Steck, 1.

The Minutes of the last meeting were read and Councilman Gillis moved the adoption of same as read. Motion was seconded by Councilman Mueller and same prevailed by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

Messrs. V. B. Keith and Uncas Johnson presented a petition to the Council, signed by the property owners in the first block west of Speedway on what is known as Twenty-ninth Street, asking that this street be renamed "Mocking Bird Lane" in order to avoid confusion in locating same, and that the bridge across the creek at this point be rebuilt, on account of its unsafe condition. After hearing the petitioners, the City Engineer was instructed to proceed with the repairing of this bridge in the manner recommended by him to the Council.

Councilman Mueller moved that the matter of rezoning the property owned by the Theta Xi Association of Texas at the northwest corner of Twenty-eighth and Rio Grande Streets, which was taken under advisement by the City Council at its last regular meeting, be referred back to the Board of Adjustment for reconsideration. Motion was seconded by Councilman Gillis and same prevailed by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

A letter from A. W. Harris, President of the Theta Xi Association of Texas, relative to the above matter, was also referred to the Board of Adjustment.

A communication from Paul O. Simms Company, Agents for the owners of the property involved, asking that the USE designation of the west fifty feet of Lots 1, 2, and 3, Block 160, same being the southeast corner of the intersection of Congress Avenue and East Fourteenth Street, be changed from RESIDENCE "B" DISTRICT to COMMERCIAL "C" DISTRICT, was read.

The Mayor then laid before the Council the following resolution:

WHEREAS, Paul O. Simms Company, Agent for Miss Dot Thornton and her mother, Mrs. Mary F. Thornton, owners of that property known as the West Fifty (50) feet of Lots 1, 2, and 3, Block 160, of the Original City of the City of Austin, Travis County, Texas, said property being located on the southeast corner of the intersection of Congress Avenue and East 14th Street, has petitioned the City Council to amend the Zoning Ordinance so as to change the USE designation of such lots hereinabove described from "B" RESIDENCE DISTRICT to "C" COMMERCIAL DISTRICT; and

WHEREAS, under the terms of the Zoning Ordinance, such matters must be referred to the Board of Adjustment for its consideration and action and that a public hearing be held at which opportunity shall be given the public to offer any objections to said amendment; therefore

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

THAT said matters be referred to the Board of Adjustment for its consideration and report to the City Council; and that a public hearing be held thereon at the City Hall

at 11:00 A. M. on Thursday, October 6, 1932, and that notice of such hearing be completed by publication as required by the terms of said Zoning Ordinance.

The above resolution was adopted by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

A copy of the above resolution was also sent to the City Plan Commission.

The Mayor laid before the Council the following:

"Austin, Texas, September 15, 1932.

Honorable City Council and
City Manager of the City of Austin,
Austin, Texas.

Gentlemen:

At the time the Fairview Park Addition out of the Isaac Decker Survey in South Austin was divided and placed upon record the map which was prepared did not have complete technical data upon it. In the past few years that portion of Hillside Drive which is north of Academy Drive has been opened up for traffic. In making the investigations, we found the maps and land descriptions vague, and a special study has been made of the conditions. I recommend that the City of Austin swap land with Norman Arlitt so that the City will have a 50 foot street known as Hillside Drive on the west side of the Arlitt property, and that the City of Austin will have a connection with Newning Avenue along the north side of the Arlitt property. The City did not have any dedicated connection along the north line of the Arlitt property and the area of the land involved in the swap is very nearly equal and it is to the City's advantage to have the boundaries of Hillside Drive and Legrande Avenue definitely located.

I recommend that the City Council approve this proposed trade and that the City Manager be authorized by the City Council to execute the necessary papers for same.

Assuming that this recommendation will be approved by the City Council, I have prepared a resolution which I believe will provide for the consummation of the swap.

Respectfully submitted,

(Sgd) Orin E. Metcalfe,
City Engineer. "

WHEREAS, the City Council of the City of Austin has considered the recommendation of the City Engineer and the City Manager that the City of Austin define the lines of Hillside Drive and Legrande Avenue adjacent to property owned by Norman Arlitt in Blocks 63, 64 and 65 of Fairview Park and that the City of Austin swap land which is not needed for street purposes for land which is needed for street purposes; and

WHEREAS, the City Council has favorably considered said recommendation; therefore,
BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

THAT the City Manager of the City of Austin is hereby authorized and instructed to execute such instruments as may be necessary for the City of Austin to quitclaim to Norman Arlitt that portion of land not needed by the City for street purposes and in return for a quitclaim deed to be executed by Norman Arlitt and wife for that portion of the land needed for city street purposes.

The above resolution was adopted by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

The Mayor laid before the Council the following resolution:

WHEREAS, Texas Public Service Company has presented to the City Council tentative maps or plans showing the proposed construction of its gas mains in the streets in the City of Austin hereafter named, and said maps or plans have been considered by the City Council; therefore,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

THAT Texas Public Service Company be and the same is hereby permitted to lay and construct its gas mains in and upon the following streets:

1. A gas main in BURNET ROAD from West Fortieth Street to West Forty-second Street, the centerline of which gas main shall be 15 feet west of and parallel to the east line of said Burnet Road. Said gas main described above shall have a cover of not less than 2½ feet.

2. A gas main in ROSEDALE AVENUE from West Fortieth Street to West Forty-second Street, the centerline of which gas main shall be 15 feet west of and parallel to the east line of said Rosedale Avenue. Said gas main described above shall have a cover of not less than 2½ feet.

3. A 6'x12' regulator pit in EAST AVENUE, the center of which regulator pit shall be 2 feet south of and 69 feet east of the intersection of the centerline of East Avenue and the centerline of East Third Street. Said regulator pit shall be constructed in such a manner that one axis of same shall be parallel to the centerline of East Avenue.

The Texas Public Service Company is hereby put upon notice that the City of Austin does not guarantee that the space assigned above is clear from other underground utilities, but is based upon the best records we have at hand, and that the minimum depth stated does not have any reference to the fact that greater depths may be required at special points. When the Texas Public Service Company requires definite information upon the ground as to elevations or working points from which to base the location of their assignments they shall apply to the City Engineering Department not less than three (3) days before such information is required. The Texas Public Service Company is further put upon notice that they will be required to bear the expense of repairs or replacement of any underground utility damaged during the construction of lines named in this resolution.

AND THAT wherever pavement is out in the vicinity of a fire plug, water must be used at intervals during the course of back-filling of the ditches.

THAT the work and laying of said gas mains, including the excavation in the streets and the restoration and maintenance of said streets after said mains have been laid, shall be under the supervision and direction of the City Manager, and under all the pertinent terms and conditions of the certain franchise granted to said company by the City of Austin.

The above resolution was adopted by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

The Mayor laid before the Council the following resolution:

WHEREAS, on August 13, 1931, the City Council of the City of Austin passed a resolution assigning space for a gas main in WEST FORTY-SECOND STREET from Alice Avenue to Rosedale Avenue, the centerline of which gas main was assigned 3 feet north of and parallel to the centerline of said West Forty-second Street, and which resolution is recorded in the City Clerk's Minutes in Book 12, Page 613; and

WHEREAS, the owner of properties adjacent said WEST FORTY-SECOND STREET between the above named streets has requested the City Engineering Department to choose a different assignment in West Forty-second Street from Alice Avenue to Burnet Road; and

WHEREAS, the City Engineering Department has chosen a different assignment in said WEST FORTY-SECOND STREET from Alice Avenue to Burnet Road and said assignment has been considered by the City Council; therefore,

BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF AUSTIN:

THAT its action of assigning space for a gas main in WEST FORTY-SECOND STREET from Alice Avenue to Rosedale Avenue according to the Minutes of the City Clerk, Book 12, Page 613, be rescinded, and

THAT the Texas Public Service Company be and the same is hereby permitted to lay and construct its gas mains in and upon the following streets:

1. A gas main in WEST FORTY-SECOND STREET from Alice Avenue to Rosedale Avenue, the centerline of which gas main shall be 5 feet south of and parallel to the north line of said West Forty-second Street. Said gas main described above shall have a cover of not less than 2½ feet.

The Texas Public Service Company is hereby put upon notice that the City of Austin does not guarantee that the space assigned above is clear from other underground utilities, but is based upon the best records we have at hand, and that the minimum depth stated does not have any reference to the fact that greater depths may be required at special points. When the Texas Public Service Company requires definite information upon the ground as to elevations or working points from which to base the location of their assignments they shall apply to the City Engineering Department not less than three (3) days before such information is required. The Texas Public Service Company is further put upon notice that they will be required to bear the expense of repairs or replacement of any underground utility damaged during the construction of lines named in this resolution.

AND THAT wherever pavement is out in the vicinity of a fire plug, water must be used at intervals during the course of back filling of the ditches.

THAT the work and laying of said gas mains, including the excavation in the streets and the restoration and maintenance of said streets after said mains have been laid, shall be under the supervision and direction of the City Manager, and under all the pertinent terms and conditions of the certain franchise granted to said company by the City of Austin.

The above resolution was adopted by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

A communication from T. H. Barrow & Sons, offering to sell the City a tract of land out of Outlot 67, located between Comal and Chalmers Streets and south of what would be an extension of Riverview Street, for a park and playground for the Metz School neighborhood, was read and referred to the Park Board.

A communication from Dr. E. P. Schoch, relative to the operation of the traffic signal lights on Guadalupe Street at Twenty-second and Twenty-third Streets and the main entrance to the University, was read. Councilman Gillis moved that the matter be referred to the Traffic Department, with instructions to report to the Council if further action is required. Motion was seconded by Councilman Alford and same prevailed by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

Councilman Gillis moved that the general program of development, as submitted by the Park Board, covering the expenditure of the remaining funds on hand in the Parks and Playgrounds Bond Fund, totalling \$101,439.93, be approved. Motion was seconded by Councilman Mueller and same prevailed by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

The following communication from the City Engineer was read:

"Austin, Texas, September 14, 1932.

Mr. Adam R. Johnson,
City Manager,
Austin, Texas.

Dear Sir:

For some time we have had in mind the renumbering of a large portion of the City in a systematic manner. This has been put off on account of the pressure of other work, and also because we desired to do this work at just about the same time that the next City

Directory was being compiled. The need of a change of the numbering system is very great. We have frequent calls for numbers and are continually giving numbers which we consider temporary so as to cause the least inconvenience to the adjacent neighbors. To do it right means that we must take in large areas so as to eliminate what would be considered local decisions.

I have made a study of the condition of the numbering system of the City and find that the area of the City is divided about as follows: 36% of the area could retain its present numbering system. I have studied 18% of the area of the City and would be prepared to make a definite recommendation to the City Council for house numbers. 46% of the area of the City is numbered in an unsatisfactory manner and studies of same have not been commenced, although considerable local data has been assembled by our Drafting Department for this purpose. Although the foregoing compilation shows that 64% of the City has to have its numbering system studied and revised, it does not mean that every house number in these areas is incorrect, and probably 60% of the numbers in these areas could still be retained under the new system, but the areas in general need a systematic revision. In connection with this study, I have prepared a map showing in crayon colors the areas which need revision, the areas which need revision and which have been studied and areas which could retain their present numbers.

The selection of block numbers of the City would involve two to three months work, although large sectional areas could be presented to the City Council at intermediate periods. I believe that the entire work of renumbering, Council action and completion of advising the public would be finished simultaneous as with the delivery of the proposed new City Directory.

There would be some opposition to the change of numbers, especially for sentimental reasons. There would be considerable pressure brought to bear upon the City Council members to waive decisions to meet the individual desires to have numbers retained. I suggest that the City Council be approached as to their desire to have the numbering system corrected with the advice that if they are not going to be in favor of making a firm stand after once having taken their executive action on the matter, that it would be foolish to attempt to make this betterment.

I further recommend that a study be made of streets which have the same or similar names. My experience has shown that the public is greatly confused and inconvenienced and that the Fire and Police Departments have been hampered in their work on account of street naming conditions. I do not believe that there should be a Harris Avenue, Harris Boulevard and Harris Park, or there should be a River Street and a River Avenue, or Milam Place and a Milam Street. The last three illustrations are given for the purpose of calling to your attention the possibility of confusion. I am presenting with this communication a partial list of streets with similar names within the City of Austin. There are also other streets with similar names which are on the outskirts of the City of Austin, but are not included in the City limits. The City Plat Committee of the City Plan Commission has prevented an increase of such errors during the past few years before recommending the acceptance of Addition plats when same have been presented to them.

Respectfully submitted,

(Sgd) Orin E. Metcalfe, City Engineer. "

The Council took the above matter under advisement.

The City Manager submitted to the Council the following final report of the Bond Construction Engineering Department, by H. R. F. Helland, Consulting Engineer:

"Austin, Texas, September 14, 1932.

Mr. Adam R. Johnson,
City Manager,
Austin, Texas.

Dear Sir:

I herewith submit to you the Final Report of the Bond Construction Engineering Department. This report covers the period from the organization of the Department in 1928 until its abandonment in 1932, and summarizes all work with which this department was connected, including that covered by previous yearly reports.

In handing you this report, I wish to say that I believe the results obtained have fully demonstrated the success of your plan for handling the Engineering Work for the Bond Construction program of the City of Austin.

For myself, I feel that it has been both a privilege and a source of personal pleasure and friendship to have been associated with you on this work. It is my hope that at some future time I may again serve you.

Sincerely yours,

(Sgd) H. R. F. Helland,
Consulting Engineer. "

FINAL REPORT
OF
BOND CONSTRUCTION ENGINEERING DEPARTMENT.

I. OBJECT OF REPORT.

The final report of the Bond Construction Engineering Department is being made in order to summarize the accomplishments and the work done under the supervision of this department and to make certain recommendations as to needed future work in the City of Austin and the method of handling such work.

II. BOND CONSTRUCTION ENGINEERING DEPARTMENT.

In 1927-28 the City of Austin employed Koch and Fowler to make a city plan report and a report on the sanitary sewer system. At the same time Mr. Orin E. Metcalfe, City Engineer, made a rather complete estimate on proposed paving work for the city.

Using the above reports as a basis there was submitted to the voters of Austin a bond issue program totalling \$4,250,000.00, of which \$2,000,000.00 was allotted to street improvement work and \$550,000.00 to sanitary sewer work. This bond issue was voted in May, 1928.

The \$2,000,000.00 Street Improvement Bond Issue was tentatively allotted as follows: \$650,000.00 for storm sewers, bridges and other structures and \$1,350,000.00 for street work. The \$550,000.00 sanitary sewer bond issue was to be used entirely for the construction of sanitary sewer mains and laterals in the city.

In order to handle work of this magnitude a great expansion of the City's Engineering Department became necessary. After considering several plans for handling the work, the City Manager and the City Council decided that it would be most feasible for the City to form a separate department to plan and supervise the construction work which was to be done out of money derived from these bond issues.

The organization of the Bond Construction Engineering Department is shown in the organization chart included with the first annual report of the department dated February 1, 1930. The Department was headed by a Consulting and Supervising Engineer, who was responsible for all the designing and supervising of construction handled by the department. The department had two divisions, the Sewer Division, which handled sanitary sewers, storm sewers, bridges and certain miscellaneous work, and a Street or Paving Division, which handled all work in connection with street improvement. The personnel of these departments will be discussed later in this report under the headings for each separate department.

The work of this department naturally required cooperation from and with the existing City Engineering Department. Drafting work was handled through the Drafting Department of the City Engineering Department, the drafting force being increased as was necessary. The establishing of street centers and setting of centerline monuments was done by a party operating under the direction of the City Engineer. The work done in the drafting department and in establishing street lines required by the Bond Construction Engineering Department was paid for out of the respective bond funds.

The number of employees paid out of the bond funds varied depending upon the amount of work in progress. It reached its maximum in 1930-1931 when a total of thirty-two engineers, draftsmen, inspectors and rodmen were on the payroll.

III. SEWER DIVISION.

A. Personnel.

The Sewer Division was headed by Mr. C. G. Levander, Sewer Engineer. It was found that for the greater part of the time one field party was sufficient for running lines, both preliminary and final and giving grades for sewer and bridge construction. For a short time one or two other field parties were employed on this work, Inspectors were used as needed, there being a maximum of five employed at one time.

B. Work Handled By The Sewer Division.

The Sewer Division made preliminary surveys, estimates and final surveys and plans, and supervised the construction of sanitary sewers, storm sewers, various bridges and culverts, miscellaneous drainage and channel work and for dam and wall construction in Barton Springs paid for out of the Park Bond Fund.

The greater part of all construction was done by independent contractors under contracts awarded after competitive bids had been received. City forces, on authority of work orders issued by the Consulting Engineer, constructed quite a quantity of sanitary and storm sewers. This work was usually such as was urgently needed and for which, due to the isolation of the work or other reasons, it was deemed inadvisable to advertise for bids and award contracts.

This department also made surveys for a report on a low dam in the Colorado River.

C. Sanitary Sewers.

In 1928 the area in the City of Austin served by existing sanitary sewers consisted of the center and older built-up parts of the city, but inside this area which was classed as being served by sanitary sewers were numerous small districts or areas which were not reached by sewers. In South Austin there were no sanitary sewers except in a small area adjacent to Congress Avenue. The entire eastern section of the city, a section of the northwest, a section in the west and large sections in South Austin, although thickly populated, were without sewers.

With the money made available for sewer construction it was planned to, first, complete the construction of lines within the existing sewer system so as to eliminate unsewered areas; second, to construct a system of mains or trunk sewers which could be used as a basis for expansion of the sewer system as needed; and, third, to construct, so far as money was available, lateral sewers to serve as much of the city as possible.

Immediately after the organization of the Bond Construction Engineering Department work was started by City forces. The first contracts were awarded in March, 1929, and the work was carried on under later contracts and by City forces until the latter part of 1931 when money available for sanitary sewers had been practically exhausted.

The following paragraphs describe certain of the more important sewers constructed and certain interesting phases of the work.

One of the most important lines constructed was an intercepting main along the north bank of the Colorado River. This line begins at Deep Eddy and follows the river bank to Waller Creek and River Street, where it discharges into a lift station. At this point, the sewage is raised approximately 28 feet and discharges into a main extending to the existing outfall main at Holley Street and East Avenue. Two siphons across the Colorado

River bring sewage from South Austin to the intercepting main. The first syphon, a double ten inch line connects at the foot of Lavaca Street and carries the sewage from the western part of South Austin. The second syphon, a single eight inch line, discharges at the lift station and carries the sewage from the old South Austin sanitary sewers, Travis Heights and the eastern part of South Austin. Air-operated lift stations at Fourth Street and Rio Grande Street and on lower East Avenue were eliminated by the construction of the lift station and intercepting main. The low level line formerly discharging into the lift station at Fourth Street and Rio Grande Street was connected directly into the intercepting main, not only eliminating the lift station at that point but relieving overloaded conditions in existing sewer mains. The lift station on lower East Avenue formerly handled sewage from South Austin which is now carried by the eight-inch syphon to the new lift station. The new lift station is equipped with three float controlled, automatically operated vertical Wood sewage pumps of 500, 1000 and 1500 gallon per minute capacity direct connected to Fairbanks-Morse $7\frac{1}{2}$, 15 and 20 horsepower motors respectively.

Several benefits are to be derived by the construction of the intercepting main. It will provide future sewer service for the developed and undeveloped territory west of Shoal Creek and north of the Colorado River. Lying in low ground adjacent to the river, future lines connecting into the intercepting main can serve all of this territory. The main itself can be extended to serve territory adjacent to the Austin dam. It eliminates the necessity for constructing additional lift stations for handling sewage from South Austin or West Austin. By having one lift station equipped with modern efficient pumps there will be a saving in operation costs. This main has already relieved overloaded conditions in existing sewer lines. It has eliminated the necessity for expensive sewer construction that would otherwise have been required in the downtown section of the city.

The construction of this intercepting main involved crossing Shoal and Waller Creeks. These crossings were made by means of pile and concrete piers carrying 30 inch cast iron pipe. Bad ground conditions were encountered east of Congress Avenue which gave difficult and interesting construction work. The size of the main varies from 15 inches to 30 inches. The total length from Holley Street and East Avenue to Deep Eddy Street is 13,459 feet. The total length of line including laterals and syphons is 23,310 feet. The total cost of this main including the lift station, the two river syphons and a small amount of connecting lines was \$161,448.93.

A second important trunk line constructed is the main beginning at the existing sewage treatment plant and extending north on Perdenales Street and following low ground through the eastern part of the city to Twenty-third Street. This main will make possible the future completion of sewer lines to serve the entire eastern part of the city.

In South Austin a main was constructed west on Barton Springs Road as far as Barton Springs Park. Connecting into this main are mains extending south along both the east and west branches of Bouldin Creek. These sewer mains form the back bone of a sewer system that will eventually serve the entire portion of South Austin lying west of South First Street.

In Travis Heights sewers were constructed to serve the entire built-up area. Future extensions to these lines will make it possible to serve almost all of this attractive addition.

In northeast Austin beginning at Thirty-eighth Street the existing East Austin main was extended north as far as Forty-fifth Street. Laterals from this main serve territory

extending to the north City Limits.

In northwest Austin a main beginning at Thirty-first Street west of Oakwood Avenue and connecting into the existing Shoal Creek main extends north to the City Limits and serves territory west of the State Hospital.

The six projects above named constitute the most important mains or systems constructed. Many lateral lines feeding into these mains were also built in conjunction with them. Many smaller systems and individual lines were also constructed throughout the city both within the area served by the old sewer system and adjacent to the new sewers. The funds available for sanitary sewers were sufficient to construct enough sewers so that at the present time practically all built-up areas in the City, with the exception of a portion of East Avenue, are served with sanitary sewers. The area in East Austin above mentioned is in the poorer residential and negro district of the city.

While ground or excavation conditions encountered on this sewer construction included solid rock, quick sand, wet excavation and unstable soil, the work as a whole did not present any difficult or unusual construction problems. Considering the total length of lines constructed, only a small amount of sheeting was required or left in place. At various points due to unstable foundations, wet ground or extreme depth, the pipe was encased in concrete.

With the exception of creek crossings and lines in the bed of a waterway where cast iron pipe was used, all pipe used was vitrified clay pipe conforming to A. S. T. M. specifications. Joints were constructed of cement mortar. Manholes were of brick. As a general rule the sewers were laid at a minimum depth of five feet. The maximum depth at which sewers were laid was 22 feet.

The specifications required that leakage or infiltration into the sewers was not to exceed 20,000 gallons per mile of sewer per day. As ground water does not occur in the greater part of the area in which the sewers were constructed, except after prolonged wet seasons, the actual possible infiltration into the sewers could not be measured. For this reason a method of measuring the tightness of the sewers was devised. At the upper end of a section of sewer selected for a test, a 90° bend was installed and at the lower end of the section a 90° bend and two joints of pipe were connected so that the lower stack would reach above the level of the upper bend. The sewer was then filled with water and allowed to stand for approximately one hour so that the sewer joints would become thoroughly saturated before making the test. When making the test the water level was brought to the top of the upper elbow and this level maintained for a certain period of time by the addition of water. With a known length of line and by measuring the amount of water added to maintain the proper level for a known period of time the rate of leakage per mile per day was easily calculable. The maximum allowable head on the lower end of the pipe was five feet. The test method here described was used on the smaller sizes of pipe. On the larger sizes of pipe the same principle was employed but instead of using elbows the lower end of the pipe as well as the end of the pipe above the test section was stopped by a tight bulkhead, the section of line between bulkheads filled with water and the measurements of leakage made in the same manner as for smaller pipe. Tests were made on lines and at locations as determined by the engineer during construction. Data from typical leakage tests is given below.

<u>Size Pipe</u>	<u>Length Section</u>	<u>Leakage in Gallons</u>	<u>Time of Test</u>	<u>Leakage in Gals. Per Mi. Per Day.</u>
15"	768	11.73	30'	3870
15"	700	9.13	5'	19800
30"	1650	2.60	1'	12000
8"	240	1.5	10'	4750
8"	408	12.0	15'	14900
6"	349	1.0	10'	2200
6"	200	5.0	20'	9500

So far as is known this is the first instance in which leakage tests were specified for sewer construction in the State of Texas. It is believed that the results obtained fully demonstrated that this requirement was worthwhile.

It was found that if the tests were made immediately after first filling the line with water that the amount of leakage would often exceed the maximum, due to the amount of water absorbed by this pipe and the jute and cement joints. This was overcome by allowing the pipe to stand full of water, as stated above, before making the tests. Tests were made before the trench had been completely backfilled so that poor joints or broken pipe could be quickly located and repaired. It was found that after a contractor had been required to make several tests and repair lines which did not pass the requirements that thereafter the work was more carefully done and very few repairs were necessary. It was also found that most of the trouble causing excessive leakage was due to careless backfilling by the contractor, the pipe being broken by rocks thrown on it or the joints being opened by throwing the backfill material on one side of the sewer.

Sanitary sewers constructed by contract amounted to 255,721 feet or 48.43 miles of 6-inch to 30-inch sewer at a total cost, including pumping station, creek crossings and special work, of \$453,099.82. Sewers constructed by City forces amount to 82,085 feet or 15.54 miles of principally 4-inch to 8-inch sewer at a total cost of \$86,663.74. The total of sewers constructed to date is 337,806 feet, or 63.97 miles at a total cost of \$539,763.56. The balance of the bond issue of \$550,000.00 was used for legal expense, easements, land, undistributed costs of engineering necessary for the work and for the construction of a small amount of lateral lines by the City forces since the discontinuance of the Sewer Division of the Bond Construction Engineering Department.

The following tabulation gives information concerning the various sanitary sewer contracts and work done by City forces.

SANITARY SEWER CONTRACTS.

<u>Cont. No.</u>	<u>Contractor</u>	<u>Location</u>	<u>Total Length of Lines Feet</u>	<u>Sizes Pipe Used</u>	<u>Total Cost</u>
1.	Kirkwood, Wharton & Lee	From W. 30th to W. 45th Sts. Between West Ave. and Shoal Creek	26,653	6" to 8"	\$ 25,113.31
2.	Kirkwood, Wharton & Lee	From 38th to 47th Sts. between Speedway and Red River St.	33,086	6" to 15"	36,837.80
3.	Dozier Construction Co.	South of Colorado River and East of Congress Avenue	22,984	6" to 8"	39,590.71
4.	Dozier Construction Co.	South of Colorado River and West of Congress Avenue	33,685	6" to 10"	57,344.52
5.	McKenzie Construction Co.	Colorado River Intercepting Main and Syphons	23,310	8" to 30"	145,593.02
5a.	Knox T. Johnson	Pile Driving			1,291.71

SANITARY SEWER CONTRACTS--(Contd)

Cont. No.	Contractor	Location	Total Length of Lines	Size Pipe Used	Total Cost
6.	McKenzie Construction Co.	Pumping Station			\$ 15,855.91
7.	Kirkwood, Wharton & Lee	East Austin Sewer Mains, Sewage Treatment Plant to Manor Road	30,917	6" to 15"	44,264.37
8.	Dallas Construction Co.	Miscellaneous Laterals in East Austin, Holley St. to Manor Road, East Ave. to Chicon St.	21,050	6" to 8"	16,546.65
9.	Kirkwood, Wharton & Lee	Miscellaneous Laterals in N.E. Austin, 19th to 38th Sts., Red River to East Avenue	10,490	6" to 8"	18,059.54
10.	W. G. Cullum	American Legion - Pressler St. - Sidon St. Alley	2,362	6"	2,323.25
11.	W. G. Cullum	Barton Springs Road to Barton Springs Park	4,104	8"	3,837.50
12.	W. G. Cullum	Miscellaneous	47,060	6" to 12"	46,441.53
	City of Austin		<u>82,085</u>	<u>4" to 16"</u>	<u>86,663.74</u>
		Total -	337,806	Total	\$539,763.56

D. Storm Sewers.

A great volume of storm sewer construction was needed and desirable in the City of Austin in 1928. At that time the existing storm sewers were mostly small lines or systems built in connection with previous street improvement work. The main existing storm sewers were the Congress Avenue system extending north from the Colorado River, the Little Shoal Creek system which begins just south of Sixth Street and follows the general line of Nueces Street and San Antonio Street north to Twenty-fourth Street, the Waller Street sewer south of Sixth Street, a small system just south of the University of Texas main campus, and storm sewers in the business district.

There were certain areas in the eastern part of the City which, after a season of wet weather, were practically impassable. There were other areas in the city which suffered a considerable amount of damage after rain storms due to overflows and washes in the streets. North Guadalupe Street north of Thirty-third Street was restricted in width because of large drainage ditches on each side of the street. In addition to these main sources of trouble and complaint there were numerous smaller areas which should be taken care of.

The following paragraphs give a description of some of the main storm sewer projects built under the supervision of the Bond Construction Engineering Department.

One of the first storm sewer contracts awarded was for the construction of a storm sewer on Guadalupe Street and Avenue "A". This storm sewer as finally completed begins at Thirty-third Street in Aldridge Place and follows the general course of the west branch of Waller Creek along Guadalupe Street and Avenue "A". This storm sewer takes care of the drainage from the greater part of Hyde Park and the State Hospital Grounds. It eliminated large and unsightly open ditches and numerous wooden culverts and driveways. Without this storm sewer it would have been impossible to improve or pave Guadalupe Street as has been done. The maximum section used in this sewer is a box section 108" x 52".

The Comal Street storm sewer system with a maximum horseshoe section 7'x8'6" begins on the north bank of the Colorado River and extends north on Comal Street to Ninth Street. One main branch extends east on Fifth Street to Chicon Street and thence north on Chicon Street to Seventh Street. The construction of this sewer eliminated a deep drainage ditch on a portion

of Comal Street and made possible the future filling in and use of the lower part of Comal Street. It also took care of bad drainage conditions on Chicon Street between Fifth Street and Seventh Street.

The Perdenales Street storm sewer system with a maximum horseshoe section of 7'x7'6" begins on the north bank of the Colorado River and extends north on Perdenales Street to Ninth Street. One branch extending west, north of Seventh Street, drains a low flat area adjacent to the Southern Pacific Railway and Fauntleroy Street. Another branch extending west on Third Street to Chalmers Street drains a large flat area which, previous to the construction of the storm sewer was wet and marshy. Since the construction of this storm sewer numerous houses have been built in this area.

The Holley Street storm sewer system begins at the west side of the City Sewage Treatment Plant and extends west on Holley Street to Chalmers Street. Laterals connecting to this sewer drain areas which, previous to the construction of this sewer, had practically no drainage, the water standing in pools until it evaporated. Considerable building has been done in this area since the construction of this storm sewer.

The Third Street system with a maximum size pipe of 60" diameter drains the area adjacent to Third Street between East Avenue and Waller Street. A great quantity of water concentrated in this area after every rain storm and made the streets practically impossible to maintain.

In East Austin a storm sewer system beginning at Rosewood Street and Leona Street and following the line of a small creek to the City Cemetery and then on the north side of the City Cemetery to Twenty-third Street and East Avenue was constructed. The construction of this sewer, particularly the lower part thereof, eliminated the necessity for the reconstruction of a number of dilapidated wooden bridges and culverts, in addition to reclaiming quite a bit of property. The maximum size of this sewer was 66"x60".

The Little Shoal Creek storm sewer was extended from a point just south of Sixth Street to the south side of Fourth Street. The size of this sewer is a double 8'x6'6" box.

In response to numerous complaints from merchants on East Sixth Street between Congress Avenue and Waller Creek a storm sewer was constructed along East Sixth Street from the alley east of Congress Avenue to Waller Creek. Numerous inlets were installed on Sixth Street and the bad drainage conditions relieved.

In connection with the channel change or re-location of Bouldin Creek along the east side of the Missouri Pacific Railway, it was necessary to construct a system of storm sewers along the Barton Springs Road between Kinney Avenue and South Third Street. These sewers are planned to care for the drainage along the Barton Springs Road and the area south thereof, having in view the ultimate paving of this trafficway.

In addition to these major storm sewer systems constructed, there were many other lines and small systems installed in various parts of the city. These lines were necessary in connection with paving construction, to relieve bad drainage conditions, to facilitate street maintenance and, in some cases, were built in cooperation with property owners to improve their property. In this last case, the property owners paid the greater part of the cost.

Material used in the construction of storm sewers was precast pipe, monolithic concrete pipe, reinforced concrete box sections and horseshoe sections. The type used in each particular case depended upon the size of the pipe, the location and the economy of the design. In practically all cases two or three different types of construction were considered before a final decision as to type was made. In a number of instances bids were received upon alternate types and the contracts awarded to that type upon which the cheapest bid had been received.

Storm sewers constructed by contract amounted to 127,649 feet or 24.18 miles, varying in size from 15" to the maximum sizes mentioned above, at a total cost of \$655,561.59. Sewers constructed by City forces amounted to 49,823 feet or 9.43 miles, varying in size from 10" to 42", at a total of \$123,243.46. The total sewers constructed amounted to 177,472 feet or 33.61 miles, at a total cost of \$778,805.05.

The following tabulation gives information concerning the various storm sewer contracts and work done by City forces:

STORM SEWER CONTRACTS

Cont. No.	Contractor	Location	Total Length Feet	Size	Cost
1.	Janes Contracting Co.	Guadalupe St. System	19,213'	15" to 108"	\$ 92,870.42
2.	Janes Contracting Co.	Comal Street System	22,530'	15" to 7' x 8' 6" Horseshoe Section	137,669.65
3.	Johnson Bros.	South Congress Avenue	281'	48"	3,079.16
6.	Janes Contracting Co.	Hyde Park		Storm Sewer Inlets	4,306.82
8.	McKenzie Construction Company	Perdenales Street System	35,869'	15" to 7' x 7' 6" Horseshoe Sec.	186,862.94
11.	Dallas Construction Co.	San Jacinto St. & Vicinity between 7th and 19th Sts.	4,849'	15" to 24"	14,430.74
12.	Fred Dellone	19th St. from Waller Creek to Speedway and Hemphill Park	2,129'	8" to 9' 0" x 5' 5" Box	27,509.54
13.	Dallas Construction Co.	Guadalupe St., 29th to King Sts.	5,850'	15" to 36"	18,467.18
14.	Dallas Construction Co.	North of City Cemetery	5,015'	15" to 48"	20,367.36
15.	G. A. Maufrais	In City Cemetery	250'	5' 6" x 5' 0" Box	2,472.74
17.	Dallas Construction Co.	Little Shoal Ck., 5th & Nueces St.	210'	13' 0" x 6' 6" Box	3,686.21
19.	W. G. Cullum & Co.	Miscellaneous Sewers	8,715'	15" to 54"	27,324.96
28.	W. G. Cullum & Co.	East Ave. bet. 10th & 11th Sts.	203'	72" x 54" Box	2,337.59
29.	W. G. Cullum & Co.	Little Shoal Ck. Culvert, 4th to 5th Sts.	440'	15" to Double 8' 0" x 6' 6" Box	11,613.31
34.	Klein Bros. Co.	Barton Springs Rd. System	3,063	24" to 54"	15,187.29
39.	Klein Bros. Co.	E. 6th Street System	2,872	15" to 39"	15,798.44
40.	Klein Bros. Co.	E. 3rd Street System	9,384	15" to 60"	35,448.03
41.	Klein Bros. Co.	West Lynn Street System	3,749	15" to 36"	8,753.79
47.	W. G. Cullum	12th and Red River Sts.	278	18" to 48"	1,092.04
48.	W. G. Cullum	Rosewood Ave. & East Austin	2,629	66" circular to 66" x 60" Box	24,750.03
49.	W. G. Cullum & Co.	Rosewood & Chicon Sts. and Rosewood and Poquito	120	96" x 60" and 108" x 72"	1,533.35
	City of Austin		49,823	10" to 42"	123,243.46
Total -			177,472'	Total -	\$778,805.05

E. Bridges and Culverts

Due to its topography the City of Austin requires numerous bridges and culverts.

Bridges and culverts constructed under the supervision of this department were needed to replace old existing structures, to open up new traffioways, to enlarge existing structures and to restore old traffioways which had been blocked by the failure or destruction

of old bridges at sometime in the past.

In the design of the bridges and culverts it was attempted to produce structures that would be pleasing to the eye as well as serve the purpose for which they were intended. Various types of designs were used, among which are arch, slab, beam and slab, and rigid frame. The two rigid frame bridges constructed over Waller Creek at Thirty-second Street and at Thirty-fourth Street are, so far as is known, the first bridges of this type constructed in the southwest. With the exception of the concrete arch bridge at Second and Red River Streets, the three-span beam and slab bridge at Fifth and Shoal Creek and the two-span double roadway beam and slab bridge at Twelfth and Waller Creek, all bridges were designed in the Bond Construction Engineering Department. The three bridges above mentioned were designed in the office of the Consulting Engineer.

Paneling and variation in concrete finish were used in order to beautify bridge structures. Some bridges were faced with stone so as to give the appearance of stone structures. False arches were constructed in some instances in order to improve the appearance of slab, or beam and slab structures.

The concrete arch bridge over Waller Creek at Second and Red River Streets replaced an old collapsed stone arch bridge. The new bridge is built partly in the street intersection and consequently is unusual in design. The construction of this bridge reopens a traffic route that was of importance even before the year 1900.

The three-span bridge across Shoal Creek on 5th Street gave a new crossing of this creek to the west.

The two-span bridge on East Twelfth Street was built in two sections, one section for each of the two driveways. The center or parked area of the street was left open for beautification.

The stone-faced bridge at Twenty-sixth Street over Waller Creek was built in connection with the opening of a new street between Speedway and San Jacinto Boulevard along the north side of University of Texas property.

On South Congress Avenue at Bouldin Creek it was necessary to lengthen the existing culvert or bridge to allow the widening of the dyke and subsequent paving of South Congress Avenue.

The bridge at Duval Street and Waller Creek was widened to allow the paving of Duval Street.

The City paid an additional amount to the contractor on the bridge at Park Boulevard and Waller Creek in order that the bridge be widened to conform to the City's requirements. This bridge had been contracted for by private capital as a part of a real estate development.

At Bouldin Creek Cut-off and Barton Springs Road a new bridge was required over the new Bouldin Creek Channel. With this bridge was constructed the outlet of the main Barton Springs Road storm sewer. The outlet is equipped with a large flap valve which prevents high water in Bouldin Creek, or back water from the Colorado River from entering the sewer and possibly flooding certain low areas adjacent to the road.

On San Jacinto Boulevard through University of Texas property two bridges have been constructed across Waller Creek. One bridge is a three-span arch structure and the second bridge is a two-span arch structure. These bridges are stone-faced. While constructed under contracts made by the University of Texas, the City of Austin is paying twenty-five per cent of the cost thereof. For this reason and for the reason that the boulevard is to become one of the main traffic arteries of the city, these two bridges should be mentioned in connection

with bridges constructed wholly by the City of Austin.

Bridges constructed, with the exception of those specifically mentioned above, were built to replace existing wooden or stone bridges which had become obsolete or dangerous, and to provide permanent structures under paved streets.

A total of twenty-one bridges and culverts was constructed and paid for either wholly or in part out of funds derived from the Street Improvement Bond Fund Issue.

The following tabulation gives information in regard to these structures:

BRIDGE AND CULVERT CONTRACTS.

CONT. NO.	Contractor	Location	Description	Cost
4.	Johnson Bros.	Red River and 26th Streets	Box Culvert 4:5x3:0x80:0	\$ 738.34
5.	Johnson Bros.	41st St. and Waller Creek	30' Roadway-Reinforced Concrete Slab- 2-18'-4" Spans	3,703.68
7.	Johnson Bros.	Duval and Waller Creek	Widening R.C. Bridge in Place- R.C. Slab and Beam - 36' Roadway - 20' Span	1,893.22
9.	Yeamans & Maufrais	Mary St. and Bouldin Creek	30' Roadway- R.C. Beam and Girder - 30' Span	6,994.22
10.	Yeamans & Maufrais	7th St. and Johnson Creek	20' Roadway - R.C. Slab 3-20' Spans	6,013.76
18.	J. F. Johnson	2nd and Red River Sts. and Waller Creek	40' Roadway - 50' R.C. Arch on Skew	33,635.52
20.	J. Odem	S. Congress Ave. & Bouldin Cr.	Extended Culvert in Place 13'-6" x 14'-0" Box Section 90' Roadway	7,257.53
21.	Schwarzer & Lorey	26 $\frac{1}{2}$ St. & Waller Creek at Intersection with San Jacinto Boulevard.	R. C. Slab with Stone Headwalls 3-10' Spans	5,631.52
22.	Schwarzer & Lorey	32nd St. and Waller Creek	30' Roadway- R.C. Rigid Frame 39' Clear Span	5,769.73
27.	J. F. Johnson	5th St. and Shoal Creek	40' Roadway-R.C. Arch Girder on Skew- 2-30' Spans and 1-40' Span	31,650.31
31.	Dozier Construction Company	Barton Springs Road and Bouldin Creek Out-Off	56' Roadway- R.C. Box Culvert on Skew with 3-10'-0" x 9'-0" Sections	8,422.53
35.	J. R. Blackmore	Monroe St. and Blunn Creek	30' Roadway-R.C. Box Culvert 20'-0" Span	4,240.13
36.	J. R. Blackmore	34th St. and Waller Creek	30' Roadway R.C. Rigid Frame 39' Clear Span	4,159.80
37.	J. R. Blackmore	30th St. and Waller Creek	64' Roadway-R.C. Box Culvert with Stone Headwalls on Skew 24' Span	5,779.57
38.	J. R. Blackmore	26th St. and Waller Creek	40' Roadway-R.C. Box Culvert with Stone Headwalls- 20' 0" Span	4,001.27
42.	Lewis Doble	Avenue "Q" and Waller Creek	36' Roadway R.C. Box Culvert 24'-0" x 6' 0"	3,073.42
45.	Dallas Construction Company	12th St. and Waller Creek	2-24' Roadways-R.C. Arch Girder on Skew- 2-31' 6" Spans	18,985.68
46.	G. A. Maufrais	Enfield Road	R.C. Box Culvert- 9'-0" x 3'-0" x 60'-0"	940.21
	Austin Bridge Co.	Park Boulevard and Waller Creek for Widening Bridge	R.C. Box Culvert Triple- 10'-0" x 7'-0"	700.26
	University of Texas (San Jacinto Blvd.)	Waller Creek at 19th St.	56' Roadway- Stone-faced Concrete Arch- Two 20' and One 25' Span Skewed	7,786.61 (City's 25%)
	University of Texas (San Jacinto Blvd.)	Waller Creek north of 24th Street	56' Roadway- Stone-faced Concrete Arch- Two 30' Spans Skewed	4,748.99 (City's 25%)
Total -				\$166,126.30

F. Miscellaneous Work.

In addition to work which can be classed under the above subdivisions, various pieces of miscellaneous work were required in connection with street paving and drainage work in the city.

Smaller pieces of miscellaneous work performed include the changing of the channel of Waller Creek between Twenty-sixth Street and Twenty-sixth and One-half Street to provide for the construction of San Jacinto Boulevard; the excavation of South Congress Avenue prior to paving construction; the changing of the channel of Waller Creek between Second and Third Streets so as to provide a full width street on East Avenue and permit the construction of a park and playground in that vicinity; the grading of drives in San Jacinto Park and San Jacinto Boulevard; the construction of a retaining wall at Twenty-third Street and Red River Street; the construction of stone walls on East Avenue between Eighth Street and Thirteenth Street, and the construction of retaining walls on Waller Creek at Seventh Street and Sabine Street.

The most important piece of work under this heading was the construction of Bouldin Creek Out-off and work incident thereto, with the exception of storm sewer and bridge work. The Bouldin Creek Out-off work consisted of the relocation of Bouldin Creek along the eastern side and parallel to the Missouri Pacific Railway right-of-way beginning at a point approximately 1,000 feet south of the Barton Springs Road and extending north to the Colorado River. The construction of this out-off required the construction of a bridge at the Barton Springs Road, but at the same time eliminated the necessity for the construction of two bridges on Barton Springs Road, two bridges on the Fredericksburg Road, one bridge on South Third Street, the enlargement of the waterway of the culvert under South Congress Avenue and the reconstruction of a bridge at Riverside Drive. It also reclaimed for building purposes or other uses a considerable amount of property formerly occupied by the creek bed. It further eliminated the danger of flood damage to property west of South Congress Avenue. Several contracts were awarded in the course of the construction of this project. The largest contract was for the channel excavation from the south end of the out-off to the Barton Springs Road. This out has a maximum depth of 45 feet and is in part through solid rock. In order to prevent future cutting back and erosion of the channel to an unnecessary depth a concrete spillway was constructed on the south bank of the Colorado River. Before this spillway was constructed a rise in Bouldin Creek cut away several thousand yards of material in the new channel. After the spillway had been constructed it was necessary to fill in this washed-out section. In order to further safeguard the channel and the spillway the slopes immediately below the Barton Springs Road bridge and below the spillway were heavily rip rapped. The total cost of Bouldin Creek Out-off, including the construction of the bridge on Barton Springs Road, was \$41,404.76. Considering the bridge construction that was eliminated by this work and the creation of future tax values by the reclamation of the old creek channel and areas adjacent thereto, this work was economically justified, in addition to eliminating flood hazards and unsightly conditions.

One piece of work that was contemplated as a joint project of the Street Improvement and the Parks and Playgrounds Bond Funds was the regulation, improvement and beautification of Waller Creek from Seventh Street to Nineteenth Street. An estimate amounting to approximately \$35,000.00 was made on this work, but the project was abandoned because of lack of funds. The carrying out of this project would have eliminated unsightly pools of stagnant water, improved

health conditions in the area adjacent to the creek and from an aesthetic standpoint would have added to the beauty of the city.

Curbs and gutters on Aldridge Place were repaired and reconstructed in preparation for the resurfacing of these streets under a maintenance contract of the company which had previously paved the streets in this area.

The following tabulation gives information in regard to the various pieces of miscellaneous work.

MISCELLANEOUS WORK CONTRACTS

Cont. No.	Contractor	Location	Description	Cost
14a.	Joe Macken	South Congress Avenue	Fill at Nellie and James Sts.	\$ 6,600.65
	Joe Macken	Waller Creek	Channel Change-26 to 26½ Sts.	3,770.04
23.	Joe Macken	South Congress Avenue	Excavating St. Opposite Deaf and Dumb Institute and Widening Dike	5,640.57
24.	Joe Macken	Bouldin Creek Out-off	Excavating Channel between Colorado River and Barton Springs Road-	6,030.75
25.	Joe Macken	Waller Creek	Channel Change between 2nd and 3rd Streets	5,613.62
26.	Raymond Canion	San Jacinto Park and Boulevard	Grading Driveways	1,219.04
30.	L. E. Whitham & Co.	23rd and Red River Sts.	Retaining Wall	1,549.15
32.	Joe Macken	Bouldin Creek Out-off	Excavating Channel S. from Barton Springs Road -	16,103.98
33.	J. F. Johnson	Bouldin Creek Out-off	Spillway at Colorado River Bank -	4,160.91
50.	Richard Schmidt	Bouldin Creek Out-off	Rip-Rap at Spillway	904.50
51.	Raymond Canion	Bouldin Creek Out-off	Backfilling Washed-out Channel	1,894.39
52.	Joe Macken	East Avenue	Excavation and Stone Retaining Walls between 8th & 14th Sts.	5,528.82
53.	Richard Schmidt	7th and Sabine Sts.	Retaining Walls at Bridge	2,001.10
54.	Dozier Construction Co.	Bouldin Creek Out-off	Excavation in Channel at Bridge -	281.60
55.	Joe Macken	Bouldin Creek Out-off	Excavation in Channel at S. End	1,001.50
56.	Joe Macken	Bouldin Creek Out-off	Rip-Rap north of Bridge	2,604.60
	R. Y. Cuyler	Aldridge Place	Curbs and Gutter	3,435.66
	Miscellaneous Curb and Gutter Construction -			2,362.76
			Total -	\$70,703.64

G. Parks and Playgrounds Bond Issue.

In addition to work paid for out of Street Improvement Bond Fund and Sanitary Sewer Bond Fund, the Sewer Division designed and handled a certain amount of work paid for out of the Parks and Playgrounds Bond Fund.

In Barton Springs a concrete dam, retaining wall and walks for the main swimming pool were constructed. The pool was cleaned out and deepened and the creek channel below the dam straightened and deepened. The excavated material was deposited along both banks of the creek protecting the high banks and trees from erosion and providing a play and picnic ground in the bed of the creek. A concrete wading pool for children was constructed at the upper end of the swimming pool. A small rock dam was constructed above this wading pool to serve

as a trap for retaining rock and gravel washed down from above the park.

A short time after this work was completed a heavy rise in Barton Creek washed out the stone trap dam and undermined a section of the retaining wall on the south side of the swimming pool. In 1930 the trap dam was reconstructed in concrete. The washed out retaining wall and additional retaining walls, walks and steps were built.

The following tabulation gives information in regard to the work paid for out of the Parks and Playgrounds Bond Fund.

CONSTRUCTION FOR PARK AND PLAYGROUND BOND FUND
AT BARTON SPRINGS

Contractor	Description of Work	Cost
J. F. Johnson	Concrete Dam and Channel Work	\$26,689.04
G. A. Maufrais	Children's Wading Pool and Rock Dams	2,726.83
Austin Bridge Co.	Rebuilding Trap Dam of Concrete	3,556.71
Austin Bridge Co.	Rebuilding Washed Out Retaining Wall	5,485.29
G. A. Maufrais	Miscellaneous Retaining Walls	2,328.01
G. A. Maufrais	Retaining Wall, Walks and Steps	762.98
Julius Johnson	Miscellaneous Sidewalks and Walls at Barton Springs	1,312.66
Richard Schmidt	Concrete Floor Around Children's Wading Pool	<u>2,494.03</u>
	Total -	\$45,355.45

IV. PAVING DIVISION.

A. Personnel.

The Paving Division was headed by Mr. L. M. Chokla, Paving Engineer. For the greater part of the time, three field parties were engaged in securing preliminary paving data and giving grades for paving construction. Due to the fact that only two paving companies secured contracts on the paving work, a large number of inspectors was not required. The number of inspectors varied from two to five. As sewer and bridge work was carried on at the same time paving work was going on, it was possible to switch inspectors between the Sewer Division and the Paving Division as needed.

In addition to the inspection by the City's inspectors, various tests of materials were made from time to time by outside agencies. All cement was tested by an independent laboratory. Concrete samples were tested through an arrangement with the University Testing Laboratory.

B. Procedure of Work.

In planning the paving procedure the City Plan as worked out by Koch and Fowler was used and followed where practical.

The paving schedule as laid out and followed provided for, first, the early improvement of primary traffic arteries carrying highway traffic into and through the City; second, the improvement of important traffic arteries within the city; and, third, the improvement of secondary or residential streets. The systematic carrying out of this schedule gave rise to many favorable comments both from the citizens of and visitors to Austin.

Due to the proposed closing of Speedway through the University Campus it was necessary to provide a primary traffic artery through the City replacing Speedway. For this reason it was planned to widen San Jacinto Street from First to Nineteenth Streets, and, in conjunction with the University of Texas, continue this artery along the general route of

Waller Creek through the University property and along the route of Waller Creek across Speedway and across Thirtieth Street to Guadalupe Street. This traffiway would intercept traffic coming from the north and east, bring it down San Jacinto Street where it could feed east into the business section of the city, or continue down to First Street and thence east to Congress Avenue and south out of the city. This project was completed as planned.

An attempt was made to provide a like main traffic artery through the western part of the city. It was proposed that Nueces Street from Second to Nineteenth Streets be made a fifty-six foot wide street, that at Nineteenth Street traffic be divided and northbound traffic be directed north on San Antonio Street from Nineteenth to Twenty-fourth Streets, while southbound traffic was to use Nueces Street from Twenty-fourth to Nineteenth Streets. North of Twenty-fourth Street, Nueces Street was to be widened to fifty-six feet up to its intersection with Guadalupe Street. Guadalupe Street was planned and built a sixty foot wide street to the City Limits. Due to strenuous objections raised by property owners along Nueces Street and San Antonio Street along the parts affected by this plan this project was abandoned, thus eliminating the construction of a main traffic artery in the western section of the city. As finally completed traffic feeds indiscriminately down the various streets between West Avenue and Lavaca Streets.

South Congress Avenue, being the main artery to the south, was first planned as a seventy-six foot wide street. Unfortunately the objections of the property owners and others to this paving width was so strong that the City Council finally acceded to their demand and South Congress Avenue was paved to a dith of ninety feet between curbs.

These three projects on the whole were the most difficult to work out and were the cause of much argument and dissension before their final completion. Other paving work in the city was carried out without very much trouble.

The State of Texas owns property abutting on a number of the streets which were included in the City's paving program. In order to provide funds for paying the State's portion of the paving costs on portions of Guadalupe Street, West Sixth Street, Nineteenth Street, Red River Street, Twenty-sixth Street, East Avenue, Third Street, Fourth Street, San Antonio Street, South Congress Avenue, and alley in Block 59, an appropriation was requested, and, after some trouble, was obtained from the 41st Legislature. Of the total appropriation of \$78,442.44 obtained, the sum of \$72,087.35 was expended in paving costs on the above named streets. Later an appropriation of \$3,051.81 was obtained from the 42nd Legislature for paying for paving in front of State-owned property abutting on portions of East Seventh Street and Thirty-eighth Street.

It was planned to pave Chicon Street from First to Twenty-third Streets. Due to the class of property abutting on this street and to the fact that this project was not undertaken until the last year of the paving program at a time when general conditions in the country were beginning to get bad, it was finally abandoned and only the section between First and Seventh Streets was paved.

A number of other paving contracts on various streets or portions of streets in the city were cancelled because of possible litigation, the probable inability of owners to meet paving assessments and, during the latter part of the program, because of lack of funds with which to complete the work.

Street widening in the business portion of the city was also contemplated. Seventh Street from Colorado to Guadalupe Streets, Eighth Street from Colorado to Lavaca Streets, Colorado Street from Seventh to Ninth Streets, Lavaca Street from Fifth to Ninth Streets, Fifth Street from Lavaca to Guadalupe Streets, Ninth Street from Colorado to Guadalupe Streets and Guadalupe

Street from Fifth to Eighth Streets were all scheduled for widening. With the exception of the widening of Guadalupe Street from Fifth to Eighth Streets this was all abandoned due to lack of funds and objections from the property owners.

It was originally planned that approximately fifty miles of street pavement be constructed out of the available funds. The paving schedule as submitted by Mr. Orin E. Metcalfe, prior to the voting of the bond issue and covering both streets of first and secondary importance, involved a paving yardage of 1,026,812 square yards. The paving actually constructed was 863,577 square yards, or 35.80 miles. In addition to permanent paving, 152,927 square yards of flushcoating, resurfacing and construction of semi-permanent pavement was done.

The reasons for not constructing as many miles of pavement as was originally contemplated are several. Some projects, notably South Congress Avenue and San Jacinto Boulevard, were very expensive and cost more than the preliminary estimates allowed. Storm sewer work, bridge and culvert work and miscellaneous work entailed a much larger expenditure than the amount originally allotted for these purposes. This was due in part to the primary need for such construction and in part due to the insistence of tax payers for certain pieces of construction, as for instance the storm sewer on East Sixth Street, which involved an expenditure of approximately \$16,500.00. As an example, this amount would pay the City's part on approximately one mile and a half of average width street paving. The payment by the City of \$102,264.69 for pavement abutting City owned property and in making adjustments on paving assessments against property the value of which did not justify the amount of the original assessment was another reason the paving program was somewhat curtailed. This item of expense had not been taken into account in preparing the preliminary paving estimates. The liberal policy adopted by the City of Austin in paying for reconstruction of sidewalks and curbs, and the construction of retaining walls was also a contributing cause to the decrease in amount of pavement constructed.

C. Paving Costs:

Paving costs were divided between the property owners and the City.

The City paid the total cost of paving street intersections plus a certain percentage of the cost of paving in front of abutting property. This percentage was on a sliding scale as follows: 10% on streets fifty feet or less in width between curbs, 12.8% on streets sixty feet in width, 18.2% on streets seventy feet in width; with a maximum of 33-1/3% paid on one ninety foot street. The property owners were required to pay the cost of constructing curbs and gutters in front of their property. With the varying percentages as previously given, the City's part of the cost of paving on the individual streets or units of construction varied from 10% to 67% of the total cost of such construction units, the percentage depending, of course, on the width of street, intersections included, and incidental work necessary. Considering the total new paving constructed, the City paid 31.8% of the total cost, this percentage not including payments made by the City as property owner, that is, for paving abutting City-owned property. The City's part of the paving cost was paid to the contractor in cash on monthly estimates. The property owners' portion of the cost was payable in six equal installments, the first due within thirty days after the street was accepted by the City and the balance in one, two, three, four and five years. Delayed payments carried interest at seven per cent.

The City of Austin adopted a very liberal policy in dealing with existing improvements in front of property abutting on streets to be paved and in regard to the construction of retaining walls made necessary because of street widening or change of street grade. Wherever

it was necessary to remove existing curb, curb and gutter or sidewalk because of street improvement work the City paid the total cost of removing such obstructions and rebuilding them at the new location and to the new grade. The City also paid the total cost of building retaining walls where a change of street grade made them necessary. Over \$50,000.00 was spent by the City in the construction of retaining walls and steps and in the taking out and reconstruction of curbs, gutters and sidewalks. Had the property owners been required to bear this expenditure themselves as is done in some cities this money could have been used in paying for the City's part on the construction of approximately four miles of street paving.

D. Types of Pavement

In the selection of paving types to be used for permanent pavement in the City of Austin consideration was given to all standard types of pavement in common use in Texas. At various times bids were received on brick, concrete and asphalt types of pavement. Concrete bases were required with two course pavements. When the street improvement work was first undertaken it was proposed that only a small amount of pavement be included in the first contract letting and that at this contract letting bids be received only on the two types of pavement at that time existing in the City of Austin, i. e. Warrenite-Bitulithic and Rock Asphalt pavement on concrete base. Due to the fact that for one reason and another, street after street was included in the list of streets to be considered in this first contract letting until the yardage amounted to approximately 195,000 square yards, it was believed by the Consulting Engineer that it would work a hardship on the City to receive bids on this large yardage without admitting other types of pavement than the two above mentioned. Accordingly it was recommended to the City Manager and the City Council that bids be also received on concrete, brick and other classes of asphalt surface pavement. This recommendation was accepted and bids received on all types of pavement. The results fully justified the recommendation in that lower prices were obtained, resulting in a saving to the city of from \$0.20 to \$0.30 per square yard of pavement. This statement is made after having received the opinions of various contractors who were interested in the work and also from some of the successful contractors.

While bids were received on all types of pavement contracts were awarded on only reinforced concrete pavement 6" and 7" in thickness and on 2" Warrenite-Bitulithic pavement on 5" and 6" concrete base. Of the total yardage of pavement constructed over 2/3 is Warrenite-Bitulithic on concrete base.

The following prices were obtained on paving contracts for the years as shown:

TYPE OF PAVEMENT	BIDS TAKEN <u>April 19, 1929.</u>	BIDS TAKEN <u>April 17, 1930</u>	BIDS TAKEN <u>Feb. 26, 1931</u>
2" Warrenite-Bitulithic on 5" Concrete Base	\$ 2.05	\$ 1.80	\$ 1.70
2" Warrenite-Bitulithic on 6" Concrete Base	2.20	1.95	1.85
6" Reinforced Concrete	1.77	1.55	1.50
7" Reinforced Concrete		1.70	1.65

Steel for reinforced concrete pavement at \$0.03 per pound.

The San Jacinto Boulevard pavement through University of Texas property was awarded on 2" Warrenite-Bitulithic pavement on 5" concrete base at a price of \$1.43 per square yard. This was in part due to the fact that this work was all paid for in cash, and assessment rolls, signing up of abutting property and such incidental work was not necessary.

E. Permanent Paving Constructed.

The paving constructed varied in width from 30' to 90'. Whenever possible on streets not purely residential it was attempted to secure a minimum width of 36' between curbs which would allow parallel parking on each side of the street and provide for two lanes of traffic. Main traffic arteries were paved a minimum width of 56' between curbs which allows parking on each side of the street and 4 lanes of traffic. As stated before, a total of 863,577 square yards, or 35.80 miles of pavement was constructed. This includes the paving of San Jacinto Boulevard between 19th Street and 26th Street through University of Texas property of which the City paid 25%. The City of Austin, as property owner, on streets which were paved and in making adjustments with property owners on paving assessments, paid a total of \$102,264.69 to the paving contractors. It is wished to again call your attention to the fact that the payment of this amount for paving abutting on streets was another reason that the total mileage of pavement constructed was materially reduced below that originally contemplated.

Noteworthy paving projects completed in the city deserving of mention are given below.

South Congress Avenue extending from the Colorado River to Live Oak Street, a distance of 6,944 feet, is 90 feet between curbs, is an extension of the main business street of the city leading directly to the State Capitol and carries all highway traffic going south out of the city.

East Twelfth Street extending from the east entrance of the State Capitol Grounds to East Avenue, a distance of 1,914 feet, has two 24' driveways and a 28 foot center parkway. This street is a companion street to West Twelfth Street which was paved in much the same manner in 1915.

East Avenue from Fourth Street to Nineteenth Street, a distance of 5,504 feet, is 200 feet wide between property lines and, depending on the topography of the ground, is paved with two driveways varying in width from 20 to 46 feet with a wide parkway in the center. It is to be regretted that lack of funds prevented the continuance of this project from Fourth Street to First Street.

Fifteenth Street from East Avenue to West Avenue, a distance of 5,207 feet, has two 26 foot driveways and a 23 foot center parkway.

San Jacinto Boulevard beginning at Nineteenth Street and following the meanders of Waller Creek north to Speedway is 56 feet between curbs, 5659 feet long and is destined as a part of the eastern traffic-way through the city to become one of the most important streets in the city.

East Seventh Street was paved from Brazos Street to Chicon Street, partly 56 feet between curbs and partly 36 feet between curbs. It relieves traffic congestion on East Sixth Street.

The construction of a bridge across Shoal Creek on Fifth Street and paving of Fifth Street from Lavaca Street to Crockett Street gives another outlet from the business section toward the west and relieves traffic congestion on West Sixth Street.

The construction of a bridge at Second Street and Red River Street and the paving of Red River Street from First Street to Fifth Street and from Sixteenth Street to Thirty-fourth Street restored a traffiway that was of importance in years past and which carries a large volume of traffic through the eastern part of the city.

Guadalupe Street from Nueces Street to Forty-fifth Street was paved 60 feet between curbs. This was made possible by the construction of the Guadalupe Street storm sewer system. This street carries highway traffic coming from the north into the city.

In addition to the above mentioned paving projects of major importance, a great part of the street area in the original city, many connecting links between paved streets, and streets leading to various sections of the city were paved.

The planting and beautification of East Avenue, Twelfth Street, Fifteenth Street and portions of San Jacinto Boulevard has made and will make these streets among the most beautiful in the State.

F. Resurfacing, Maintenance and Miscellaneous Street Work.

In addition to the permanent paving above described, a certain amount of resurfacing, maintenance and miscellaneous street surfacing was done.

Congress Avenue from the Colorado River Bridge to Eleventh Street and East Sixth Street from Congress Avenue to East Avenue were old brick surface streets paved from 25 to 27 years ago. These streets in part were extremely rough and it was decided that some type of resurfacing work should be done. Various methods were considered, among which was the taking up, turning over and re-laying of the present brick pavement, the laying of hot bituminous surface on the existing brick surface and the laying of cold bituminous surfacing on the present brick surface. Before any work at all could be done on these two streets it was necessary that the street railway tracks be put in good condition. For various reasons, among which was the inability of the Street Railway Company to secure money for their track work, the resurfacing of these two streets was delayed until the last part of the street improvement program. In the fall of 1931 bids were received on resurfacing these streets with a hot or cold bituminous surfacing. Contract was awarded on using cold Uvalde Rock Asphalt. The work was not begun until May, 1932, and then only after an agreement between the Street Railway Company and the City was reached by which the City of Austin advanced to the Street Railway Company a sum not to exceed \$7,500.00 on labor and material bills for resurfacing their tracks. The completion of the resurfacing of these streets has materially improved both their appearance and riding qualities. The contract price on this work was \$5.48 per ton of rock asphalt complete in place, separate bids, of course, being received on incidental work necessary.

On S. Congress Avenue between Bouldin Creek and the Colorado River Bridge, the street was not paved to its ultimate width of 90 feet with permanent paving. This was for the reason that the original fill across this valley was only wide enough to carry a 50 foot strip of pavement. Excavated materials from South Congress Avenue and other work in the city were used in widening this dike so as to allow a full width of 90 feet of pavement. Due to the fact that this widening fill had not had sufficient time to become thoroughly compacted, it was decided not to place permanent pavement on this area at this time. In order to secure a full 90 foot width of traffiway, to provide a better street surface and to reduce maintenance costs on this section, bids were received on one-course asphalt penetration treatment. The contractor on this work requested that instead of the one-course asphalt penetration treatment, he be allowed to use approximately a 1" thickness of emulsified asphalt macadam on approximately one-half of this area. This work has now been completed and after the penetration treatment has had sufficient time to bleed and take up additional stone this portion of South Congress Avenue will have the appearance of a full width paved street.

Many blocks of old bituminous streets in the city were badly in need of some maintenance treatment. Bids were first received on flushcoating Congress Avenue from Thirteenth Street to Nineteenth Street, and on Nineteenth Street from Congress Avenue to West Avenue. Contract was awarded on a flushcoat treatment using rock asphalt. The specifications for this work had been written after consulting with producers of rock asphalt but in carrying out the work it was found that the rock asphalt shipped into Austin to be used in this work had been too finely ground and caused great dust clouds to be formed under traffic for the reason that the asphalt prime coat did not penetrate the finely ground rock asphalt when the latter was applied. It is believed that coarser rock asphalt particles would have made a satisfactory job. This contract was never completed as only Congress Avenue and a portion of Nineteenth Street was worked on. At the present time this section of Congress Avenue is in excellent condition because of the treatment given it, which confirms my belief that rock asphalt surfacing as here attempted is not a failure.

After the trouble experienced with rock asphalt resurfacing, contracts were awarded for double flushcoating old bituminous streets. Approximately 76,600 square yards of old pavement was given this surface treatment. The streets were first thoroughly cleaned, excess oil, dirt and grease removed, cracks cleaned out and filled with fine surfacing mixture. The entire street was then given an asphalt priming coat which was thoroughly broomed to insure its penetration into the old roadway surface. The primary coat was allowed to dry for at least thirty minutes until the asphalt became slightly sticky. It was then covered with a second asphalt flushcoat applied with squeegees at a temperature between 250° and 350° Fahrenheit. Immediately after the application of the second asphalt coat a uniform layer of coarse dry sand was spread over the asphalt. Sufficient sand was used to absorb and take up the asphalt coat so that no asphalt would show through the sand layer. The street was then rolled and opened to traffic. From time to time as needed the sand was spread or brushed back on the pavement so as to take up all bleeding of the asphalt. This work was done at a contract price of \$0.15 per square yard.

In Barton Springs, driveways and park areas were paved with 2" Warrenite-Bitulithic pavement on a gravel base. This work was paid for by Park Board Funds.

In order to connect a permanent pavement on East Avenue or Cameron Road at Twenty-third Street with the county pavement at the City Limits a contract was awarded for surfacing a 20-foot strip between these two points with emulsified asphalt macadam. This work was done under the supervision of the City Engineer but was paid for out of the Street Improvement Bond Fund.

The following tabulations give information in regard to paving, resurfacing and flushcoating contracts. The City's part as given includes all engineering and incidental charges against the work as shown on the Finance Department Records and so far as these records were completed at the time of writing this report. Additional information on these contracts, such as type and thickness of pavement, the width of pavement between curbs, etc., can be obtained from the yearly reports of the Bond Construction Engineering Department and from the individual files of each paving contract.

This tabulation includes the paving of Barton Springs Driveways, which was paid for out of Park Bond Funds.

Of the total of 863,576.9 square yards of permanent pavement shown in the tabulation, 306,055.2 square yards is reinforced concrete, the balance, a total of 557,521.7 square yards, being Warrenite-Bitulithic on concrete or gravel base.

STREET PAVING CONTRACTS.

Con- tract No.	Street	Type of Pavement	Lin.Ft.	Sq.Yds.	City's Part Exclusive of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost of Contract
1.	WEST 1ST STREET Congress Ave. to Guadalupe Street	Bitu- lithic	1,131.2	6,208.6	\$ 5,696.49	\$ 6,262.59	\$ 11,959.08	\$ 23,173.71
2.	WEST 2ND STREET Colorado to Nueces Streets	"	1,362.5	8,995.2	6,472.75	1,542.19	8,014.94	24,540.25
3.	WEST 3RD STREET Congress Ave. to Nueces Street	"	1,774.5	4,374.9	2,182.95		2,182.95	12,864.30
4.	WEST 4TH STREET Colorado to Nueces Streets	"	1,350.9	5,510.2	5,066.58	1,183.49	6,250.07	16,597.19
5.	WEST 5TH STREET Guadalupe St. to Nueces Street	"	632.3	4,183.2	4,051.39	2,309.38	6,360.77	14,692.65
6.	COLORADO STREET 1st to 2nd Streets	"	276.3	1,360.8	1,213.99		1,213.99	4,193.63
7.	LAVACA STREET 1st to 5th Streets	"	1,348.7	6,866.1	4,222.26	44.40	4,266.66	18,905.87
8.	GUADALUPE STREET 1st to 5th Streets	"	1,346.0	6,834.3	6,052.26	2,501.90	8,554.16	23,240.13
9.	SAN ANTONIO STREET 2nd to 6th Streets	"	1,429.5	6,755.8	3,659.58	2,008.73	5,668.31	20,562.74
10.	GUADALUPE STREET 8th to 19th Streets	"	4,098.9	18,588.9	21,992.89	1,793.42	23,786.31	51,977.31
10a.	GUADALUPE STREET 6th to 8th Streets	"	632.0	3,885.1	4,235.30		4,235.30	10,629.15
11.	EAST 11TH STREET San Jacinto to Red River Streets	Concrete	1,005.8	4,514.6	3,296.84	351.96	3,648.80	10,797.41
12.	EAST 1ST STREET Chicon to Llano Streets	"	3,514.5	13,500.5	7,427.67		7,427.67	32,748.58
13.	EAST 6TH STREET Chicon to Perde- nales St.	"	2,680.4	11,035.2	3,835.93	261.73	4,097.66	27,949.24
14.	SOUTH CONGRESS AVE. Nellie to Live Oak Streets -	Bitu- lithic	3,914.3	39,654.4	48,535.70	3,144.51	51,680.21	104,702.73
15.	DUVAL STREET 29th to 35th Streets	Con- crete	2,690.8	10,633.0	6,252.00	96.00	6,348.00	26,884.86
16.	DUVAL STREET 35th to 45th Streets	"	4,174.4	16,081.7	10,540.50	358.00	10,898.50	39,954.84
17.	WEST 15TH STREET Congress Ave. to West Avenue	Bitu- lithic	2,488.2	13,172.7	18,468.94		18,468.94	39,653.76
18.	EAST 34TH STREET Duval Street to Speedway	Con- crete	1,366.5	3,868.2	2,952.47		2,952.47	9,725.69
19.	BARTON SPRINGS Driveway	Bitu- lithic	766.5	7,975.2	13,088.65		13,088.65	13,088.65
20.	RIO GRANDE STREET 28th to 29th Sts.	"	858.2	2,736.2	1,424.56		1,424.56	7,294.69
21.	ELMWOOD STREET Duval Street to Harris Park Ave.	Con- crete	551.7	1,683.8	350.04		350.04	3,981.08
22.	GUADALUPE STREET 5th to 6th Sts.	Bitu- lithic	277.3	1,842.1	3,114.85		3,114.85	5,375.93

STREET PAVING CONTRACTS (CONTD)

Cont. No.	Street	Type of Pavement	Lin.Ft.	Sq.Yds	City's Part Exclusive of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost of Contract
23.	WEST 5TH STREET Nueces St. to West Avenue	Bitu-lithic	932.0	3,880.0	\$ 3,723.06		\$ 3,723.06	\$ 10,483.71
24.	WEST AVENUE 5th to 6th Sts.	"	356.0	1,138.0	446.62		446.62	2,827.42
25.	RIO GRANDE STREET W.5th to W.6th Sts."		356.0	1,226.0	517.13		517.13	2,765.58
26.	NUECES STREET W.2nd to W.6th Sts."		1,428.0	9,097.0	6,855.60	\$ 1,775.88	8,631.48	23,298.74
27.	NUECES STREET W.19th to W.24th Streets	"	1,980.5	7,421.0	4,034.35		4,034.35	19,548.52
28.	SAN ANTONIO STREET W.19th to W.24th Streets	"	2,046.4	7,430.0	8,560.09		8,560.09	23,422.86
29.	NUECES STREET 28th to Guadalupe Street	Concrete	473.6	2,418.0	1,956.53		1,956.53	6,113.34
29a.	NUECES STREET 24th to 27th Streets	"	1,486.2	5,514.0	1,841.85	1,470.38	3,312.23	15,088.22
29b.	NUECES STREET 27th to 28th Streets	"	450.3	2,008.0	831.70		831.70	4,991.15
30.	GUADALUPE STREET 27th to Nueces Sts."		908.3	2,843.4	2,287.36	226.86	2,514.22	8,924.87
31.	GUADALUPE STREET Nueces to 40th Sts."		4,488.0	25,864.9	23,722.69	316.21	24,038.90	80,518.30
32.	GUADALUPE STREET 40th to 45th Sts.	"	2,400.0	15,498.2	7,525.37	190.00	7,715.37	37,982.20
33.	SAN JACINTO STREET 1st to 5th Sts.	Bitu-lithic	1,346.0	8,060.0	9,244.25		9,244.25	23,162.05
34.	SAN JACINTO STREET 6th to 7th Streets	Concrete	276.0	1,782.0	641.66		641.66	3,882.87
35.	SAN JACINTO STREET 7th to 9th Streets	"	712.6	3,974.0	12,065.18		12,065.18	18,545.29
36.	SAN JACINTO STREET 9th to 13th Street	Bitu-lithic	1,434.4	9,063.0	17,379.10		17,379.10	32,940.81
37.	SAN JACINTO STREET 13th to 15th Sts.	"	814.3	5,355.0	8,466.91		8,466.91	15,451.47
38.	SAN JACINTO STREET 15th to 19th Sts.	"	1,271.8	7,786.0	4,616.06		4,616.06	19,783.58
39.	SEVENTH STREET Brazos to Trinity Streets -	Concrete	711.9	4,594.0	15,022.70		15,022.70	21,887.58
40.	SEVENTH STREET Trinity St. to East Avenue	"	1,354.0	7,808.0	4,327.30	2,010.66	6,337.96	20,028.97
41.	EAST 19TH STREET Congress Avenue to East Avenue	Bitu-lithic	2,497.0	11,205.0	8,490.87		8,490.87	27,171.01
42.	RED RIVER STREET 16th to 19th Sts.	"	987.7	4,370.0	2,299.61	556.23	2,855.84	10,593.56
43.	RED RIVER STREET 19th to 24th Sts.	Concrete	2,551.5	11,826.0	11,863.83	301.95	12,165.78	33,317.56
44.	RED RIVER STREET 24th to 32nd Sts.	"	1,836.0	6,699.0	2,941.26	83.01	3,024.27	17,014.17

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type of Pavement	Lin. Ft.	Sq. Yds.	City's Part Exclusive of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost of Contract
45.	WEST 12TH STREET West Ave. to Enfield Road	Bitulithic	974.0	4,061.0	\$ 2,818.15	\$ 198.93	\$ 3,017.08	\$ 10,091.27
46.	PARKWAY and ENFIELD ROAD 12th St. to West Lynn St.	"	3,208.0	14,568.0	8,594.58	1,239.35	9,833.93	33,761.15
47.	EAST 22ND STREET Red River St. to East Ave.	"	1,265.0	4,793.0	4,682.39	30.50	4,712.89	13,480.67
48.	EAST AVENUE 4th Street to 6th Street	"	632.3	5,722.0	6,749.09		6,749.09	14,848.95
49.	EAST AVENUE 6th Street to 8th Street	"	723.0	7,103.0	10,928.17	2,097.60	13,025.77	21,151.57
50.	EAST AVENUE 16th Street to 19th Street	"	1,053.9	8,857.0	10,470.45		10,470.45	21,113.65
51.	EAST AVENUE 19th Street to 23rd Street	"	2,029.0	10,189.0	10,445.32	5,003.23	15,448.55	30,287.57
53.	WEST 29TH STREET Guadalupe St. to Rio Grande St.	"	353.0	1,539.0	1,846.07		1,846.07	4,377.64
54.	NUCES STREET 6th to 19th Streets	"	4,515.5	21,223.0	21,665.05		21,665.05	55,647.73
55.	WEST 24TH STREET Guadalupe St. to Rio Grande St.	"	903.0	3,521.0	4,480.32	755.35	5,235.67	10,715.87
56.	WEST 24TH STREET Rio Grande St. to San Gabriel St.	"	927.4	3,491.0	2,474.41		2,474.41	9,635.53
57.	SOUTH CONGRESS AVENUE Nellie St. to Bouldin Creek	"	1,047.5	10,427.0	9,969.40	3,176.52	13,145.92	32,346.89
58.	WEST 6TH STREET West Lynn St. to I. & G.N.Ry.	"	1,680.0	6,021.0	3,168.54	87.98	3,256.52	18,192.18
59.	NORTH GUADALUPE STREET 27th Street to 29th Street	Concrete	836.0	2,761.7	1,133.29	226.86	1,360.15	6,574.52
60 & 61.	WEST 26TH STREET Guadalupe St. to Speedway	Bitulithic	1,173.7 588.9	6,197.0 2,834.0	3,319.44 2,055.97	1,336.33	3,319.44 3,392.30	14,281.82 9,139.28
61a.	EAST 26TH STREET East End Paving - Bridge	"	34.5	141.0	134.67	250.20	384.67	384.67

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type of Pavement	Lin. Ft.	Sq. Yds.	City's Part Exclusive of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost of Contract
62.	ALLEY IN BLOCK 59 Trinity St. to Neches St.	Concrete	276.5	641.0	210.13	\$	\$ 210.13	\$ 1,235.19
63.	EAST 23RD STREET East Ave. to City Limits	"	2,555.4	9,607.0	4,771.76	784.97	5,556.73	23,438.77
64.	CHICOM STREET 1st St. to 7th St.	"	2,078.9	7,862.0	4,721.58	520.00	5,241.58	19,930.92
65.	ALLEY - BETWEEN 1ST & 2ND STS. Colorado to Lavaca Sts.	"	277.5	590.0	112.82		112.82	1,046.26
66.	ALLEY - BETWEEN 1ST & 2ND STS. Lavaca to Guadalupe Sts.	"	281.0	547.0	154.21		154.21	1,053.97
69.	PRIVATE WAY - 2ND TO 3RD STS. Congress Ave. to Colorado Sts.	"	344.3	765.0	537.22		537.22	1,679.43
70.	ALLEY - 3RD TO 4TH STREETS Colorado to Lavaca Sts.	"	277.5	613.0	99.64		99.64	1,033.62
71.	ALLEY - 3RD TO 4TH STREETS Lavaca to Guadalupe Streets	"	277.5	658.0	98.84		98.84	1,097.96
72.	ALLEY - 5TH & 6TH STS. Guadalupe St. to San Antonio St.	"	280.5	632.0	142.32		142.32	1,169.60
75.	ALLEY - 11TH & 12TH STS. Lavaca St. to Guadalupe St.	"	285.0	604.0	123.41		123.41	1,067.33
76.	ALLEY - 12TH & 13TH STS. Lavaca St. to Guadalupe St.	"	279.0	490.0	111.92		111.92	907.72
78.	ALLEY - 14TH & 15TH STS. Lavaca St. to Guadalupe St.	"	276.0	560.0	97.99		97.99	990.55
79.	WEST 1/2 OF ALLEY - 15TH & 16TH Guadalupe St. - 138' East	"	136.0	324.0	84.19		84.19	602.61
81.	ALLEY - 8TH & 9TH STS. Brazos St. to San Antonio St.	"	279.0	470.0	92.55		92.55	864.58
82.	ALLEY - 9TH & 10TH STS. Brazos St. to San Jacinto St.	"	277.5	528.0	99.19		99.19	965.25
83.	EAST 1/2 OF ALLEY - 10TH & 11TH San Jacinto St. 128' West	"	138.0	255.0	53.48		53.48	456.70

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type Of Pavement	Ln. Ft.	Sq. Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost Of Contract
84.	ALLEY - 7TH & 8TH STS. San Jacinto St. to Trinity St.	Concrete	277.0	625.0	\$ 1,079.29	\$	\$ 1,079.29	\$ 2,151.82
85.	WEST 38TH STREET Guadalupe St. to Duval St.	"	2,945.6	9,066.0	5,584.71		5,584.71	22,906.65
86.	COMAL STREET 1ST to 7TH STS.	"	2,060.9	7,256.0	4,612.51	645.07	5,257.58	18,706.88
87.	WEST 34TH STREET Guadalupe St. to Alamo St.	"	3,125.3	12,167.0	8,134.33	260.95	8,395.28	30,510.85
88.	TRINITY STREET 6TH St. to 7TH St.	"	275.0	1,718.0	1,347.74		1,347.74	4,565.48
89.	NECHES STREET 6th to 7th STS.	"	275.6	1,672.0	618.65		618.65	3,865.77
90.	PERDENALES STREET 5th St. to 5th St.	"	347.3	1,285.0	1,369.04		1,369.04	3,092.01
91.	BRAZOS STREET 1st St. to 2nd St.	Bitulithic	268.8	1,808.0	1,417.32		1,417.32	4,932.06
92.	EAST 15TH STREET Congress Ave. to Red River St.	"	1,686.5	10,126.0	12,200.78	1,737.74	13,938.52	29,728.64
93.	EAST 15TH STREET Red River to Sabine STS.	"	358.9	2,020.0	1,483.46		1,483.46	4,351.10
94.	EAST 15TH STREET Sabine St. to East Ave.	"	277.5	1,330.0	239.94	1,328.11	1,568.05	4,353.21
95.	WEST 29TH STREET Rio Grande St. to Salado St.	"	294.2	615.0	302.26		302.26	1,576.11
96.	WEST 29TH STREET Salado St. to Shoal Crest	"	1,027.7	3,588.0	2,712.17		2,712.17	8,801.78
97.	EAST AVENUE 8th St. to 10th St.	"	713.9	5,705.0	8,667.88	349.84	9,017.72	15,622.45
98.	EAST AVENUE 10th St. to 13th St.	"	1,160.25	10,111.0	12,583.47	1,874.87	14,458.34	28,390.53
99.	EAST AVENUE 13th St. to 15th St.	"	811.8	7,452.0	11,564.46	2,959.44	14,523.90	21,085.34

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type Of Pavement	Lin. Ft.	Sq Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost Of Contract
100.	SAN ANTONIO STREET 6th to 7th Sts.	Bitulithic	276.0	1,145.0	\$ 402.68	\$	\$ 402.68	\$ 2,724.60
101.	WEST 11TH STREET Guadalupe St. to Lavaca St.	"	279.4	1,397.0	355.14		355.14	3,071.53
102.	ALLEY - UNIVERSITY AVE. & WHITIS 19th St. to 20th St.	Concrete	368.8	799.0	198.13		198.13	1,471.46
103.	ALLEY - UNIVERSITY AVE. & WHITIS 20th to 21st Sts.	"	349.0	765.0	121.92		121.92	1,289.52
104.	WEST 18TH STREET Congress Ave. to Guadalupe St.	Bitulithic	922.8	3,072.0	1,432.01		1,432.01	7,504.29
105.	ALLEY - 6TH & 7TH STS. San Jacinto St. to Trinity St.	Concrete	277.0	540.0	154.13	5.21	159.34	1,019.52
106.	ALLEY - 9TH & 10TH STS.- San Jacinto to Trinity Sts.	"	280.0	610.0	211.76		211.76	1,196.52
107.	EAST AVENUE 15th to 16th Sts.	Bitulithic	276.0	1,141.0	1,394.83		1,394.83	2,664.40
108.	WEST 24TH STREET San Gabriel to E. End Shoal Creek Bridge	"	1,647.0	6,021.0	4,929.72	3,884.77	8,814.49	21,625.85
109.	EAST 2ND STREET Brazos St. to Red River St.	Concrete	1,444.1	6,302.0	3,958.52	665.52	4,624.04	15,562.38
110.	EAST 3RD STREET Neches St. to Red River St.	"	275.4	1,114.0	484.08		484.08	2,884.23
111.	EAST 4TH STREET Brazos St. to San Jacinto St.	"	276.1	1,163.0	346.58		346.58	2,188.05
112.	EAST 4TH STREET San Jacinto St. to Red River St.	"	987.9	4,306.0	2,744.37	1,283.40	4,027.77	11,400.18
113.	TRINITY STREET 1st St. to 3rd St.	"	634.7	1,919.0	1,214.00		1,214.00	4,800.56
114.	TRINITY STREET 3rd St. to 5th St.	"	633.0	3,250.0	960.85	1,615.98	2,576.83	8,354.41
115.	NECHES STREET 1st St. to 3rd St.	"	634.5	1,957.0	1,286.92		1,286.92	4,709.24

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type Of Pavement	Lln. Ft.	Sq. Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost Of Contract
116.	NICHES STREET 3rd St. to 5th St.	Concrete	633.0	2,821.0	\$ 841.05	\$ 1,811.39	\$ 2,652.44	\$ 8,671.95
117.	RED RIVER STREET 1st to 3rd Streets	"	713.5	3,055.0	2,309.58	1,804.37	4,113.95	8,866.38
118a.	RED RIVER STREET 3rd St. to 4th St.	"	276.7	1,141.0	514.40		514.40	2,872.68
118b.	RED RIVER STREET 4th St. to 5th St.	"	357.2	2,266.0	1,646.92		1,646.92	4,932.34
119	BLANCO STREET 5th St. to 9th St.	Bitulithic	929.1	3,437.0	2,138.49		2,138.49	7,818.83
119a.	BLANCO STREET 9th to 12th Streets	"	1,072.9	3,494.0	2,215.77	629.88	2,845.65	9,248.21
120	WINDSOR ROAD 12th St. to 13th St.	"	425.9	1,401.0	774.24		774.24	2,771.08
120a.	WINDSOR ROAD 13th St. to Enfield Road	"	455.0	1,617.0	640.73	520.57	1,161.30	4,221.54
121.	WEST 14th Street Lavaca St. to Congress Avenue	"	700.1	2,625.0	1,518.98		1,518.98	6,510.12
122.	EAST 14TH STREET Congress Ave. to San Jacinto St.	"	695.9	2,629.0	1,026.93		1,026.93	6,224.66
123.	BRAZOS STREET 13th St. to 19th St.	"	1,937.5	7,584.0	4,268.31	1,150.00	5,418.31	17,299.78
124.	COLORADO STREET 14th St. to 19th St.	"	1,791.2	6,634.0	3,209.67		3,209.67	13,544.93
125.	SAN ANTONIO STREET 9th St. to 11th St.	"	712.3	3,142.0	2,949.79	1,229.03	4,178.82	8,447.29
126.	SAN ANTONIO STREET 11th St. to 12th St.	"	421.9	1,437.0	1,516.34		1,516.34	3,156.34
127.	SAN ANTONIO STREET 12th St. to 15th St.	"	1,058.8	4,620.0	3,897.58		3,897.58	10,372.48
128.	SAN ANTONIO STREET 15th St. to 19th St.	"	1,330.7	6,005.0	3,928.84		3,928.84	13,324.67

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type Of Pavement	Ln. Ft.	Sq. Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost Of Contract
129.	WEST 21ST STREET Guadalupe St. to Rio Grande St.	Bitulithic	902.3	3,098.0	3,122.48	\$	\$ 3,122.48	\$ 8,469.63
131.	WEST 23RD STREET Guadalupe St. to Rio Grande St.	"	903.0	2,905.0	1,990.07		1,990.07	7,077.45
132.	WEST 29TH STREET Guadalupe St. to Rio Grande St.	Concrete	700.8	2,127.0	1,013.93	50.59	1,064.52	4,761.26
133.	EAST 32nd STREET DUVAL Street to Red River St.	"	1,961.9	5,777.0	2,341.74	300.27	2,642.01	12,771.56
134.	RED RIVER STREET 32nd St. to 34th St.	"	942.9	3,505.0	936.24		936.24	8,390.45
135.	WEST AVENUE 30th to 34th Streets	Bitulithic	1,451.7	4,601.0	2,053.66	89.70	2,143.36	9,822.29
136.	WEST AVENUE 29th St. to 30th St.	"	475.4	1,489.0	498.92		498.92	3,277.43
137.	WEST 30TH STREET E.L. West Ave. to W. L. West Ave.	"	245.3	936.0	981.12		981.12	2,032.93
138.	SOUTH CONGRESS AVENUE Bridge to Bouldin Creek	"	1,903.1	11,809.0	17,221.04		17,221.04	17,221.04
139.	MONROE STREET Congress Ave. to Brackenridge St.	"	722.3	2,508.0	2,866.39		2,866.39	6,761.72
140.	MONROE STREET Brackenridge St. to East Side Drive	"	997.1	3,334.0	2,759.65		2,759.65	7,866.64
141.	MONROE STREET East Side Drive to Travis Hts. Blvd.	"	1,144.5	3,428.0	2,795.12	1,039.41	3,834.53	10,573.21
142.	TRAVIS HEIGHTS BOULEVARD Riverside Dr. - S.L. Lot 7, Blk. 21	"	3,207.0	13,829.0	6,502.40	708.72	7,211.12	28,514.96
144.	WEST 9TH STREET Guadalupe St. to San Antonio St.	"	275.7	1,005.0	145.32	1,884.40	2,029.72	2,029.72
145.	WEST 10TH STREET Lavaca St. to San Antonio St.	"	557.3	2,139.0	311.49	991.39	1,302.88	5,263.84
146.	WEST 11TH STREET Guadalupe St. to San Antonio St.	"	276.4	1,235.0	242.59		242.59	2,454.40

STREET PAVING CONTRACTS (CONTD)

Contract No.	Street	Type Of Pavement	Lin. Ft.	Sq. Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	TOTAL COST OF CONTRACT
147.	EAST 7TH STREET East Ave. to Waller St.	Concrete	1,373.1	5,668.0	\$ 3,621.86	\$	\$ 3,621.86	\$12,508.32
148.	EAST 7TH STREET Waller St. to Cowal St.	"	1,388.0	5,743.0	3,675.67		3,675.67	12,118.72
149.	EAST 7TH STREET Cowal St. to Chilcon St.	"	1,360.4	5,060.0	2,235.36	400.50	2,635.86	12,097.20
155.	WEST 29TH STREET Shoal Crest to E. End of Bridge	Bitulithio	434.2	1,455.0	1,013.66	926.91	1,940.57	4,504.02
156.	EAST 11TH STREET Red River to East Avenue	"	639.4	2,340.0	1,358.67	1,855.41	3,214.08	7,528.20
157.	WEST 5TH STREET West Avenue to Bowie St.	"	641.0	2,028.0	1,395.92	1,796.29	3,192.21	7,273.15
158.	WEST 5TH STREET Bowie to Crockett Streets	"	1,072.0	4,210.0	3,975.02		3,975.02	10,004.13
159.	CROCKETT STREET 5th St. to 6th St.	"	417.4	1,594.0	844.47		844.47	3,866.26
160.	EAST 12TH STREET Brazos St. to East Avenue	"	1,758.4	9,535.0	11,676.64	769.81	12,446.45	28,054.40
161.	WEST LYNN STREET 6th St. to 12th St.	"	2,249.0	6,406.0	3,462.84	1,518.28	4,981.12	16,722.51
162.	WEST LYNN STREET 12th St. to Enfield Road	"	957.8	3,335.0	3,066.33	315.54	3,381.87	8,835.60
164.	ALLEY - 6th & 7th Sts. Trinity to Neches Sts.	Concrete	275.6	601.0	126.28		126.28	1,056.93
165.	ALLEY - 6th & 7th Sts. Neches St. to Red River St.	"	281.0	602.0	155.20		155.20	1,065.45
167.	HARRIS PARK AVENUE Elmwood to E. 32nd St.	"	1,114.9	3,258.0	1,606.44	1,614.99	3,221.43	8,325.70
168.	WABASH AVENUE 34th St. to 36th St.	Bitulithio	989.6	3,283.0	764.61	89.28	853.89	5,738.47
169.	WEST 38TH STREET Wabash Ave. to Alice Ave.	"	197.7	643.0	989.62		989.62	1,645.34

STREET PAVING CONTRACTS (CONTD)

Con- tract No.	Street	Type Of Pavement	Lin. Ft.	Sq. Yds.	City's Part Exclusive Of Frontage	Frontage And Adjustments Paid by City	Total Cost To City	Total Cost Of Contract
170.	ALICE AVENUE 38th St. to 40th St.	Bitulithic	1,069.9	3,612.0	\$ 2,896.08		\$ 2,896.08	\$ 9,493.80
171.	ALICE AVENUE 40th St. to 42nd St.	"	1,053.7	3,539.0	4,127.26	\$ 661.32	4,788.58	10,781.98
172.	ALICE AVENUE 42nd St. to 45th St.	"	1,510.0	4,250.0	1,934.55	1,418.27	3,352.82	10,960.77
175.	S. CONGRESS AVE. (WEST SIDE) Sta. 14+83 to Sta. 19+35	"	452.0	5,156.0	3,235.18		3,235.18	5,106.89
176.	SAN JACINTO BOULEVARD N.L. Archway to W.L. Speedway S.L. Park Pl. to W.L. Speedway	Concrete	1,392.0	10,200.0	10,204.27	7,834.72	18,038.99	30,391.34
177.	WEST 30TH STREET Speedway to Guadalupe St.	"	2,298.8	8,993.0	5,637.55	5,287.41	10,924.96	26,939.98
178.	NORTH GUADALUPE STREET 29th St. to East Drive	"	293.0	1,031.0	1,012.25	525.97	1,538.22	3,107.87
179.	NORTH GUADALUPE STREET East Drive to 30th St.	"	167.6	509.0	525.79	859.05	1,384.84	2,243.89
180.	WEST 29th Street N. Guadalupe St. to Guadalupe	"	593.0	2,384.0	1,848.85	514.18	2,363.03	6,296.03
181.	DUVAL STREET San Jacinto Blvd. to 29th St.	"	167.0	1,475.0	2,032.20		2,032.20	3,050.59
182a.	WEST 30TH STREET Rio Grande to Guadalupe Sts.	Bitulithic	421.0	1,265.0	523.01		523.01	2,958.60
182b.	WEST 30TH STREET West Ave. to Rio Grande St.	"	383.8	1,073.0	1,001.75		1,001.75	2,601.94
183.	BELLEVEUE PLACE Duval St. to Harris Park Ave.	Concrete	613.3	1,874.0	395.32	244.99	640.31	4,159.26
184a.	EAST 10TH STREET Brazos to San Jacinto Sts.	Bitulithic	552.5	1,137.0	376.98		376.98	2,522.33
186.	SAN JACINTO BOULEVARD University Prop. to N.L. Archway " to S.L. Park Pl	Concrete	277.8	1,397.0	643.53	2,313.85	2,957.38	5,573.92
	SAN JACINTO BLVD. & TRINITY ST. 19th St. to 26th St.	Bitulithic	4,239.0	24,527.0	13,453.79		13,453.79	53,815.17
TOTALS -			189,314.5	863,576.9	\$723,355.21	\$102,264.69	\$825,619.10	\$2,270,877.65

FLUSH COATING CONTRACTS

Contract No.	Contractor	Street	Limits	Sq. Yds.	Amount
200	Southwest Bitulithic Co.	Colorado Street	S.L. 8th St. to S. L. 9th St.	1,565.0	\$ 234.75
200-1	"	Lavaca Street	N.L. 6th St. to N. L. 11th St.	8,206.0	1,230.90
200-2	"	West 9th Street	S.L. Lavaca St. to W.L. Congress Ave.	3,863.0	579.45
200-3	"	East 10th Street	E.L. Lavaca St. to W.L. Colorado St.	1,059.0	158.85
200-4	"	West Avenue	N.L. 12th St. to S. L. 19th St.	10,463.0	1,619.62
200-5	"	Colorado Street	S.L. 2nd St. to S.L. 5th St.	5,527.0	829.05
200-6	"	Colorado Street	N.L. 6th St. to S.L. 8th St.	3,472.0	520.80
200-7	"	Lavaca Street	N.L. 11th St. to S.L. 19th St.	12,362.0	1,857.30
200-8	"	Second Street	E.L. Colorado St. to W. L. Brazos St.	4,511.0	676.65
200-9	"	Seventh Street	E.L. Colorado St. to W. L. Brazos St.	4,314.0	647.10
200-10	"	Eighth Street	E.L. Colorado St. to W. L. Brazos St.	3,425.0	513.75
200-11	"	Guadalupe Street	N.L. 19th St. to N.L. 24th St.	10,779.0	1,616.85
200-12	"	E. 16th St.	E.L. Congress Ave. to W.L. Sabine St.	7,025.0	1,053.75
TOTALS -				76,611.0	\$11,538.82

BITUMINOUS SURFACE TREATMENT CONTRACTS

P-187a	Brown & Root, Inc.	S. Congress Ave.	Sta. 17+09 to Sta. 31+51.1	6,491.0	\$ 4,070.59
P-190	"	Cameron Road	N.L. Manor Road to City Limits	2,464.0	5,296.67
TOTALS -				15,955.0	\$ 9,367.26

RESURFACING CONTRACT

P-188	Southern Paving Co.	Congress Avenue East 6th St.	Colorado Bridge - N.C.L. 11th St. E.L. Congress Ave. to W.L. East Ave.	60,361.0	\$29,299.28
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V. MISCELLANEOUS WORK AND EXPENSES.

In connection with street widening, street straightening and new thoroughfare construction, it was necessary that certain pieces of property be bought. Some property was also necessary for sewer construction, easements, etc. The records of the City Finance Department show that \$61,629.73 out of the Street Improvement Bond Fund was expended in the purchase of lands, easements, recording fees, etc., and \$2190.37 out of the Sanitary Sewer Bond Fund for the purchase of land and work incidental hereto.

As a result of agitation favoring the construction of a low dam in the Colorado River for the beautification of the river front through the city and on request of the Park Board a "Report on Construction of a Low Dam in the Colorado River" was made by this department. This report covered the effect of the construction of such a dam on existing utilities, gave recommendations as to the correction of any damage that might occur and included an estimate of the total cost of the project.

Certain equipment for the use of the Engineering Department was paid for out of the bond funds. Such equipment purchased included a Bear Cat shovel, automobiles and engineering instruments.

As a result of the street improvement program certain changes in the service of the Austin Street Railway Company were made. The Duval Street and the East Avenue lines were abandoned and the tracks taken up because of the paving of San Jacinto, Duval and Fifteenth Streets and East Avenue. The East Sixth Street line from Waller Street to Chicon Street was abandoned and the tracks taken up as the Street Railway Company wished to use the rails in track reconstruction work on Congress Avenue and East Sixth Street that had to be done before these two streets could be resurfaced. The Street Railway Company agreed to place concrete in the abandoned track area on East Sixth Street, paying the cost out of the \$7500.00 loan obtained from the City for rebuilding the tracks on Congress Avenue and Sixth Street. The City agreed to the abandonment of the above named lines on the condition that bus service be given in place of street cars. The portion of the Duval Street and East Avenue line on Eleventh Street from Congress Avenue to Brazos Street and on Brazos Street from Eleventh to Thirteenth Streets was not removed but was covered with cold rock asphalt. After the Street Railway Company had placed concrete in the track area on East Sixth Street between Waller Street and Chicon Street this area was also covered with rock asphalt. The cost of placing these two strips of rock asphalt is included in the cost of the resurfacing contract of Congress Avenue and East Sixth Street.

VI. ENGINEERING COSTS.

The engineering work done by the Bond Construction Engineering Department and paid for out of bond funds included all preliminary work, both field and office, in connection with the various projects, the surveying of street lines and setting of centerline monuments, surveys of land purchased and easements obtained.

All records obtained through this work, notes on design, preliminary estimates, final plans and estimates are on file in the Engineering Department of the City.

In connection with sanitary sewer work it is estimated that 115 miles of preliminary lines and final lines were surveyed. Construction grades and lines were given on 63.97 miles of sewer and structures in connection therewith.

In connection with storm sewer work it is estimated that 47 miles of preliminary lines and final lines were surveyed. Construction grades and lines were given on 33.61

miles of sewer and structures in connection therewith.

In connection with the street work it is estimated that 83 miles of preliminary street profiles were run. Profiles for street paving work included street cross sections for estimating excavation amounts. Final grades and cross sections were given for the 35.80 miles of street pavement constructed.

In addition to the above mentioned field work, field lines and grades were also given for the bridge and culvert construction and all miscellaneous work as well as incidental grades for drainage and miscellaneous investigations.

The cost of the actual engineering expense on the work averaged 3.4% on paving work, 4.62% on storm sewers and bridges and 3.06% on sanitary sewers. In addition to these percentages there was a quantity of engineering work which could not be charged directly to the various projects. The total engineering and incidental cost, as charged by the Finance Department on \$1,317,826.37 of storm sewers, sanitary sewers, bridges, culverts and miscellaneous work amounted to \$98,947.39, or 7.6% of the total cost of the work, and for \$2,270,877.65 of paving work amounted to \$68,111.10, or 3% of the total cost of the paving work. While some engineering percentages may seem somewhat high, it must be remembered that the incidental charges as made by the Finance Department include all undistributed engineering costs and labor on work that was performed in making numerous preliminary surveys, establishing of street lines, investigations, labor, etc. that could not be properly charged directly against the various contracts. The information obtained by this incidental work is on file in the City Engineering Department and much of it will no doubt be of value in the future. Charges for such work were carried in the records as undistributed engineering costs and at the end of the accounting period were prorated over the various jobs.

In the tabulations herewith included the cost of the work as shown includes all engineering and incidental costs, such as advertising and legal expense, chargeable to the work.

VII. RECOMMENDATIONS.

Although a great deal of work was done with the funds derived from the 1928 bond issues and a remarkable change was made in the appearance of the streets of the city and in sewer service given to the citizens, at the same time there yet remains a great deal of needed work.

Sanitary sewer do not yet serve the entire city. There are some outlying districts which could be reached through somewhat expensive construction and there are some districts adjacent to trunk sewers where laterals were not constructed because of lack of funds. In addition to this, it will be only a very short time until the Sewage Treatment Plant must be enlarged or a new one built. Believing that all utilities should pay their own way, it is recommended that a sewer charge be made for sewerage service. The income from this sewer charge should be sufficient to pay all operating charges on the sewer system, pay the interest on and retire the outstanding sewer bonds and also provide funds for a small amount of sewer connection.

There is almost no limit to the amount of money that could be expended on storm sewer work. This need will increase as the city builds and improvements encroach on existing drainage ways and waterways. Many such waterways could at some future time be covered over

or enclosed in storm sewer systems with a resulting enhancement in property values. The City should be in a position to cooperate with property owners for the construction of such sewers through private property. Complaints in regard to drainage conditions will from time to time come to the city with a request that storm sewers across private property or along the streets be constructed.

The improvement of Waller Creek from Seventh Street to Nineteenth Street as once contemplated and discussed above under "Miscellaneous Work" is one that is worthy of consideration.

A number of new bridges are needed either to replace old wooden structures or to open up new passageways. Prior to 1916 there were a number of small bridges across Waller Creek which were washed out during floods. These bridges have not all been replaced. While not seriously needed at this time the future reconstruction of these bridges should be kept in mind. This is also true in regard to bridges that will be required as the outlying portions of the city develop.

Bridge or culvert construction that should be accomplished in the not far distant future are a bridge at Fourth and Waller Creek, at South First Street and Bouldin Creek, replacing of wooden structures on Mary Street, reconstruction of the two culverts at Riverside Drive and Bouldin Creek and a number of smaller wooden structures in various parts of the city. It is also believed that the construction of bridges across Waller Creek between Seventh Street and Fourteenth Street should be kept in mind. It is also believed that an additional crossing leading to the western part of the city across Shoal Creek would be advantageous.

In the construction of bridges such as will be required in the City of Austin it is recommended that some type of concrete or stone structures should be used. Concrete or stone bridges are permanent, can be made attractive and require practically no maintenance.

A definite plan should be worked out to provide for the maintenance of paved streets. A definite appropriation should be made each year for this purpose and a small amount of flushcoating or resurfacing of old paved streets completed each year. It is not believed that use of bond funds for maintenance work is proper.

It is to be regretted that certain paving projects which were contemplated had to be abandoned due to lack of funds or other reasons. This is particularly true in regard to the lower end of East Avenue, the paving of Twenty-fourth Street west of Shoal Creek and Windsor Road, the paving of Mary Street from Congress Avenue to the Fredericksburg Road, Chicon Street from Seventh Street to Twenty-third Street, Barton Springs Road from Congress Avenue to Barton Springs and a number of short sections of street connecting existing paved streets. Some of these short sections of pavement would materially reduce the City's street maintenance work. For example, this is particularly true in regard to streets between Rio Grande Street and West Avenue.

It is recommended that the street widening projects mentioned on Page 29 of this report, be carried out when possible. Any lines or grades given for building or sidewalk construction on the sections of streets in question should conform to future street widening requirements. These projects would materially relieve traffic congestion.

In connection with future street improvement work it is suggested that the City, now having a large tract of land available in the Zilker tract on which a semi-permanent rock crushing plant could be erected, in re-working streets use crushed rock as a base to such

depth that at some future time this base could be used under some type of bituminous surface. This is not necessarily recommended for main traffic arteries. For such streets reinforced concrete pavement or a bituminous pavement on a concrete base is recommended.

In undertaking any piece of street improvement work extreme care should be taken that the street be considered as a whole and in connection with adjacent streets. The detailed study of such a project will eliminate the necessity for any great amount of changing of street grades and reconstruction of curbs and walks as was necessary in some instances in the program just completed. It is realized, of course, that this cannot always be accomplished and that the City and the Engineering Department must take cognizance of the importance of the street, the funds available and the economies of the problem at the time the work is done.

In the carrying out of a street paving program the importance of completing all underground work, i. e. , water lines, sewer lines, gas lines, conduits, etc., as far in advance of actual paving construction as possible has been thoroughly demonstrated in connection with the program just completed. Practically all longitudinal cracks appearing in the new pavement are due to backfilled drainage ditches or trenches for utilities. It is extremely difficult to secure thorough compaction of backfill materials in such drainage ditches or trenches, even when the backfill is mechanically or water tamped. Some additional settlement will almost always take place. Only a slight settlement is sufficient to cause a pavement crack. For this reason it is extremely important that all underground work be completed as far in advance of paving construction as possible, and that extreme care be taken that the backfilling of ditches or trenches be properly done. The installation of underground work at least a year in advance of paving construction would be of great benefit in minimizing future pavement cracks. When funds are provided for street improvement by a bond issue a tentative paving program will, no doubt, have been laid out. The underground work should immediately be done on the streets included in the program. The public will, of course, criticize any delay in commencing the actual paving construction, but such construction should be delayed in spite of such criticism for at least a year or until the authorities in charge are satisfied that all ditches or trenches have been thoroughly compacted. Such a procedure would be insurance against future pavement failures.

VIII. CONCLUSION

A. Summary

The following tabulation summarizes the expenditures on work handled by the Bond Construction Engineering Department and paid for out of the various bond issues, and including some work paid for out of the Street Improvement Bond Fund but handled by the City Engineering Department. Maps published in the "Report of the City Manager of the City of Austin, Texas, for the Year 1931" show the location of the sanitary sewers, storm sewers, bridges and pavement constructed.

The tabulation includes work done by City forces on work orders issued by this department but not previously mentioned in this report. This work includes miscellaneous street excavation, widening and filling such as on Twenty-fourth Street east from Shoal Creek, South Congress Avenue, and Barton Springs Road, also work incidental to the improvement program such as small pavement repairs, grading of connecting streets, side-

walk and curb repairs after completion of paving contracts, and a small amount of channel excavation and rip rap. This work is all itemized under the work order tabulation of the Finance Department.

It is not hereby intended to give the final report on all moneys expended out of the Street Improvement and the Sanitary Sewer Bond Issues. This cannot be done until the close of the present year and will undoubtedly be given by the Finance Department at the proper time.

SUMMARY OF EXPENDITURES.

Parks and Playground Bonds

Dams, Walls, etc. at Barton Springs
Paving Driveways at Barton Springs

\$ 45,355.45
13,088.65

Total for Parks and Playgrounds Bonds -

\$ 58,444.10

Sanitary Sewer Bonds

Sewer Construction
Land, Easements

\$539,763.56
2,190.37

Total for Sanitary Sewer Bonds -

541,953.93

Street Improvement Bonds

Storm Sewers
Bridges and Culverts
Miscellaneous Work
Land and Easements
Equipment
Loan to Street Railway Company
Resurfacing Contracts
Flushcoating
Bituminous Surface Treatment
City's Frontage and Paving Adjustments
City's Part on Paving Contracts
24th Street Excavation and Fill East of Shoal Creek
Widening and Fill on S. Congress Ave. and Barton Springs
Road -
Miscellaneous Street Excavation, Repair, and Incidental
Work
Undistributed Engineering Costs 1932 (Approximate)

\$778,805.05
166,126.30
70,703.64
61,629.37
10,396.83
7,500.00
29,299.28
11,538.82
9,367.26
102,264.69
710,266.56
2,365.26
22,636.93
10,009.98
6,000.00

Total for Street Improvement Bonds

1,998,909.80

Total for City Expenditures
Paving Paid by Property Owners
Bridge Cost Paid by University of Texas

\$2,599,308.00
1,445,258.55
37,606.82

GRAND TOTAL Cost of Work Done

\$4,082,193.37

B. Acknowledgement

It is believed that the work of the Bond Construction Engineering Department has been well done and that the decision of the City Manager in 1928 as to the formation of this department for doing engineering work in connection with the then contemplated improvement program has been justified. The data obtained bearing directly on the work and incidental thereto, and now on file in the City Engineering Department, is more complete and in greater detail than would have been the case had the engineering work been done by contract.

The entire program was completed at an earlier date than was at first proposed. In some respects a much greater amount of work has been done than at first believed possible. This, in part, was due to general conditions prevailing in the State, to the method of awarding contracts, and to the prices obtained on the work.

Considering its magnitude, the many various activities carried on at one time, and the number of different organizations affected by or involved therein, the work proceeded

with a minimum amount of friction and trouble to all concerned.

Much credit for the success of the work should be given to Mr. G. G. Levander, Sewer Engineer, for his painstaking study of design and conditions affecting the projects with which he was connected, and for the organization and handling of his department; to Mr. L. M. Chokla, Paving Engineer, for his detailed study of street grades and paving plans, and the development of the method of preparing paving plans and paving procedure; and to them both for their unfailing interest in and attention to their work.

The cooperation of the various departments of the City; Mr. O. E. Metcalfe, City Engineer, and the City Engineering Department in establishing street lines, furnishing available necessary data and in handling the drafting work; Mr. W. E. Seaholm, Mr. A. R. Davis, and the Water and Light Department in constructing or reconstructing their utilities in advance of improvement work; the Police Department in diverting and rerouting traffic, was, on the whole, extremely satisfactory.

The City of Austin was fortunate in securing, with few exceptions, first class contractors on all its work. This is particularly true for the reason that invariably the low bid on work was accepted. Very little trouble was had because of unsatisfactory performance of contracts, unsatisfactory superintendents, foremen or irresponsible parties.

The advice and suggestions of Mr. Adam R. Johnson, City Manager, his clear unbiased opinions on problems brought to him for discussion, and his unwavering stand often in the face of would be outside influence on any policy or procedure or question of construction upon which a decision had been made, have been of untold value to this Department. The wholehearted support of the City Council and the City Manager, and the confidence expressed by them in accepting recommendations of this Department on the character and procedure of work did much to assist in maintaining the morale of this Department and the successful carrying out of the work undertaken.

The above report was received and filed.

No further business coming before the Council, Councilman Mueller moved that the Council recess, subject to call of the Mayor. Motion was seconded by Councilman Gillis and same prevailed by the following vote: Ayes, Councilmen Alford, Gillis, Mayor McFadden, Councilman Mueller, 4; nays, none; Councilman Steck absent, 1.

The Council then recessed.

Approved:

J. M. Fadden
Mayor.