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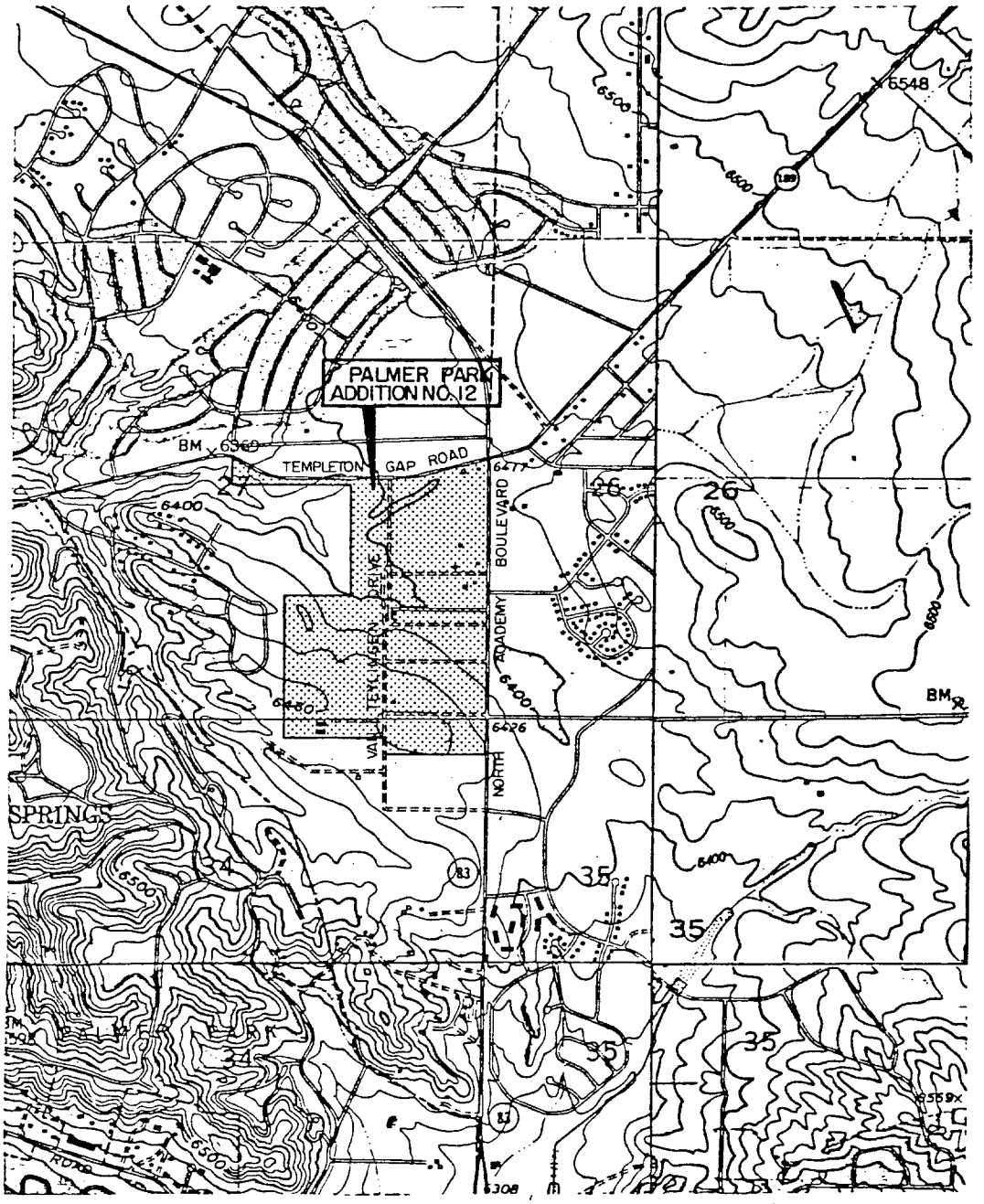
MASTER DRAINAGE REPORT AND PLAN

PALMER PARK

ADDITION NO. 12

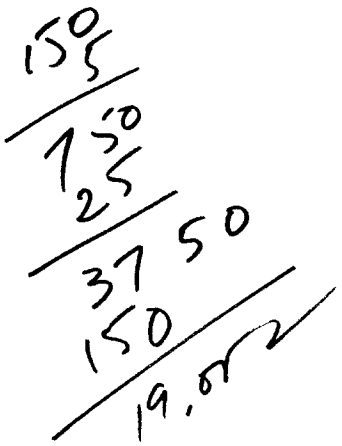
JANUARY, 1975



Prepared By: LEIGH WHITEHEAD AND ASSOCIATES
5 W. Las Vegas - Colorado Springs, Colorado

MASTER DRAINAGE STUDY

PALMER PARK ADDITION NO. 12



LEIGH WHITEHEAD & ASSOCIATES
CONSULTING ENGINEERS AND SURVEYORS
5 WEST LAS VEGAS • PHONE 636-5179
COLORADO SPRINGS, COLORADO 80903

January 31, 1975

Mr. DeWitt L. Miller
Director of Public Works
City of Colorado Springs
115 North Nevada Avenue
Colorado Springs, Colorado

Dear Mr. Miller:

Transmitted herewith is the Master Drainage Report and Plan for Palmer Park Addition No. 12 in the City of Colorado Springs, El Paso County, Colorado. The report is a restudy of that portion of the Templeton Gap Drainage Basin of which Palmer Park Addition No. 12 is a part.

The report includes history, hydrology, recommendations, and cost estimates pertinent to drainage in the study area. Concerned citizens in the study area have been contacted and their input has been very helpful in formulating the report's recommendations.

Please contact this office if there are any questions concerning any part of the study.

Very truly yours,

Roland G. Obering

Roland G. Obering
Project Engineer

LEIGH WHITEHEAD & ASSOCIATES
CONSULTING ENGINEERS AND SURVEYORS
5 WEST LAS VEGAS • PHONE 636-5179

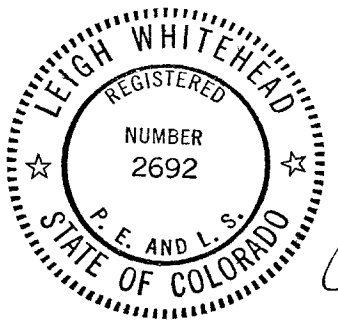
COLORADO SPRINGS, COLORADO 80903

January 31, 1975

Re: Master Drainage Study
Palmer Park Addition
No. 12

Project Number: 74081

I, Leigh Whitehead, a registered engineer in the State of Colorado, hereby certify that the attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. I further certify that said drainage report is in accordance with all City of Colorado Springs Ordinances and specifications and criteria.



Leigh Whitehead
Leigh Whitehead
P.E. & L.S., Colo. 2692

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SECTION I

G E N E R A L

A. Description of Annexation

An area at the Southeast corner of the intersection of Templeton Gap Road and Academy Boulevard was annexed into the City of Colorado Springs on May 8, 1974. The approximate 190 acre tract, known as Palmer Park Addition No. 12, lies generally in the Southwest quarter of Section 27 and the North half of the Northeast quarter of Section 34, both in Township 13 South, Range 66 West of the 6th P.M., now in the City of Colorado Springs, El Paso County, Colorado. Prior to annexation the area was an enclave to the City.

The area is bounded on the North and East by major City arterial streets, Templeton Gap Road on the North and North Academy Boulevard on the East. The Parkmoor Village Subdivision forms the Southern boundary while the Greencrest Subdivisions lie on the West side of the annexation. The entire annexation lies within the North Shooks Run - Templeton Gap Drainage Basin.

The fact that the area has been an enclave has created a potentially dangerous drainage problem. High density residential development has taken place in the drainage basin above this annexation. Since this area was not within the City limits, no provisions or precautions for potential drainage problems within the City were taken. Subsequent to annexation and realization of these potential problems and at the urging of the affected property owners, the City Council has authorized this detailed hydrologic study of Palmer Park Addition No. 12 to the City of Colorado Springs.

B. Historical Background

In an attempt to obtain first hand historical information on the drainage problems in the annexation area prior to 1967, a number of present and former residents were contacted. Floods seemed to etch vivid memories in the minds of these people and their memories seem to verify the results of hydrologic studies in the surrounding area. When the 50-year storm does occur, there will be serious flooding in the area and particularly through this annexation where no drainage facilities exist.

The typical flood producing storm in this area occurs during the summer months of May through August. These thunderstorms are isolated and frequently quite severe, but are limited in areal extent. Floods resulting from these storms are characterized by high peak flows, moderate volumes, and short duration.

The most serious flood the older residents remembered was the flood in June, 1921. The flood has been documented in several publications and has generally been considered in the magnitude of the 50-year storm. The flood destroyed all of the existing bridge on the Templeton Gap floodway from this area West to Monument Creek. It caused serious erosion all along the floodway in addition to creating a serious threat to the safety of the local residents.

Other significant flood dates that were recalled included May 1935, a 1956 flood, and more recently, June of 1965 which flood caused its major damage outside of this immediate area. These flood dates were all prior to the recent high density residential development above the annexation. This development has occured since 1967. It was the concensus of the people contacted that if a flood like those "in the days of old" did occur, there would be very serious damage in the area. This reasoning seems to be justified and warrants the detailed hydrologic study.

C. Recent Development

The period from 1967 to the present has seen the area surrounding this annexation being developed into high density residential communities in addition to multi-family and commercial areas. The most extensive developments include the Village Seven area and the Park Vista Estates area on the East as well as Parkmoor Village area on the South.

Two major natural drainage channels enter this property from the East. The larger of the two drainage channels enters in the extreme Northeast corner of the annexation at the intersection of Templeton Gap Road and North Academy Boulevard. This 1600 acre drainage basin above the annexation has recently been restudied. The July 1974 study entitled "A Restudy of a Portion of the Templeton Gap Drainage Basin Involving the Park Vista Estates Subdivision" was approved by the City and the runoff quantity is accepted in this analysis. This drainage entrance has been designated for reference as HP-A.

The second major natural drainage entering the annexation is located approximately 1,700 feet South of the intersection of Templeton Gap Road and North Academy Boulevard. The total contributing area is a portion of the Village Seven development. This area included a rather large natural pond or lagoon which occured naturally and has been filled in and developed into a

City park. The elimination of this pond in addition to the high density residential development has increased runoff in the area from practically none to nearly 600 c.f.s. The point of entrance of this runoff has been designated as HP-B.

The flows contributing to HP-B have been analyzed in various drainage reports prepared in accordance with subdivision ordinances during the subdivision of the Village Seven area. The most comprehensive study was the Northridge Filing No. 1 report, dated March 17, 1969. Subsequent drainage reports have been prepared for portions of this area but are generally in compliance with the 1969 report. The runoff quantities were determined based on the 50-year storm. Since this has been designated a major drainage channel, the 100-year storm was applied to the various sub-basins as outlined in the 1969 report to obtain a new design runoff figure. Results of these various computations are summarized in the following Section.

The majority of the annexation is undeveloped. Several small annexations along North Academy Boulevard were completed prior to this larger annexation, but for practical purposes are included in the drainage basin and considered within the overall boundary of this annexation. These smaller annexations include Dodge Addition, which has been developed into a high density apartment complex, Davis Addition No. 1, Stone Addition, and Bloom-Cowton Addition.

The undeveloped area does contain several single family residences, all of the small farm configuration with a house and several out buildings. The area is covered with native grasses with little runoff. In anticipation of future development, the zoning indicates the area along North Academy Boulevard and Templeton Gap Road will be developed commercially with the balance of the annexation being multi-family and single family developments. These potential development plans were used as a basis for runoff calculations.

SECTION II

H Y D R O L O G Y

A. Synthetic Hydrograph Method

The purpose of a hydrologic study is to determine the peak runoff for a selected design frequency storm over a particular drainage basin. This peak runoff is the maximum discharge of a flood for which drainage facilities are designed. Many parameters affect the runoff from a particular area and it is impractical to include all of them in drainage computations. The Synthetic Hydrograph Method is a method developed by the U.S.D.A. Soil Conservation Service and used extensively throughout the Front Range of Colorado. This method uses selected parameters that most affect runoff in this region.

The Synthetic Hydrograph Method is the method of runoff computations adopted by the City of Colorado Springs as well as El Paso County in an effort to standardize drainage criteria. A recent publication by the Soil Conservation Service entitled "Procedures for Determining Peak Flows in Colorado", December 1972, has been very useful in interpretation and application of this method. This publication is available at the local Soil Conservation Service office at no cost to interested persons.

The Synthetic Hydrograph Method uses the following formula for runoff computations, ie: $q_p = qAQ$. This basic formula may be described as follows:

q_p = peak rate of discharge in cubic feet per second.
A = area of drainage basin in square miles.
Q = storm runoff in inches (using the soils complex number, CN).
q = peak discharge in c.f.s. per square mile per inch.

The design storms applied to this formula were the 100-year storm of 3.4 inch intensity and 6 hour duration for the major green belt (contributing to HP-B) and the 50-year storm of 3.2 inch intensity and 6 hour duration for the smaller interior sub-basins.

The flow entering this study area at HP-A has been accepted by the City as 4250 c.f.s. and there is no justification for modifying this figure. Therefore, it is accepted as accurate for design.

The flow entering this study area at HP-B has been modified from the previously accepted drainage reports. The sub-basins in the Northridge Filing No. 1 Drainage Report, dated March 17, 1969, have been recalculated with the application of the 100-year storm for a major drainage basin. The estimated runoff

from the 100-year storm entering the annexation at HP-B is 600 c.f.s. (597 c.f.s. from actual calculations). The cumulative total runoff from the Northridge report indicates approximately 322 c.f.s. entering at this point.

The per cent increase at HP-B as a result of application of the 100-year storm is nearly the same as that increase noted at HP-A (from 2976 c.f.s. to 4250 c.f.s.). The 600 c.f.s. at HP-B and the 4250 c.f.s. at HP-A have been used in design of the recommended structures through the annexation. Interior runoff contributing to this flow has been calculated on the 50-year storm. Actual routings are dependent upon the land use within the study area.

B. Calculations

1. Exterior Drainage to HP-A

HP-A is a hydrographic point located at the Northeast corner of the annexation, near the intersection of Templeton Gap Road and North Academy Boulevard. The flow to this point has been restudied in July, 1974, and the drainage report titled "A Restudy of a Portion of the Templeton Gap Drainage Basin Involving the Park Vista Estates Subdivision", has been accepted by the City Engineer's office. This report states that the flow from a 100-year storm reaching HP-A is 4250 c.f.s. This figure has been used in this report as the design flow for the structure along the North line of the annexation.

The flow of 4250 c.f.s. enters the annexation under North Academy Boulevard through a Colorado State Highway Department triple concrete box culvert, Type 13-16-A. This culvert was designed for Q^{50} = 3500 c.f.s. The 100-year flood would exceed the culvert's capacity considerably. The water will, nevertheless, reach the West side of North Academy Boulevard, probably by overflowing the road, and will continue Westerly in the drainage structure proposed in this report.

2. Exterior Drainage to HP-B

HP-B is a hydrologic point located on the East side of this annexation, approximately 1700 feet South of HP-A. The majority of the runoff generated in the Village Seven area outfalls to this point. The flow of 600 c.f.s. enters the annexation under North Academy Boulevard through a Colorado State

Highway Department double concrete box culvert, Type 8-8-A. The design capacity of this culvert was Q^{50} = 500 c.f.s. Again the 100-year storm flow exceeds this capacity. It is assumed that the additional flow could reach the West side of North Academy Boulevard by overflowing the highway, but would more likely pond in the park area, causing no threat to public safety or private property. The 600 c.f.s. flow was, however, used as the design flow for the structure.

The 600 c.f.s. flow (100-year storm) is a result of a restudy of the pertinent Village Seven drainage plans in the contributory basin. The 100-year storm has been applied to the various areas and the 600 c.f.s. is the result of this study. This figure includes a 20 acre area West of North Academy Boulevard, designated as Basin A in the Interior Drainage Summary that flows Easterly down Rebecca Lane, through the park and finally to point HP-B.

A summary of the runoff computations to this point follows. The Northridge Filing No. 1, dated March, 1969, drainage plan was the basis for determining the areas and points of concentration. The Type II-A storm of 6 hour duration was used to determine the peak discharges.

HYDROLOGIC DATA
EXTERIOR DRAINAGE
$q_p = AqQ$

Description - Basin Concentration Point	Area Sq. Mi.	CN	T_c(hrs)	q	Q^{100}	q_p (c.f.s.)
A - Harmony Drive as it leaves Northridge, Filing No. 1	25.5	87	0.30	900	2.10	75.4
B - Intersection of Half-turn Place & Hollow Rd.	27	86	0.20	965	2.01	81.9
C - Intersection of Half-turn Road & Haven Circle	25	86	0.18	975	2.01	76.6
D - North Carefree Circle & N.W. Corner of Junior High School	61	85	0.16	985	1.93	181.2
E - Intersection of North Carefree Circle & West Carefree Circle (Includes runoff from Basin I - Interior Drainage)	45	86	0.28	910	2.01	128.0
F - Village Green Park	19.2	87	0.36	860	2.10	54.2
TOTAL RUNOFF ACCUMULATION AT HP-B (100-year Storm)						597.3 *

* = Total has been rounded off to 600 c.f.s. for this report.
Reference is made to the Northridge Filing No. 1, dated March, 1969.

3. Interior Drainage

The interior drainage as studied includes those areas outlined on Plate 1. The basins have been determined on the basis of contours obtained photogrametrically from Ocotber, 1974 photos. In all likelyhood, these basins will change in size during the course of development of the various parcels. The total runoff from the annexation will presumably not change substantially.

Basins II and V include some contributing area exterior to the annexation while Basin I is totally exterior but contributes to HP-B (see Section B - 2. Exterior Drainage to HP-B). These basins have been studied in this section because detailed mapping has been done on them recently and they do contribute to the subject annexation.

Basins II and III have been further analyzed on a sub-basin approach. The sub-basins have been determined by realistically considering the property ownerships as they would relate to potential future development. Basin II - Sub-Basin 2 is already fully developed into a high density apartment complex. Generally, the area East of Van Teylingen Drive has been considered for potential commercial development while that area West of Van Teylingen Drive has been considered for medium density residences.

The Soil Conservation Service Synthetic Hydrograph Method was used to determine potential runoffs for the 100-year storm in the interior basins. The hydrologic soil group as determined on the latest (1970) soil map of the area is Group A (R7, Blakeland Series). A soil survey data sheet on this soil type is included in the Appendix of this report.

The 100-year storm of 6 hour duration was analyzed. This 6 hour duration gives traditionally higher flows than the typical 24 hour duration storm. The soil complex number (CN) was determined by consideration of the potential type of development, mainly medium density residential or commercial. The rainfall intensity (i) was obtained from the Soil Conservation Service isopluvials of 100-year 6 hour precipitation for the Colorado Springs area. The figure used was 3.4 inches annual.

Time of concentration, an important factor in the method, was computed by use of both a Nomograph and the Upland Method. Both methods gave similar results so the Nomograph result was used in all of the computations. The Type II-A 6 hour duration

storm was used to determine q. A copy of this chart from the Soil Conservation Service is included in the Appendix to this report. This chart was developed specifically for the area in Colorado East of the 105 degree longitude.

The following is a summary of the Hydrograph computations for interior drainage.

HYDROLOGIC DATA
INTERIOR DRAINAGE
$q_p = AqQ$

Basin Sub-Basin	Sq. Mi.	CN	T_c(hrs)	q	Q^{100} c.f.s.
I	0.0310	74	0.16	985	1.17 35.7
II-1	0.0284	72	0.15	990	1.06 29.8
II-2	0.0164	72	0.11	995	1.06 17.3
III-1	0.0134	74	0.10	1000	1.17 15.7
III-2	0.0150	74	0.10	1000	1.17 17.6
III-3	0.0224	73	0.20	960	1.11 23.9
III-4	0.0359	73	0.18	975	1.11 38.9
III-5	0.0362	72	0.10	1000	1.06 38.4
III-6	0.0109	72	0.10	1000	1.06 11.6
IV	0.0193	74	0.20	960	1.17 21.7
V	0.0189	72	0.10	1000	1.06 20.0
VI	0.0099	72	0.10	1000	1.06 10.5

4. Hydrograph Point Summation

The hydrograph points along the major drainage channels have been established and the total flow entering at the particular point has been calculated. These flows were used in routing and design of the various structures. A tabulation of these hydrograph points along with the Q^{100} flows as calculated in this report and flows as established from other drainage reports have been included. The source of the other reports has also been listed.

SUMMATION OF FLOWS
AT HYDROGRAPH POINTS

Point	Q^{100}(c.f.s.)	Q(others)	Source
HP-A	4250	4250	UWE Restudy, July 1974
HP-B	600	322	Original Drainage Reports
HP-B-1	633	---	This Report
HP-C	47	---	This Report
HP-D	781	484	Greencrest Area Master Drainage Report, 1972
HP-E	4722	3391	Greencrest Area Master Drainage Report, 1972
HP-F	5644	3681	Greencrest Area Master Drainage Report, 1972
		5000	Greencrest Subdivision No. 5, September, 1965
HP-G	20	40	Greencrest Area Master Drainage Report, 1972

C. Flood Routing

The flood routing through this annexation was originally considered in the 1963 study of the entire Templeton Gap Drainage Basin. This original routing has been considered and basically followed. There are two major green belts and several minor interior drainage courses. The existing property boundaries and ownerships, as well as existing public right-of-ways, have been the controlling parameters in determining exact routings. The citizen input from various property owners directly affected has also been considered in the final flood routing.

1. Major Greenbelt HP-A to HP-E

This major greenbelt is the upper extension of the Templeton Gap Floodway. Anticipated runoff entering and going through this major greenbelt includes 4250 c.f.s., with an

additional 450 c.f.s. entering from the Shoppers World area.

After thorough consideration of several alignments and channel sections, including open channel, closed channel, underground pipe and combinations of these, the following recommendations are made. The channel be a trapezoidal concrete section with concrete lining of both sides and bottom. The channel be sized to accommodate 4250 c.f.s. with 1.0 foot freeboard. The crossection and alignment be as shown on Plate 2. This alignment follows a 50-foot right-of-way which was dedicated to El Paso County for roadway purposes in 1885. A copy of this deed is included in the Appendix. A title company opinion was not obtained, but is recommended, on the present status of the right-of-way.

The ditch section would require enlargement at the existing 72-inch R.C.P. from Shoppers World. The increase in crossection would be 0.5 feet in both depth and width of the bottom. A suitable transition from the R.C.P. to the open channel would also be required.

A concrete box culvert of suitable size would be required at Van Teylingen Drive. This culvert would be constructed to City and State Highway Department standards and would be sized to accommodate the design flow.

The Greencrest Subdivision Master Drainage Plan includes the construction of a concrete lined ditch compatible with the cross section recommended in this report. Temporary rock riprap would be required at the outfall of the proposed ditch if it is constructed prior to construction in Greencrest.

2. Major Greenbelt HP-B-1 to HP-D West

This major greenbelt drains a great deal of the Village Seven area through the Village Green Park East of North Academy Boulevard. This park area was a natural lagoon prior to development. The lagoon area has subsequently been filled in during construction, creating a serious runoff problem through this annexation. Runoff has increased from virtually none in 1966 to 600 c.f.s. at present.

A State Highway Department box culvert under North Academy Boulevard was constructed to accommodate 500 c.f.s. This restudy and application of the 100-year storm indicates 600 c.f.s. would be developed. Additionally, 33 c.f.s. enters

the greenbelt through a 24-inch R.C.P. on the West side of North Academy Boulevard.

Several possible alignments and channels were considered in the flood routing of this greenbelt. After gathering as much property owner input as was possible, the following recommendations are made. The recommended cross section and alignment is as shown on Plate 2. The channel be a combination closed and open channel, with the closed portion constructed along North Academy Boulevard until the alignment turns West at the existing 20-foot alley. The closed section would be twin 72-inch equivalent pipe arch R.C.P. of the inside dimensions of 54-inch by 88-inch. The open channel portion be constructed in the existing alley right-of-way and a suitable maintenance easement be obtained from the ownerships on both sides of the channel.

A concrete box culvert will be required at Van Teylingen Drive. The culvert would be sized to accommodate 650 c.f.s. and would be designed and constructed according to City and State Highway Department standards.

The routing West of Van Teylingen Drive is schematic and would be finalized to be compatible with the development plans of the owner. A trapezoidal section has been proposed in the Greencrest Subdivision Master Drainage Plan and is compatible with the section proposed in this report. Rock riprap would be required to prevent erosion if the Greencrest area is developed subsequent to this annexation.

3. Van Teylingen Drive HP-C to HP-D

The natural drainage near HP-C is into an existing natural depression area East of HP-C as shown on Plate 1. Subsequent development in this area will require filling this depression area.

It is recommended that an underground drainage system be installed to drain this area. The required size would be 30-inch R.C.P. to accommodate the anticipated 47 c.f.s. flow. The R.C.P. would be constructed in the existing Van Teylingen Drive right-of-way and would extend Northerly to outfall into the proposed concrete ditch 1400 feet North. Several catch basins would be required to divert the flow into the underground system and location would be contingent on final development plans.

4. West Side of North Academy Boulevard

Runoff in this area has been previously considered in a drainage report and plan for Dodge Subdivision. The restudy of this area indicates the proposed structures would be adequate. It may be desirable to divert some of the runoff from the depression area East into North Academy Boulevard, in which case, the proposed structure would need to be enlarged.

The proposed system includes suitable catch basins and a 21-inch/24-inch R.C.P. North to the proposed closed channel system near the existing bridge. This construction would be done in either the existing street right-of-way or the utility easement provided during platting.

5. Southwest Corner of Annexation

A small amount of runoff from this annexation would concentrate in the extreme Southwest corner. Approximately 22 c.f.s. concentrates at this point and has been considered in the Greencrest Master Drainage Plan. A 30-inch R.C.P. has been constructed in the Greencrest area to carry the flow West. This structure is adequate to handle any anticipated runoff from this area although a catch basin may be required at the time of development.

SECTION III

C O S T - E S T I M A T E

A. Right-of-way

1. Major Greenbelt HP-A to HP-E

Construction of the proposed drainage facility in this greenbelt will require a minimum 50-foot permanent right-of-way. This right-of-way may already exist in the form of an old right-of-way granted to El Paso County for road purposes, but this should be further investigated prior to final design. It is assumed for estimating purposes that the right-of-way can be obtained at no cost either through the old grant or through normal platting procedure.

2. Major Greenbelt HP-B-1 to HP-D West

The proposed facilities in this greenbelt utilize an existing 20-foot alley easement for construction of the open channel section through the platted area. An easement for maintenance purposes would be required along one side of the concrete ditch.

Construction of the underground twin R.C.P. pipe arch along North Academy Boulevard would require a temporary construction easement in addition to a permanent building restriction on the structures, but no property acquisition.

The developer of the property West of Van Teylingen Drive would be required to furnish a suitable drainage easement at the time of platting. The exact alignment would be contingent upon fixed development plans.

It is assumed that the temporary construction easement and the permanent maintenance easements can be obtained from the property owners without cost to the City. If these easements cannot be obtained, a maintenance road would need to be purchased from the property owners. No cost for acquisition has been included in the cost estimates.

3. All Other Areas

The drainage structures required elsewhere in the annexation are through unplatted property. Therefore, suitable drainage easements can be obtained through the normal platting process. No acquisition cost has been included in any other area.

B. Construction Cost Estimates

1. Major Greenbelt HP-A to HP-E
(Parallel to Old Templeton Gap Road)

DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST	CITY COST
Channel Excavation	5,390 c.y.	$1.50/c.y.	$ 8,085	None
Compacted Backfill	11,040 c.y.	$1.50/c.y.	$ 16,560	None
Concrete Lined Channel (35.5 s.f./1.f.)	1,590 l.f.	$44.35/1.f.	$ 70,516	None
Triple Box Culvert (Inc. Headwalls)	1	Each	$141,500	None
72-inch R.C.P.* (610'-350'=260')	260 l.f.	$70.00/1.f.	$ 18,200	None
Rock Riprap Apron	1	Each	$ 500	None
Subtotal.			$255,361	None
Engineering & Contingencies (10%) . . .			$ 25,536	None
TOTAL			$280,897	None

* = Shoppers World Drainage Report requires 350 lineal feet of 72-inch R.C.P. to be installed by developer.

2. Major Greenbelt HP-B-1 to HP-D West
(From Village Green Park Through Davis Subdivision)

DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST	CITY COST
Channel Excavation	6,250 c.y.	$1.50/c.y.	$ 9,375	$ 6,420 (4279 c.y.)
Compacted Backfill	1,000 c.y.	$1.50/c.y.	$ 1,500	$ 1,500 (100 %)
Twin 72-inch Equivalent Pipe Arch R.C.P. Class IV (54"x88" I.D.)	1,000 l.f. (2-500 lf)	$85.00/l.f.	$ 85,000	$ 85,000 (100 %)
Concrete Lined Channel (25 s.f. / l.f.)	1,300 l.f.	$31.20/l.f.	$ 40,560	$ 27,770 (890 l.f.)
Double Box Culvert (Inc. Headwalls)	1	Each	$ 29,000	$ 14,500 (50 %)
Rock Riprap Apron	1	Each	$ 500	None
Subtotal			$165,935	$135,190
Engineering & Contingencies (10%) . .			$ 16,590	$ 13,520
TOTAL			$182,525	$148,710

3. Van Teylingen Drive HP-C to HP-D

30-Inch R.C.P.	1,400 l.f.	$26.50/l.f.	$ 37,100	None
Catch Basin (6')	2	$1,000/ea.	$ 2,000	None
Subtotal			$ 39,100	None
Engineering & Contingencies (10%) . .			$ 3,910	None
TOTAL			$ 43,010	None

4. West Side of North Academy Boulevard

DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST	CITY COST
21-Inch R.C.P.	400 l.f.	$21.50/l.f.	$ 8,600	$ 8,600 *
24-Inch R.C.P.	175 l.f.	$23.00/l.f.	$ 4,025	None
Catch Basin (6')	2	$1,000/ea.	$ 2,000	$ 1,000
Subtotal			$14,625	$ 9,600
Engineering & Contingencies (10%) . .			1,463	960
TOTAL			$16,088	$10,560

* "Dodge Subdivision" has paid or arranged for payment on this liability.

C. Cost Summary

The unit prices used are January 1975 prices. The quantities are approximate and subject to final design. It is assumed that there will be no land acquisition costs. It is also assumed that no utility relocation will be required for construction of the proposed facilities.

Total estimated cost of construction of all drainage facilities within the Palmer Park Addition No. 12 is $522,520.

Total estimated construction cost to the City of Colorado Springs for construction of facilities through platted properties is $159,270.

Drainage fees payable to the City of Colorado Springs for approximately 83 unplatted acres @ $659.00 per acre (1975) are $54,697. In addition there are 13.51 acres of undeveloped lots in "Davis Subdivision" on which and for which drainage fees are collectible at $659.00 per acre giving an additional of $8,903.

Total drainage fees from Palmer Park Addition No. 12 payable to the City of Colorado Springs are $63,600.

SECTION IV

A P P E N D I X

U. S. DEPARTMENT OF A/ JLTURE
SOIL CONSERVATI ERVICE

(R7) Blakeland series

APPENDIX A

SOIL SURVEY INTERPRETATIONS

MLRA: 49

The Blakeland series consists of deep, dark, coarse-textured soils. The surface layer, about 6 to 20 inches thick, is a loamy sand or a light sandy loam. The subsoil, about 10 to 14 inches thick, is a loamy sand. Underlying material is a light colored loamy sand or sand extending to 60 inches or more.

L.S.L. 12/71

ESTIMATED PHYSICAL AND CHEMICAL PROPERTIES

MAJOR SOIL HORIZONS (INCHES)	CLASSIFICATION			COARSE FRACT. > 3 IN. %	PERCENTAGE LESS THAN 3 INCHES PASSING SIEVE NO. ----				LL	PI	PERMEABILITY (in./hr)	AVAILABLE WATER CAPACITY (In/In)	SOIL REACTION (pH)	SALINITY (EC x 10^3 @25°C)	SHRINK-SWELL POTENTIAL	POTENTIAL FROST ACTION
	USDA TEXTURE	UNIFIED	AASHO		4	10	40	200								
0-60	Loamy sand	SP or SM, SP-SM	A-2	<1	100	100	50-70	5-15	NP	NP	6.0-20.0	0.06-0.08	6.1-7.3	0-2	low	low

DEPTH TO BEDROCK OR HARDPAN: > 60 inches

FLOOD HAZARD: None

DEPTH TO SEASONAL HIGH WATERTABLE >60 inches

HYDROLOGIC GROUP A

SUITABILITY AND MAJOR FEATURES AFFECTING SOIL AS RESOURCE MATERIAL

TOPSOIL: Poor: loamy sand	GRAVEL: Unsuitable: no gravel
SAND: Fair: SP-SM, fines	ROADFILL: Good

DEGREE OF LIMITATION AND MAJOR SOIL FEATURES AFFECTING SELECTED USE

LOCAL ROADS AND STREETS: Slight: slope 8% or less; Moderate: slope over 8%	SEPTIC TANK FILTER FIELDS: Slight if slope is less than 8%; Moderate if slope is 8 to 15%. 1/
SHALLOW EXCAVATIONS: Severe: sandy textures	SEWAGE LAGOONS: Severe: rapid permeability
DWELLINGS: Slight if slope is 8% or less; Moderate on slopes 8 to 15%	CORROSIVITY - UNCOATED STEEL: low
RESERVOIR AREA: Rapid permeability	CORROSIVITY - CONCRETE: low
RESERVOIR EMBANKMENT: High seepage	

1/ Hazard of ground water pollution

APPENDIX - A

DEGREE OF SOIL LIMITATIONS AND MAJOR FEATURES AFFECTING RECREATION DEVELOPMENT

CAMP AREAS	Moderate: loamy sand texture
PICNIC AREAS	Moderate: loamy sand texture
PLAYGROUNDS	Moderate: loamy sand texture; Severe on slopes over 5%
PATHS AND TRAILS	Moderate: loamy sand texture

CAPABILITY, SOIL LOSS FACTORS, AND POTENTIAL YIELDS--(High Level Management)

PHASES OF SERIES	CAPABILITY	SOIL LOSS K	SOIL LOSS T							

WOODLAND SUITABILITY

PHASES OF SERIES	WOODLAND SUITABILITY GROUP	SPECIES AND SITE INDEX	MANAGEMENT HAZARDS OR LIMITATIONS					
			SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPET.	EQUIPMENT LIMITATION	EROSION HAZARD	SPECIES SUITABILITY

RANGE

PHASES OF SERIES	RANGE SITE NAME	IMPORTANT CLIMAX SPECIES	TOTAL ANNUAL YIELD LBS/AC
Blakeland ls	Sandy Foothills	Big bluestem, little bluestem, prairie sandreed, needle and thread, sideoats grama, blue grama, western wheatgrass, Junegrass, native bluegrass	E - 1400 P - 400

WILDLIFE SUITABILITY

PHASES OF SERIES	POTENTIAL FOR HABITAT ELEMENTS							POTENTIAL AS HABITAT FOR--		
	GRAIN AND SEED CROPS	GRASSES, LEGUMES	WILD HERBACEOUS PLANTS	HARDWOOD TREES AND SHRUBS	LOW CONIFER PLANTS	WETLAND FOOD AND COVER	SHALLOW WATER DEVELOP.			

OTHER

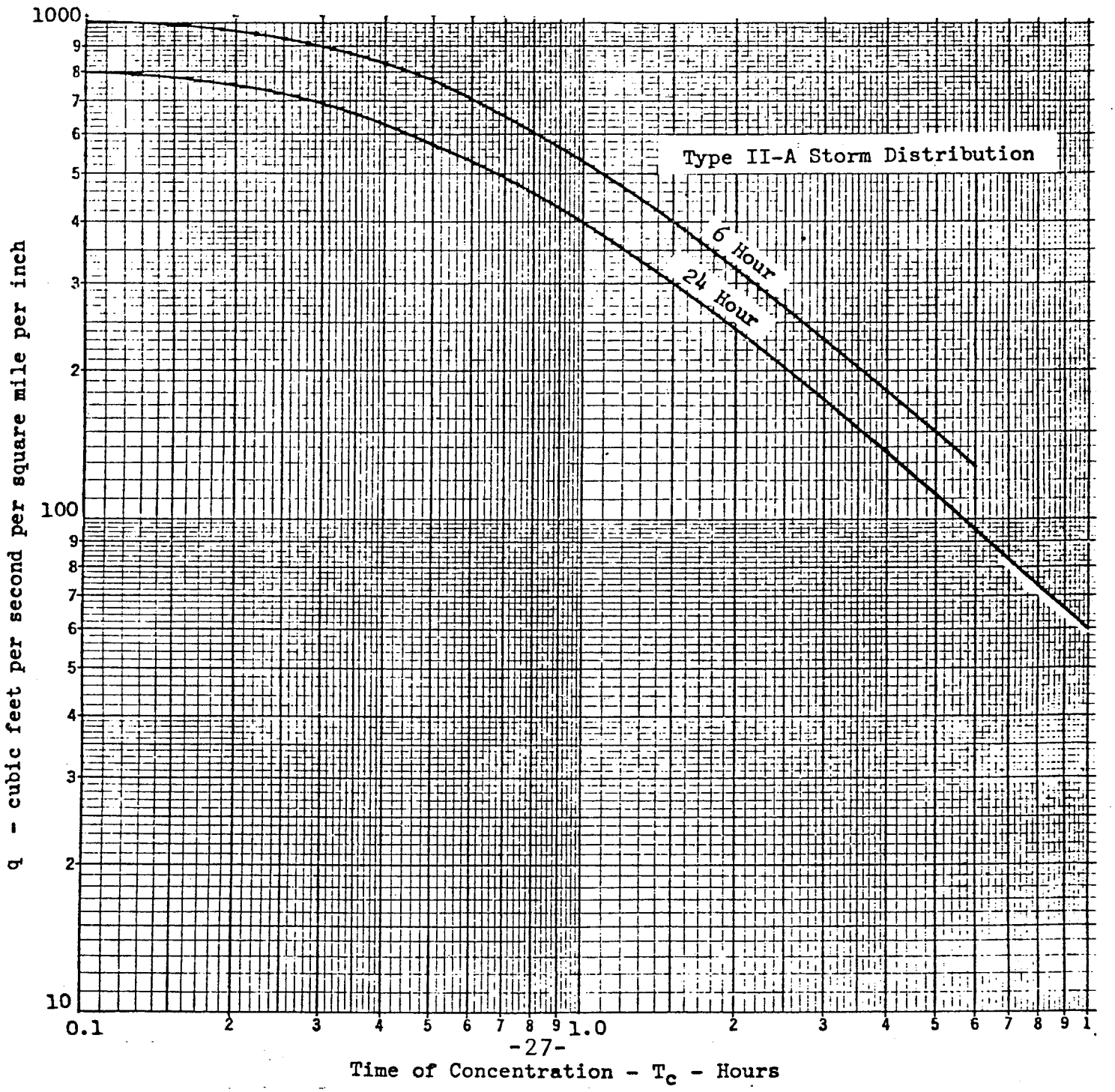
PHASES OF SERIES	

USDA-SCS-PORTLAND, OREG. 1971

APPENDIX - B

Type II-A Storm

Figure 8B- Peak Discharge in
csm per inch of runoff
versus
Time of Concentration, T_c



APPENDIX - C

Right-of-way Deed

Book 50 Page 108	HENRY W. AUSTIN, THE COLORADO SPRINGS CO., By WILLIAM A. BELL, Vice President, Attest: GEO. H. PARSONS, Secy., (Corporate Seal of the Colorado Springs Co.) THE OHIO LIVE STOCK COMPANY, by IRANE HATCHER, President, Attest: CHARLES W. LONG, Secretary, (No Corporate Seal)	INSTRUMENT Consideration Dated Acknowledged Recorded	QUIT CLAIM DEED. $1. November 26, 1884. January 8, 1885, before J. E. McIntyre, Notary Public in El Paso County, Colorado. (Seal) January 9, 1885.

to

THE COUNTY OF EL PASO in the State of Colorado.

Remises, releases, sells, conveys and quit claims all the right, title, interest, claim and demand which first parties have in and to the following described premises, situate in the County of El Paso and State of Colorado, to-wit:

The North 50 feet off the South half of Section 27 and the Southeast quarter of Section 28 and the South 30 feet off from the Northeast quarter of Section 28 and North half of Section 27. Also a strip of land 80 feet in width diagonally across the Northwest quarter of Section 26, more particularly described as follows, to-wit: Commencing at a point 30 feet North of the center and West line of Section 26; thence running in a due Northeasterly direction to a point 30 feet West of the center and North line of said Section 26, thence running on the North line of said Section 26 due East 80 feet, thence running in a Southwesterly direction to a point 50 feet South of said West and center line of said Section 26 in Township 13, Range 66 West of the 6 P. M., El Paso County, Colorado. The above described property is given for the purposes only of a public highway and is to revert to the said grantors if not so used.

APPENDIX - D

Bibliography

1. All City of Colorado Springs Ordinances and Design Standards.

2. All pertinent City approved Drainage Reports.

3. Procedures for Determining Peak Flows in Colorado, U.S. Department of Agriculture, Soil Conservation Service, December, 1972.

4. Morris, Applied Hydraulics in Engineering, The Ronald Press Company, 1963.

5. Seelye, Design, John Wiley and Sons, Inc., Third Edition, 1968.

6. Design of Small Dams, U.S. Department of the Interior, Bureau of Reclamation, Second Edition, 1963.

7. Design Manual, Department of Highways, State of Colorado, 1963.

8. Design Data, American Concrete Pipe Association, 1968.

9. Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute, Second Edition, 1971.

10. ASTM Standards for Precast Concrete Pipe, American Concrete Pipe Association.

SECTION V

D R A W I N G S