E-17/D063*

MASTER DRAINAGE REPORT

For

LEE GALLES ON SAN MATEO

JUNE, 2000

Prepared for:

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2000.024.2

DRAINAGE REPORT

I. Executive Summary and Introduction:

The purpose of this report is to analyze the existing and proposed drainage conditions in conjunction with proposed building construction at the Lee Galles Automobile Dealership on San Mateo Boulevard NE. The proposed development represents a modification to an existing site within an infill area. The site has a history of flooding problems. It is the intent of this Report to determine the cause(s) of the flooding and to improve site drainage conditions in association with the proposed construction. Included with this report are site specific grading plan details for the proposed improvements. This report is submitted for foundation permit approval, building permit approval and work order approval (Project #644181).

The designated drainage outfall is a 30" CMP culvert located within New Mexico State Highway and Transportation Department right-of-way. This culvert is part of a system of ditches, culverts, and open areas which receives runoff generated by San Mateo, the Galles site, and I-25 with its access ramps and frontage roads. The Galles site consists of two drainage basins, one draining directly to the NMSHTD culvert, the other draining to a detention pond which mechanically pumps runoff to the NMSHTD culvert.

As described in the Existing Conditions Analysis which follows, the site is impacted by offsite flows from San Mateo Boulevard NE. An existing onsite public drainage easement allows the conveyance of public storm runoff through the site. A copy of this easement is included in Appendix C. The public storm flows will continue to be accepted by this site and conveyed to the historic outfall. As described in the Developed Conditions Analysis which follows, the public storm drain will be extended within the existing easement to more efficiently deliver runoff to the proximity of this culvert, and to ensure that the runoff is confined within the existing easement. This public storm drain extension will be constructed by City Work Order (City Project # 644181).

The proposed improvements consist of new building construction on existing paved areas which represent modifications to an existing developed site within an infill area. The proposed conditions are consistent with the previously approved grading and drainage plans for this site which established the criteria that there be no increase in peak rate of internally generated flow attributable to site development. This Report will also be submitted to the NMSHTD for their review and approval of the continued discharge of runoff to their right-of-way at historic rates.

There are no new platting or easement requirements associated with this project.

II. Project Description:

As shown by Vicinity Map E-17 on page 12, the site is located in Northeast Albuquerque near the southeast corner of Interstate 25 and San Mateo Boulevard NE. The site is bounded on the east by San Mateo, on the west by the I-25 frontage road, on the north by a Texaco service station, and on the south by a commercial development. The site is currently developed as an automobile dealership with showrooms, storage, and service facilities. The site consists of three platted properties; Tracts B and C, H. B. Woodward and Tract A1A2, Triangle Realty. The site is zoned C-3. Copies of the topographic and boundary surveys are included in Appendix G.

As shown by panel 139 of 825 of the National Flood Insurance Program Flood Insurance Rate Maps, Bernalillo County, New Mexico, and Incorporated areas, dated September 20, 1996, a portion of this site is encumbered by a flood hazard zone designated AH with an elevation of 5186. The limits of this flood hazard zone are shown on the Site Plan, and on page 13 of this Report. The flood plain limits roughly coincide with the detention pond limits and appear to be consistent with the existing conditions. All proposed and existing buildings are located at a minimum elevation of 5192 which is 6 feet above the designated flooding elevation. There is no new construction proposed within the flood hazard zone. As described in the Developed Conditions Analysis, the proposed onsite drainage improvements will reduce the volume of stormwater impacting this existing flood hazard zone.

III. Background Documents:

The following is a list of plans and reports and other information relative to this site and/or referenced within this report. This list may not be inclusive, however, represents a summary of those plans and documents which are known to this preparer.

A. *Drainage Report for San Mateo Blvd. NE (S.A.D. 192)* prepared by Molzen-Corbin and Associates dated June, 1978. This report supported the San Mateo paving and drainage improvements constructed by S.A.D 192. This report demonstrated that the San Mateo storm drain system was designed for the 10-year design storm (not including any additional flow from the Far North Shopping Center).
B. *Storm Drainage Report for Galles Oldsmobile Dealership* prepared by Gordon Herkenhoff and Associates, Inc. dated December, 1978 (E17/D009). This report investigated the offsite and onsite drainage characteristics of the site and was prepared to support the original Galles site development. This plan included the design of the existing public storm drain which currently accepts offsite public runoff from San Mateo Blvd within a public drainage easement.
C. *Far North Shopping Center Grading Plan* prepared by Enchantment Engineering, dated June 1976 (E18/D19B). This report shows that the Far North Shopping Center is intended to drain to a public drainage channel which passes behind the shopping center. In the existing condition, it is apparent that the majority of the 7+ acre paved parking lot is not in accordance with this plan and instead drains to San Mateo Boulevard and subsequently impacts the Galles site.
D. *Far North Shopping Center Remodel Grading and Drainage Plan* prepared by Easterling and Associates dated 03-03-87. This plan detailed site modifications and improvements including storm drain improvements intended "to give relief to the area facing San Mateo Boulevard which is not draining properly." This project was never constructed.

E. *Drainage/Grading Plan for Galles Used Car Sales* prepared by Bohannan-Huston, Inc. Engineer's stamp dated 10-23-86 (E17/D10). This plan addressed the construction of additional paved surfacing for the used car lot to the south of the main dealership site. The retention pond constructed as part of the original Galles improvements was expanded to accept the additional runoff, and a pump was provided to drain this pond to the frontage road ditch at a rate of 0.5 cfs. This discharge was approved by the NMSHTD.

F. *Lee Galles Lexus Showroom Grading Plan* prepared by DWL Architects + Planners, Inc., Engineer's stamp dated 01-10-90 (E17/D009A). This plan addressed the construction of a new Lexus Showroom building on a portion of the site. This Plan did not address overall site hydrology because the new construction replaced impervious area and did not increase site runoff.

G. *Site and Drainage Plan- Lee Galles Oldsmobile/Lexus* prepared by Hall Engineering Company, Inc. dated 09-15-92 (E17/D009B). This Plan addressed the construction of a new car wash building on a portion of the site. This Plan did not address overall site hydrology because the new construction replaced impervious area and did not increase site runoff.

H. *Personal Interview with Walt Lehman, Lee Galles Service Director* conducted 04-04-2000. Mr. Lehman described his observations from past and recent site flooding events. Notable observations include large amounts of offsite flows from the Far North Shopping Center and San Mateo Boulevard entering the site through the southern private entrance. A recent topographic survey prepared by this office confirmed that there is no waterblock at this location.

I. *Various City of Albuquerque Hydrology Files* – Several files for sites on Academy Road and San Mateo Boulevard were researched in determining the offsite basins. These files include, but are not limited to E18/D002, 12, 13, 19B, 24, 24A, 30, 38, 39, 42, 43, 46, and 52. Field verification of the existing drainage conditions was also used in conjunction with drainage file review to determine the contributing areas.

In addition to the above listed documents, site inspections were made before, during, and after rainfall events. An inspection made on March 31, 2000 during a medium intensity rainstorm (0.2" rainfall over 2 hours +/-) confirmed that the majority of parking lot runoff from the Far North Shopping Center does drain directly to San Mateo Boulevard NE.

IV. Existing Conditions:

A. Onsite

The site is currently developed as a new and used car dealership with associated maintenance and operational facilities. The drainage basins and patterns are consistent with those shown on the previously referenced plans (B,E,F,G) for the site. The site generally drains from southeast to northwest via overland sheet flow and concentrated flow.

The site is divided into two drainage basins. The smaller basin, Basin C, contains the area east of the sales building, and most of the area north of the sales building. The point of concentration of this basin is the inlet to a 30" CMP culvert near the northwest end of the site on NMSHTD right-of-way. This ~~culvert~~ 30" culvert is the historic outfall for runoff from this site, and for runoff which previously was generated east of San Mateo Boulevard NE and crossed under San Mateo via 24" RCP culvert and across the site prior to development. The 30" CMP culvert passes under the frontage road, and outlets to a graded flowline within NMSHTD right-of-way. From this point, the flowline leads to a series of culverts which pass under I-25, and the northbound and southbound exit ramps and main frontage roads. These culverts are interconnected by graded flowlines within large open ponding areas of NMSHTD right of way which serve to drain I-25 and its related facilities. Because the existing discharge rates have been approved by four previous plans for this site, downstream capacity is assumed to exist for this site. Inasmuch, a downstream analysis of this complicated NMSHTD system beyond the initial 30" culvert has not been performed as part of this report.

An existing 30" public storm drain discharges offsite flows at a point within the northern boundary of the site. The public runoff is collected upstream of the site by 2 storm inlets in San Mateo. The storm drain is located within a public drainage easement, a copy of which is contained herein (Appendix D). The public flows are conveyed across the site within an informal channel formed by asphalt pavement, concrete valley gutter, an asphaltic concrete curb, and some asphalt slope paving. As demonstrated in the Herkenhoff Report (ref. B), these improvements were designed to contain the public runoff within the limits of the public drainage easement, however, inspection of the existing conditions indicates that this is not the case. The original plan also identifies a 6" cobble rip-rap rundown designed to dissipate flow energy at the downstream edge of the easement leading to the 30" culvert.

Site inspection and visual observations made in April, 2000 indicated that the existing asphalt curb, slope pavement, valley gutter, and pavement which convey the offsite flows are all in need of maintenance, repair, and sediment removal. The rip-rap rundown had been completely silted over, and the area surrounding the culvert had been overgrown by grasses, shrubs, and trees which significantly decrease the culvert entrance capacity. The entrance condition was further reduced by the presence of cut tree limbs and other debris covering the culvert entrance and partially clogging the culvert. In late May, 2000, the NMSHTD cleaned out and regraded this area at the request of the Galles Owner's representative. This work has greatly improved the culvert entrance condition and energy dissipater efficiency.

An AHYMO analysis was performed to model site drainage conditions. As detemined by the model, the 100-year, six hour peak flow rate reaching the NMSHTD culvert from onsite and offsite sources is 52.7 cfs. If the 30" culvert were operating under ideal maintenance conditions, its maximum existing capacity would be 30 cfs at a water surface level (w.s.l) of 5187.88 which is the approximate elevation at which water will begin to overflow from Basin C to the south into Basin B. As demonstrated by the AHYMO analysis, this water surface elevation will be reached under ideal culvert entrance conditions during a 25 year, 6-hour storm. Larger rainfall events will cause water from Basin C to overflow to the south into Basin B. Once again, this analysis assumes ideal culvert operational characteristics. Prior to the recent NMSHTD maintenance, the culvert entrance was almost completely blocked, thereby resulting in more frequent occurrences of basin overflow. As indicated by an analysis performed assuming culvert operation at 25% of its maximum capacity due to clogging and poor entrance conditions, it was determined that overflow flooding will likely occur during events as frequent as the 2-year storm. In summary, the reduced culvert capacity due to lack of maintenance caused runoff from basin C to overflow to Basin B, thereby aggravating the observed drainage problems. As previously indicated, the recent NMSHTD maintenance has greatly improved this condition.

Basin B is the larger of the two onsite basins. Runoff from this basin is conveyed via overland flow to an existing detention pond located within the existing flood hazard zone at the west end of the site. This pond was originally designed in 1978 as a retention pond sized to retain the 6 hour, 100 year volume of runoff generated by this basin (37,150 cf @ w.s.l = 5185.0, ref. B). In 1986, this pond was converted to a detention pond and redesigned to receive additional developed runoff from the used car sales lot (46,170 cf @ w.s.l = 5186.10, ref. E). The pond outlet discharges via pump at a rate of 0.5 cfs to the proximity of the aforementioned Basin C culvert. This discharge was approved by the New Mexico State Highway and Transportation Department in a letter dated 10/21/86. (Appendix D)

Comparison of the 1986 design calculations to the present day conditions reveal that the Basin B pond and pump system are properly sized for the 100-year, 6-hour storm. The existing Basin B 100-year volume generated is 52,100 cf. Subtracting the pump outflow of 0.5 cfs from the hydrograph results in a required 100-year pond volume of 46,095 cf which is slightly less than the 1986 design volume. This information and the as-constructed pond volume calculations confirm that the pond was constructed in substantial conformance with the approved plan.

Despite the pond being correctly sized, flooding problems occur in the area of the pond. There have been several occurrences of water surface levels in excess of the 100-year design elevation of 5186.1 reported. The Galles Dealership utilizes the paved area around the pond for vehicle parking, and has subsequently experienced water damage to vehicles parked in this area. Inspection of the topographic survey indicates that the lowest point of overflow from the pond is to a ditch along the frontage road at an approximate elevation of 5187.0, thereby confirming the potential for water surface levels in excess of the design level of 5186.1. In the event of a flooding situation, the head required to force water through this overflow will result in the potential for floodwaters reaching an elevation of 5188.5, varying from 3 to 4 feet deep at the edge of the paved parking area at the perimeter of the pond. As reported by Walt Lehman (ref. H) this condition was most recently observed in the summer of 1999. Compounding the problem is a lack of a designated emergency overflow to release floodwaters which exceed those for which the pond was designed.

As previously indicated, the pond is properly sized for runoff generated by Basin B during the 100-year storm. The flooding conditions which have been observed are most likely due to additional runoff for which the pond was not sized.

The following factors could contribute to Basin B flooding:

- A rainfall event in excess of the 100-year, 6 hour design storm
- Pump failure
- Additional runoff from Basin C
- Unanticipated Additional runoff from offsite areas
- The lack of a designated overflow spillway

Rainfall in excess of the design storm is an infrequent occurrence and can not be controlled. Because the pump rate is small (0.5 cfs), its failure would not contribute significantly to the flooding, except when multiple rainfall events occur in a short period of time. As previously demonstrated, Basin C overflow will occur under ideal maintenance conditions for events greater than or equal to the 25-year storm, however, the historic lack of maintenance near the 30" culvert inlet has likely caused more frequent overflow from basin C. As for runoff from offsite areas, Walt Lehman (ref. H) has reported observing significant offsite flows entering the site through the southern private entrance at San Mateo Blvd. NE, directly across the street from the entrance to the Far North Shopping Center. The lack of a well defined waterblock at the Galles entrance indicates that street flows in San Mateo will likely enter the site as reported. These offsite flows are more fully discussed in the offsite analysis which follows. It is the conclusion of this report that the Basin B flooding problems are attributable to overflow runoff from both onsite and off-site sources. Although the Basin B pond is adequately sized for Basin B runoff, it is not sized for additional offsite runoff.

B. Offsite

As calculated by the AHYMO model, the site is impacted by offsite flows totaling 41.3 cfs from Academy Road NE, San Mateo Blvd. NE., and the I-25 Frontage Road. The limits of the contributing basins are shown on the Offsite Basin Map (page 15). The hydraulic and hydrologic characteristics of these basins were modeled to determine the peak rate and volume of runoff delivered to the Galles site. The model includes the partial interception of offsite flows by existing public storm inlets in San Mateo and Academy which drain directly to the Bear Arroyo, and do not contribute to this site. Runoff which bypasses these inlets will flow north in San Mateo, ultimately reaching the public storm drain system which drains through the Galles site. A similar offsite basin analysis was performed as part of the 1978 Herkenhoff Report (ref. B), with similar basin delineation and storm drain interception assumptions. The 1978 report determined that 40 cfs will enter the north basin of the Galles site through a combination of public storm drain flow and street flow which overtops the curb. The existing onsite public storm drain and public drainage easement were created as a result of this previous analysis. The site is obligated to accept these flows.

The Far North Shopping Center (FNSC) discharges approximately 27 cfs directly to San Mateo during the 100-year storm. This runoff drains to San Mateo through an existing private entrance located directly across from the aforementioned southern Galles entrance. Review of the FNSC Grading Plan (ref. C) indicates that all FNSC runoff is supposed to be directed to an onsite private storm drain which discharges to the public

Borealis drainage channel behind the shopping center. Review of the existing conditions indicate that this is not the case. The majority of site runoff drains directly to San Mateo due to the lack of curb openings specified on the FNSC plan, the lack of a defined waterblock at the private entrance, and the presence of a speed hump which partially blocks surface runoff from flowing to the north within the site. This drainage pattern was verified by visual observation during a medium intensity rainfall event on March 31, 2000 (0.2" over 2 hours). For purposes of this analysis, it was assumed that 80% of site runoff drains to San Mateo, with the remaining 20% draining away to the designated outfall. The aforementioned Herkenhoff Report (ref. B) made a similar observation about the Far North Shopping Center, and also included this runoff in their offsite flow and storm drain calculations, assuming a 75%/25% runoff split. It should be noted that this additional runoff was not accounted for in the design report for the San Mateo Storm Drain System (SAD 192, ref. A) which was designed for the 10-year storm. This additional runoff therefore creates a flooding problem in San Mateo.

San Mateo Boulevard was constructed with an average slope of 0.37% (0.0037), sloping downhill to the north. Although the majority of the offsite flows (FNSC, Academy Road) drain to the east side of the street, it is difficult to determine how much of this flow will remain on the east side, and how much may cross over the crown to the west side of the street due to momentum. The amount of crossover will increase during larger rainfall events as the amount of runoff increases, creating fuller street sections, and greater flow depths and momentum which approach San Mateo perpendicularly from Academy Road and the FNSC entrance. Regardless of the actual east/west distribution of San Mateo street flows approaching the Galles site, all runoff ultimately crosses to the west side of the street through median openings in front of the site. This is because the San Mateo street section fronting the Galles site transitions from a normal crown section to a fully superelevated section, with the west (Galles) side being on the low side.

During a rainfall event, the initial flows which reach the superelevated portion of San Mateo will be intercepted by the public storm inlets which discharge within the Galles site. The residual flow will be conveyed north within the street section, and will continue within the west side of San Mateo Blvd to the intersection with the NMSHTD frontage road. Flow will split at this location, with approximately two thirds (67%) of the runoff continuing to the north, and one third (33%) of the runoff turning to the southwest along the frontage road which also lacks a waterblock, and appears to be designed to accept some runoff from San Mateo. This observation is supported by review of the grading plan for the Texaco Service Station (E17/D23) which is located at the southwest corner of this intersection. This grading plan shows onsite and offsite runoff conveyed within a ditch section along the south side of the frontage road which is superelevated such that all street runoff is directed to this ditch. The point of concentration for this portion of frontage road, the Texaco Station, and the residual San Mateo flow is the same aforementioned 30" CMP culvert located at the point of concentration for onsite Basin C. It is at this point that all of the offsite flows combine with the onsite flows. As stated in the preceding Onsite Conditions section, the peak flow rate calculated at this location is 52.7 cfs. Because this rate exceeds the culvert capacity and storage volume, runoff will overflow from Basin C to Basin B, contributing to the flooding problems observed in that

Basin. The fact that this culvert entrance area was in a poor state of maintenance exacerbated the frequency and magnitude of the problem.

As previously mentioned, the southernmost Galles private entrance was constructed without a defined waterblock, allowing public runoff from San Mateo to enter the site and contribute to Basin B flooding. For aforementioned reasons, the exact amount of this runoff is difficult to quantify, and as such can not be accurately modeled. As previously mentioned, the Basin B pond was not sized to accept any offsite flows.

C. Overall

As determined by the preceding analyses of both onsite and offsite conditions, it is apparent that the Basin B pond is receiving far more runoff than it was designed for. The additional runoff is generated by both onsite and offsite sources. Offsite flows directly enter the site at the southern private entrance to San Mateo which lacks a waterblock. This condition was not the intent of the original design for the site (Ref. B) which assumed all offsite runoff was confined to San Mateo at this point. Offsite flows at this location should rightfully be blocked by a properly constructed private entrance with a City standard waterblock at least 0.87' in height above the corresponding flowline.

The offsite flows approaching the 30" CMP culvert from the Frontage road include runoff from the Frontage Road, the Texaco Service Station, and from San Mateo Blvd. This runoff totals 15.0 cfs which was not accounted for in any of the reference documents. As previously indicated, the total flow reaching this culvert entrance from onsite and offsite sources exceeds the culvert capacity, causing runoff to overflow into Basin B. The AHYMO reservoir routing indicates that this overflow will occur under ideal culvert entrance conditions for rainfall events equal to or greater than the 25-year storm. Until recent maintenance be the NMSHTD, the culvert entrance condition was severely limited due to sediment and overgrown vegetation, likely resulting in the overflow condition observed during a rainfall equal to or greater than the 2-year rainfall event.

Significantly contributing to the Basin B flooding problems is the fact that a large amount of runoff generated by the Far North Shopping Center drains to San Mateo instead to the public drainage channel shown on the approved 1976 grading and drainage plan (ref. C). A subsequent plan was prepared in 1987 (ref. D) for proposed site improvements which included a new storm drain and storm inlets at the problem area which were designed to correct the drainage problem. Unfortunately, these improvements were never constructed, and the problem remains uncorrected. As part of this report, A hypothetical AHYMO model was created which assumed that only 5% of the shopping center drains to San Mateo. This model demonstrates that bringing the shopping center into compliance with their approved grading plan would significantly reduce the frequency and magnitude of offsite flows contributing to the flooding problems. It would add a factor of safety to the site drainage system, and reduce the dependency on continued culvert maintenance. It will also reduce the additional flows reaching the San Mateo storm drain system which was not designed for this runoff, and subsequently fails the

DPM 10-year storm criteria for arterial streets. The possibility of correcting this problem should be explored conjunction with the drainage improvements proposed herein.

Based upon this analysis of existing conditions, the magnitude of the existing onsite flooding problems within Basin B can be significantly reduced by 1) reconstructing the southernmost San Mateo entrance with a standard waterblock, combined with 2) realizing the benefits of the recently completed maintenance by the NMSHTD on the downstream 30" CMP culvert. These two improvements will serve to restore the design conditions, and to greatly improve site drainage conditions. Site flooding would also be significantly reduced if the Far North Shopping Center was required to divert their runoff to the public drainage channel as identified on their approved Grading Plan.

V. Developed Conditions:

A. Basin B

Basin B currently accepts offsite flows from San Mateo as described in the existing conditions analysis. Because the Basin B pond was not sized for these offsite flows, the additional runoff contributes to flooding problems. The offsite flows enter the site at the southern private entrance which was mistakenly constructed without a waterblock. To correct this situation, the entrance will be removed and reconstructed with a 0.87' waterblock. This waterblock will prevent San Mateo street flows from entering the site at this location. The street flows will instead be diverted to the north as they were intended, toward the existing single "C" storm inlet which was designed to accept these flows. This is the condition for which the San Mateo storm drain system and the Galles site was designed and modeled in the Herkenhoff Plan (Ref. B) Appendix E includes a grading plan detail of this proposed entrance reconstruction.

These proposed improvements within Basin B will not create any change in the overall area or land treatment distribution within the basin. All runoff will continue to drain overland as concentrated and sheet flow to the existing detention pond which is properly sized for runoff generated by this Basin. Constructing a waterblock at the entrance will divert offsite public flows to their intended flow path within a public storm drain. This modification will reduce the likelihood of flooding problems within this basin, and will keep the public flows within the system for which they were designed.

B. Basin C

A new Subaru automobile showroom and service building with associated paved parking and landscaping will be constructed at the north end of the site. This new construction will be in an area that is currently paved, therefore will not increase the runoff generated by this basin. As shown on the grading plan detail in Appendix E, the new building roof drainage will be directed to the north and east, closely respecting the existing drainage basin boundary which divides Basins B and C. The proposed construction will not significantly alter the drainage basin areas. Runoff from the eastern portion of this Basin will enter the onsite public storm drain through a private storm drain connection. The remaining runoff will drain overland to the ~~to the~~ proximity of the 30" CMP culvert via curb and gutter, discharging to the rip-rap apron via private storm drain.

As described in the existing conditions analysis is the fact that even with an improved and maintained entrance condition due to recent NMSHTD maintenance, the 30" culvert only has capacity to pass the flows from a 25 year storm, with larger events likely causing an overflow situation whereby runoff from Basin C will drain into Basin B. Basin B is not designed to accept this additional runoff which will cause flooding problems in the area of the detention pond. To correct this deficiency, the pavement in the overflow area will be removed and reconstructed to provide an additional waterblock to ensure that Basin C runoff is contained within Basin C. As calculated by the AHYMO model, this extra head will allow the culvert to pass the 100 year, 6-hour runoff without overtopping to Basin B. Refer to the grading plan details (Appendix E) for this reconstruction.

C. Public Storm Drain Extension (City Project # 644181)

Currently, the existing public storm drain discharges onto the Galles site, and the runoff drains to the NMSHTD 30" CMP culvert as surface flow. These overland flows create maintenance problems, and are not confined within the public drainage easement. The public storm drain will be extended within the existing public drainage easement such that the flows will be more efficiently delivered to the historic discharge point, and be confined to the easement. This storm drain extension will be constructed by Work Order, and will be maintained by the City of Albuquerque. There are minor offsite flows within a concrete rundown entering the site from a small portion of the Texaco Station to the north. This rundown is not shown on the approved plan for the Texaco Site (E17/D23). Because the grading required for the new storm drain construction will effectively block these offsite flows, a new curb and gutter will be constructed along a portion of the north property line, continuing the flowline to the west and to their intended outfall to NMSHTD right of way. This construction will require the approval of the adjacent property owner. The plan and profile design of this public storm drain extension is contained in Appendix F.

VI. Grading Plans:

The Enlarged Grading Plans in Appendix E of this submittal are intended to supplement the Drainage Site Plan. These plans show: 1) existing grades indicated by spot elevations and contours at 1'0" intervals as taken from the boundary and topographic survey prepared by Jeff Mortensen & Associates, Inc. dated April, 2000, 2) proposed grades indicated by spot elevations and contours at 1' 0" intervals, 3) the limit and character of the existing improvements, 4) the limit and character of the proposed improvements, and 5) continuity between existing and proposed grades.

VII. Calculations:

The calculations, which appear hereon, analyze both the existing and developed conditions for the 100-year, 6-hour rainfall event. The Procedure for Small and Large Watersheds (AHYMO) as set forth in the Revision of Section 22.2, Hydrology of the Development Process Manual, Volume 2, Design Criteria, dated January, 1993, has been used to quantify the peak rate of discharge and volume of runoff generated. As shown by these calculations, there will be no change in the peak rate and volume of runoff generated by this site during the 100-year rainfall event. The continued discharge of developed runoff from this site in historic rates is consistent with several previously approved grading and drainage plans for this site. Storm inlet capacities were calculated using D.P.M Plates 22.3 D-5 and D-6. Storm Drain and Street Hydraulics were calculated using Haestad FlowMaster PE Version 6.0. Culvert entrance conditions were calculated using the Orifice Equation. Pond volumes were calculated using the average end-area method.

VIII. Conclusion:

Existing flooding problems at the site are due to an incorrectly constructed private entrance, lack of maintenance by the NMSHTD to the outfall culvert, and to uncontrolled offsite flows from the Far North Shopping Center. These factors all contribute to the Basin B pond receiving more runoff than that for which it was designed. To correct these problems, the private entrance will be reconstructed. The culvert area has been recently restored to its design condition by the NMSHTD. Furthermore, the ridge between Basins B and C will be raised to prevent Basin C runoff from overflowing into Basin B. The proposed improvements will be constructed in association with new building construction. The new buildings will be constructed on paved areas, and will not change the peak rate or volume of runoff draining to New Mexico State Highway Department right of way.

A public storm drain extension will be constructed by Work Order within an existing onsite public drainage easement. This storm drain will convey public offsite flows through the site in a controlled manner to their historic outfall. No new easements or design variances are required for this project. The public storm drain will be owned, operated, and maintained by the City of Albuquerque. All other site drainage improvements will be privately maintained by the developer.

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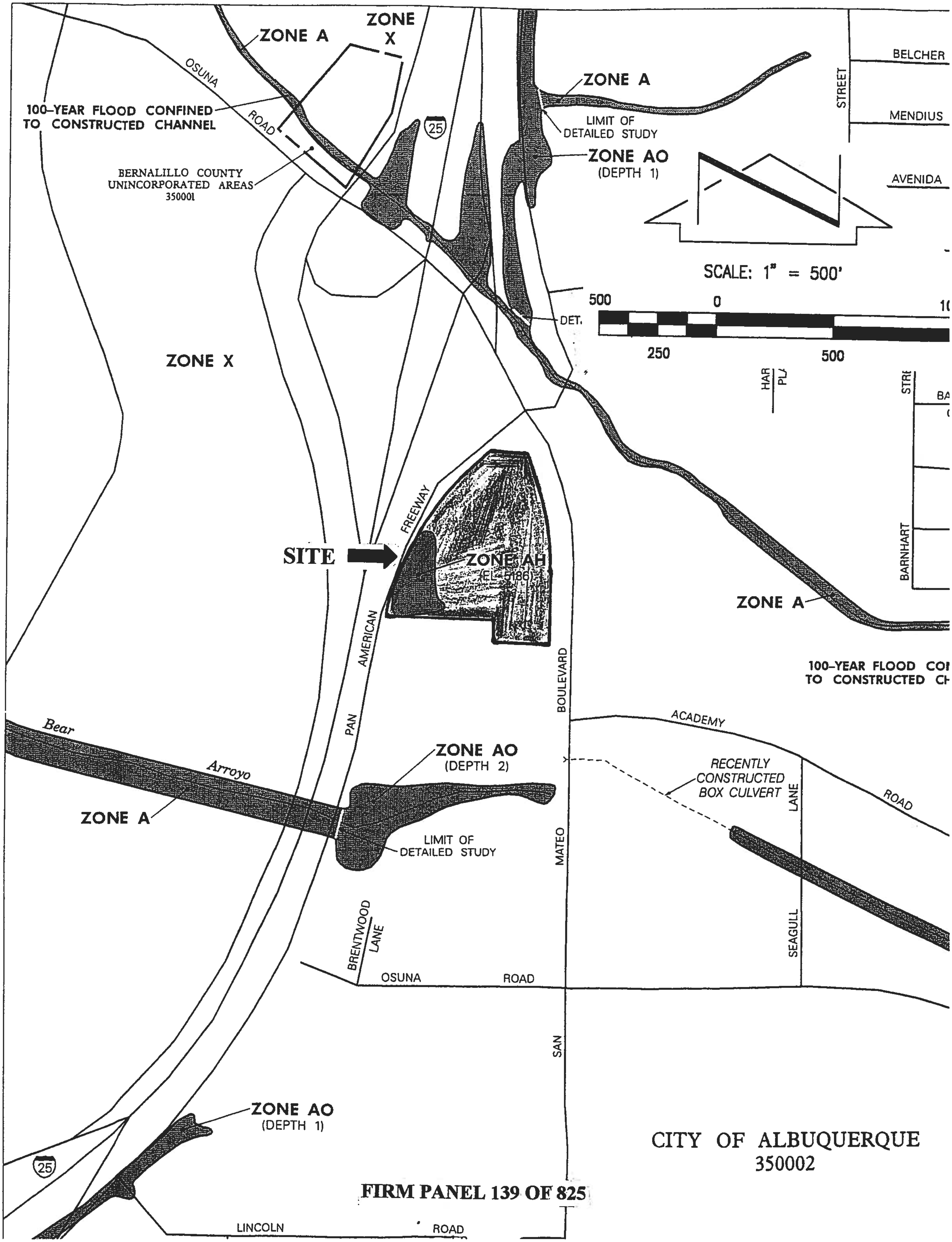


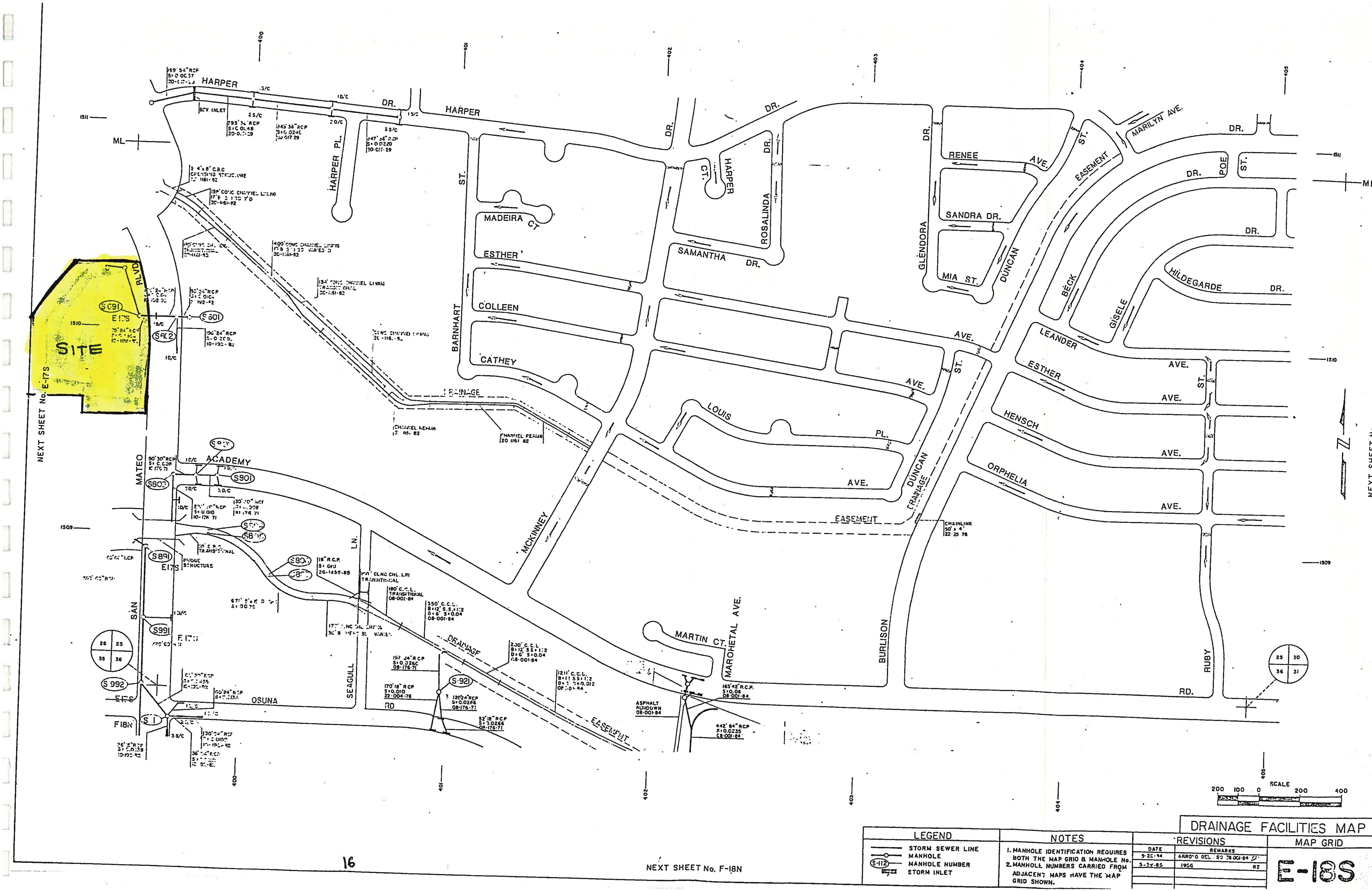
FIRM PANEL 139 OF 825

LEE GALLES ON SAN MATEO

BASIN SUMMARY TABLE

BASIN	AREA (AC)	T_C (HR)	IMPERVIOUS (%)	V_{10} (AC-FT)	V_{100} (AC-FT)	Q_{10} (CFS)	Q_{100} (CFS)
A-1	9.29	0.20	59	0.769	1.324	18.3	30.0
A-2	2.05	0.20	90	0.222	0.358	6.2	9.5
A-3	3.14	0.20	75	0.309	0.511	8.9	13.9
A-4	3.14	0.20	75	0.309	0.511	8.9	13.9
SM-1	3.79	0.20	91	0.417	0.669	11.6	17.7
SM-2	2.96	0.20	90	0.318	0.512	8.8	13.6
SM-3	7.34	0.20	90	0.788	1.268	21.8	33.5
SM-4	1.72	0.20	91	0.189	0.304	5.3	8.1
FR-1	1.51	0.20	71	0.138	0.231	4.0	6.3
B	7.30	0.20	80	0.730	1.196	20.6	32.2
C	2.46	0.20	80	0.246	0.403	7.0	10.9

BASIN	DESCRIPTION	COMMENTS
A-1	RESIDENTIAL AREA	DRAINS TO NORTH SIDE OF ACADEMY
A-2	COMMERCIAL AREA	DRAINS TO NORTH SIDE OF ACADEMY
A-3	STREET AREA	NORTH SIDE OF ACADEMY
A-4	STREET AREA	SOUTH SIDE OF ACADEMY
SM-1	STREET AREA	SAN MATEO SOUTH OF ACADEMY
SM-2	STREET AREA AND MCDONALD'S	SAN MATEO NORTH OF ACADEMY AND SOUTH OF FAR NORTH SHOPPING CENTER
SM-3	FAR NORTH SHOPPING CENTER PARKING LOT	80% DRAINS TO SAN MATEO
SM-4	STREET AREA	SAN MATEO NORTH OF FAR NORTH SHOPPING CENTER
FR-1	STREET AREA AND TEXACO	DRAINS TO NMSHTD CULVERT
B	GALLES ON-SITE BASIN	DRAINS TO GALLES POND
C	GALLES ON-SITE BASIN	DRAINS TO NMSHTD CULVERT



HARPER DR.
HARPER PL.
HARPER DR.
BARNHART ST.
MADEIRA CT
ESTHER
COLLEEN
CATHEY
SAMANTHA DR.
ROSALINDA DR.
GLENDORA DR.
RENEE AVE.
SANDRA DR.
MIA ST.
DUNCAN
BECK ST.
EASEMENT
MARILYN AVE.
POE ST.
DR.
HILDEGARDE DR.
GISELE
LEANDER AVE.
ESTHER AVE.
HENSCH AVE.
ORPHELIA AVE.
AVE.
LOUIS PL.
DUNCAN ST.
DRAINAGE EASEMENT
DRAINAGE
MCKINNEY
ACADEMY
SAN MATEO BLVD
SITE
NEXT SHEET No. E-17S
NEXT SHEET No. E-19S
NEXT SHEET No. F-18N
SEAGULL LN.
OSUNA RD
DRAINAGE EASEMENT
MARTIN CT.
MAROHETAL AVE.
BURLISON
RUBY
RD.
ASPHALT RUNDOWN 08-001-84
CHAINLINK 50' x 4' 22 25 78
ML
1511
1510
1509
400
401
402
403
404
405
S 901
S 891
S 991
S 992
S-921
SCALE
200 100 0 200 400
LEGEND
STORM SEWER LINE
MANHOLE
MANHOLE NUMBER
STORM INLET
NOTES
1. MANHOLE IDENTIFICATION REQUIRES BOTH THE MAP GRID & MANHOLE No.
2. MANHOLE NUMBERS CARRIED FROM ADJACENT MAPS HAVE THE MAP GRID SHOWN.
REVISIONS
DATE
REMARKS
DRAINAGE FACILITIES MAP
MAP GRID
E-18S
16

STREET HYDRAULICS AND STORM INLET CALCULATIONS

SUMMARY TABLE

ANALYSIS POINT	INLET TYPE	Q_{100} (CFS)	DEPTH (FT)	Q_{INLET} (CFS)	$Q_{RESIDUAL}$ (CFS)
AP-1 (NORTH SIDE)	DBL 'C'	40.5	0.55	10.5	30.0
AP-1 (NORTH SIDE)	DBL 'C'	30.0	0.50	9.0	21.0
AP-1 (SOUTH SIDE)	DBL 'C'	13.9	0.40	5.5	8.4
AP-1 (SOUTH SIDE)	DBL 'C'	8.4	0.35	4.0	4.4
AP-2	DBL 'C'	3.5	0.34	2.2	1.3
AP-3	DBL 'C'	6.7	0.44	4.1	2.6
AP-4	SGL 'C'	6.5	0.44	3.8	2.7
AP-5 (EAST SIDE)	DBL 'C' (SAG)	62.7	0.67' (FULL)	17.8	44.9
AP-5 (WEST SIDE)	SGL 'C'	44.9	0.67' (FULL)	10	34.9*
* THE RESIDUAL FLOW IS CARRIED WITHIN THE STREET 1/2 SECTION WHICH HAS A CAPACITY OF 38 CFS.					

SAG INLET CALCULATIONS (AP-5, EAST SIDE)

METHODOLOGY FROM U.S.D.O.T. FEDERAL HIGHWAY ADMINISTRATION URBAN HIGHWAY DRAINAGE MANUAL (HEC-22).

DOUBLE 'C' INLET, ASSUME FULL CURB DEPTH.

PER SECTION 4.4.5.4, INTERCEPTION CAPACITY OF A COMBINATION INLET (THROAT AND GRATE) IS ESSENTIALLY EQUAL TO THAT OF A GRATE ALONE IN WEIR FLOW.

$Q_i = C_W P d^{1.5}$ (EQ. 4-26)

$C_W = 3.0$

$P = 2 \text{ X } 25" + 80" = 130" = 10.83'$ (2 GRATES)

$d = 0.67$ FT

$Q_i = 17.8$ CFS

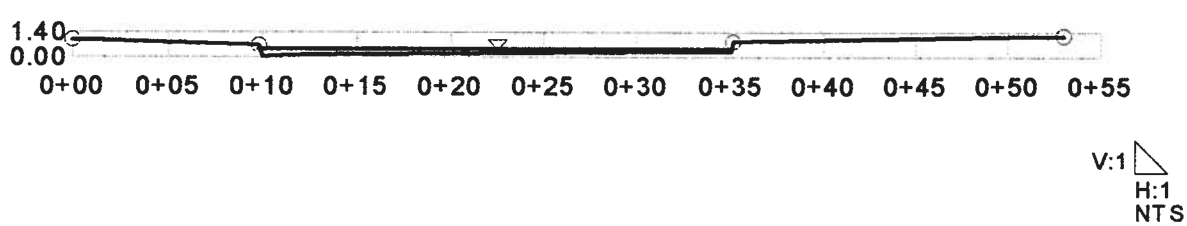
Irregular Report

Label	Mannings Coefficient	Slope (ft/ft)	Water Surface Elevation (ft)	Discharge (cfs)	Wetted Perimeter (ft)	Flow Area (ft^2)	Top Width (ft)	Actual Depth (ft)	Critical Elevation (ft)	Critical Slope (ft/ft)	Velocity (ft/s)	Specific Energy (ft)	Froude Number	Flow Type
Academy (AP-1) North1	0.017	0.017200	0.50	30.50	25.65	6.6	25.17	0.50	0.60	0.006133	4.63	0.83	1.60	Supercritical
Academy (AP-1) North2	0.017	0.017200	0.55	40.48	25.75	7.8	25.20	0.55	0.67	0.005797	5.18	0.97	1.64	Supercritical
Academy (AP-1) South1	0.017	0.017200	0.40	13.88	25.44	4.1	25.11	0.40	0.45	0.007219	3.39	0.58	1.48	Supercritical
Academy (AP-1) South2	0.017	0.017200	0.35	8.38	22.46	2.9	22.18	0.35	0.39	0.008035	2.91	0.48	1.43	Supercritical
San Mateo (AP-2)	0.017	0.003700	0.34	3.54	10.94	2.1	10.66	0.34	0.28	0.008375	1.71	0.38	0.68	Subcritical
San Mateo (AP-3)	0.017	0.003700	0.45	6.65	14.22	3.4	13.85	0.45	0.38	0.007701	1.98	0.51	0.71	Subcritical
San Mateo (AP-4)	0.017	0.003700	0.44	6.46	13.89	3.3	13.52	0.44	0.37	0.007735	1.97	0.50	0.71	Subcritical
San Mateo (AP-5)	0.022	0.008000	1.00	37.96	36.38	12.8	35.80	1.00	0.96	0.010527	2.97	1.14	0.88	Subcritical

Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Academy(AP-1)N1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

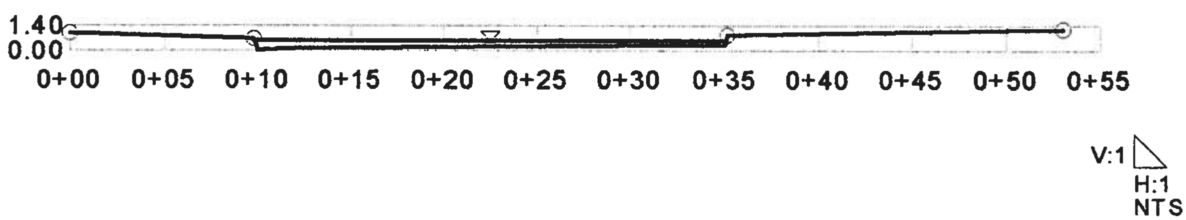
Section Data	
Mannings Coefficient	0.017
Slope	0.017200 ft/ft
Water Surface Elevation	0.50 ft
Elevation Range	0.00 to 1.24
Discharge	30.50 cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Academy(AP-1)N2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

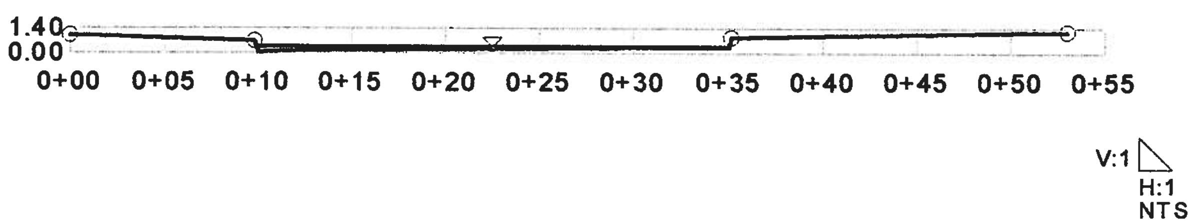
Section Data	
Mannings Coefficient	0.017
Slope	0.017200 ft/ft
Water Surface Elevation	0.55 ft
Elevation Range	0.00 to 1.24
Discharge	40.48 cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Academy(AP-1)S1
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

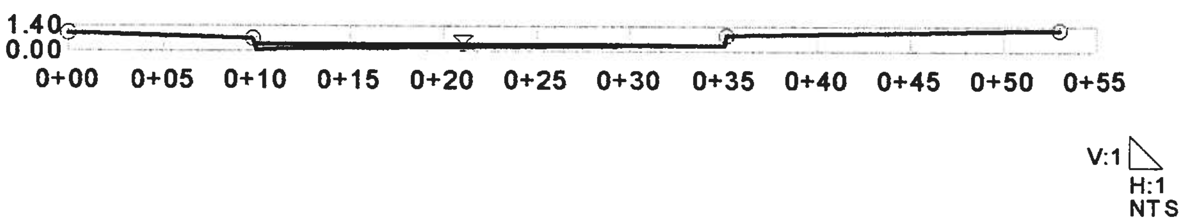
Section Data		
Mannings Coefficient	0.017	
Slope	0.017200	ft/ft
Water Surface Elevation	0.40	ft
Elevation Range	0.00 to 1.24	
Discharge	13.88	cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	Academy(AP-1)S2
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

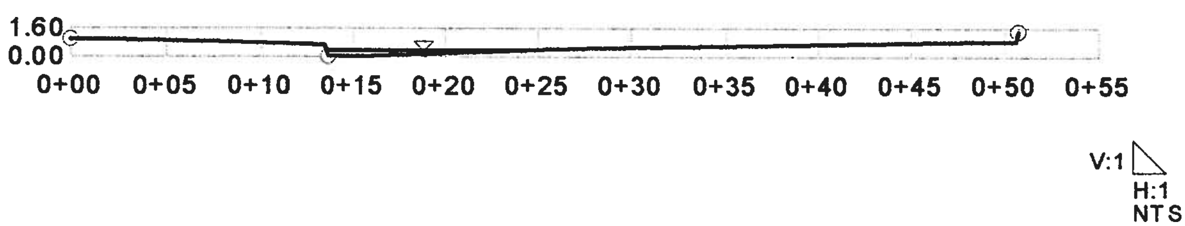
Section Data	
Mannings Coefficient	0.017
Slope	0.017200 ft/ft
Water Surface Elevation	0.35 ft
Elevation Range	0.00 to 1.24
Discharge	8.38 cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	San Mateo (AP-2)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

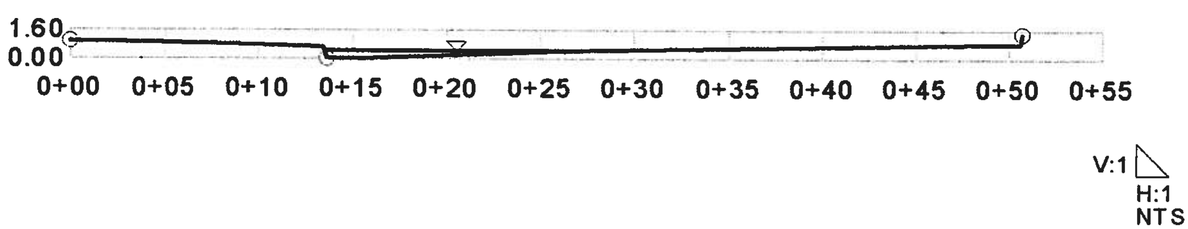
Section Data		
Mannings Coefficient	0.017	
Slope	0.003700	ft/ft
Water Surface Elevation	0.34	ft
Elevation Range	0.00 to 1.41	
Discharge	3.54	cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	San Mateo (AP-3)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

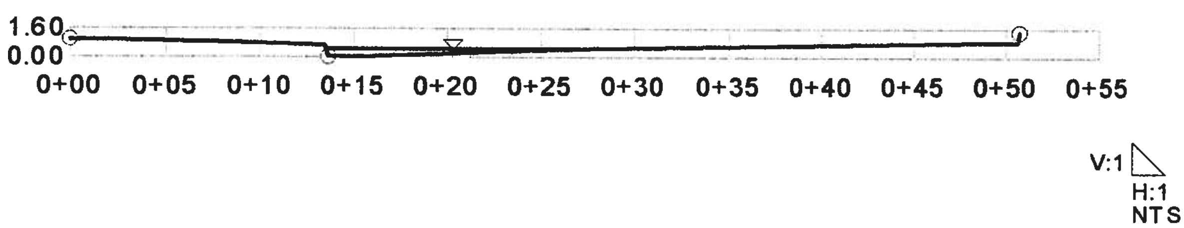
Section Data		
Mannings Coefficient	0.017	
Slope	0.003700	ft/ft
Water Surface Elevation	0.45	ft
Elevation Range	0.00 to 1.41	
Discharge	6.65	cfs



Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	San Mateo (AP-4)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Channel Depth

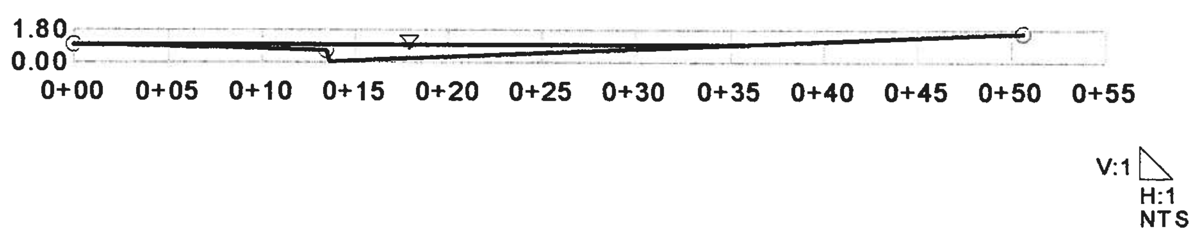
Section Data		
Mannings Coefficient	0.017	
Slope	0.003700	ft/ft
Water Surface Elevation	0.44	ft
Elevation Range	0.00 to 1.41	
Discharge	6.46	cfs



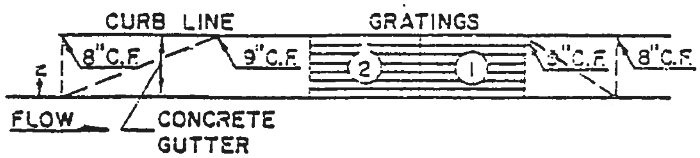
Cross Section
Cross Section for Irregular Channel

Project Description	
Worksheet	San Mateo (AP-5)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Discharge

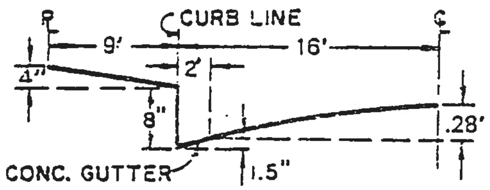
Section Data	
Mannings Coefficient	0.022
Slope	0.008000 ft/ft
Water Surface Elevation	1.00 ft
Elevation Range	0.00 to 1.64
Discharge	37.96 cfs



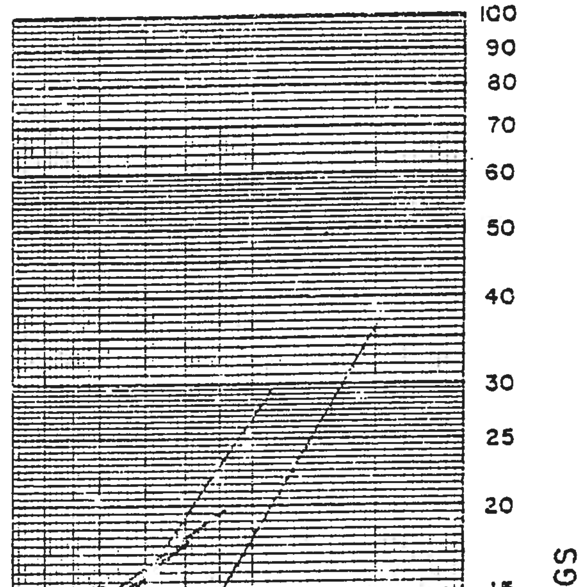
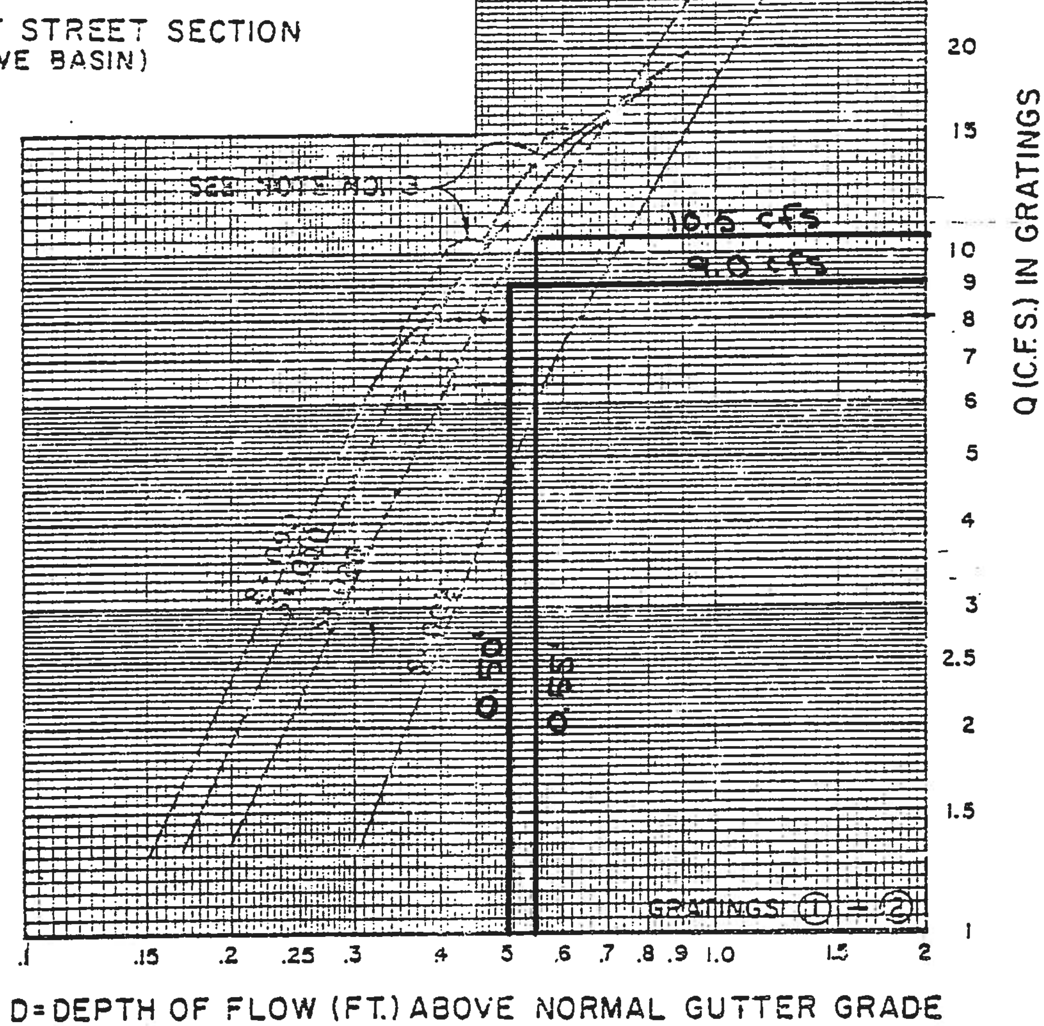
GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



GRATING & GUTTER PLAN

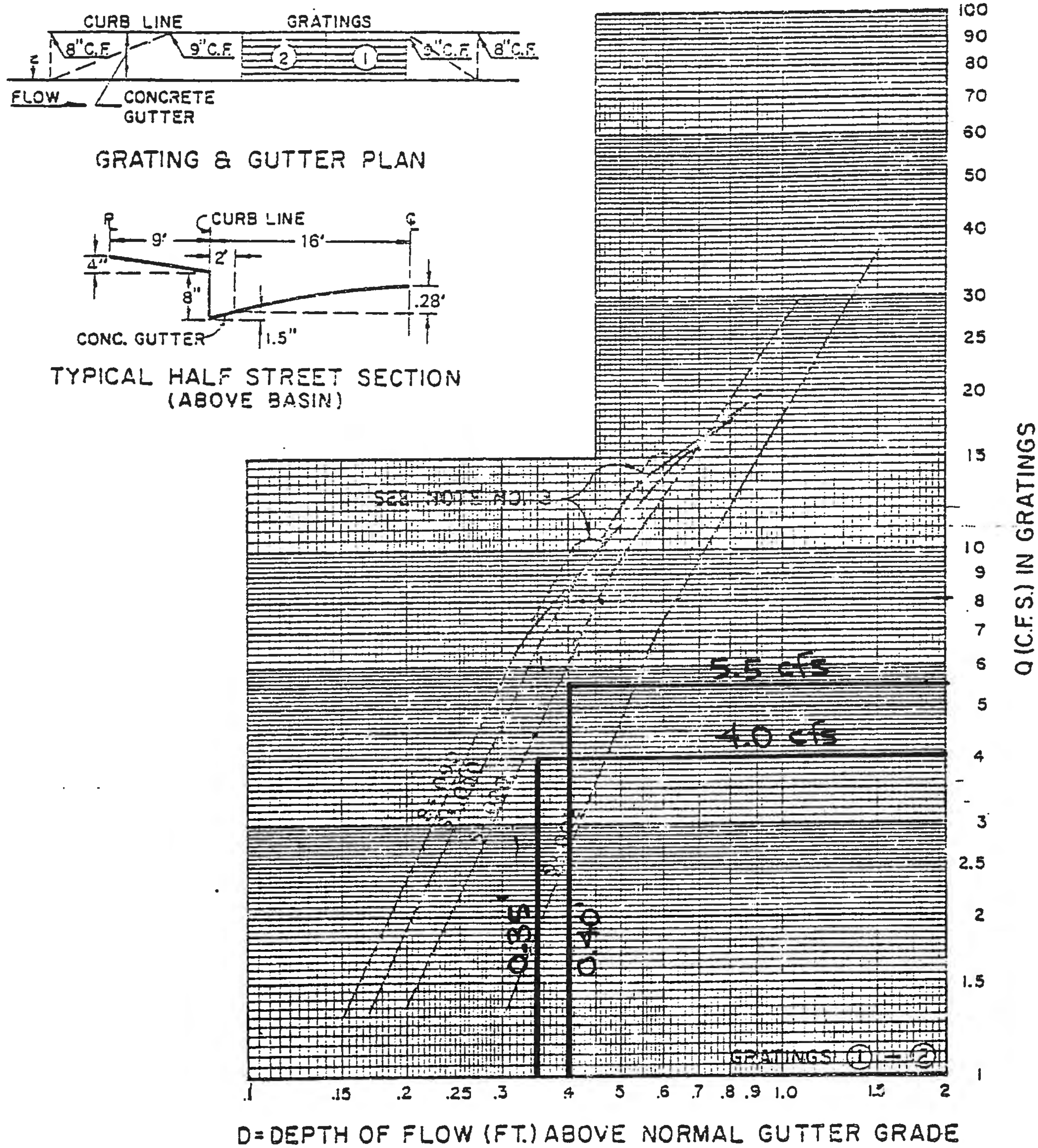


TYPICAL HALF STREET SECTION
(ABOVE BASIN)

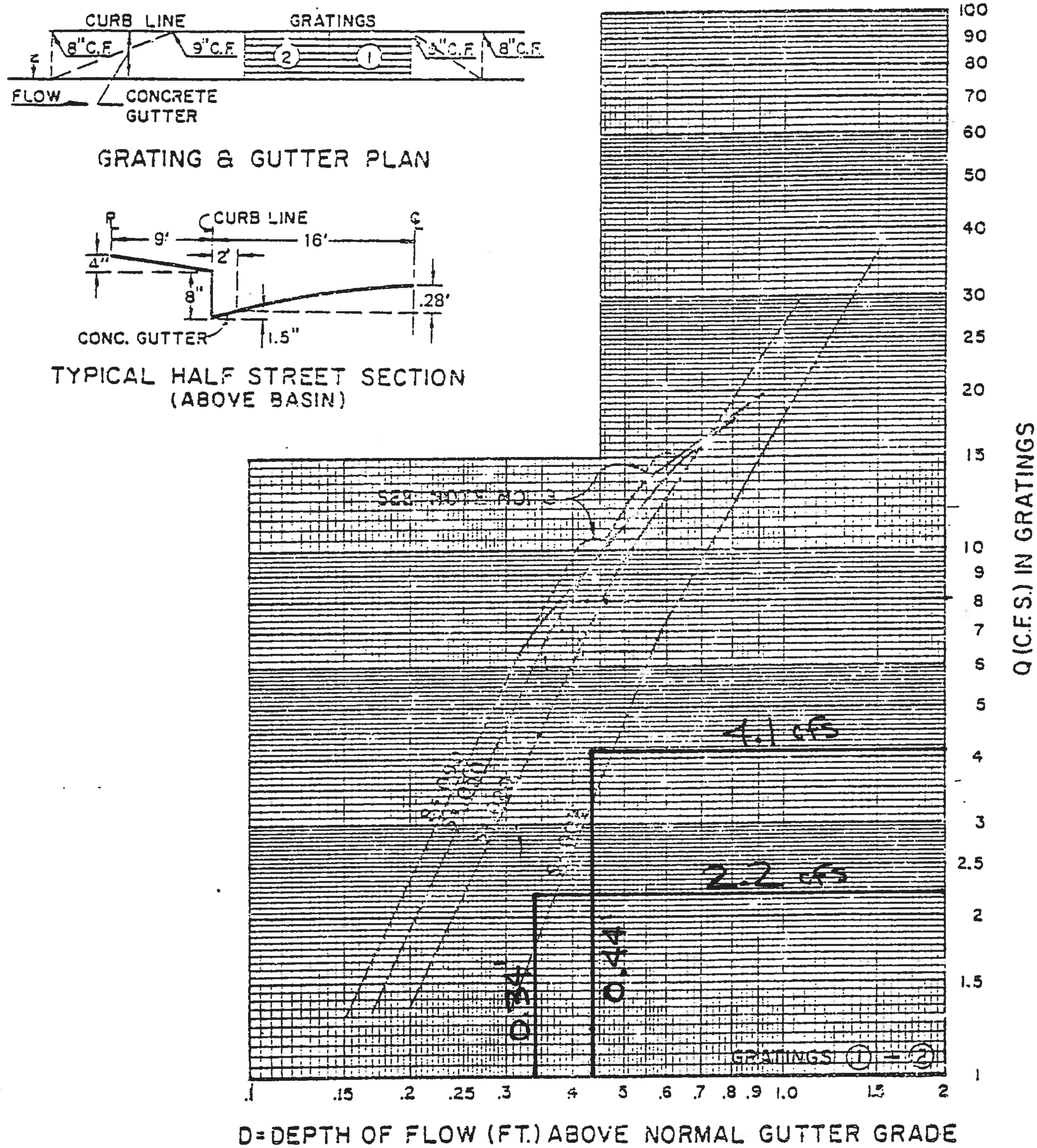
AP-1 (NORTH)

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"



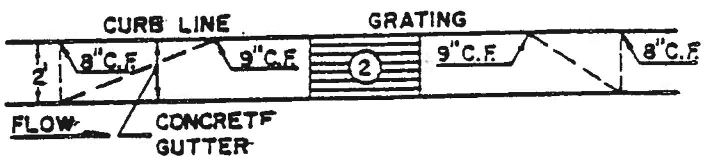
AP-1 (SOUTH)

GRATING CAPACITIES FOR TYPE DOUBLE "C," AND "D"

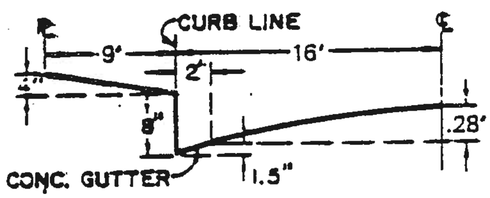


AP-2, AP-3

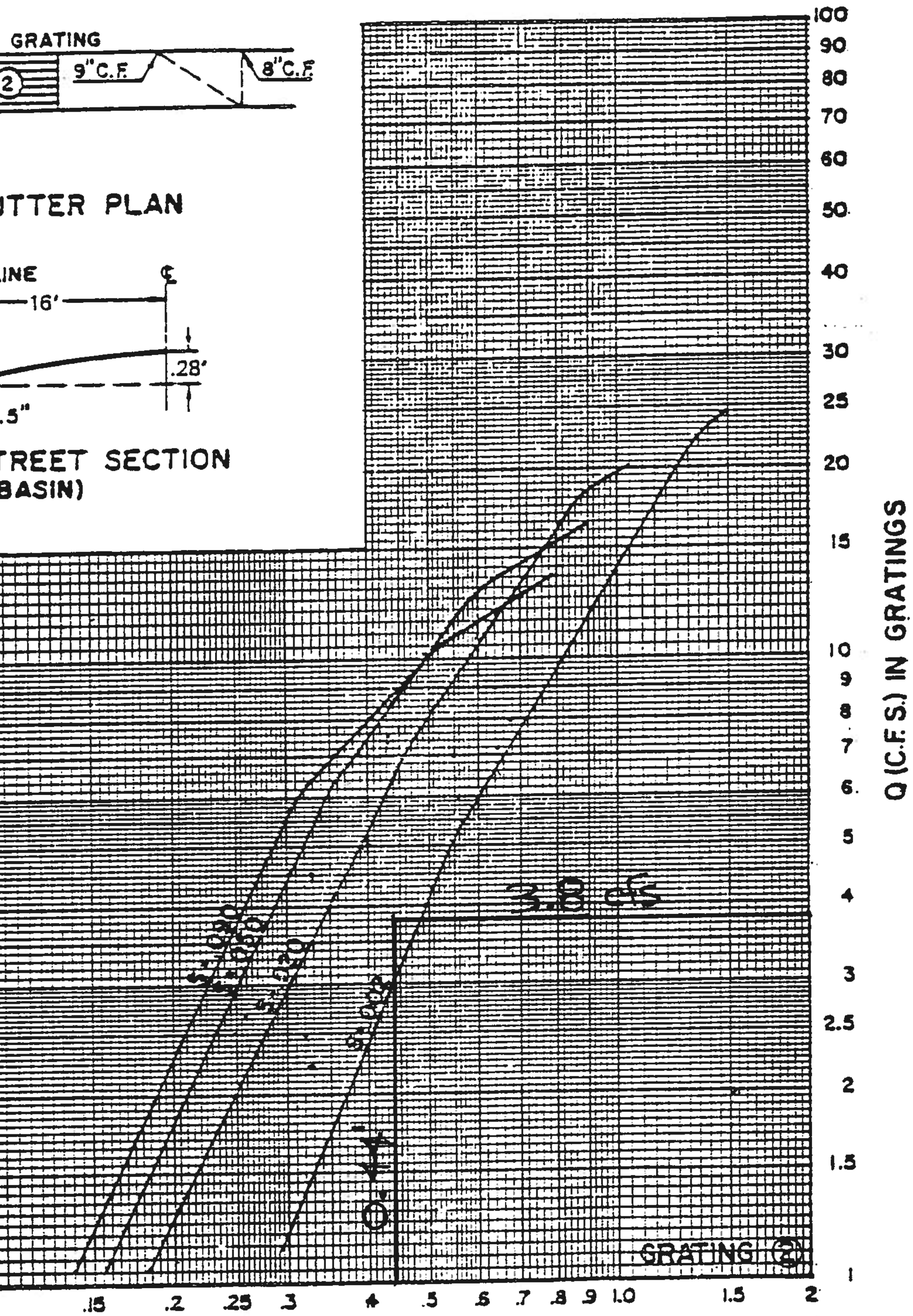
GRATING CAPACITIES FOR TYPE "A" , "C" and "D"



GRATING & GUTTER PLAN



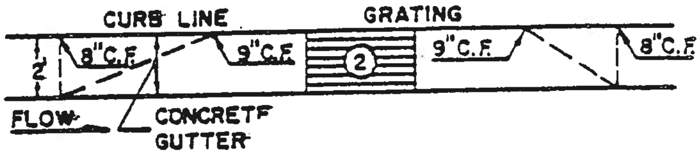
TYPICAL HALF STREET SECTION
(ABOVE BASIN)



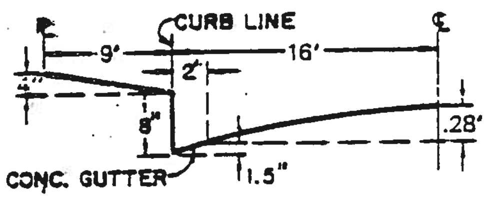
D=DEPTH OF FLOW (FT.) ABOVE NORMAL GUTTER GRADE

AP-4

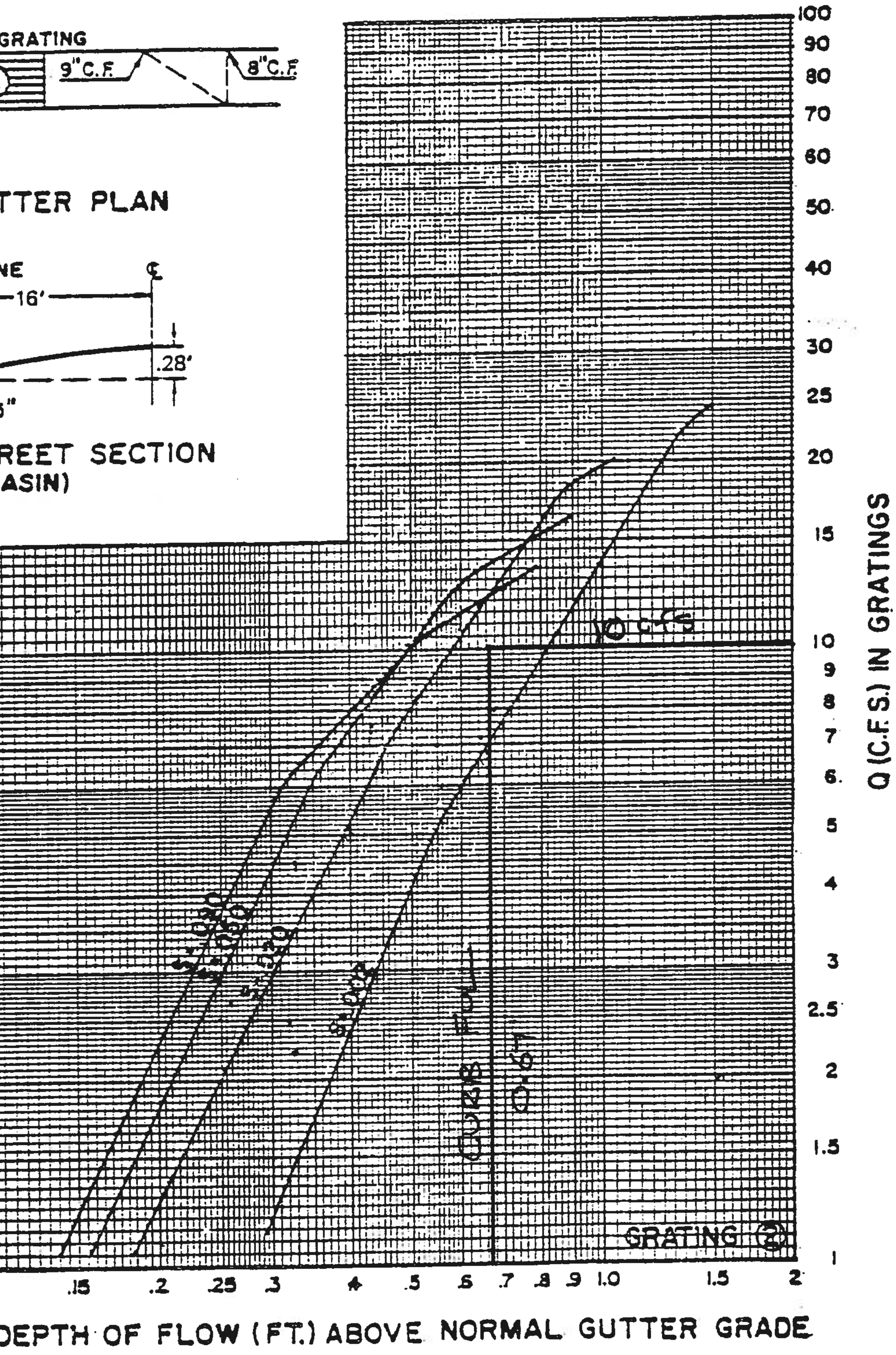
GRATING CAPACITIES FOR TYPE "A", "C" and "D"



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)



AP-5
(WEST)

30" PUBLIC STORM DRAIN CALCULATIONS

$Q_{100\ OFFSITE}$ = 27.8 CFS (FROM AHYMO)

$Q_{100\ ONSITE}$ (SUB-BASIN C-1)

A_T = 71,680 SF/1.65 AC
A_B = 0.17 AC (10%)
A_D = 1.49 AC (90%)

$Q_{100\ ONSITE}$ = (2.28)(0.17) + (4.70)(1.49) = 7.4 CFS

Q_{TOTAL} = 27.8 + 7.4 = 35.2 CFS

30" RCP, S = 0.0120, n = 0.013
v = 10.13 fps
d = 1.67'
F_r = 1.47 (supercritical)

Head Loss at MH #2 = Bend Loss + Manhole Loss (45° Bend)
$h_L = 0.05(v^2/2g) + K_b(v^2/2g)$ (DPM 22.3 B.2.D.4,5)
v = 10.13 fps, K_b = 0.15 (DPM Plate 22.3 B-3)
h_L = 0.32 ft

$v_1^2/2g = v_2^2/2g + h_L$
v_2 = 9.06 fps

Head Loss at MH #1 = Bend Loss + Manhole Loss (90° Bend)
$h_L = 0.05(v^2/2g) + K_b(v^2/2g)$
v = 9.06 fps, K_b = 0.20
h_L = 0.32 ft

Q_{MAX} = 48.33 CFS > Q_{100}

18" PRIVATE STORM DRAIN CALCULATIONS

Q_{100} = 7.4 CFS (SUB-BASIN C-1)

18" RCP, S = 0.0100, n = 0.013
v = 6.44 fps
d = 0.93'

Q_{MAX} = 11.3 CFS > Q_{100}

CULVERT RESERVOIR CALCULATIONS

30" CMP CULVERT INV @ 5184.34
S = 0.0293
Q_{CAP} = 38 CFS (MANNING'S NORMAL FLOW)

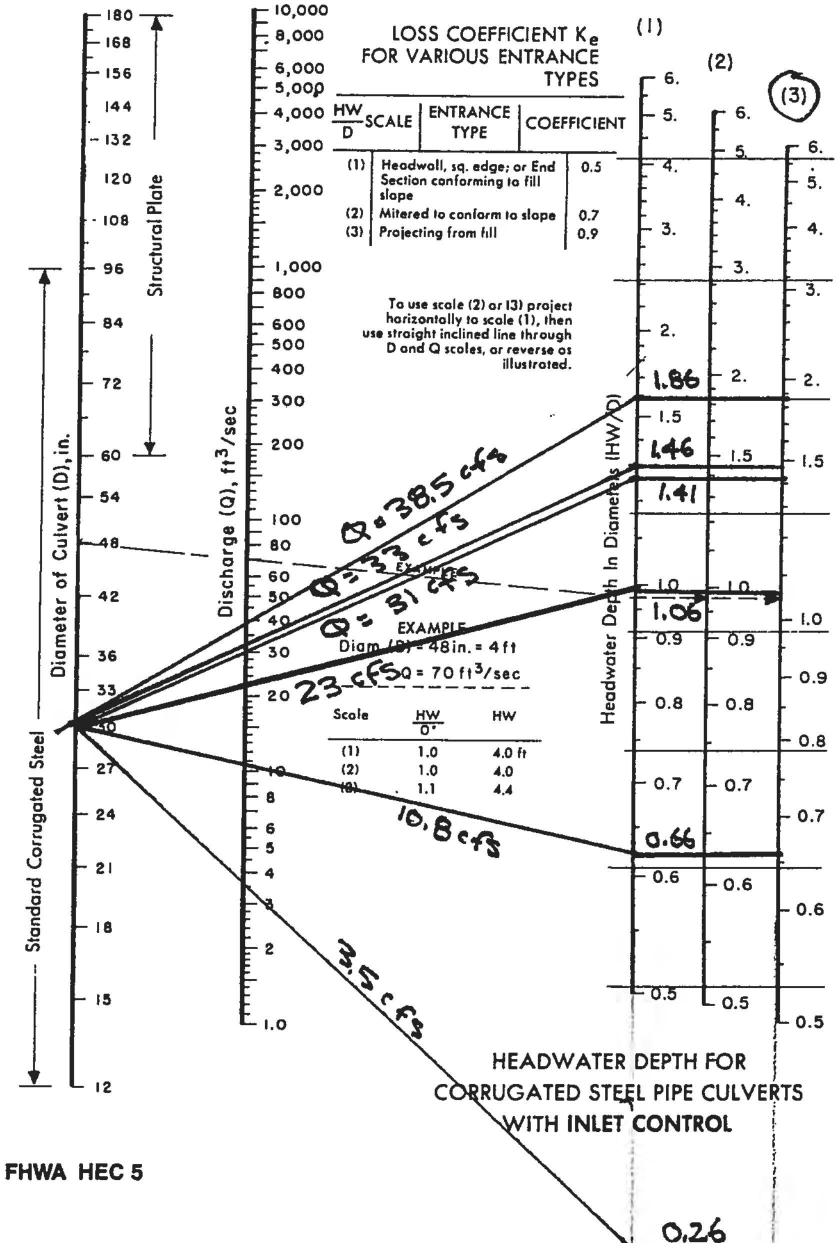
1. EXISTING CONDITIONS STORAGE/DISCHARGE TABLE

ELEVATION (FEET)	AREA (SF)	STORAGE VOLUME (CF)	HW/D	OUTFLOW* (CFS)
5185.0	54	18	0.26	3.5
5186.0	2,102	1,096	0.66	10.8
5187.0	7,993	6,144	1.06	23.0
5187.88	14,770	17,526	1.41	31.0

2. PROPOSED CONDITIONS STORAGE/DISCHARGE TABLE

ELEVATION (FEET)	AREA (SF)	STORAGE VOLUME (CF)	HW/D	OUTFLOW* (CFS)
5185.0	54	18	0.26	3.5
5186.0	2,102	1,096	0.66	10.8
5187.0	6,680	5,487	1.06	23.0
5188.0	12,025	14,840	1.46	33.0
5189.0	20,100	30,903	1.86	38.5

* SEE CULVERT NOMOGRAPH ON FOLLOWING PAGE



Scale	HW/D	HW
(1)	1.0	4.0 ft
(2)	1.0	4.0
(3)	1.1	4.4

FHWA HEC 5

Figure 4-28 *Inlet control* nomograph for corrugated steel *pipe* culverts. The manufacturers recommended keeping *HW/D* to a maximum of 1.5 and preferably to no more than 1.0.

BASIN B EXISTING POND VOLUME CALCULATIONS

ELEVATION (FEET)	AREA (SF)	VOL (CF)	Σ VOLUME (CF)
5180	22		
		760	760
5181	1,497		
		2,864	3,624
5182	4,231		
		5,070	8,694
5183	5,909		
		6,896	15,589
5184	7,882		
		9,533	25,122
5185	11,184		
		18,662	43,784
5186	26,140		
		33,823	77,607
5187	41,506		

DESIGN VOLUME = 46,170 CF @ 5186.1 (E17/D10)

□(s16.66H□□□□□□□□□□□

AHYMO SUMMARY TABLE (AHYMO194) - AMAFCA Hydrologic Model - January, 1994 RUN DATE (MON/DAY/YR) =06/13/2000

INPUT FILE = wtrblk.inp USER NO.= J_MORTEN.I01

PAGE = 1

COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
START										TIME= .00
RAINFALL TYPE= 1										RAIN6= 2.450
COMPUTE NM HYD	BSN.A-1	-	1	.01451	30.01	1.324	1.71106	1.580	3.231	PER IMP= 59.00
COMPUTE NM HYD	BSN.A-2	-	2	.00321	9.49	.358	2.08911	1.500	4.617	PER IMP= 90.00
COMPUTE NM HYD	BSN.A-3	-	3	.00490	13.88	.511	1.95462	1.500	4.425	PER IMP= 75.00
COMPUTE NM HYD	BSN.A-4	-	6	.00490	13.88	.511	1.95462	1.500	4.425	PER IMP= 75.00
ROUTE	BSN.A-1.RT1	1	4	.01451	24.79	1.324	1.71106	1.660	2.670	
ROUTE	BSN.A-2.RT1	2	5	.00321	7.90	.358	2.08911	1.560	3.846	
ADD HYD	TEMP.SUM	4& 5	1	.01772	31.52	1.682	1.77948	1.640	2.780	
ADD HYD	BSN.A.NORTH.	1& 3	1	.02262	40.48	2.193	1.81741	1.600	2.796	
DIVIDE HYD	PIPE.AWAY	1	2	.01750	19.50	1.696	1.81741	1.460	1.741	
	BSN.A.NORTH.	AND	3	.00512	20.98	.496	1.81741	1.600	6.403	
DIVIDE HYD	PIPE	6	20	.00452	9.50	.471	1.95456	1.440	3.286	
	BSN.A-4.DIV1	AND	7	.00038	4.38	.040	1.95457	1.500	17.857	
ADD HYD	BSN.A.AP-1	3& 7	3	.00550	21.99	.536	1.82695	1.560	6.246	
COMPUTE NM HYD	BSN.SM-1	-	2	.00592	17.71	.669	2.11874	1.500	4.673	PER IMP= 91.00
DIVIDE HYD	BSN.SM-1.EAS	2	1	.00296	8.85	.334	2.11869	1.500	4.673	
	BSN.SM-1.WES	AND	4	.00296	8.85	.334	2.11869	1.500	4.673	
DIVIDE HYD	BSN.SM-1.EAS	1	2	.00118	3.54	.134	2.11864	1.500	4.673	
	BSN.SM-1.EAS	AND	5	.00178	5.31	.201	2.11864	1.500	4.673	
DIVIDE HYD	PIPE.AWAY	2	20	.00106	2.20	.120	2.11846	1.420	3.233	
	BSN.SM-1.EAS	AND	1	.00012	1.34	.014	2.11846	1.500	17.372	
ADD HYD	BSN.SM-1.EAS	1& 5	2	.00190	6.65	.214	2.11856	1.500	5.481	
DIVIDE HYD	PIPE	2	20	.00170	4.10	.193	2.11856	1.440	3.757	
	BSN.SM-1.EAS	AND	1	.00019	2.55	.022	2.11856	1.500	20.811	
DIVIDE HYD	BSN.SM-1.WES	4	2	.00216	6.46	.244	2.11864	1.500	4.673	
	BSN.SM-1.WES	AND	5	.00080	2.39	.090	2.11864	1.500	4.673	
DIVIDE HYD	PIPE	2	20	.00191	3.80	.215	2.11860	1.420	3.115	
	BSN.SM-1.WES	AND	4	.00025	2.66	.029	2.11860	1.500	16.332	
ADD HYD	SM-1.WEST.NE	4& 5	2	.00105	5.05	.119	2.11840	1.500	7.491	
ADD HYD	BSN.SM-1	1& 2	2	.00125	7.61	.141	2.11842	1.500	9.541	
ADD HYD	AP-1.TOTAL	2& 3	1	.00675	27.99	.677	1.88076	1.540	6.482	
COMPUTE NM HYD	BSN.SM-2	-	2	.00463	13.55	.512	2.07293	1.500	4.572	PER IMP= 90.00
ROUTE	AP-1.RT1	1	3	.00675	21.92	.677	1.88080	1.620	5.076	
ADD HYD	STREET.SM-2	2& 3	1	.01138	31.75	1.189	1.95893	1.580	4.361	
COMPUTE NM HYD	BSN.SM-3	-	2	.01147	33.54	1.268	2.07293	1.500	4.569	PER IMP= 90.00
DIVIDE HYD	SM-3.DIV1	2	3	.00918	26.83	1.014	2.07291	1.500	4.569	
	FLOW.AWAY	AND	20	.00229	6.71	.254	2.07291	1.500	4.569	
ADD HYD	PC.SM-2.TOTA	3& 1	1	.02055	55.01	2.203	2.00981	1.540	4.182	
ROUTE	PC.SM-4.RT1	1	3	.02055	50.34	2.203	2.00983	1.600	3.827	
COMPUTE NM HYD	BSN.SM-4	-	2	.00269	8.06	.304	2.11874	1.500	4.680	PER IMP= 91.00
ADD HYD	PC.BSN.SM-4	1& 2	1	.02324	62.67	2.507	2.02241	1.540	4.213	
DIVIDE HYD	SM-4.DBLC	1	2	.01347	17.80	1.452	2.02241	1.360	2.065	
	SM-4.SFC.DIV	AND	3	.00978	44.87	1.055	2.02241	1.540	7.171	
DIVIDE HYD	SM-4.SGLC	3	4	.00391	10.00	.421	2.02241	1.420	4.000	
	SM-4.SFC.DIV	AND	1	.00587	34.87	.633	2.02241	1.540	9.281	
ADD HYD	SM-4.INLET	2& 4	2	.01737	27.80	1.874	2.02241	1.420	2.500	
DIVIDE HYD	SM-4.STREET	1	3	.00587	34.87	.633	2.02241	1.540	9.281	
	OVERTOP.FLOW	AND	4	.00000	.00	.000	.00000	-.020	.000	
ADD HYD	OFFSITE.FLOW	2& 4	1	.01737	27.80	1.874	2.02241	1.420	2.500	
ROUTE	OFFSITE.RT1	1	7	.01737	27.82	1.874	2.02242	1.440	2.502	
ROUTE	SM-4.STREET.	3	2	.00587	34.41	.633	2.02293	1.560	9.158	
DIVIDE HYD	SM-4.TOT.DIV	2	3	.00194	11.36	.209	2.02289	1.560	9.158	
	STREET.AWAY	AND	20	.00393	23.06	.424	2.02289	1.560	9.158	
ROUTE	SM-4.STREET.	3	2	.00194	10.05	.209	2.02297	1.600	8.104	
COMPUTE NM HYD	BSN.FR-1	-	3	.00236	6.34	.231	1.83852	1.520	4.195	PER IMP= 71.00

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COMMAND	HYDROGRAPH IDENTIFICATION	FROM ID NO.	TO ID NO.	AREA (SQ MI)	PEAK DISCHARGE (CFS)	RUNOFF VOLUME (AC-FT)	RUNOFF (INCHES)	TIME TO PEAK (HOURS)	CFS PER ACRE	NOTATION
ADD HYD	FR.TOTAL.OFF	2& 3	2	.00430	15.02	.440	1.92154	1.580	5.462	
COMPUTE NM HYD	BSN.B	-	3	.01140	32.17	1.196	1.96716	1.500	4.410	PER IMP= 80.00
DIVIDE HYD	PUMP.OUT	3	5	.00131	.50	.138	1.96713	1.180	.595	
	BSN.B.DIV1	AND	6	.01009	31.67	1.058	1.96713	1.500	4.906	
COMPUTE NM HYD	BSN.C	-	4	.00384	10.85	.403	1.96716	1.500	4.415	PER IMP= 80.00
ADD HYD	ONSITE.TO.CU	4& 5	1	.00515	11.35	.541	1.96710	1.500	3.442	
ADD HYD	ONSITE.AND.S	1& 7	1	.02253	39.15	2.414	2.00976	1.500	2.716	
ADD HYD	TTL.TO.CULV	2& 1	1	.02682	52.67	2.855	1.99562	1.560	3.068	
ROUTE RESERVOIR	PC.BSN.C.RES	1	2	.02682	35.98	2.855	1.99562	1.840	2.096	AC-FT= .540
FINISH										

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