CITY OF PHILOMATH
Storm Drainage System Master Plan

Section 5
ALTERNATIVES AND EVALUATION

SECTION 5
SYSTEM EVALUATION AND RECOMMENDED IMPROVEMENTS

5.1 Project Approach Alternatives

Four basic conceptual approaches to stormwater management were considered for application within the City of Philomath: (1) no action; (2) upgrade the existing system to provide capacity; (3) provide regional detention in upper basins; or (4) reroute stormwater between basins. These basic approaches may be implemented singly or in combination to manage present and anticipated future stormwater flows.

a. No Action

The no action approach implies that no improvements to the existing drainage system (excluding maintenance or repairs). Obviously, this approach is recommended for those areas of the system which have sufficient capacity to convey the design flows and are in acceptable condition. Although this approach may be justified in isolated areas within the system on a case-by-case basis where there is insufficient capacity to convey design flows, this approach was effectively eliminated by the City Council as a system-wide policy based on the parameters specified for this storm drain master plan.

Although it is always an option to not improve the system, the result is continued damages and inconveniences where drainage facilities are inadequate or nonexistent. However, to ensure that system improvements are justified, it is necessary to consider the costs and advantages of proposed improvements against the risks entailed by the no action alternative. It should be noted that since resources are limited and the storm system cannot be upgraded all at one time, the phasing plan adopted by the City for the improvements will in effect require that the no action alternative be adopted <u>on a temporary basis</u> for all but the first phase improvements.

It should be noted that since the detailed hydraulic analysis of the system was limited to the trunk storm collection system, the recommendations do not encompass the minor or local portions of the storm drainage system unless there have been reported problems in these areas.

b. Upgrade Existing System

This approach involves constructing replacement or parallel pipes and upgrading existing ditches to provide adequate capacity for the design flow. Upgrading existing ditches may consist of vegetation and debris removal, regrading, shaping, channel enlargement or replacement with a piped system. This is often the most obvious alternative since it provides the greatest assurance that the storm drainage system can convey the design flows through town and that overflows will be kept to a minimum, which in turn limits the City's liability.

c. Regional Detention

The concept of regional detention is straight forward. It involves construction of a basin to store excess upstream runoff that would cause flooding problems downstream. This excess water is released later at a rate the downstream drainage structures are capable of handling. The rate of release from the detention site may be based on the capacity of existing downstream drainage structures. Alternatively, the rate of flow release may be a reduction to a lesser design storm flow (ie. the system design storm may have a 10-year recurrence interval, and the detention facility outlet may be sized to release only 5-year storm flows).

An underlying concept relating to detention facilities which must be understood is that when a storm larger than that used to size the detention facility is experienced, or when the outlet orifice is blocked by debris, the downstream system will experience flowrates similar to undetained flowrates. This is the reason that the proposed PWDS recommend that all detention facilities designate an overflow route downstream of detention facilities which will minimize impacts to downstream properties. Since any regional detention facility would by necessity be located in the upper portions of the drainage basins, any overflows or failure of the system could result in flooding all the way through town.

Conversations and meetings with City Public Works personnel raised another issue of concern relating to regional detention facilities. The Mary's River flood plain extends a significant distance into the City (see flood maps, Appendix B). Once the water level rises to the point that it backs up into the storm drainage pipes along Applegate Street, the capacity of the outfall pipes is reduced significantly, and water overflows out of the system along Applegate and Main Street. Under these conditions, the system is no longer limited by the capacity of the pipes, but by the lack of hydraulic grade necessary to move water through the pipes. Due to this characteristic of the system, the expressed preference of Public Works is to move the storm runoff out of town as efficiently as possible prior to the rise of the Mary's River. Metering flows out of a regional detention facility will tend to extend the duration of flows and increase the likelihood of overflows due to high water levels in the river. Obviously, long term intense storm such as those experienced during February or November of 1996 resulted in high runoff while the river levels were high. However, this would be the case with or without regional detention.

Due to wetland, topographic and floodplain constraints, the City staff indicated early on in the process of preparing this storm drainage study that regional detention was not an preferred alternative. Examination of the system and major storm channel/pipe routing supports this conclusion.

Even if regional detention is not feasible, the City should continue with current policy of requiring on-site detention facilities for all developments for which there is inadequate downstream capacity to carry design flows. On-site detention may be accomplished using small detention ponds, underground pipe storage, or parking lot detention.

d. Reroute Stormwater

Under this scenario, stormwater would be diverted or rerouted from one drainage basin or system to another. This approach is practical in cases where an existing storm channel has capacity far in excess of that needed to convey design flows and stormwater diversion is practical from a construction and topographic standpoint. However, the storm drainage systems in the City of Philomath which have some excess capacity are those to which it is not feasible or possible to divert flows to (ie. due to topographic constraints).

Although stormwater diversion may be practical at the local level on a case-by-case basis, topographic constraints and capacity limitations effectively eliminate it from consideration on a basin-wide basis. Additionally, analysis of effect of such diversion on the floodplain levels in the major stream channels is outside the scope of this study.

5.2 Recommended Improvements

Based on the results of the hydrologic and hydraulic analysis discussed in the previous chapter, a number of basins were determined to have pipes or other drainage facilities which do not provide adequate capacity for runoff generated from a design storm under either existing conditions or conditions anticipated at buildout.

The City's goal is to develop a storm drainage system which not only meets existing needs, but which accommodates future development. The types of projects considered to accomplish this goal include, but are not limited to, the following.

- Replace damaged or deteriorated structures which no longer function as designed
- Reconstruct or replace under-capacity culverts and ditches
- Replace or supplement under-capacity storm drain pipes
- Construct new storm drain pipes and/or ditches as required
- Preserve natural drainages and floodplains

Based on the anticipated stormwater flows based on the existing zoning within the UGB, we recommend that the City establish a formal Capital Improvement Program to replace and/or upgrade the major storm drain lines in the existing system to provide capacity to convey the design flows under fully developed conditions. It is recommended that the City implement a program of phased construction of these improvements as funding becomes available.

In total, 18 projects are recommended for inclusion in the City's Storm Drainage Capital Improvements Plan (Priority 1 & 2 projects). These included replacement of culverts under road crossings, reconstruction or replacement of segments of storm drain pipe, and reconstruction of open channels. Since the scope of the detailed modeling provided under this study is limited to the major trunk lines in the storm drainage system, projects to provide additional capacity for a local system are not included unless a reported problem exists in that area. Replacement of private driveway culverts is not included in the scope of this summary unless required as part of upgrading a major storm system.

A conceptual design was developed for each major improvement project to determine the approximate size and features needed to convey the design flows. As part of this process, alternatives such as alignment, feasibility of reusing existing portions of the system, opportunities for upstream detention were identified and evaluated. This involved evaluation of topographic opportunities, available vacant lands, and natural resource constraints with field reconnaissance to confirm the conceptual-level feasibility of each alternative.

Note: City review of the final draft master plan should include a discussion of the feasibility of the proposed improvements to ensure that local conditions of which we are not aware do not conflict with the recommendations.

The improvements described below and shown in **Table 5-1** will result in a storm drainage trunk system with the capacity needed to convey flows from within the planning area assuming development to zoning densities shown. This layout is intended to minimize the amount of new piping which must be installed, as well as to minimize the unnecessary replacement of existing storm drain mainlines.

The proposed trunk drainage system improvements largely follow existing street right-of-ways through the community, or along existing drainage alignments. As such, the alternative alignments are limited. The notable exception is the proposed new trunk line in Basin 13 from the railroad to Applegate Street, which has two possible alignments as outlined below.

The alignment of future lines through the undeveloped land along the east and north sides of town has not yet been determined. The final alignment of storm lines in these areas should be determined as property develops, but should be placed within right-of-ways whenever possible. If the UGB is to be expanded in the future, the storm system should be re-examined to determine where additions are needed and if alternate alignments are justified.

As additional development occurs within the City, it is recommended that the City acquire easements (and maintenance accessways) along the existing drainages or have them replaced with piped systems as appropriate.

a. Basin 6

This basin drains approximately 130 acres on the west side of Philomath. Future land use is comprised primarily of low density residential zoning with a smaller amount of medium density residential lands. The basin is relatively steep in the upper portions and the existing system has adequate grade to convey design storm flows. Criteria for storm frequencies suggest application of the 25-year storm for trunk lines (18-inch pipe and larger). At the downstream end of the basin however, there is deficient capacity at the 24-inch concrete culvert crossing Southern Pacific Railroad, for future buildout land use conditions. In addition, the downstream 24-inch concrete storm drainage pipe system parallel to and crossing Highway 20 is undersized for buildout. Projected future storm flows vary from 10% to 50% over existing capacity.

It is recommended that a parallel storm line be constructed to allow for to the continued use of the existing 24-inch concrete storm pipes. It is assumed that the improvements will include a bore under both the railroad and the highway.

Although the segment between the railroad and the highway is currently in a ditch, it is recommended that the ditch be replaced with a piped system as the land in this basin develops.

b. Basin 9

This basin drains approximately 80 acres in the 9th Street area on the west side of Philomath. The middle portion of the basin is relatively flat with a mix of medium and high density residential zoning, as well as some portions of light industrial. Criteria for storm frequencies suggest application of the 25-year storm for trunk lines (18-inch pipe and larger). Estimated future design flows exceed existing capacity of the piped system by a relatively small amount. Therefor, no capital improvements are recommended for the piped system in this basin.

The major problem in Basin 9 relates to the existing ditch south of Applegate Street, which lack capacity to pass existing peak flows, resulting in backups into Applegate Street. The location of this ditch south of the Water Treatment Plant effectively precludes the City from cleaning and maintaining this ditch, since tracked equipment would be required to access the area. It is our understanding that the City has been exploring the option of installing a road or path south along the 9th Street right-of-way to provide an alternate access to the Mary's River Park. It is recommended that a new drainage ditch be constructed south along the 9th Street alignment west of the existing wetlands and along the proposed road alignment.

c. Basin 13

Basin 13 drains approximately 240 acres and outfalls along 13th Street. Currently much of the upper portion of the basin is undeveloped, but is expected to develop with a mix of low, medium, and high density residential. The existing capacity problems along 12th Street, coupled with the inaccessibility and failure of the ditch between 12th & 13th Street north of Pioneer Street, a new system is needed to provide additional capacity. Criteria for storm frequencies suggest application of the 25-year storm for trunk lines (18-inch pipe and larger). For purposes of discussion and presentation, the improvements to this portion of the system are broken into three segments as follows: North of Pioneer Street, between Pioneer Street and Applegate Street, and south of Applegate Street.

North of Pioneer Street. North of Pioneer Street, a new trunk storm line is recommended along 12th Street. This line should be designed to collect not only the flows from Basins

1304 through 1306 (west of 12th Street), but should also be deep enough to intercept the flows from the ditch between 12th & 13th Street. Based on design flows and assumed slopes, it appears that a 36-inch pipe is required from Pioneer to Grant Street, with a 30-inch pipe from Grant to Madison Street. 15-inch pipes are proposed from the existing ditch east of 12th to the new storm line at Lincoln, Grant, Monroe and Madison Streets.

Pioneer Street to Applegate Street. There are two possible alignments south of Pioneer Street. The first possible alignment is along the existing 30-inch line, while the second is along 12th Street to Applegate, and thence east to 13th Street. The existing 30-inch storm line generally follows the alignment of the alley between 12th and 13th Street. To the best of our knowledge, the City does not have any additional easements for the portions of this line which are outside of the public right-of-way. Since the existing storm line appears to wander back and forth across the alley and cross private property, there does not appear to be adequate room to construct a parallel line without the acquisition of significant new easements. Therefor, it is recommended that a new 36-inch pipe be constructed along 12th Street from Pioneer Street to the intersection of 13th and Applegate Street. This line will be in addition to and will not replace the existing 30-inch storm line. The improvements will include a bore under both the railroad and the highway.

South of Applegate Street. It is recommended that the existing 30-inch pipe along 13th Street remain in service. However, a parallel 36-inch pipe must be constructed to provide capacity for the design flows. It is recommended that a new 48-inch pipe be constructed south of the end of the existing 30-inch pipe to the Mary's River. It is recommended that the new pipe extend along 13th Street to a point ±400 feet south of Chapel Drive, and then run southeast to the Mary's River. An easement would need to be acquired across private property prior to construction of this line.

d. Basin 15

Basin 15 drains a relatively small area of approximately 100 acres and outfalls along 15th Street. Currently much of the upper portion of the basin is developed. It appears that some of the flooding problems along 15th Street are due to the backwater effect from the 13th Street drainage which ends up at the intersection of 15th Street and Chapel Drive. The improvements summarized for Basin 13 above (south of Applegate Street) will have the effect of providing additional capacity for the Basin 15 flows along and downstream of Chapel Drive. The existing drainage problems along 15th Street appear to be limited to the area around Willow Lane and Cooper Lane. It is anticipated that cleaning and/or reconstruction of the ditches downstream of this point will alleviate much of the problem. A new piped system sized for design flows should be installed in the future when 15th Street is improved.

e. Newton Creek Basin

This basin drains approximately 1800 acres north of Chapel Drive, and is the largest open natural drainageway in the Philomath area. The creek was analyzed as part of the City of Philomath Flood Insurance Study and a floodplain has been defined from the confluence with the Mary's River upstream to West Hills Road (approximately 2.4 stream miles, see Appendix B).

Principal areas of concern are at the Highway 20 crossing of Newton Creek and a smaller tributary immediately to the east of the main channel (Basin NC 24). The tributary drains approximately 600 acres north of Highway 20. The drainage enters a 24-inch culvert across the highway which ties into a 21-inch closed pipe storm drainage system south of Highway 20 and along Green Street. Criteria for storm frequencies suggest application of the 50-year storm for minor creeks and drainageways. The entire pipe storm drainage system is extremely undersized for a 50-year storm event. It is suggested that a new diversion channel be constructed along the north side of Highway 20 to divert high flows west to Newton Creek and away from the existing 21-inch system. If Highway 20 is improved as was previously proposed by ODOT, the overflow channel should be piped. The design elevation of the overflow channel or pipe shall be set to limit the head (water level) over the highway crossing culvert, and should be based on the capacity of the downstream 21-inch pipe with Newton Creek at 50 year flood levels. Because this work involves a FEMA floodplain, a more detailed analysis of potential impacts on the main channel should be undertaken in conjunction with the design of these improvements.

f. East Newton Creek Basin

This basin drains approximately 390 acres on the east side of Philomath, and East Newton Creek joins with Newton Creek downstream of Chapel Drive. Future land use is comprised primarily of light residential zoning. Four culvert crossings of East Newton Creek were considered for hydraulic analysis. The crossings occur at Highway 20, James Street, Applegate Street and approximately midway between James and Applegate Streets. Criteria for storm frequencies suggest application of the 50-year storm for minor creeks and drainageways. At buildout land use according to zoning, each of the crossings should be improved with an additional culvert of similar size in order to effectively convey the 50-year design storm peak flow. In addition, the existing ditch between James Street and Applegate Street (through the City Park) has overgrown and filled in, significantly reducing capacity. This ditch should be excavated out to provide capacity for design flows in conjunction with the culvert replacement.

In addition to East Newton Creek through the park, there are three reported local problem areas within this basin due to the lack of catch basins at low points in the intersection of Applegate and 27th, 28th, and 29th Place. Catch basins and storm pipes should be installed to drain these intersections to avoid premature failure of the road.

g. Southwood Basin

The Southwood Basin drains approximately 40 acres and outfalls to the Southwood Ditch and Chapel Drive. Currently much of the upper portion of the basin is developed. The only recommended improvements within this basin are those required to correct reported problems.

h. Bell Fountain Basin

The Bell Fountain Basin drains approximately 56 acres and outfalls to the intersection of Bell Fountain Road and Chapel Drive. Currently much of the upper portion of the basin is developed. The only recommended improvements within this basin are those required to correct reported problems.

TABLE 5-1
RECOMMENDED MAJOR STORM DRAINAGE IMPROVEMENTS

Sub-Basin	Location	Map Quad	Existing Facility	Recommended Improvement	Length (feet)
Basin 6					
640	Railroad crossing	SW	24" pipe	parallel 24" pipe railroad bore	80 60
	Ditch from RR to Hwy 20	SW	ditch	36" pipe	90
	North side Hwy 20	SW	24" pipe	parallel 24" pipe	275
	Highway crossing	SW	24" pipe	parallel 24" pipe highway bore	65 65
Basin 9					
960	9th Street ditch south of WTP	SW	ditch	Reroute ditch	1250
Basin 13					
1304	12th Str, Grant to Madison Str	SW/SE	ditch/culverts	30" pipe	800
1305	12th Str, Pioneer to Grant Str	SW	ditch/culverts	36" pipe	1100
1306 1307	Lincoln, Grant & Monroe Str	SW	none	15" pipe	650
1302	Ditch from 11th to 12th Street north of Pioneer	SW	ditch	±24" pipe	550
1320 1340 1350	12th Str, Pioneer to Applegate Railroad Crossing Highway Crossing	SW	no trunk lines	36" pipe railroad bore highway bore	1600 60 80

TABLE 5-1 RECOMMENDED MAJOR STORM DRAINAGE IMPROVEMENTS					
Sub-Basin	Location	Map Quad	Existing Facility	Recommended Improvement	Length (feet)
1350	13th Street, Applegate to end of existing 30" pipe	SW	30" pipe	parallel 36" pipe	920
1360	13th Street, end of existing 30" pipe to Mary's River	SW	ditch/culverts	48" pipe	2300
Basin 15					
1540	South of Willow Lane	SW	ditch/culverts	pipe, size based on street design grade	1150
Newton Creek Basin					
NC24	North side of Hwy 20, 24" to Newton Creek	SE	none	bypass ditch	500
East Newton Creek Basin					
ENC 20	Highway 20 crossing	SE	30" pipe (2) 24" pipes	parallel 30" pipe highway bore	80 80
	James Street crossing	SE	(2) 30" x 36" pipes	33" pipe	60
	East Newton Creek Park	SE	(2) 24" x 42" pipes	33" pipe	30
	Applegate Street crossing	SE	(2) 30" x 42" pipes	36" pipe	80
	Ditch through East Newton Creek Park	SE	ditch	excavate & clean ditch	1200
	Intersection of Applegate & 27th, 28th & 29th Street	SE	none	Catch basin & cross pipe	120
Bell Fountain Basin					
BF80	Intersection of Upper & Lower Bentonview Drive	SE	none	12" pipe	200

5.3 Recommended Capital Improvement Priorities

As summarized in the previous sections, the storm drainage system in Philomath has a number of deficiencies during moderate and major storm events. Some of these deficiencies are more critical than others. In order to assist the City in the planning and scheduling the construction of needed improvements, the improvements recommended in previous sections are grouped as Priority 1, Priority 2 and Priority 3 as outlined below.

In order that the recommended improvements resolve existing problems and meet the requirements of future growth to the system, this prioritization is necessary, since the City obviously cannot afford all of the recommended storm drainage system improvements at once, and because some improvements are not critical at the present time, but will be needed later as develop occurs. Additional pipelines may be needed to serve future developments. In such cases, if current City policies are maintained, a portion or all of the cost for installing such pipelines will be borne by the developers as required by the particular development conditions.

- **Priority 1** (Near Term Improvements) - These are those projects representing existing system deficiencies (currently needed to meet existing and near future projected stormwater runoff flows) or problem areas needing immediate attention. Priority 1 improvements are further broken into Class A and Class B Priorities, with Class A being the most critical. It is recommended that Priority 1 improvements be accomplished as soon as practical considering financing, construction time requirements and timing associated with other related projects.

- **Priority 2** (Vital Future Improvements) - These are improvements which will be needed in the future to meet projected development conditions and design flows. Although not necessary at this time, they should be considered as improvement projects which will be upgraded to Priority 1 in the future.

- **Priority 3** (Long Term Improvements/Possible Future Need) - These improvements are needed to improve system reliability and convey future design flows if land develops to zone intensities. While important, they are not considered to be critical at the present time, or are deemed less desirable due to cost/benefit or impact standpoint. These improvements should be incorporated into street or other utility improvement projects which may allow for concurrent construction.

Each of the projects was examined and assigned a priority for implementation according to the criteria described below. **Table 5-2** shows the list of projects considered in this evaluation and summarizes the results of the evaluation.

The preliminary project cost estimates for the projects in each of these categories are approximately as follows:

Priority 1A	$1,547,700
Priority 1B	$108,800
Priority 2	$852,350
Priority 3	$239,375

a. Project Evaluation Criteria

Five criteria were used by the City to evaluate individual projects and alternative capital improve programs for the major basins. Each of the projects and alternative capital improvement programs was examined and rated according to the following criteria.

- Pipe Size and Flow Increase. Comparisons were made between the diameter of the existing structure and the proposed replacement, and the hydraulic capacity of the existing facility and the peak flow for the design storm event. The relative increase in diameter and flow were assigned values of high, medium and low.

- Flood Hazard. Maps were reviewed to evaluate the potential for flooding moderately to heavily used streets and private property if a project was not implemented. The relative severity of the consequences of potential flooding at a site was assigned values of high, medium, and low.

- City Priority. Certain projects were identified by City engineering and maintenance personnel to be high priority for implementation.

- Reported Problem. The number of times the City had received a citizen report on a specific problem was considered in assigning priorities to projects.

- Capital Costs. Capital costs include all the costs of implementing a project, such as surveying, design, permitting, construction, legal fees and administration. Costs for acquisition of land were not included.

- Structural Damage. Projects to replace damaged components of the major drainage system that no longer function as designed (e.g., rusted, crushed culvert) were assigned a high priority.

b. Ranking of Recommended Improvements

Many of the problems evident in the existing storm drainage system are the result of major trunk storm facilities which are inadequately sized for the storm flows draining to them. **Table 5-2** outlines and prioritizes the proposed major improvements relating to the storm drain system. As previously discussed, this table does not represent an exhaustive listing of all necessary improvements. **Figure 5-1** through **Figure 5-3** show the approximate locations of the proposed Priority 1 improvements to the storm drainage system.

TABLE 5-2 RECOMMENDED CAPITAL IMPROVEMENT PRIORITIES				
Location	Size (inch)	Length (feet)	Estimated Project Budget*	Priority
Basin 6				
Railroad crossing Railroad bore	24 36	80 60	$14,040 $18,000	2
Ditch from RR to Hwy 20	36	90	$23,690	2
North side Hwy 20	24	275	$48,260	2
Highway crossing Highway bore	24 36	65 65	$11,410 $19,500	2
Basin 9				
9th Street ditch south of WTP	ditch	1250	$30,000	1B
Basin 13				
12th Str, Grant to Madison Str	30	800	$175,500	2
12th Str, Pioneer to Grant Str to lincoln st	36	1100	$289,575	2
Lincoln, Grant & Monroe Str	15	650	$71,300	2
Ditch from 11th to 12th Street north of Pioneer	24	550	$96,525	2
12th Str, Pioneer to Applegate Railroad bore Highway bore	36 50 50	1600 60 80	$421,200 $33,000 $44,000	1A
13th Street, Applegate to end of existing 30" pipe	36	920	$242,190	1A
13th Street, end of existing 30" pipe to Mary's River	48	2300	$807,300	1A
Basin 15				
South of Willow Lane	assume 24"	1150	$201,825	3
Newton Creek Basin				
North side of Hwy 20, 24" to Newton Creek	ditch	500	$35,000	2

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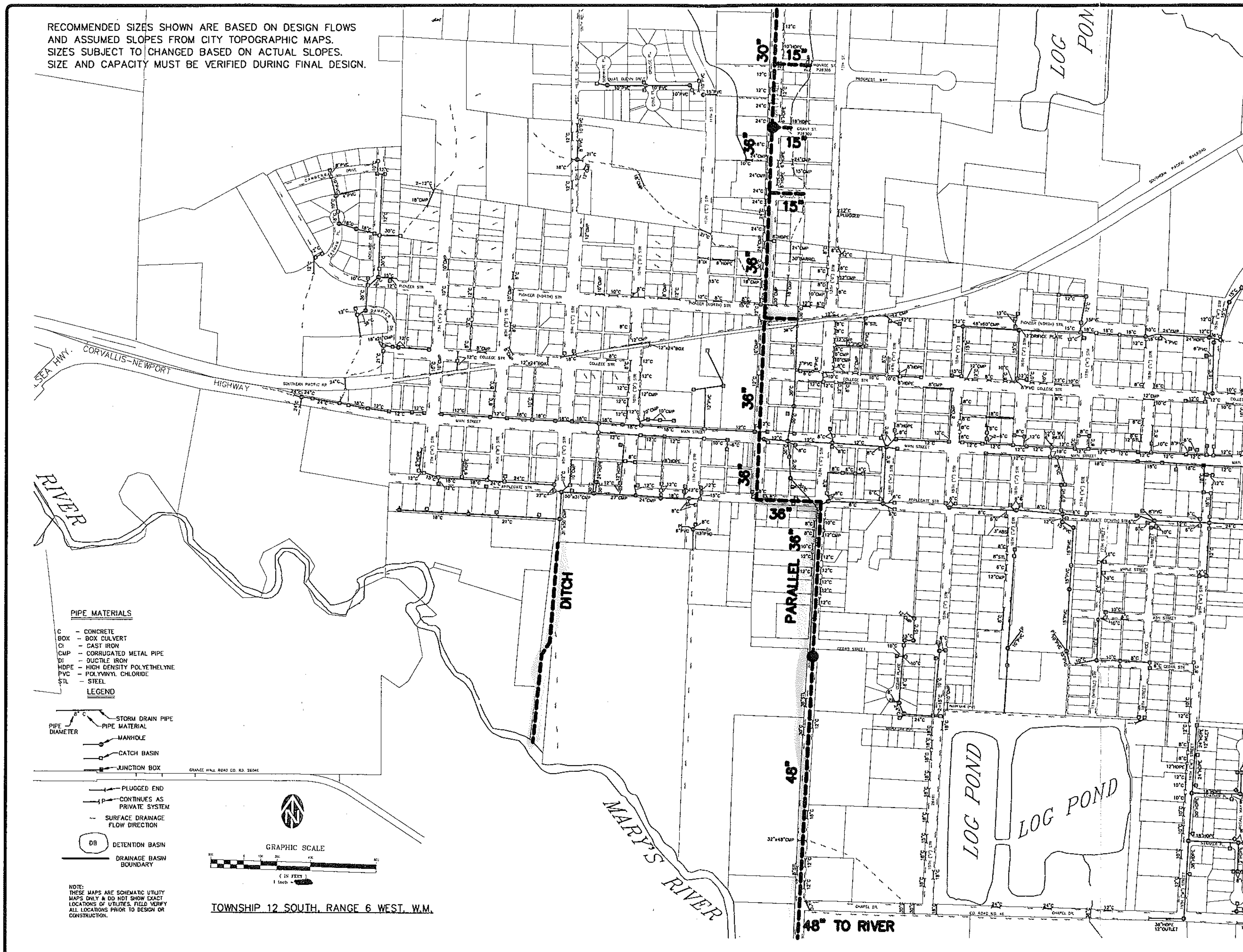
2003

TABLE 5-2
RECOMMENDED CAPITAL IMPROVEMENT PRIORITIES

Location	Size (inch)	Length (feet)	Estimated Project Budget*	Priority
East Newton Creek Basin				
Highway crossing Highway bore	30	80 80	$17,550 $32,000	2
James Street crossing	33	60	$14,480	1B
East Newton Creek Park	33	30	$7,240	1B
Applegate Street crossing	36	80	$21,060	1B
Ditch through East Newton Creek Park	ditch	1200	$36,000	1B
Intersection of Applegate & 27th, 28th & 29th Street	12	120	$20,000	3
Bell Fountain Basin				
Intersection of Upper & Lower Bentonview Drive	12	200	$17,550	3

*Costs are 1997 dollars and assume dry weather construction. ENR 20 Cities Index = 5838.



MAP UPDATED: 11-5-97

SCALE
HORIZ:
VERT:
DSN. D.M.
DRN. D.M.
CKD. J.Y.
DATE: APR 1997

NO. | DATE | DESCRIPTION | BY
REVISIONS

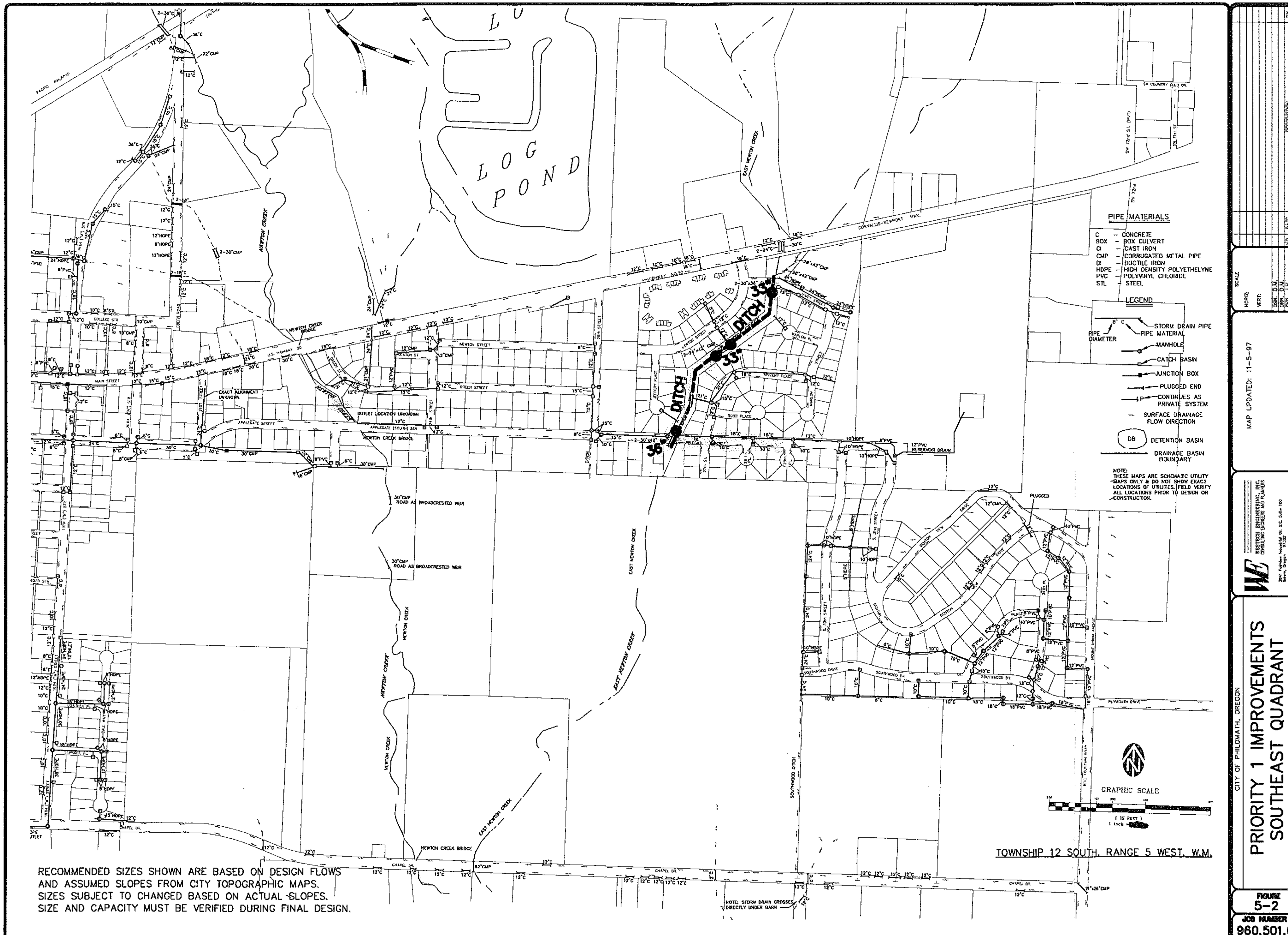
WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS

CITY OF PHILOMATH, OREGON

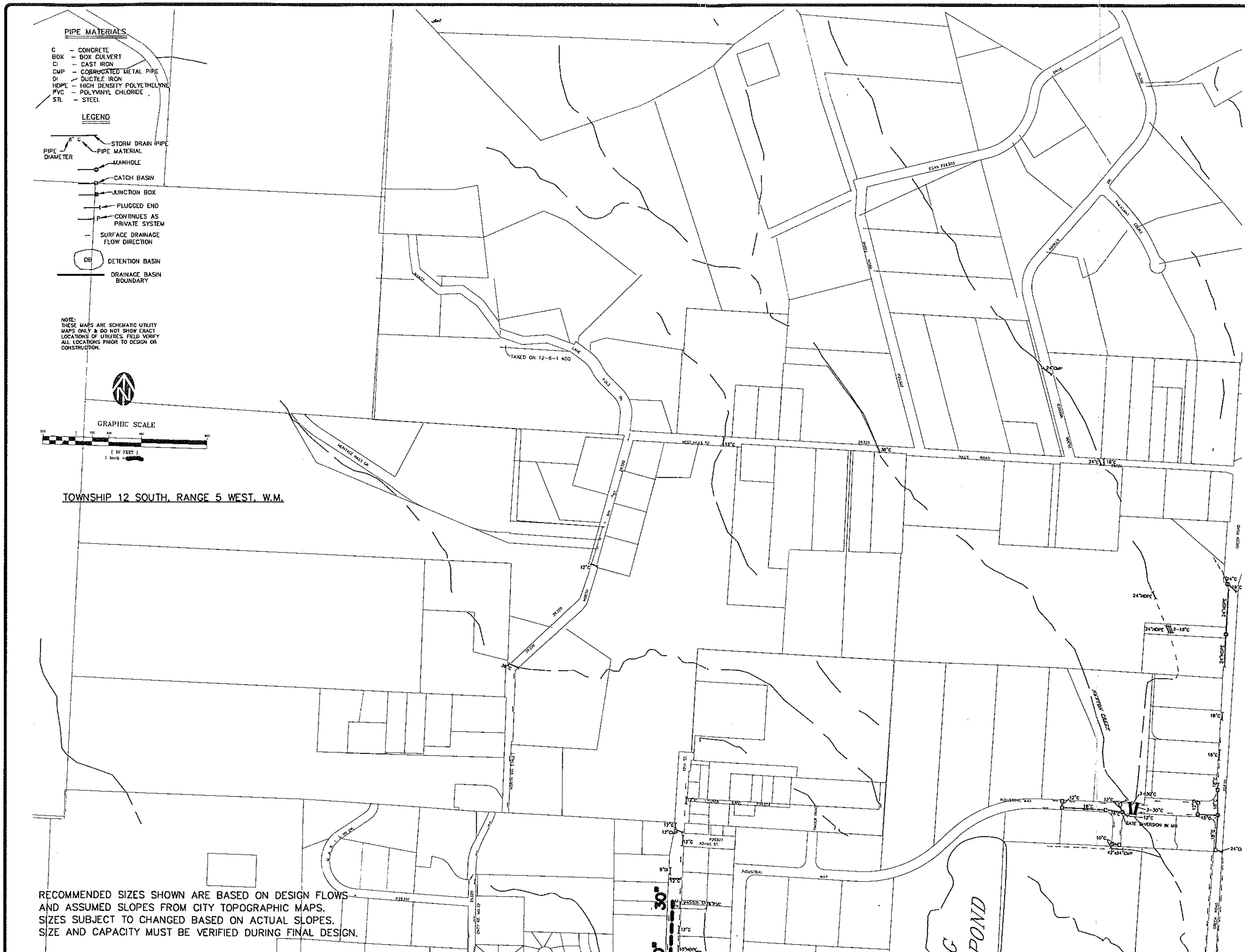
PRIORITY 1 IMPROVEMENTS SOUTHWEST QUADRANT

FIGURE 5-1

JOB NUMBER 960.501.0



LOG POND
CORVALLIS–NEWPORT HWY.
NEWTON CREEK
EAST NEWTON CREEK
DITCH
DITCH
DITCH
33"
33"
36"
PIPE MATERIALS
C – CONCRETE
BOX – BOX CULVERT
CI – CAST IRON
CMP – CORRUGATED METAL PIPE
DI – DUCTILE IRON
HDPE – HIGH DENSITY POLYETHELYNE
PVC – POLYVINYL CHLORIDE
STL – STEEL
LEGEND
STORM DRAIN PIPE
PIPE DIAMETER
PIPE MATERIAL
MANHOLE
CATCH BASIN
JUNCTION BOX
PLUGGED END
CONTINUES AS PRIVATE SYSTEM
SURFACE DRAINAGE FLOW DIRECTION
DETENTION BASIN
DRAINAGE BASIN BOUNDARY
NOTE: THESE MAPS ARE SCHEMATIC UTILITY MAPS ONLY & DO NOT SHOW EXACT LOCATIONS OF UTILITIES. FIELD VERIFY ALL LOCATIONS PRIOR TO DESIGN OR CONSTRUCTION.
GRAPHIC SCALE
(IN FEET)
TOWNSHIP 12 SOUTH, RANGE 5 WEST, W.M.
RECOMMENDED SIZES SHOWN ARE BASED ON DESIGN FLOWS AND ASSUMED SLOPES FROM CITY TOPOGRAPHIC MAPS. SIZES SUBJECT TO CHANGED BASED ON ACTUAL SLOPES. SIZE AND CAPACITY MUST BE VERIFIED DURING FINAL DESIGN.
MAP UPDATED: 11-5-97
WESTECH ENGINEERING, INC.
CITY OF PHILOMATH, OREGON
PRIORITY 1 IMPROVEMENTS
SOUTHEAST QUADRANT
FIGURE
5-2
JOB NUMBER
960.501.0



MAP UPDATED: 11-5-97

CITY OF PHILOMATH, OREGON

PRIORITY 1 IMPROVEMENTS NORTHWEST QUADRANT

FIGURE 5-3

JOB NUMBER 960.501.0

5.4 Basis of Preliminary Cost Estimates

Preliminary construction costs for improvements recommended in this study are based on the following assumptions. The cost estimates reflect projects bid in early 1998. These estimates are based on construction costs for similar projects and manufacturers information. The costs do not reflect a detailed investigation of existing utilities and soils. It is important to note that the cost estimates are budget level estimates, not engineering estimates, and are intended to be within the range of plus or minus 25% of the actual project cost. The elements which comprise these budget estimates are:

- Construction Cost (materials and installation) - $4.50 per inch-diameter per foot
- Construction Contingencies - 25% of estimated construction cost
- Engineering & Administration Costs (surveying, engineering design, permitting, administration, legal, financing and construction administration) - 30% of estimated construction cost plus contingency

Example: 150 lineal feet of new 36-inch storm pipe

Est. Construction Cost =	150 feet x 36 inches x $4.50 =	$24,300
Contingencies =	$24,300 x 25% =	$6,075
Engineering & Admin =	($24,300 + $6,075) x 30% =	$9,112
Total Est. Project Cost =		$39,487

Once the Master Plan is adopted by the City, the projects listed can be selected for completion through the City's budgeting process. The steps for completion are:

- Project identification and budget level cost estimate (Master Plan)
- Project selection and project budget approval
- Retain consulting engineer to design project
- Preparation of plans, specifications and engineering cost estimates
- Bidding and contract award
- Construction

These construction costs are preliminary estimates, but they should help the City in the process of planning and allocating resources in the most cost effective manner. All costs are estimates of probable costs and do not reflect changes that could include increasing labor costs, material, and phased construction dates. Unit costs used for installation of storm drains and culverts include excavation and export of material, bedding and backfill, cutting of asphalt, repaving of streets, pipe placement, upstream and downstream channel protection, catch basins and manholes.