INFRASTRUCTURE FINANCING STUDY

CAPITAL COST OF GROWTH MEMORANDUM

submitted by

duncan associates

in association with
Public and Environmental Finance Associates

September 2000

CONTENTS

LIST OF TABLES

LIST OF FIGURES

OVERVIEW

In this memorandum, we attempt to estimate the net capital cost to accommodate new development at the City of Lincoln's existing levels of service for arterial streets, water, wastewater, electric power, parks, libraries, and fire and police protection facilities. The analysis is based on accepted methods of impact fee analysis, which take into account not only the cost of new capital facilities needed to accommodate growth, but also the revenues that will be generated by new development over the useful life span of the capital facilities that will be available to help pay for a portion of those growth-related capital costs. The revenue credits are deducted from the costs to determine the net costs of serving new development.

Costs, credits and net costs are calculated on the basis of "service units." A service unit is a common unit of demand and capacity, often defined as "a standardized measures of consumption, use, generation or discharge." The service unit for parks, for example, might be acres of park land. Using an appropriate measure for service units greatly enhances the accuracy of gauging project impacts. For example, in a road impact fee program, using vehicle trips alone as a service unit does not account for the length of trip. Rather, a service unit defined as vehicle-miles of travel (VMT) combines the number of vehicles and the distance that these vehicles travel in miles.

In conducting the analysis for each of the facility types, we have reviewed current capital facilities plans, estimated total cost by major facility of serving new development, estimate credits towards these costs paid by new development through existing debt service and other dedicated or outside funding sources, and developed potential fee schedules reflecting total net cost by major facility less credits.

The analysis presented in this report represents order-of-magnitude estimates of the maximum potential impact fees that could be charged by the City of Lincoln for all the facilities surveyed. The analysis may not be sufficient to support the adoption of impact fee ordinances for all of the facilities studied. No new capital facilities planning or engineering work is included as part of this analysis, and existing plans in some cases do not contain sufficient data to support legally-defensible impact fees. The estimates prepared as part of this project would need further refinement before they could legally support impact fees.

As summarized in the table below, the capital cost to provide a new single-family dwelling with the major types of infrastructure provided by the City of Lincoln at current levels of service totals about $17,421. This figure excludes drainage, for which a capital cost analysis could not be conducted with current data. Over the next 20 or so years, that new unit will generate roughly $4,104 through debt service payments or outside funding, leaving a net capital cost of about $13,317 per unit.

While the cumulative amount of potential fees per single-family unit is very large, two things should be kept in mind when reviewing these figures. First, we have not recommended, nor is the City likely

to adopt, maximum fees for all possible facilities. The maximum potential fees for the facilities recommended in the Financial Alternatives Memorandum total $7,390, just over half of the total net cost of all facilities.

Second, developers are already contributing substantially to some of these capital improvement costs, particularly for arterial streets, water and wastewater facilities, through existing developer exaction policies. While the contribution made through developer exactions is difficult to quantify, studies of arterial street exactions that resulted in estimates that exactions amount to one-quarter to one-half of the net cost attributable to new development. Thus, developers may already be contributing, on average, as much as $3,000 per unit in the form of arterial street and water and wastewater line improvements. Of course, some developers are not required to make any contributions to system facilities, while others may contribute even more than their net cost per unit, at least for some facilities.

Table 1
NET CAPITAL COST PER SINGLE-FAMILY UNIT

Facility Type	Capital Cost	Revenue Credit	Net Cost	Recommended Facilities
Arterial Streets	$4,033	$1,336	$2,697	$2,697
Water	$2,909	$369	$2,540	$2,540
Wastewater	$1,369	$152	$1,217	$1,217
Parks	$1,574	$638	$936	$936
Libraries	$347	$157	$190	
Police	$93	$0	$93	
Fire	$75	$21	$54	
Electrical Facilities	$7,021	$1,431	$5,590	
Drainage	N/A	N/A	N/A	
Total	$17,421	$4,104	$13,317	$7,390
Total, Excluding Electrical	$10,400	$2,673	$7,727	$7,390

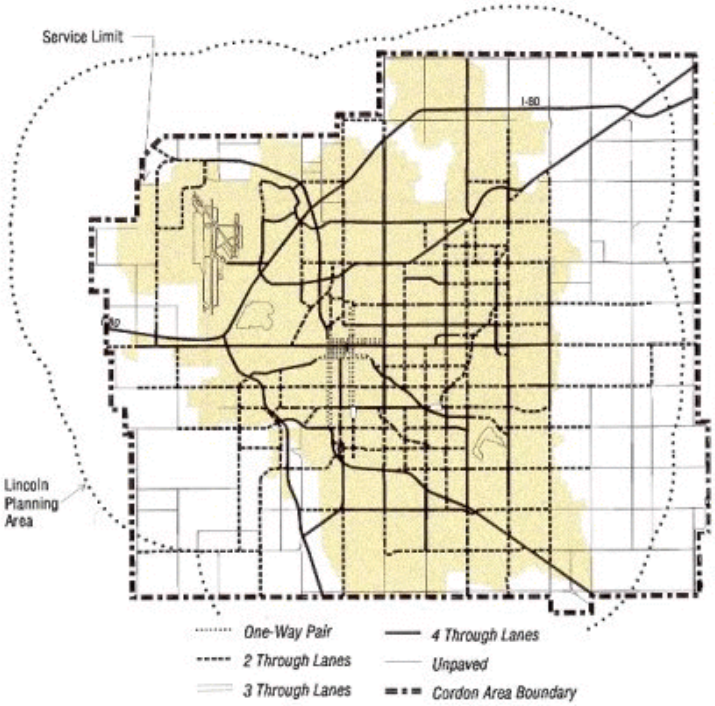
Source: Costs and credits from tables in this report; recommended facility types from Duncan Associates, et. al.,*Infrastructure Financing Study, Financial Alternatives Memorandum*, September 21, 2000.

It should be emphasized that the focus of this memorandum is capital costs. The issue of the additional operating costs required to serve new development is also important, and will be addressed later during the course of this project.

ARTERIAL STREETS

The arterial street system maintained by the City of Lincoln is a key component of local infrastructure that makes development of land within the city possible. The demands placed upon the arterial street system by growth necessitate costly improvements, including the widening of existing roads, intersection and signalization improvements and the construction of new roads to relieve congested corridors.

Figure 1
EXISTING MAJOR ROAD NETWORK



Currently, new development makes contributions toward the cost of expanding the arterial system through several mechanisms. New development is subject to development exactions, which include requirements for dedication of right-of-way and construction of adjacent and internal arterial streets. New development also contributes by generating increased motor fuels taxes and vehicle registration fees, some of which are used by the City for capacity-expanding arterial street improvements.

Developers are required to dedicate the full width of right-of-way (ROW) for the ultimate cross-section required by the Transportation Plan. The City reimburses developers for the cost of oversized width or pavement depth beyond what would be required for a local street (26 feet of pavement in 60 feet of ROW). Funds are set aside in the Capital Improvements Plan (CIP) to reimburse developers for street oversizing. There is generally sufficient funding to reimburse developers for oversizing collectors, but often not for the much more considerable cost of arterial street oversizing. In the event of insufficient funding, there is no standard approach to allocating the available reimbursement funds among qualifying developers.

The arterial street improvements that are required of developers as a condition of development approval are negotiated on a case-by-case basis. This process of negotiated developer contributions is commonplace, but is often criticized for being unpredictable, time-consuming and unfair. The fairness arguments are that the process penalizes larger developers, developers with frontage on streets needing improvement, and late-comers whose traffic triggers the need to widen a street or install turn lanes at an intersection. Developer exactions also do not address congestion in older parts of the community resulting from development on the fringes.

The analysis presented in this section estimates the net capital cost of major roadway (i.e., arterial) improvements required to accommodate growth in Lincoln. The net cost excludes the portion of the cost that is paid for by future gas tax and other highway user fees generated by the new development, but not the value of developer contributions toward the arterial system. These contributions are difficult to quantify and vary widely between developments. As a general rule, however, it has been our experience that developer exactions rarely recover more than half of the net capital costs of growth-related roadway improvements. By the same token, if the City were to adopt impact fees to recover the full net capital cost, the actual revenues may only be half as much as might be expected, due to credits against the impact fees to developers for ROW dedication and arterial construction.

Service Unit

Service units create the link between supply (arterial street capacity) and demand (traffic generated by new development). An appropriate service unit for arterial street capital cost analysis is vehicle-miles of travel (VMT). Vehicle-miles is a combination of the number of vehicles traveling during a given time period and the distance (in miles) that these vehicles travel. Generally, the most critical period for arterial street capacity in urban areas is during the evening peak hour, and for this reason peak hour VMT was chosen as the service unit for the arterial street capital cost analysis. The unit of capacity that is consumed by the demand unit represented by a VMT is a vehicle-mile of capacity (VMC). VMC is the peak hour capacity at the desired level of service of a roadway segment multiplied by the length of the segment in miles.

Although the capital cost analysis is based on peak hour traffic conditions, local data is often expressed in terms of average daily travel. Consequently, a peaking factor is needed to convert average daily demand and capacity data to peak hour values. Based on national data, approximately ten percent of daily travel occurs in the afternoon peak hour,[1] and this factor will be used to convert between average daily and peak hour values.

The travel demand generated by specific land use types is a product of three factors: 1) trip generation, 2) percent new trips and 3) trip length. The first two factors are well documented in the professional literature, and the average trip generation characteristics identified in studies of communities around the nation should be reasonably representative of trip generation characteristics in Lincoln. In contrast, trip lengths are much more likely to vary between communities, depending on the geographic size and shape of the community and its arterial street system.

[1] According to the Institute of Transportation Engineers (ITE), *Transportation and Traffic Engineering Handbook*, 1982, p. 283, "Approximately 10% of all person travel takes place in the morning peak period, and again in the evening peak period." The ratio of PM peak hour trip rates to average daily trip rates for 115 land use categories from the 1997 sixth edition of the ITE *Trip Generation* manual averages 9.82%.

Trip Generation

Trip generation rates were based on information published in the most recent edition of the Institute of Transportation Engineers' (ITE) *Trip Generation* manual. Trip generation rates represent trip ends, or driveway crossings at the site of a land use. Thus, a single one-way trip from home to work counts as one trip end for the residence and one trip end for the work place, for a total of two trips. To avoid over-counting, all trip rates have been divided by two. This splits the burden of travel equally between the origin and destination of the trip and eliminates double-charging for any particular trip.

New Trips Factor

Trip rates also need to be adjusted by a "new trip factor" to exclude pass-by and diverted-link trips. This adjustment is intended to reduce the possibility of over-counting by only including primary trips generated by the development. Pass-by trips are those trips that are already on a particular route for a different purpose and simply stop at a development on that route. For example, a stop at a convenience store on the way home from the office is a pass-by trip for the convenience store. A pass-by trip does not create an additional burden on the street system and therefore should not be counted in the assessment of arterial street impacts. A diverted-link trip is similar to a pass-by trip, but a diversion is made from the regular route to make an interim stop. The reduction for pass-by and diverted-link trips was drawn from published information.

Average Trip Length

The average trip length is the most difficult travel demand factor to determine. In the absence of local data, we can estimate that local arterial trips length in Lincoln are in the range of one-half of the national average trip lengths identified in the U.S. Department of Transportation's 1995 *Nationwide Personal Transportation Survey*. Using this ratio, reasonable trip lengths can be estimated for specific trip purposes, including home-to-work trips, shopping, school/church and other personal trips, as shown in Table 2.

Table 2
AVERAGE TRIP LENGTH BY TRIP PURPOSE

Trip Purpose	National Data	Local Ratio	Est. Local Trip Lengths
To or from work	11.73	0.50	5.9
Doctor/Dentist	9.23	0.50	4.6
Average	8.92	0.50	4.5
School/Church	8.05	0.50	4.0
Family/Personal	6.88	0.50	3.4
Shopping	5.61	0.50	2.8

Source: Average trip lengths in miles; national data from US. Department of Transportation, *Nationwide Personal Transportation Survey*, 1995 (http://www-cta.ornl.gov/npts/1995/Doc/table1.pdf); local ratio assumed; estimated local trip lengths are products of national data by ratio.

Peak hour travel demand must be estimated for a variety of land uses in order to develop a net cost schedule. The result of combining trip generation rates, new trip factors and average trip lengths is a travel demand schedule that establishes the vehicle-miles of travel (VMT) during the evening peak hour generated by various land use types per unit of development. The recommended travel demand schedule is presented in Table 3.

Table 3
TRAVEL DEMAND SCHEDULE

Land Use Type	Unit	Trip Rate	% New Trips	Length (miles)	Pk Hr VMT
Single-Family Detached	Dwelling	0.51	100%	5.90	3.01
Multi-Family	Dwelling	0.31	100%	5.90	1.83
Mobile Home/RV Park	Pad Site	0.28	100%	5.90	1.65
Hotel/Motel	Room	0.31	100%	3.40	1.05
RETAIL/COMMERCIAL					
Shopping Ctr (<100,000 sf)	1000 sq. ft.	3.14	61%	2.20	4.21
Shopping Ctr (100,000-299,999 sf)	1000 sq. ft.	2.16	72%	2.50	3.89
Shopping Ctr (300,000-499,999 sf)	1000 sq. ft.	1.82	75%	2.80	3.82
Shopping Ctr (500,000-999,999 sf)	1000 sq. ft.	1.44	80%	3.10	3.57
Shopping Ctr (1 million sf+)	1000 sq. ft.	1.25	82%	3.40	3.48
OFFICE/INSTITUTIONAL					
Office, General	1000 sq. ft.	0.75	100%	5.90	4.43
Office, Medical	1000 sq. ft.	1.83	100%	4.60	8.42
Hospital	1000 sq. ft.	0.46	100%	4.60	2.12
Nursing Home	1000 sq. ft.	0.18	100%	4.60	0.83
Church	1000 sq. ft.	0.33	100%	4.00	1.32
Day Care Center	1000 sq. ft.	6.60	24%	3.40	5.39
Elementary/Secondary School	1000 sq. ft.	0.51	24%	4.00	0.49
INDUSTRIAL					
Industrial Park	1000 sq. ft.	0.46	100%	5.90	2.71
Warehouse	1000 sq. ft.	0.26	100%	5.90	1.53
Mini-Warehouse	1000 sq. ft.	0.13	100%	3.40	0.44
RECREATIONAL					
Amusement Park	Acre	1.98	100%	3.40	6.73
Bowling Alley	1000 sq. ft.	1.77	100%	3.40	6.02
Golf Course	Hole	1.37	100%	3.40	4.66
Golf Driving Range	Tee	0.63	100%	3.40	2.14
Health Club	1000 sq. ft.	2.15	50%	3.40	3.66
Miniature Golf Course	Hole	0.17	100%	3.40	0.58
Park	Acre	0.20	100%	3.40	0.68

Source: "PHT" is ½ trip ends during PM peak hour of adjacent street on a weekday, ITE, *Trip Generation*, 6th ed., 1997; shopping center rates based on upper end of range; new trip percentages for most uses from ITE, *Trip Generation Handbook,* October 1998; day care center from paper by Hitchens, 1990 ITE Compendium; elementary/secondary school assumed same as for day care; health club new trip percentages assumed; average trip lengths from Table 2; shopping center average trip length reduced from average retail trip length for centers smaller than 300,000 square feet and increased for centers larger than 500,000 square feet.

Cost per Service Unit

The major alternative methodologies used in arterial street capital cost analysis are the "improvements-driven" and "demand-driven" approaches. These are described below.

The "improvements-driven" approach essentially divides the cost of growth-related improvements required over a fixed planning horizon (or to build-out) by the number new service units (e.g., VMT) projected to be generated by growth over the same planning horizon in order to determine a cost per service unit. The improvements-driven approach depends on accurate planning and forecasting. For example, the analysis will be accurate only if the forecasted increase in traffic actually necessitates all of the improvements identified in the transportation master plan. If many of the planned improvements will provide excess capacity over the planning horizon that will be available to serve additional development beyond the planning horizon on which the fees are based, the identified costs may be too high.

The recommended "demand-driven" approach avoids these problems, because it does not depend on knowing in advance what improvements will be made or what type or density of development will occur. The demand-driven model simply allocates to a new development the cost of replacing the capacity that it consumes on the arterial system. That is, for every service unit of traffic generated by the development, the demand-driven analysis charges the net cost to construct an additional service unit of capacity.

Since travel is never evenly distributed throughout a roadway system, actual roadway systems require more than one unit of capacity for every unit of demand in order for the system to function at an acceptable level of service. Suppose for example, that the City completes a major arterial widening project. The completed arterial is likely to have a significant amount of excess capacity for some period of time. If the entire system has just enough capacity to accommodate all of the vehicle-miles of travel, then the excess capacity on this segment must be balanced by another segment being over-capacity. Clearly, roadway systems in the real world need more total aggregate capacity than the total aggregate demand, because the traffic does not always precisely match the available capacity. Consequently, the standard demand-driven model generally underestimates the full cost of growth. It is, however, a conservative and relatively simple approach to the estimation of arterial street capital costs.

The first step in the demand-driven methodology is to estimate the average cost to construct a new arterial lane-mile. Building a new one-mile stretch of two-lane roadway, or widening a one-mile segment of an existing two-lane arterial to four lanes, each creates two additional lane-miles. In estimating the replacement value of the existing arterial system, City public works staff used an average cost of $500,000 per lane-mile. While this figure may be appropriate for new arterial construction in undeveloped areas, it is likely to significantly underestimate the cost of widening arterials in developed areas. And this is precisely where most public road construction dollars are

spent. An analysis of the City's current CIP, for example, reveals that all of the projects that add new lanes are widening projects, which have an average cost of about $1.7 million per new lane-mile (see Table 4).

Table 4
COST PER LANE-MILE

Street	Miles	Improvement Type	New Lane-Miles	Total Cost	Cost/ Lane-Mile
Pine Lake Rd	3.00	2-4 Lane	6.00	$6,868,500	$1,145,000
O St (Hwy 34)/66th St	2.30	4-6 Lane	4.60	$13,373,200	$2,907,000
Pioneers/84th St	2.00	2-4 Lane	4.00	$7,584,500	$1,896,000
84th St	3.80	2-4 Lane	7.60	$14,231,500	$1,873,000
Old Cheney Rd	1.80	2-4 Lane	3.60	$7,604,600	$2,112,000
56th St	1.25	2-4 Lane	2.50	$3,867,500	$1,547,000
14th St	1.43	2-4 Lane	2.86	$4,381,000	$1,532,000
70th St/Adams St	1.80	2-4 Lane	3.60	$4,111,900	$1,142,000
Pine Lake Rd	1.50	2-4 Lane	3.00	$3,925,700	$1,309,000
Pine Lake Rd/98th	1.75	2-4 Lane	3.50	$3,685,300	$1,053,000
10th St	0.30	2-4 Lane*	0.60	$2,879,400	$4,799,000
Total			41.86	$72,513,100	$1,732,000

* includes bridge structure
Source: City of Lincoln, *Capital Improvements Program, FY 2000-2006*, May 2000 draft.

The next step is to determine the average capacity of a lane. The street design standards in the City-County comprehensive plan list maximum capacities for a range of improvement types in developed, fringe and rural areas. The rural improvement types are probably more appropriate for the unincorporated areas of the county and are excluded from this analysis. The capacities for the different improvement types range from 4,000 to 8,000 average daily trips, and average 6,800 trips, as shown below. Using the ten percent peaking factor discussed earlier, 680 is a reasonable estimate of the average hourly capacity of a lane under typical conditions in Lincoln.

Table 5
AVERAGE CAPACITY PER LANE

Improvement Type	Area Type	Location	Through Lanes	Maximum Capacity	Capacity/ Lane
A	Developed	All	2	12,000	6,000
B	Developed	No Signals	4	16,000	4,000
C	Developed	Commercial or Signals	4	24,000	6,000
D	Developed	All	4	32,000	8,000
D+	Developed	Major Commercial	5	40,000	8,000
K	Developed	Major Commercial	6	48,000	8,000
E	Fringe	All	2	12,000	6,000
F	Fringe	All	4	32,000	8,000
Average Daily Capacity per Lane					6,800
Peaking Factor					10%
Average Hourly Capacity per Lane					680

Source: 1994 *Lincoln City-Lancaster County Comprehensive Plan*, Street Design Standards, Figures 29 and 30 (capacities for D+ and K assumed); peaking factor based on national data (see text).

As noted above, the $500,000 per lane-mile cost used by staff to estimate the replacement cost of the existing arterial system is probably a reasonably good estimate of the cost of building new arterials on the city's fringe developing areas, most of which is probably built by developers. And it is possible that two-thirds of new arterial capacity gets added in this way. Using that ratio, the weighted average cost is about $900,000 per lane-mile. Dividing this by the average hourly capacity of a lane yields an estimated cost per service unit of $1,340 per peak hour vehicle-mile of travel.

Table 6
ARTERIAL STREET COST PER SERVICE UNIT

Cost per Lane-Mile (Private, New Construction)	$500,000
Cost per Lane-Mile (Public, Widening)	$1,732,000
Weighted Average Cost per Lane-Mile (2/3 new, 1/3 widen)	$911,000
Average Hourly Capacity per Lane	680
Average Cost per Peak Hour Vehicle-Mile	$1,340

Source: Private cost of new construction is estimated arterial system replacement cost from Dennis Bartels, Lincoln Public Works and Utilities Department, 7/25/00 memorandum; public cost of widening projects from Table 4; average hourly capacity per lane from Table 5.

Net Cost per Service Unit

In the calculation of the impact of new development on infrastructure costs, credit should be given for dedicated revenues or non-local funding that will be generated by new development and used to pay for growth-related capital improvements. Credit should also be provided for property taxes that will be paid by new development and used to retire outstanding debt for past arterial street improvements.

The City of Lincoln does not currently have any outstanding debt for arterial street improvements. Nor does the City use general fund monies to fund growth-related arterial street improvements. The funding sources identified in the current CIP for growth-related arterial street improvements are the wheel tax and state and federal highway funds. Over the next six years, the City has programmed over $100 million for capacity-expanding road projects in its CIP.

The first step in calculating a revenue credit for arterial streets is to divide the annual growth-related capital funding from dedicated and non-local sources (which is virtually all of it in Lincoln) by the total number of service units (peak hour vehicle-miles of travel) on Lincoln's arterial system today. The total number of existing service units can be estimated by multiplying existing land uses by the peak hour travel demand estimates calculated earlier. These calculations indicate that peak hour travel on the City's arterial system on an average weekday is in the vicinity of 480,000 vehicle-miles of travel, as shown in Table 7.

Table 7
TOTAL VEHICLE-MILES OF TRAVEL

Land Use	Units	Number	Pk Hr VMT/ Unit	Total Pk Hr VMT
Single-Family Detached	Dwelling	53,580	3.01	161,276
Multi-Family	Dwelling	36,479	1.83	66,757
Mobile Home	Dwelling	2,501	1.65	4,127
Total Residential		92,560		232,160
Retail/Commercial	1,000 sq. ft.	12,496	3.82	47,735
Office	1,000 sq. ft.	7,690	4.43	34,067
Industrial/Warehousing	1,000 sq. ft.	18,243	2.71	49,439
Government/Institutional	1,000 sq. ft.	27,021	4.43	119,703
Total Nonresidential		65,450		250,944
Total				483,104

Source: Estimated dwelling units as of June 2000 from Kent Morgan, City of Lincoln Planning Department, June 19, 2000; nonresidential square feet from Table 71; peak hour vehicle-miles of travel per unit from Table 3 (retail based on mid-sized shopping center, office and government/institutional based on general office; industrial/warehousing based on industrial park.

The City has programmed in its current six-year CIP about $100 million for roadway improvement projects that add lanes and thus expand the capacity of the major roadway system. This is the equivalent of spending about $35 annually for every peak hour vehicle-mile of travel on the City's arterial system during the average weekday. Assuming that as the city grows the City will increase its funding proportionately, new development can be said to generate about $35 annually for each new service unit of travel demand it generates. Over the roughly 25-year useful life of road facilities, this is the equivalent of $444 per service unit.

Table 8
ARTERIAL STREET REVENUE CREDIT PER SERVICE UNIT

Total Funding for Growth-Related Road Projects, FY 2001-2006	$100,827,000
Annual Growth-Related Road Funding	$16,804,500
Total Peak Hour Vehicle-Miles of Travel	483,104
Annual Growth-Related Road Funding per VMT	$34.78
Present Value Factor (25 Years @6% Discount Rate)	12.78
Present Value of Growth-Related Road Funding per VMT	$444

Source: Total funding from City of Lincoln, *2000-2006 Capital Improvement Program* for projects that add lanes; total peak hour VMT from Table 7.

Reducing the capital cost per service unit by the revenue credit calculated above yields a net capital cost of $896 per service unit, as shown in Table 9.

Table 9
ARTERIAL STREET NET COST PER SERVICE UNIT

Capital Cost per VMT	$1,340
Revenue Credit per VMT	$444
Net Cost per VMT	$896

Source: Capital cost per VMT from Table 6; revenue credit per VMT from Table 8.

Multiplying the net cost per VMT by the peak hour travel demand generated by various land use types results in an estimate of the net capital cost of arterial street improvements to serve new development, shown in Table 10 for a range of land use types.

Table 10
ARTERIAL STREET NET COST SCHEDULE

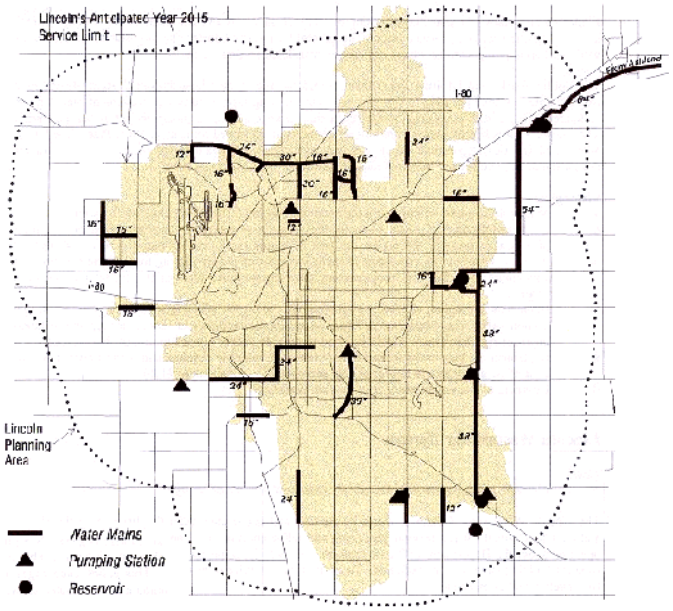
Land Use Type	Unit	Pk Hr VMT	Net Cost/ VMT	Net Cost/ Unit
Single-Family Detached	Dwelling	3.01	$896	$2,697
Multi-Family	Dwelling	1.83	$896	$1,640
Mobile Home/RV Park	Pad Site	1.65	$896	$1,478
Hotel/Motel	Room	1.05	$896	$941
RETAIL/COMMERCIAL				
Shopping Ctr (<100,000 sf)	1000 sq. ft.	4.21	$896	$3,772
Shopping Ctr (100,000-299,999 sf)	1000 sq. ft.	3.89	$896	$3,485
Shopping Ctr (300,000-499,999 sf)	1000 sq. ft.	3.82	$896	$3,423
Shopping Ctr (500,000-999,999 sf)	1000 sq. ft.	3.57	$896	$3,199
Shopping Ctr (1 million sf+)	1000 sq. ft.	3.48	$896	$3,118
OFFICE/INSTITUTIONAL				
Office, General	1000 sq. ft.	4.43	$896	$3,969
Office, Medical	1000 sq. ft.	8.42	$896	$7,544
Hospital	1000 sq. ft.	2.12	$896	$1,900
Nursing Home	1000 sq. ft.	0.83	$896	$744
Church	1000 sq. ft.	1.32	$896	$1,183
Day Care Center	1000 sq. ft.	5.39	$896	$4,829
Elementary/Secondary School	1000 sq. ft.	0.49	$896	$439
INDUSTRIAL				
Industrial Park	1000 sq. ft.	2.71	$896	$2,428
Warehouse	1000 sq. ft.	1.53	$896	$1,371
Mini-Warehouse	1000 sq. ft.	0.44	$896	$394
RECREATIONAL				
Amusement Park	Acre	6.73	$896	$6,030
Bowling Alley	1000 sq. ft.	6.02	$896	$5,394
Golf Course	Hole	4.66	$896	$4,175
Golf Driving Range	Tee	2.14	$896	$1,917
Health Club	1000 sq. ft.	3.66	$896	$3,279
Miniature Golf Course	Hole	0.58	$896	$520
Park	Acre	0.68	$896	$609

Source: Peak hour vehicle-miles of travel per unit from Table 3; net cost per VMT from Table 6.

WATER

Most of the City's water supply comes from a 1,600-acre well field along the Platte River near Ashland, Nebraska. The water enters the city from the northeast through a supply line capable of transmitting 110 million gallons per day (mgd). Because the primary source of water is so far away, the City has more storage capacity than most communities, equal to approximately one peak day's demand.

Figure 2
FUTURE WATER IMPROVEMENTS



Service Unit

A water utility must be able to supply water to satisfy demand that fluctuates over a wide range. Yearly, monthly, daily and hourly variations must all be accommodated. Water demand rates most important to the design and operation of a water system are average day, maximum day and maximum hour. The allocation of capital costs in this analysis is based on maximum day water demand.

The City's projected peak day water demand is estimated to be about 102 million gallons per day (mgd). Approximately two-thirds of water demand is generated by residential uses. During the hottest days of the year, when lawn watering is at its peak, the City's residential customers can consume over 300 gallons per capita per day (gpcd), as shown in Table 11. This figure includes the residential share of unaccounted for water; direct consumption is somewhat lower. The City water master plan projections are based on a residential average day consumption of 110 gpcd and a peak day factor of 2.5, for a maximum day residential demand of 275 gpcd.

Table 11
WATER DEMAND, 1990-2010

	1990	2000	2010
Maximum Day Water Demand (mgd)	90.40	102.65	114.90
City of Lincoln Population	191,970	218,535	242,000
Maximum Day Water Demand per Capita (gpcd)	471	470	475
Percent Residential Water Usage	67%	67%	67%
Residential Maximum Day Water Demand per Capita (gpcd)	316	315	318

Source: 1990 and projected 2010 demand, projected 2010 population and residential share of water usage from Black & Veatch, *Water Distribution System Master Plan Report for Lincoln Water System*, December 1995; year 2000 demand interpolated; 1990 population from U.S. Census; year 2000 population estimate based on 1998 population estimate from U.S. Bureau of the Census, Population Estimates Program and average annual growth rate of 1.27% from same source.

While the proposed service unit for the water system analysis is water demand expressed in gallons per day (gpd), it is useful to determine the demand associated with a single-family dwelling unit. Based on an average household size in Lincoln of about 2.8 persons per unit, an average single-family household can be expected to have a peak day demand of 879 gallons per day, as shown in Table 12.

Table 12
WATER DEMAND PER SINGLE-FAMILY UNIT

Persons per Unit, Single-Family Detached Unit	2.79
Residential Maximum Water Demand per Capita (gpcd)	315
Maximum Day Water Demand per Single-Family Unit (gpd)	879

Source: Persons per unit for single-family units in Lincoln from 1990 U.S. Census (see Table ?); residential per capita demand from Table 11;

Cost per Service Unit

The capital facilities required to provide water service include water supply, treatment, transmission mains, pumping, storage reservoirs and distribution mains.

Treatment and Transmission Facilities

In the early 1990s, the City made a major investment in expanding its water production facilities near Ashland, as well as in the 15 miles of transmission lines to carry that water to the city. One way to estimate the capital cost of the water production, treatment and transmission facilities per service unit is to divide the original, undepreciated cost of the existing Ashland facilities by the capacity of the existing transmission line. This approach yields an estimated cost of water treatment and supply facilities of $0.97 per gallon per day of water demand, as shown in Table 13.

Table 13
WATER TREATMENT AND SUPPLY COST

Cost of Ashland Water Treatment and Pumping Facilities	$104,404,871
Transmission Line Capacity (gpd)	108,000,000
Water Treatment and Supply Cost per gpd	$0.97

Source: Undepreciated cost of Ashland water plant assets from "Lincoln Water System, Utility Plant In Service, August 31, 1999; transmission line capacity from Black & Veatch, *Water Distribution System Master Plan Report for Lincoln Water System*, December 1995.

Water Storage Reservoirs

At the time the 1995 water master plan was completed, the City's water system had 79 million gallons (mg) of storage reservoirs, and the addition of another 26 mg was planned by the year 2010. While the costs or the new storage facilities vary, they average $712,000 per mg in current dollars, as shown in Table 14. The fact that the facilities that have actually were built to-date have differed somewhat from those in the plan could be taken into consideration in a more detailed analysis, but is unlikely to have a significant effect on the average cost per unit of storage capacity.

Table 14
WATER STORAGE CAPACITY AND COST

Storage Facility	Storage Capacity (mg) Existing	New	Future	Improvement Cost	Cost/mg
Vine St Reservoir	10	10	20	$7,000,000	$700,000
Pioneers Park Reservoir	4	0	4	0	N/A
S 56th St Reservoir	4	4	8	$1,400,000	$350,000
Southeast Reservoir	5	0	5	0	N/A
"A" St Reservoir	32	0	32	0	N/A
Air Park Reservoir	3	0	3	0	N/A
NW 12th St Reservoir	0	3	3	$1,600,000	$530,000
Pine Lake Reservoir	4	4	8	$1,400,000	$350,000
51st St Reservoir	12	0	12	0	N/A
Northeast Reservoir	5	5	10	$4,940,000	$988,000
Total	79	26	105	$16,340,000	$630,000
ENR Construction Cost Inflation Factor, August 1995 to September 2000					1.13
Cost per mg in Current (September 2000) Dollars					$712,000

Source: Black & Veatch, *Water Distribution System Master Plan Report for Lincoln Water System*, December 1995; construction cost inflation factor based on Construction Cost Index from *Engineering News-Record* website (http://www.enr.com/cost/costcci.asp).

Summarized below are two alternatives for estimating the cost of providing water storage reservoirs to accommodate new water customers. The more conservative approach is to divide the replacement cost of existing reservoirs by current maximum day demand. The more aggressive, and arguably the most accurate, approach is to divide the cost of the new facilities by the increase in demand over the planning period, which is labeled in the table below as the "marginal cost" approach. To be somewhat conservative, this analysis will use the replacement cost of existing facilities, which is $0.62 per gallon per day, as shown in Table 15.

Table 15
WATER STORAGE COST PER SERVICE UNIT

Calculation Component	Replacement Cost	Marginal Cost
Storage Reservoir Cost	$56,250,000	$18,510,000
Base Year Maximum Day Demand (gpd)	90,400,000	24,500,000
Storage Cost per gpd	$0.62	$0.76

Source: Replacement cost is existing capacity times average cost per mg from Table 14; marginal cost is new capacity times average cost per mg from Table 14; base year demand from Table 11 is 1993 for replacement cost approach and projected growth between 1990 and 2010 for marginal cost approach.

Pumping Stations

At the time the 1995 water master plan was completed, the City's water system had 323.1 million gallons per day (mgd) of installed pumping station capacity, and planned to install an additional 161 mgd by the year 2010 (because some of the new capacity replaces existing obsolete or under-sized pumps, the planned future capacity is less than the sum of existing and new capacity). While the cost per unit of added capacity varies somewhat, it averages $270,000 per mgd in current dollars, as shown in Table 16.

Table 16
WATER PUMPING STATION CAPACITY AND COST

	Installed Capacity (mgd)			Improvement	
Pumping Facility	Existing	New	Future	Cost	Cost/mgd
51st St Pumping Station	70.0	69.0	89.0	$2,200,000	$32,000
Northeast Pumping Station	65.0	60.0	110.0	$2,350,000	$39,000
"A" St Pumping Station	63.0	0.0	63.0	N/A	N/A
Vine St Pumping Station	75.0	20.0	95.0	$750,000	$38,000
Belmont Pumping Station	21.2	6.0	26.6	$350,000	$58,000
Merrill Pumping Station	7.4	0.0	7.4	N/A	N/A
Southeast Pumping Station	21.5	6.0	26.8	$430,000	$72,000
Total	323.1	161.0	417.8	$6,080,000	$239,000
ENR Construction Cost Inflation Factor, August 1995 to September 2000					1.13
Cost per mg in Current (September 2000) Dollars					$270,000

Source: Black & Veatch, *Water Distribution System Master Plan Report for Lincoln Water System*, December 1995; construction cost inflation factor based on Construction Cost Index from *Engineering News-Record* website (http://www.enr.com/cost/costcci.asp).

Summarized below are two alternatives for estimating the cost of providing water storage reservoirs to accommodate new water customers. The more conservative approach is to divide the replacement cost of existing reservoirs by current maximum day demand. The more aggressive, and arguably the most accurate, approach is to divide the cost of the new facilities by the increase in demand over the planning period, which is labeled in the table below as the "marginal cost" approach. However, to be somewhat conservative, this analysis will use the replacement cost of existing facilities, which is $0.97 per gallon per day, as shown in Table 17.

Table 17
WATER PUMPING STATION COST PER SERVICE UNIT

Calculation Component	Replacement Cost	Marginal Cost
Water Pumping Station Cost	$87,240,000	$43,470,000
Base Year Maximum Day Demand (gpd)	90,400,000	24,500,000
Storage Cost per gpd	$0.97	$1.77

Source: Replacement cost is existing capacity times average cost per mgd from Table 16; marginal cost is new capacity times average cost per mgd from Table 16; base year demand from Table 11 is 1993 for replacement cost and projected growth between 1990 and 2010.

Water Distribution Mains

The cost of water distribution main improvements needed to serve new customers can be estimated by dividing the cost of main improvements determined to be needed over the 1990-2010 planning horizon by the additional maximum day water demand anticipated due to growth over the same period. Some of these improvements may be needed to address existing capacity deficiencies, but even these improvement are likely to add additional capacity for growth. To account for possible deficiencies, a somewhat lower figure of $0.75 per gpd will be used as the growth-related water distribution main cost per service unit.

Table 18
WATER DISTRIBUTION MAIN COST PER SERVICE UNIT

Planned Distribution Main Improvements (August 1995 Dollars)	$19,278,000
ENR Construction Cost Inflation Factor, August 1995 to September 2000	1.13
Planned Distribution Main Improvements (September 2000 Dollars)	$21,784,000
New Maximum Day Demand, 1990-2010 (gpd)	24,500,000
Water Distribution Main Cost per gpd	$0.89
Assumed Water Distribution Main Cost per gpd Attributable to Growth	$0.75

Source: Planned improvements are water distribution mains of 12" or more in diameter determined to be needed by Black & Veatch, *Water Distribution System Master Plan Report for Lincoln Water System*, December 1995; construction cost inflation factor based on Construction Cost Index from *Engineering News-Record* website (http://www.enr.com/cost/costcci.asp); new maximum day demand from Table 11.

Cost per Service Unit Summary

In summary, the capital cost to serve new development is about $3.31 per gallon per day of additional water demand. Based on maximum day water demand, it will cost approximately $2,909 to construct the capital facilities to accommodate an additional single-family unit, as shown in Table 19.

Table 19
WATER TOTAL COST PER SERVICE UNIT

Treatment Plant/Transmission Cost per gpd	$0.97
Storage Reservoir Cost per gpd	$0.62
Pumping Station Cost per gpd	$0.97
Distribution Main Cost per gpd	$0.75
Total Water Cost per gpd	$3.31
Maximum Day Water Demand per Single-Family Unit (gpd)	879
Water Capital Cost per Single-Family Unit	$2,909

Source: Treatment plant cost from Table 13; storage reservoir cost from Table 15; pumping station cost from Table 17; distribution main cost from Table 18; demand per single-family unit from Table 12.

Net Cost per Service Unit

The analysis above has estimated the actual capital cost required to accommodate an additional service unit or single-family detached dwelling at the existing level of service provided to current water customers. However, new water customers will be paying for some of the cost through their rates that will be used to retire existing debt on the water system. Dividing the amount of outstanding debt on the water system by current water demand provides a reasonable estimate of the amount that new customers will be paying. In effect, this approach puts new customers on an equal footing with current customers, allowing them to pay for the same share of their capital costs through rates. As shown in Table 20, the debt service credit amounts to $0.42 per gallon per day of additional demand, or $369 per single-family dwelling.

Table 20
WATER DEBT SERVICE CREDIT PER SERVICE UNIT

Outstanding Water System Debt	$43,445,000
Year 2000 Maximum Day Demand (gpd)	102,650,000
Debt Service Credit per gpd	$0.42
Maximum Day Demand per Single-Family Unit (gpd)	879
Debt Service Credit per Single-Family Unit	$369

Source: Outstanding water system debt principal as of September 2000 from debt service schedule for Water Revenue & Refunding Bonds, Series 1993; year 2000 maximum day water demand from Table 11; demand per single-family unit from Table 12.

Reducing the cost per service unit or single-family unit by the amount of the debt service credit calculated above results in the estimated net cost per service unit or single-family dwelling. As shown in Table 21, the net cost to accommodate growth in customers is estimated to be $5.72 per gallon per day of additional maximum day water demand or $2,540 per new single-family customer. Currently, this cost is paid for by all customers out of water rates. An alternative would be to recover this cost, or a portion of it, through a fee assessed at the time of connection to the water system. However, before a water connection fee could be assessed, a more detailed study should be performed.

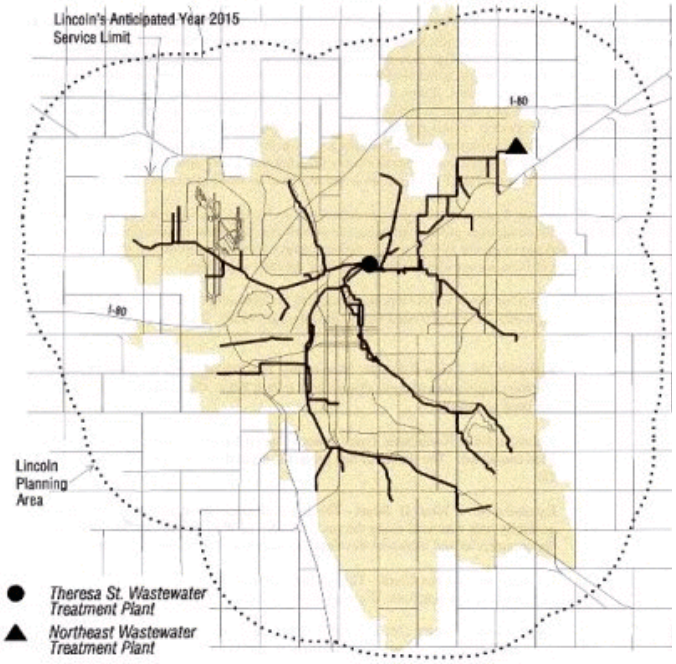
Table 21
WATER NET COST PER SERVICE UNIT

	Gallon/Day	Single-Family Unit
Water System Capital Cost	$6.14	$2,909
Water Debt Service Credit	$0.42	$369
Water Net Capital Cost	$5.72	$2,540

Source: Capital costs from Table 19; debt service credits from Table 20.

WASTEWATER

Figure 3
EXISTING WASTEWATER FACILITIES



Lincoln has been served by a public wastewater collection system since 1888. The collection system was operated by Sanitary District No. 1 of Lancaster County, which was created by the state legislature in 1891, until it was taken over by the City in 1957. The present collection system serves 12 major drainage basins and includes over 860 miles of sanitary sewer pipes ranging from 6 to 90 inches in diameter.

Wastewater generated in Lincoln is currently treated at the City's two wastewater treatment plants. The Theresa Street Wastewater Treatment Plant is centrally located; the Northeast Wastewater Treatment Plant is located at the northeastern edge of the city. The Theresa Street plant is currently treating an average annual flow of 20 mgd. During wet periods with high intensity rainfall events, peak hydraulic flows have reached as high as 85 mgd. The Northeast plant is currently treating an average annual flow of 6 mgd, with peak wet weather flows approaching 26 mgd.

The Theresa Street facility occasionally exceeds its permitted discharge limits for organic waste strength due to periods of high volume, high strength organic wastes discharged from several large industries. Improvements are currently underway to provide additional oxidative capacity for treatment of such high strength wastes. Improvements to both plants to meet new National Pollution Discharge Elimination System (NPDES) permit limits for ammonia are currently estimated at $20 to $25 million.

In several areas of the city, the trunk sewer systems are approaching or have already exceeded their capacity to transport peak sewage flows during severe rainfall events. In particular, the Salt Creek basin requires additional capacity. A new gravity relief sewer is currently under phased construction to provide additional capacity in this area.

Service Unit

There are a number of parameters that are used in wastewater system design. The average daily flow that passes through a wastewater treatment facility on an annual basis is called the average annual flow (AAF). AAF is used to determine long-range planning requirements. The highest monthly flow,

on a 30-day average, is defined as the maximum month flow (MMF). MMF is used in combination with maximum month biological oxygen demand to determine the design capacity of the organic treatment components. The maximum hourly flow entering the treatment facility at any time during the period of record is defined as the peak wet weather flow (PWWF). PWWF is the total wastewater flow that occurs at the facility during precipitation events such as rain or snow storms, and includes dry weather infiltration as well as direct stormwater inflow (infiltration/inflow or I/I). (Even though considerable effort has been made to reduce I/I, large storms still exert a significant impact on the maximum flows at Lincoln's two treatment facilities.) PWWF is used to determine the maximum hydraulic capacity of pipelines, lift stations and various treatment units of the overall collection and treatment system.

For the purpose of this analysis, the cost of wastewater facilities will be allocated to new development based on its contribution to average annual flow. Existing and projected average daily wastewater flows from the wastewater master plan are about 120 to 125 gallons per capita per day, as shown in Table 22. This per capita figure includes both residential and nonresidential flows.

Table 22
WASTEWATER DEMAND PER CAPITA, 1993-2015

	1993	2000	2015
Average Daily Flow (gpd)	24,300,000	26,000,000	30,600,000
Population	196,670	218,535	245,700
Average Per Capita Flow (gpcd)	124	119	125

Source: 1993 and 2015 data from Brown and Caldwell and HWS Consulting Group, *Lincoln Wastewater Facility Plan*, January 1995; year 2000 flow from City utilities staff; year 2000 population estimate from Table 11.

Although average annual flow in terms of gallons per day will be the service unit, it will also be useful to know the demand represented by an additional single-family dwelling unit. Based on the residential share of wastewater flows and the average size of a single-family household in Lincoln, a single-family unit generates an average daily wastewater flow of about 223 gallons per day, as shown in Table 23.

Table 23
WASTEWATER DEMAND PER SINGLE-FAMILY UNIT

Average Per Capita Flow (gpd)	120
Percent Residential Wastewater Demand	67%
Residential Average Per Capita Flow (gpd)	80
Average Household Size, Single-Family Detached Unit (persons/unit)	2.79
Average Day Wastewater Demand per Single-Family Unit (gpd)	223

Source: Average per capita flow assumed based on Table 22; percent residential flow assumed same as for water from Table 11; single-family average household size from Table 12.

Cost per Service Unit

The capital cost to provide wastewater service consists primarily of treatment plant costs and major trunk sewers. Each of these components are addressed below.

Treatment Plants

The capacity of a wastewater treatment plant is a relative concept. The rated capacity of a treatment plant is generally accepted as being the capacity of the limiting process in the plant. The main types of capacity are hydraulic capacity and treatment capacity. Hydraulic capacity is the ability of the major components to physically accommodate the flow of wastewater. The treatment capacity of a secondary wastewater treatment facility consists of both clarification capacity and oxidation capacity. Clarification is the process of removing solids from the wastewater stream. Oxidation is the process of reducing the organic load carried by the wastewater to a level that meets permit effluent limits. In both plants, the limitation is the oxidative capacity, which reflects the biological capacity of the trickling filters and aeration basins. The Theresa Street plant is currently rated for a design oxidative capacity of 28 mgd, and the Northeast plant is currently rated for a design oxidative capacity of 8 mgd, at maximum month loading conditions.

The population of Lincoln has increased by over 25 percent since the last expansion of the Theresa Street plant in 1973. The City's wastewater master plan recommends improvements to upgrade and expand the capacity of both plants over the 1995-2015 period, at a cost (in 1995 dollars) of about $38 million.

The sites of the two treatment plants have adequate area for expansion to serve the needs of the City for up to 50 years. Both plants can be expanded in logical increments of capacity to meet growth needs at a cost of about $3 per gallon of required treatment capacity, according to City utilities staff. If future growth of the city dictates the need for an additional treatment facility, the approximate unit cost for construction is $4 per gallon of capacity , not including the costs of land acquisition.

Staff recently conducted an analysis of the cost of the treatment plant expansion that would be required in each of six defined growth areas to serve the build-out development in each area. On average, the cost of treatment plant expansion to accommodate new development on the fringe is $3.36 per additional gallon per day of average daily wastewater demand (Table 24).

Table 24
WASTEWATER PLANT COST PER SERVICE UNIT

Treatment Plant Cost to Serve Six Fringe Growth Areas	$209,620,000
Average Daily Flow (ggd) at Build-Out from Growth Areas	62,300,000
Treatment Plant Cost per gpd	$3.36

Source: Treatment plant expansion cost to serve build-out of six defined growth areas, and average daily flow projected at build-out from the six areas, taken from memo from Mark Bauer, Lincoln Public Works & Utilities–Wastewater, July 18, 2000.

Wastewater Trunk Lines

The City is increasing the wastewater interceptor system by about 15 to 20 miles per year. A major improvement to the collection system currently underway is the Salt Creek relief sewer trunk. This project, which will ultimately cost about $24 million, is about one-third done, and will take another 8 to 10 years to complete. It is intended to serve additional growth in the City's existing service areas to the south. In order to provide sewer capacity to serve build-out, additional relief sewers will be needed to transport peak flows to the Theresa Street Plant, or a flow equalization facility or an additional treatment facility will be needed on the west/southwest side of the city.

Wastewater lines within a development are installed at the developer's expense. When line extensions are needed to serve new development, or when larger lines are needed within a development in order to serve other developments, the City will pay for the cost of oversizing pipes beyond eight inches in diameter. In general, lines smaller than 18 inches in diameter are considered tappable mains, and the City's *Directional Growth Analysis* study performed in 1996 excluded the cost of such lines from consideration, since at least a portion of the cost of such lines would be paid for by developers. The City's existing system contains about 79 miles of wastewater trunk lines 18 inches and greater, and the cost of installing this amount of pipe in undeveloped areas at today's costs would total about $54 million, as shown in Table 25.

Table 25
WASTEWATER TRUNK REPLACEMENT COST

Pipe Diameter	Length (feet)	Cost/ Foot	Replacement Value
78"	3,254	$700	$2,278,000
72"	140	$600	$84,000
60"	12,306	$350	$4,307,000
54"	16,797	$280	$4,703,000
51"	1,080	$225	$243,000
48"	54,144	$200	$10,829,000
42"	31,244	$170	$5,311,000
36"	50,353	$125	$6,294,000
30"	43,347	$110	$4,768,000
27"	24,825	$100	$2,483,000
24"	49,397	$80	$3,952,000
21"	47,807	$70	$3,346,000
18"	80,286	$65	$5,219,000
Total	414,980		$53,817,000

Source: Pipe size, length and cost per foot from memo from Mark Bauer, Lincoln Public Works & Utilities–Wastewater, to Dennis Bartels, July 18, 2000.

One way to estimate the cost of new sewer trunk lines required to serve new development is to divide the replacement cost of existing trunk lines, as estimated above, by current average day demand. The presumption is that the expansion of the trunk line system will be proportional to the increase in demand. This approach yields an average trunk line cost of $2.07 for each gallon per day of additional wastewater generation, as shown in Table 26. This approach, however, is conservative, and additional analysis recently conducted by City wastewater utility staff provides a better estimate. Staff recently conducted an analysis of the cost of the sewer trunk lines that would be required in each of six defined growth areas to serve the build-out development in each area. On average, the cost of major sewer trunk lines (i.e., greater than 18 inches in diameter) to accommodate new development on the fringe is $2.78 per additional gallon per day of average daily wastewater demand (Table 26).

Table 26
WASTEWATER LINE COST PER SERVICE UNIT

Calculation Component	Existing System	Growth Area Analysis
Sewer Trunk Line Cost	$53,817,000	$173,420,000
Average Daily Flow (ggd)	26,000,000	62,300,000
Sewer Line Cost per gpd	$2.07	$2.78

Source: Sewer trunk line cost of existing system from Table 25; existing average daily flow from City utilities staff; growth analysis data is cost of sewer trunk lines to serve build-out of six defined growth areas, and average daily flow is projected flow at build-out from the six areas, taken from memo from Mark Bauer, Lincoln Public Works & Utilities–Wastewater, to Dennis Bartels, July 18, 2000.

Cost per Service Unit Summary

In summary, the capital cost to serve new development is about $6.14 per gallon per day of additional wastewater demand. Based on average wastewater generation rates, it will cost approximately $1,369 to construct the capital facilities to accommodate an additional single-family unit, as shown in Table 27.

Table 27
WASTEWATER TOTAL COST PER SERVICE UNIT

Treatment Plant Cost per gpd	$3.36
Sewer Trunk Line Cost per gpd	$2.78
Total Wastewater Cost per gpd	$6.14
Wastewater Demand per Single-Family Unit (gpd)	223
Wastewater Cost per Single-Family Unit	$1,369

Source: Treatment plant cost from Table 24; sewer trunk line cost from Table 26; demand per single-family unit from Table 23.

Net Cost per Service Unit

The analysis above has estimated the actual capital cost require to accommodate an additional service unit or single-family detached dwelling at the existing level of service provided to current wastewater customers. However, new wastewater customers will be paying for some of the cost through their rates that will be used to retire existing debt on the wastewater system. Dividing the amount of outstanding debt on the wastewater system by current wastewater demand provides a reasonable estimate of the amount that new customers will be paying. In effect, this approach puts new customers on an equal footing with current customers, allowing them to pay for the same share of their capital costs through rates. As shown in Table 28, the debt service credit amounts to $0.68 per gallon per day of additional demand, or $152 per single-family dwelling.

Table 28
WASTEWATER DEBT SERVICE CREDIT PER SERVICE UNIT

Outstanding Wastewater System Debt	$17,603,947
Average Daily Wastewater Demand (gpd), 2000	26,000,000
Debt Service Credit per gpd	$0.68
Average Daily Demand per Single-Family Unit (gpd)	223
Debt Service Credit per Single-Family Unit	$152

Source: Outstanding wastewater system debt principal as of August 31, 1999 for wastewater revenue bonds from City of Lincoln Comprehensive Annual Financial Report and outstanding principal as of September 2000 for Nebraska Department of Environmental Quality loan from final loan amortization schedule, June 22, 1993; year 2000 average daily wastewater demand from Table 22; demand per single-family unit from Table 23.

Reducing the cost per service unit or single-family unit by the amount of the debt service credit calculated above results in the estimated net cost per service unit or single-family dwelling. As shown in Table 29, the net cost to accommodate growth in customers is estimated to be $5.46 per gallon per day of additional average day wastewater demand or $1,217 per new single-family customer. Currently, this cost is paid for by all customers out of wastewater rates. An alternative would be to recover this cost, or a portion of it, through a wastewater fee assessed at the time of connection to the wastewater system. However, before a wastewater connection fee ordinance is adopted, a more detailed study should be performed.

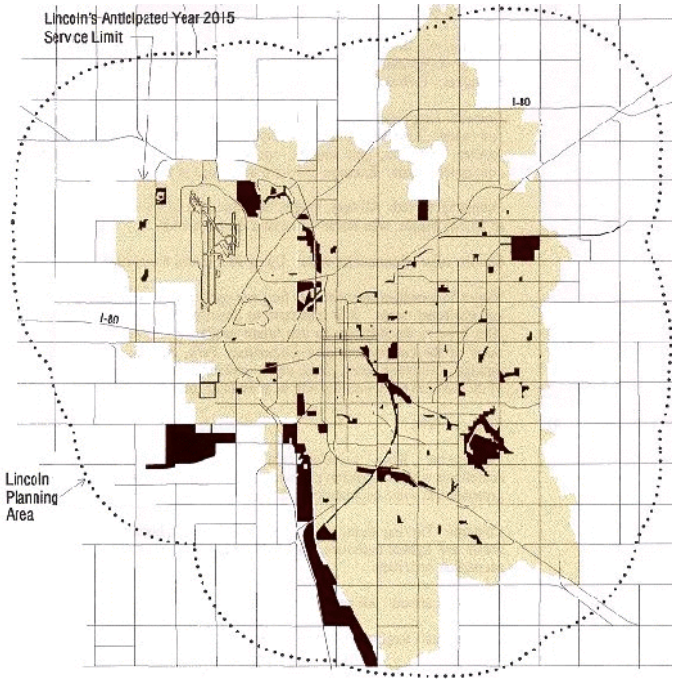
Table 29
WASTEWATER NET COST PER SERVICE UNIT

	Gallon/Day	Single-Family Unit
Wastewater System Capital Cost	$6.14	$1,369
Wastewater Debt Service Credit	$0.68	$152
Wastewater Net Capital Cost	$5.46	$1,217

Source: Capital costs from Table 27; debt service credits from Table 28.

PARKS

Figure 4
EXISTING PARKS



The City of Lincoln provides a wide variety of parks and recreational facilities. The four types of parks are mini-parks, neighborhood, community and regional parks. All told, these parks total about 2,536 acres. The City also operates many special purpose facilities, such as Pinewood Bowl, Pioneers Park Nature Center, Hyde Observatory, Woods Tennis Bubbles, Folsom Children's Zoo, Camp A Way and Sherman Field. In addition, the City provides 75 miles of trails, nine swimming pools, five golf courses and five gyms. The City also operates the County-owned 1,455-acre Wilderness Park, as well as the 40-acre Seacrest Range conservancy.

The City's desired level of service for parks includes one 8- to 10-acre neighborhood park per square mile of residential development, a community park within 5 miles and a trail within one mile. The City also provides four large regional parks. The City golf courses were built with revenue bonds and are self-supporting enterprises. Lancaster County is not active in the parks arena, and the City manages the one County park. The City participates in joint use of recreational facilities with the Lincoln School District.

Service Unit

In impact fee and fiscal impact analysis, park and recreation facilities are generally considered to benefit only residential development. It is considerably more difficult to establish the nexus between new nonresidential development and the increased demand for park facilities.

Permanent, year-round population is the most commonly-used service unit for park impact fees, parkland dedication requirements and park fiscal impact analysis. However, a more accurate and quantifiable measure is park equivalent dwelling units (EDUs). Park EDUs are the number of single-family equivalents of various housing types, based on ratios of average household size.

The first step in computing park EDUs is to determine the average household size associated with different housing types. The average household sizes for Lincoln from the 1990 Census range from about 1.6 to 2.8 persons per unit, according to the data presented in Table 30.

Table 30
AVERAGE HOUSEHOLD SIZE BY HOUSING TYPE, 1990

Housing Type	Total Units	Occupied Units	Household Population	Avg, HH Size
Single-Family Detached	46,194	44,987	125,298	2.79
Single-Family Attached	3,799	3,622	8,451	2.33
Duplex	4,572	4,265	8,831	2.07
Multi-Family	22,143	20,296	33,333	1.64
Mobile Home	2,371	2,232	5,294	2.37
Total	79,079	75,402	181,207	2.40

Source: U.S. Census Bureau, 1990 Census Summary Tape File 1 (100% count for basic demographic variables), for City of Lincoln from web site (http://venus.census.gov/cdrom/lookup).

Taking the ratio of the average household size for each housing type to the average household size of a single-family unit results in the number of equivalent dwelling units associated with a dwelling unit of each housing type. Multiplying the EDUs per dwelling unit by the total number of units in Lincoln yields the total number of park service units in the city today.

Table 31
PARK SERVICE UNITS, 2000

Housing Type	Avg, HH Size	EDUs/ Unit	Total Units, 2000	Total EDUs, 2000
Single-Family Detached	2.79	1.00	53,580	53,580
Single-Family Attached	2.33	0.84	3,300	2,772
Duplex	2.07	0.74	5,840	4,322
Multi-Family	1.64	0.59	27,339	16,130
Mobile Home	2.37	0.85	2,501	2,126
Total			92,560	78,930

Source: U.S. Census Bureau, 1990 Census Summary Tape File 1 (100% count for basic demographic variables), for City of Lincoln from web site (http://venus.census.gov/cdrom/lookup).

For the purposes of impact fees or fiscal impact analysis, the existing level of service should be used in calculating the fees or fiscal impact, rather than a higher, desired level of service. The City's current inventory of neighborhood and mini-parks, community parks, regional parks and conservancy land totals 4,049 acres, as summarized in Table 32. Dividing park acres by the city's estimated year 2000 park service units yields the following existing level of service standards.

Table 32
PARK LEVELS OF SERVICE

Facility	Acres	EDUs, 2000	Acres/EDU
Neighborhood and Mini Parks	485.92	78,930	0.0062
Community Parks	668.40	78,930	0.0085
Regional Parks*	1,381.98	78,930	0.0175
Conservancy Land	1,512.85	78,930	0.0192
Total	4,049.15	78,930	0.0513

* excludes 191-acre Pioneers Golf Course
Source: Park acres from memorandum from Lynn Johnson, City of Lincoln Parks and Recreation Department, July 20, 2000; year 2000 EDUs from Table 31.

Most park land dedication requirements are based on the level of service for neighborhood and community parks, but not for regional parks or conservancy land. This is because a residential development, no matter how large, is unlikely to be required to dedicate a regional park or conservancy site. Park impact fees, on the other hand, often are used to acquire regional parks or open space, and the existing level of service for those facilities is often used in calculating such fees.

The City does not have a mandatory park land dedication requirement, although it does encourage developers to donate land. Park land dedication requirements are one of the oldest and most common forms of developer exactions, and are generally coupled with a provision that allows the City to accept cash in-lieu of dedication. Today they often play a supplementary role in a park impact fee system, in which the City can require land dedication if there is a suitable park site with a proposed subdivision, but the developer is given credit for the value of any such required dedication against the park impact fees. Potential park land dedication requirements, based on the existing level of service for neighborhood and community parks and park service units by housing type, are presented in Table 33.

Table 33
PARK LAND DEDICATION REQUIREMENTS

Housing Type	EDUs/ Unit	Acres/ EDU	Acres/ Unit
Single-Family Detached	1.00	0.0147	0.0147
Single-Family Attached	0.84	0.0147	0.0123
Duplex	0.74	0.0147	0.0109
Multi-Family	0.59	0.0147	0.0087
Mobile Home Park (per pad site)	0.85	0.0147	0.0125

Source: EDUs per unit from Table 31; acres/EDU is sum of neighborhood and community park acres per EDU from Table 32.

Cost per Service Unit

According to City parks and recreation staff, the estimated current cost for developing an eight-acre neighborhood park, including site grading and drainage improvements, seeding, construction of a playground, construction of a park shelter and site landscaping is approximately $70,000. This assumes that City staff prepare the master plan, prepare plans for grading and drainage improvements, prepare the landscape plan, install the play equipment and shelter, and seed the site. The construction cost for a 60-acre community park with a variety of active recreation facilities, such as Densmore Park, is approximately $3.5 million. While recent land for neighborhood parks has been acquired through dedication at annexation, it is estimated that land in developing areas would cost about $30,000 per acre to purchase for park sites.

Table 34
PARK COST PER ACRE

Cost Component	Neighborhood Park	Community Park
Development Cost	$70,000	$3,500,000
Park Size (Acres)	8.00	60.00
Development Cost per Acre	$8,750	$58,333
Land Cost per Acre	$30,000	$30,000
Total Cost per Acre	$38,750	$88,333

Source: Memorandum from Lynn Johnson, City of Lincoln Parks and Recreation Department, July 20, 2000.

As shown in Table 35, the replacement value of the City's existing parks and recreational facilities is estimated to be approximately $124.3 million. This excludes the County-owned Wilderness Park and the Seacrest Range Park, which are classified as conservancy land rather than as regional parks.

Table 35
PARK SYSTEM REPLACEMENT COST

Facility	Units	Cost/Unit	Replacement Cost
Neighborhood Parks (acres)	485.92	$38,750	$18,829,400
Community Parks (acres)	668.40	$88,333	$59,041,777
Regional Parks (acres)	1,381.98	$5,000	$6,909,900
Regional Park Improvements	N/A	N/A	$3,683,213
Neighborhood Swimming Pools	10	$2,100,000	$21,000,000
Acquatic Park	1	$3,500,000	$3,500,000
Recreation Centers (square feet)	70,394	$110	$7,743,340
Indoor Playground	1	$1,400,000	$1,400,000
Indoor Rifle Range	1	$200,000	$200,000
Outdoor Education Center	1	$1,200,000	$1,200,000
Parks Dept Office Bldg	N/A	N/A	$459,864
Parks and Rec Stockroom	N/A	N/A	$300,854
Total Replacement Cost			$124,268,348

Source: Lynn Johnson, City of Lincoln Parks and Recreation Department, July 20, 2000 and September 19, 2000 memoranda; regional park improvements, office and stockroom are insured values from "City of Lincoln Building and Contents," July 31, 2000.

The cost to provide a new single-family unit or equivalent with these facilities at the City's existing level of service is $1,574 as shown in Table 36.

Table 36
PARK COST PER SERVICE UNIT

Existing Park System Replacement Cost	$124,268,348
Park Equivalent Dwelling Units, 2000	78,930
Park Cost per EDU	$1,574

Source: Park replacement cost from Table 35; park service unit estimate (EDUs) from Table 31.

Net Cost per Service Unit

Some of the cost to provide new residents with park facilities will be paid by the new residents themselves through future property tax payments that will be used to retire outstanding debt on existing park facilities. In addition, some of the park capital costs to serve growth will be paid by outside funding sources. Consequently, the cost per service unit should be reduced to take account of these factors, and the result is referred to as the net capital cost.

There are several outstanding bond issues that were used exclusively or partially to fund park improvements. Just this year, the City issued $3.2 million in Municipal Infrastructure Redevelopment

Fund Bonds to build a community recreation center. In 1999, the City issued $21.8 million in general obligation (GO) bonds to fund two parks and two libraries. Since the exact amounts allocated to the two types of facilities are not known at this time, it will be assumed that half of this bond issue is for parks. Also last year, the City issued $8.22 million in GO bonds to refund 1989 and 1991 GO bonds, and the 1989 bonds were partially used to fund the trail system, park property and zoo facilities. All told, the outstanding debt for park facilities is estimated to be about $16 .3 million, as shown in Table 37. Reducing this amount by the residential share of the City's property tax base and dividing the residential share by existing park service units results in a debt service credit of $92 per equivalent dwelling unit.

Table 37
PARK DEBT SERVICE CREDIT PER SERVICE UNIT

	Total Debt	Park Share
2000 Municipal Infrastructure Redevelopment Bonds	$3,200,000	$3,200,000
1999 Various Purposes Series A	$21,800,000	$4,700,000
1999 Various Purposes Series B Refunding	$7,455,000	$2,191,770
Total Outstanding Park Debt		$10,091,770
Residential Share of Property Tax Base		72%
Residential Share of Outstanding Debt		$7,266,074
Park Equivalent Dwelling Units, 2000		78,930
Debt Service Credit per EDU		$92

Source: Total outstanding debt principal as of September 2000 from debt service schedules; park share of 1999 Series A park and library bonds from Lincoln Parks and Recreation Department, September 19, 2000 memorandum; park share of 1999 B refunding bonds estimated to be 29.4%; residential share of property tax from City of Lincoln, *Comprehensive Annual Financial Report, Fiscal Year Ended August 31, 1999*, p. 116; current service unit estimate (EDUs) from Table 31.

The May 2000 draft of the City of Lincoln's *Capital Improvement Program* for fiscal years 2000/01 through 2005/06 programs $19.8 million in park and trail capital improvements over the six-year period. Just under half of that funding, about $9.1 million, could be considered "growth-related" in that it expands the capacity of park facilities and trails, as opposed to rehabilitating or replacing existing facilities. Funding for the growth-related improvements is roughly evenly divided among Keno funds, general funds, and other funding sources. Other funding sources include almost half a million dollars from the Municipal Infrastructure Redevelopment Fund for the F Street Community Center, and just over $900,000 from unspecified sources for trail projects. The programmed CIP projects and their funding sources are summarized in Table 38.

The City has not received much in the way of state grants for growth-related park improvements, although it has for trails. Generally, trails are considered separately from parks in impact fee analysis or land dedication requirements. Excluding projects for trails or rehabilitation of existing park facilities, park grants funding for growth-related park improvements amounts to less than 1 percent of annual growth-related CIP expenditures, as shown in Table 39.

Table 38
PARK CAPITAL IMPROVEMENTS FUNDING

Capital Improvement Project	Keno	Gen. Fund	Ath. Fees	Other	Total
Antelope Valley Community Revit	$440,000	$0	$0	$0	$440,000
Jensen Park	$1,020,000	$950,000	$100,000	$0	$2,070,000
NE Lincoln N'hood Park	$0	$50,000	$0	$0	$50,000
North Lincoln N'hood Park	$0	$50,000	$0	$0	$50,000
Pahres Park Construction	$0	$55,000	$0	$0	$55,000
Pioneers Park Nature Center	$350,000	$1,410,000	$0	$0	$1,760,000
South Lincoln N'hood Park	$10,000	$60,000	$0	$0	$70,000
SE Lincoln N'hood Park	$15,000	$45,000	$0	$0	$60,000
Wilderness Park Land Acquisition	$0	$0	$0	$1,500,000	$1,500,000
Woods Pool Sprayground	$500,000	$0	$0	$0	$500,000
F Street Community Center	$742,000	$0	$0	$467,000	$1,209,000
Billy Wolff/Antelope Crk Trail	$0	$90,000	$0	$0	$90,000
Hwy 2 Trail West Extension	$0	$90,000	$0	$240,000	$330,000
Husker Link Trail Land Acquisition	$0	$0	$0	$500,000	$500,000
Husker Link Trail	$0	$180,000	$0	$0	$180,000
Oak Lakes Trail	$0	$90,000	$0	$175,000	$265,000
Total Growth-Related	$3,077,000	$3,070,000	$100,000	$2,882,000	$9,129,000
Percent	33.7%	33.6%	1.1%	31.6%	100.0%

Source: Growth-related projects from City of Lincoln, *Capital Improvements Program, FY 2000-2006*, May 2000 draft.

Table 39
PARK GRANTS, FY 1996-2000

Grant	Year	Amount	Growth-Related
NE Environmental Trust (dredge ponds)	1995-96	$103,000	$0
LPSNRD Community Forestry Program	1995-96	$23,000	$23,000
LPSNRD Community Forestry Program	1996-97	$11,200	$11,200
Nebraska Recycling Fund (playgrounds)	1997-98	$11,000	$11,000
TEA-21 (Bison Trail)	1997-98	$322,000	$0
Nebraska Recreational Trails Program (Bison Trail)	1997-98	$20,000	$0
LPSNRD Community Forestry Program	1997-98	$5,400	$5,400
FEMA Grant (tree replacement)	1998-99	$249,000	$0
Nebraska Recreational Trails Program (Wmburg/Tierra Trail)	1998-99	$68,000	$0
LPSNRD Community Forestry Program	1998-99	$3,000	$3,000
Institute of Museums & Libraries (Pioneers Park Nature Center)	1999-00	$66,000	$0
Pipher, Jaffrey Foundation (Green Team)	1999-00	$10,000	$10,000
Nebraska Recycling Fund (playgrounds)	1999-00	$10,000	$10,000
Five-Year Total		$901,600	$73,600
Average Annual Grant Amount		$180,320	$14,720
Annual Growth-Related CIP Spending			$1,521,500
Grant Percentage			1.0%

Source: Memo from Lynn Johnson, Parks and Recreation, July 20, 2000; annual CIP growth-related funding is one-sixth of FY 2000-2005 funding from Table 38.

Deducting the amount that new residents will pay through property tax debt service payments and amounts that will be funded with Keno funds and grants, the net cost to maintain the existing park level of service is about $936 per equivalent dwelling unit.

Table 40
PARK NET COST PER SERVICE UNIT

Park Capital Cost per EDU	$1,574
Debt Service Credit per EDU	$92
Keno Funding per EDU (33.7%)	$530
Grant Funding per EDU (1.0%)	$16
Net Cost per EDU	$936

Source: Park capital cost from Table 36; debt service credit from Table 37; Keno funding is capital cost time percent Keno funding from Table 38; grant funding is capital cost times percent grant funding from Table 39.

The net cost per dwelling unit of providing new residential developments with the existing level of parks facilities is shown in Table 41 below for various housing types.

Table 41
PARK NET COST BY HOUSING TYPE

Housing Type	EDUs/ Unit	Net Cost/ EDU	Net Cost/ Unit
Single-Family Detached	1.00	$936	$936
Single-Family Attached	0.84	$936	$786
Duplex	0.74	$936	$693
Multi-Family	0.59	$936	$552
Mobile Home Park (per pad site)	0.85	$936	$796

Source: EDUs per unit from Table 31; net cost per EDU from Table 40.

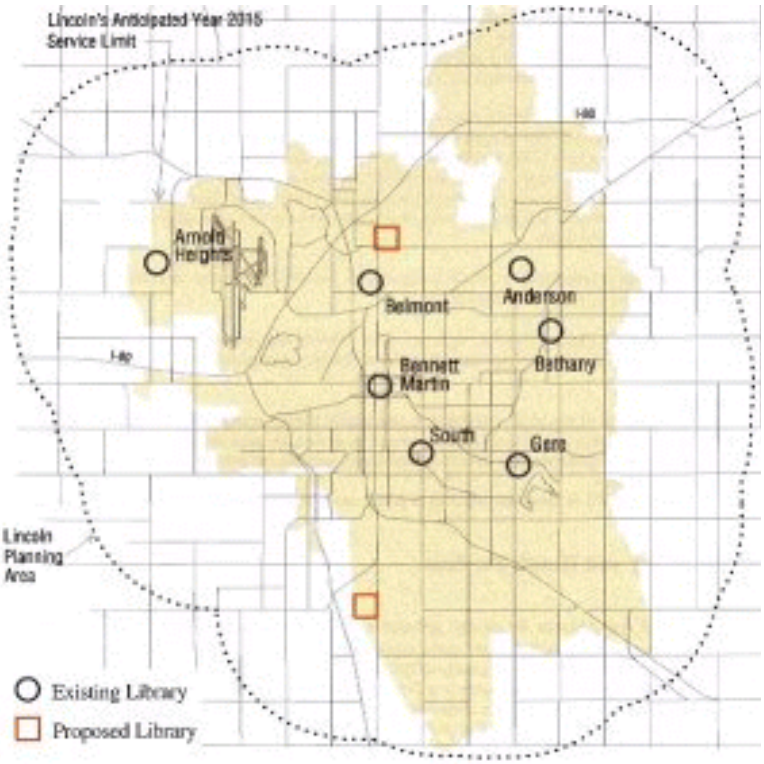
LIBRARIES

The Lincoln Public Library system operates a main library, six branch libraries and a bookmobile. The system's circulation materials include 641,300 books, more than 39,000 sound recordings and nearly 2,000 periodical subscriptions, as well as a growing collection of video cassettes and compact disks.

Through contractual arrangement, residents living outside Lincoln, but within Lancaster County, have access to all services of Lincoln Public Libraries. The City receives about $425,000 annually from Lancaster County to help with operating costs, based on the unincorporated area's per capita share of the tax portion of the library budget. The County does not share in library capital costs.

The library system also gets some of its operating revenues, but no capital financing, from two trust funds. Polley Music Service, which costs the library $120,000 annually to provide, gets about $80,000 annually from a $2 million trust fund. The Library Foundation also provides a small annual grant to help fund the Heritage Room Service.

Figure 5
EXISTING AND PLANNED LIBRARIES



Service Unit

In impact fee and fiscal impact analysis, library facilities are generally considered to benefit only residential development. It is considerably more difficult to establish the nexus between new nonresidential development and the increased demand for library facilities. As with the park capital cost analysis, the service unit for library facilities will be single-family equivalent dwelling units (EDUs), based on the average household size of various housing types. The service units per dwelling unit for various housing types will be the same as those used in the park analysis (see Table 31).

Cost per Service Unit

As shown in Table 42, the replacement value of the City's existing library facilities is estimated to be approximately $27.4 million.

Table 42
LIBRARY FACILITY REPLACEMENT COST

Branch Library	Sq. Ft.	Building	Furniture & Fixtures	Computer & Security	Media	Shelving	Total
Anderson	12,000	$1,452,000	$74,306	$62,870	$816,244	$22,293	$2,427,713
Arnold Heights	2,390	$0	$8,595	$13,873	$75,030	$1,154	$98,652
Belmont	1,500	$0	$11,259	$10,434	$71,455	$2,862	$96,010
Bennett Martin	67,910	$8,217,000	$368,916	$360,071	$6,961,389	$98,343	$16,005,719
Bethany	3,800	$460,000	$35,928	$11,156	$323,984	$11,194	$842,262
Gere	33,000	$3,993,000	$221,238	$93,302	$2,328,232	$87,387	$6,723,159
South	4,900	$593,000	$35,276	$14,940	$518,242	$11,637	$1,173,095
Total	125,500	$14,715,000	$755,518	$566,646	$11,094,576	$234,870	$27,366,610

Source: Square feet from "Lincoln City Libraries Stats by Unit," building replacement cost is square feet times $121 per square foot construction cost for planned libraries per Lincoln library staff at June 20, 2000 meeting; estimated value of contents from "Lincoln City Libraries: Schedule of Buildings and Contents," June 2000.

The cost to provide a new single-family unit or equivalent with library facilities at the City's existing level of service is $347 as shown in Table 43.

Table 43
LIBRARY COST PER SERVICE UNIT

Existing Library System Replacement Cost	$27,366,610
Library Equivalent Dwelling Units, 2000	78,930
Library Cost per EDU	$347

Source: Library replacement cost from Table 42; library EDUs is same as park EDUs from Table 31.

Net Cost per Service Unit

Some of the cost to provide new residents with library facilities will be paid by the new residents themselves through future property tax payments that will be used to retire outstanding debt on existing library facilities. Consequently, the cost per service unit should be reduced to take account of these future tax payments, and the result is referred to as the net capital cost.

There are two outstanding bond issues that were partially used to fund library improvements. The 1999 library and park bond issue approved by voters in November 1998 authorized $15.2 million to build two new branch libraries. Both will be located in existing parks, and will require no additional expenditure for land acquisition. The City issued $8.22 million in 1999 to refund 1989 and 1991 GO bonds, and the 1991 bonds were partially used to fund library improvements. All told, the outstanding debt for library facilities is estimated to be about $17.2 million, as shown in Table 44. Reducing this amount by the residential share of the City's property tax base and dividing the residential share by existing service units results in a debt service credit of $157 per EDU.

Table 44
LIBRARY DEBT SERVICE CREDIT PER SERVICE UNIT

	Original Principal Amount		Outstanding Debt Principal	
Bond Issue	**Total**	**Library Share**	**Total**	**Library Share**
1999 Various Purposes Series A	$21,800,000	$15,200,000	$21,080,000	$14,698,000
1999 Various Purposes Series B	$8,220,000	$2,790,000	$7,455,000	$2,530,000
Total Outstanding Park Debt				$17,228,000
Residential Percent of Property Tax Base				72%
Residential Share of Outstanding Debt Repayment				$12,404,160
Library Equivalent Dwelling Units, 2000				78,930
Debt Service Credit per EDU				$157

Source: Total original principal and total outstanding debt as of September 2000 from City of Lincoln debt service schedules; original park share of series A from Lincoln library staff at June 20, 2000 meeting; original library share of series B, which refunded 1989 and 1991 issues, assumed to be one-half of 1991 issue, which was used for library and drainage purposes; residential share of property tax from City of Lincoln, *Comprehensive Annual Financial Report, Fiscal Year Ended August 31, 1999*, p. 116; library EDUs same as park EDUs from Table 31.

Deducting the amount that new residents will pay through property tax debt service payments, the net cost to maintain the existing library level of service is about $190 per equivalent dwelling unit.

Table 45
LIBRARY NET COST PER SERVICE UNIT

Capital Cost per EDU	$347
Revenue Credit per EDU	$157
Net Cost per EDU	$190

Source: Capital cost per EDU from Table 43; debt service credit per EDU from Table 44.

The net cost per dwelling unit of providing new residential developments with the existing level of library facilities is shown in Table 46 below for various housing types.

Table 46
LIBRARY NET COST BY HOUSING TYPE

Housing Type	EDUs/ Unit	Net Cost/ EDU	Net Cost/ Unit
Single-Family Detached	1.00	$190	$190
Single-Family Attached	0.84	$190	$160
Duplex	0.74	$190	$141
Multi-Family	0.59	$190	$112
Mobile Home Park (per pad site)	0.85	$190	$162

Source: Persons per unit from Table ?; net cost per person from Table 45.

POLICE PROTECTION

The Lincoln Police Department provides numerous capital facilities that are used to support the provision of police services in the city. This section calculates the net capital cost of police facilities required to serve new development at the existing level of service.

Service Unit

Disparate types of development must be translated into a common unit of measurement that reflects the impact of new development on the demand for police protection services. This unit of measurement is called a "service unit." A common service unit used in fiscal impact analysis is the "equivalent dwelling unit" or EDU, which represents the impact of a typical single-family dwelling.

The relative demand for police facilities and services required to serve development units of various land use types is measured in terms of the number of police calls-for-service reported during a 12-month period. Detailed data on the 135,137 calls-for-service for 1999 was provided by the Police Department. Approximately two-thirds of the calls-for-service could be attributed to a specific land use; the remainder occurred on streets or parking lots (e.g., car accidents) and are related to movement between land uses, or took place on undeveloped sites.

Existing residential land use for the city was based on Planning Department housing unit estimates as of June 2000. Estimates of nonresidential square footage were based on 1998 employment data and national average multipliers of square feet per employee (see Table 71 in the Appendix).

The combination of these two data sets yields police calls-for-service per development unit for various land use categories. These are then converted into EDUs by taking the ratio of the calls-for-service of the specific land use by the calls-for-service generated by a single-family unit. As shown in Table 47, a mobile home generates twice the annual number of police calls-for-service as a single-family unit, and 1,000 square feet of retail or commercial development generates over three times the number of calls-for-service.

Table 47
POLICE SERVICE UNITS BY LAND USE

Land Use	Units	Existing Units, 2000	Calls-for-Service, 1999	Calls-for-Service per Unit	EDUs/ Unit
Single-Family Detached	Dwelling	53,580	26,085	0.49	1.00
Duplex	Dwelling	5,840	5,047	0.86	1.76
Multi-Family	Dwelling	30,639	18,220	0.61	1.24
Mobile Home	Dwelling	2,501	2,512	1.00	2.04
Retail/Commercial	1,000 sq. ft.	12,496	20,390	1.63	3.33
Office	1,000 sq. ft.	7,690	1,074	0.14	0.29
Industrial/Warehousing	1,000 sq. ft.	18,243	1,472	0.08	0.16
Govt/Institutional	1,000 sq. ft.	27,021	10,380	0.38	0.78
Total			85,180		

Source: Existing land uses from Table 7; police calls-for service from Lincoln Police Department, "1999 CFS by Location Codes," July 13, 2000; equivalent dwelling units is ratio of calls per unit to single-family detached calls per unit..

The total number of police service units attributable to existing development can be estimated by multiplying the EDUs per unit of development calculated above by the total number of existing development units in the city. These calculations, presented in Table 48, yield an estimate of about 154,000 police service units, each of which is the equivalent of the demand associated with a single-family unit.

Table 48
POLICE EQUIVALENT DWELLING UNITS, 2000

Land Use	Unit	Existing Units	EDUs/ Unit	EDUs
Single-Family Detached	Dwelling	53,580	1.00	53,580
Duplex	Dwelling	5,840	1.76	10,278
Multi-Family	Dwelling	30,639	1.24	37,992
Mobile Home	Dwelling	2,501	2.04	5,102
Retail/Commercial	1,000 sq. ft.	12,496	3.33	41,612
Office	1,000 sq. ft.	7,690	0.29	2,230
Industrial/Warehousing	1,000 sq. ft.	18,243	0.16	2,919
Govt/Institutional	1,000 sq. ft.	27,021	0.78	21,076
Total				153,713

Source: Existing units and EDUs per unit from Table 47.

Cost per Service Unit

The capital facilities that are used to support the provision of police services in Lincoln consist primarily of buildings and vehicles. Lincoln Police Department facilities include the main station in

the City/County complex, a new substation, training facilities on land owned by the airport authority, and leased space used by the narcotics unit. The Department also has plans for the construction of another substation to the east. The total replacement cost of existing police buildings, including building contents and outdoor structures, is estimated based on insured values to be approximately $8.2 million, as shown in Table 49.

Table 49
POLICE BUILDING COST

Facilities	Square Feet	Building Cost	Content Cost	Total Cost
Police Dept. Building*	57,000	$5,397,008	$500,000	$5,897,008
Pistol Range Tower	N/A	$4,286	$4,170	$8,456
Police Range Shop/Garage	N/A	$64,165	$7,425	$71,590
Police Classroom	1,600	$134,984	$7,435	$142,419
Center Team Police Substation	8,200	$950,000	$150,000	$1,100,000
LPD Narcotic Unit	N/A	$0	$100,000	$100,000
Police Garage	10,000	$754,916	$100,667	$855,583
Total Building Replacement Cost	76,800	$7,305,359	$869,697	$8,175,056

* another 20,000 square feet is shared with the Lancaster Sheriff's Office
Source: Square feet from Lincoln Police Department, Capt. T. Sherrill, Management Services, July 13, 2000 memorandum; cost of building and contents based on insured values from City of Lincoln Risk Management Dept., "Building and Contents Coverage," July 31, 2000.

The Police Department maintains a fleet of vehicles, including 173 marked police cars, 69 unmarked cars and a number of support vehicles. The Department does not have a vehicle take-home program, and almost all patrol vehicles are assigned to more than one officer. Based on current replacement costs, the existing fleet of police vehicles has a total cost of about $6.1 million, as summarized in Table 50.

Table 50
POLICE VEHICLE COST

Vehicle Type	Number	Unit Cost	Total Cost
Marked Vehicles	173	$27,000	$4,671,000
Unmarked Vehicles	69	$20,000	$1,380,000
Total Vehicle Replacement Cost			$6,051,000

Source: Lincoln Police Department, Capt. T. Sherrill, Management Services, July 13, 2000 memorandum

The total cost of police facilities, including buildings, building contents and vehicles, is approximately $14.2 million. Dividing this total capital cost by total existing service units yields a cost of about $93 per equivalent dwelling unit, as summarized in Table 51.

Table 51
POLICE COST PER SERVICE UNIT

Building Replacement Cost	$8,175,056
Vehicle Replacement Cost	$6,051,000
Existing Police Facility Cost	$14,226,056
Total Equivalent Dwelling Units, 2000	153,713
Police Cost per Equivalent Dwelling Unit	$92.55

Source: Building replacement cost from Table 49; vehicle cost from Table 50; total equivalent dwelling units from Table 48.

Net Cost per Service Unit

The capital cost attributed to new development should be reduced to account for future property tax payments made by new development that will be used to retire outstanding debt for existing police facilities, or for dedicated or anticipated outside funding that will be generated by new development and used to finance police capital improvements. However, the City of Lincoln does not have any outstanding debt for police facilities, nor is there a dedicated funding source or likely additional outside funding for such improvements. The most recently-constructed substation was funded by federal funds and is located in a tax increment financing district, but this situation is unique and not likely to be repeated. For these reasons, no reductions from the capital cost per service unit appear warranted.

Based on the data, methodology and assumptions described above, the police capital cost of new development can be calculated by multiplying the equivalent dwelling units per development unit associated with various land uses by the net cost per EDU of maintaining the existing level of service. The net cost calculations are shown in Table 52.

Table 52
POLICE NET COST SCHEDULE

Land Use	Unit	EDUs/ Unit	Net Cost/ EDU	Net Cost/ Unit
Single-Family Detached	Dwelling	1.00	$92.55	$93
Duplex	Dwelling	1.76	$92.55	$163
Multi-Family	Dwelling	1.24	$92.55	$115
Mobile Home Park	Pad Site	2.04	$92.55	$189
Retail/Commercial	1,000 sq. ft.	3.33	$92.55	$308
Office	1,000 sq. ft.	0.29	$92.55	$27
Industrial/Warehousing	1,000 sq. ft.	0.16	$92.55	$15
Government/Institutional	1,000 sq. ft.	0.78	$92.55	$72

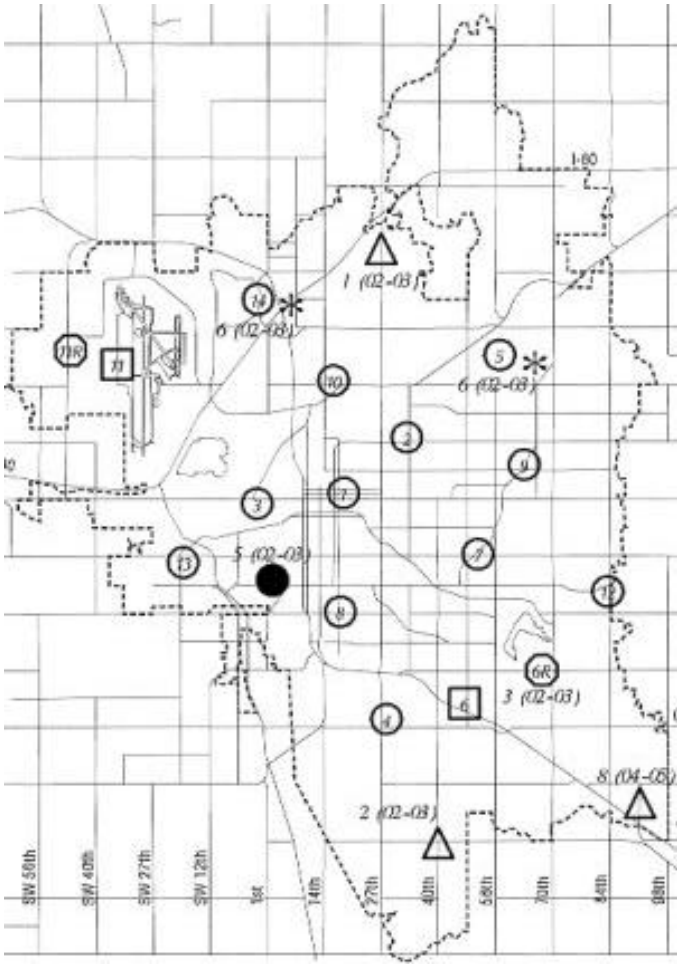
Source: EDUs per unit from Table 47; net cost per EDU from Table 51.

FIRE PROTECTION

This section estimates the net capital cost of fire protection facilities required to serve new development at the existing level of service. The Lincoln Fire Department currently operates out of 14 stations located throughout the city. The location of the stations is designed to achieve an average three minute response time. With the exception of the northern and southern extremes of the city, the Department is currently averaging a response time of 3.23 minutes. Two new stations are planned to improve response times to the north and south. A third new station being planned for the southeast. The Department had previously considered relocating station #6, but that is not currently being planned.

All of the City's firefighters are paid professionals who are cross-trained as paramedics to offer Advance Life Support. The rest of the county is served by volunteer fire districts. Emergency transport is currently provided by a private ambulance company, although the City will be taking that service over as of January 1, 2001. Emergency dispatch is a separate, county-wide function that serves City of Lincoln Fire and Police Departments, the volunteer fire districts and the Lancaster County Sheriff's Office.

Figure 6
FIRE STATION LOCATIONS



Service Unit

Various types of development must be translated into a common unit of measurement that reflects the impact of new development on the demand for fire protection services. This unit of measurement is called a "service unit." A common service unit used in fiscal impact analysis is the "equivalent dwelling unit" or EDU, which represents the impact of a typical single-family dwelling.

The relative demand for fire facilities and services required to serve development units of various land use types is measured in terms of the number of fire incidents (including medical calls) reported during a 12-month period. Detailed data on the 12,988 fire incidents logged by the Fire Department from September 20, 1999 through September 19, 2000 was analyzed. About 73 percent of the

incidents could be attributed to a specific land use; the remainder occurred on streets or parking areas and are related to movement between land uses, or took place on undeveloped sites.

Existing residential land use for the city was based on Planning Department housing unit estimates as of June 2000. Estimates of nonresidential square footage were based on 1998 employment data and national average multipliers of square feet per employee (see Table 71 in the Appendix).

The combination of these two data sets yields fire incidents per development unit for various land use categories. These are then converted into EDUs by taking the ratio of the fire incidents of the specific land use by the fire incidents generated by a single-family unit. As shown in Table 53, 1,000 square feet of retail or commercial development generates over three times the number of fire incidents as a single-family unit.

Table 53
FIRE SERVICE UNITS BY LAND USE

Land Use	Units	Existing Units, 2000	Annual Fire Incidents 1999-2000	Fire Incidents per Unit	EDUs/ Unit
Single-Family Detached*	Dwelling	56,081	3,919	0.49	1.00
Duplex	Dwelling	5,840	227	0.86	1.76
Multi-Family	Dwelling	30,639	2,095	0.61	1.24
Retail/Commercial	1,000 sq. ft.	12,496	974	1.63	3.33
Office	1,000 sq. ft.	7,690	303	0.14	0.29
Industrial/Warehousing	1,000 sq. ft.	18,243	287	0.08	0.16
Govt/Institutional	1,000 sq. ft.	27,021	1,702	0.38	0.78
Total			9,507		

* includes mobile homes
Source: Existing land uses from Table 7; fire incidents from Patty West, Lincoln GIS Department, September 20, 2000; equivalent dwelling units is ratio of incidents per unit to single-family detached incidents per unit..

The total number of fire service units attributable to existing development can be estimated by multiplying the EDUs per unit of development calculated above by the total number of existing development units in the city. These calculations, presented in Table 54, yield an estimate of about 151,000 fire service units, each of which is the equivalent of the demand associated with a single-family unit.

Table 54
FIRE EQUIVALENT DWELLING UNITS, 2000

Land Use	Unit	Existing Units	EDUs/ Unit	EDUs
Single-Family Detached	Dwelling	56,081	1.00	56,081
Duplex	Dwelling	5,840	1.76	10,278
Multi-Family	Dwelling	30,639	1.24	37,992
Retail/Commercial	1,000 sq. ft.	12,496	3.33	41,612
Office	1,000 sq. ft.	7,690	0.29	2,230
Industrial/Warehousing	1,000 sq. ft.	18,243	0.16	2,919
Govt/Institutional	1,000 sq. ft.	27,021	0.78	21,076
Total				151,112

Source: Existing units and EDUs per unit from Table 53.

Cost per Service Unit

The capital facilities that are used to support the provision of fire protection services in the city consist primarily of fire stations and other buildings and firefighting apparatus and vehicles. The City currently operates out of 14 fire stations, a fire vehicle and apparatus maintenance shop and a firefighter training center. Included in the cost of fire stations is the cost of supporting equipment, including communications equipment, breathing systems and specialized extrication equipment. The replacement cost of existing fire stations and contents, excluding vehicles, can be approximated based on insured values. The buildings themselves are insured at $90 per square foot, except for the main station, which is insured at $140 per square foot. Including contents and outdoor structures, the total insured value for most stations is about $100 per square foot, and $163 per square foot for Station No. 1. In total, the existing stations represent an investment of about $8.9 million, as summarized in Table 55.

Table 55
FIRE STATION AND EQUIPMENT REPLACEMENT COST

Fire Station	Sq. Ft.	Building	Contents (1)	Total Cost
Fire Station #1	12,670	$1,773,251	$295,353	$2,068,604
Fire Station #2	4,383	$395,127	$36,810	$431,937
Fire Station #3	3,673	$331,121	$87,463	$418,584
Fire Station #4	3,936	$354,830	$36,810	$391,640
Fire Station #5	6,035	$544,055	$53,935	$597,990
Fire Station #6	3,393	$305,879	$22,629	$328,508
Fire Station #7	5,608	$505,561	$52,651	$558,212
Fire Station #8	5,137	$463,101	$45,201	$508,302
Fire Station #9	3,911	$352,577	$36,030	$388,607
Fire Station #10	4,394	$396,029	$37,863	$433,892
Fire Station #11 (2)	N/A	$0	$24,173	$24,173
Fire Station #12	3,099	$279,375	$39,352	$318,727
Fire Station #13	2,811	$253,412	$25,011	$278,423
Fire Station #14	4,863	$514,216	$74,000	$588,216
Maintenance Shop	N/A	$204,644	$110,915	$315,559
Training Center	N/A	$5,895	$208,055	$213,950
NUSRTF Equipment (3)	N/A	$0	$1,000,000	$1,000,000
Total	63,913	$6,679,073	$2,186,251	$8,865,324

Source: Square feet from Lincoln Fire Dept., "Fire Station Area Use," January 24, 1997; costs are based on insured values from City of Lincoln, "Building & Contents Coverage," July 31, 2000; (1) and outdoor structures; (2) owned by Airport Authority; (3) leased warehouse space housing National Urban Search and Rescue Task Force equipment.

The Fire Department operates a fleet of fire-fighting apparatus and support vehicles. Based on current replacement costs, the existing fleet has a total cost of about $2.5 million (see Table 56).

Table 56
FIRE VEHICLE COST

Model	Make	Year	Value
Step Van	Ford	1996	$42,000
Mini-Pumper	GMC	1984	$8,000
Bus	Flexible	1972	$3,600
Explorer	Ford	1995	$15,000
1250 Gallon Pumper	E One Century	1997	$144,000
1250 Gallon Pumper	E One Century	1995	$111,000
1250 Gallon Pumper	E One Century	1999	$209,000
1250 Gallon Pumper	Ferraha	1992	$73,000
1250 Gallon Pumper	Central State	1992	$58,500
1250 Gallon Pumper	Sentry	1994	$84,500
1250 Gallon Pumper	E One Century	1996	$111,000
1250 Gallon Pumper	Central State	1990	$47,000
1250 Gallon Pumper	Sentry	1995	$95,000
1250 Gallon Pumper	Central State	1993	$73,000
1250 Gallon Pumper	Smeal	1986	$32,000
1250 Gallon Pumper	Smeal	1989	$36,000
1250 Gallon Pumper	Smeal	1987	$34,000
1250 Gallon Pumper	Smeal	1988	$36,000
1000 Gallon Pumper	Smeal	1978	$18,000
1000 Gallon Pumper	Ford	1984	$29,000
1000 Gallon Pumper	Smeal	1982	$25,000
1000 Gallon Pumper	Smeal	1980	$24,000
Suburban 4WD	Chevrolet	1986	$2,400
Suburban	GMC	1993	$11,000
Suburban	Chevrolet	1994	$11,500
Victoria	Ford	1993	$1,100
Suburban 4WD	Chevrolet	1987	$3,200
Suburban	Chevrolet	1988	$3,200
Suburban	Chevrolet	1985	$720
F250 Pickup	Ford	1989	$4,500
Station Wagon	Pontiac	1989	$2,000
Pickup	Dodge	1976	$400
Suburban	Chevrolet	1982	$720
Cleebrity	Chevrolet	1989	$450
HazMat Truck	E One Century	1996	$111,000
3/4 Ton Pickup/Air Comp	Dodge	1978	$3,200
3/4 Ton Van	GMC	1985	$450
Step Van	Chevrolet	1982	$15,000
Mini-Pumper	GMC	1984	$8,000
75' Aerial	E One Century	1996	$248,000
75' Aerial	E One Century	1996	$248,000
75' Aerial	E One Century	1996	$248,000
105' Aerial	Pierce/Smeal	1990	$111,000
105' Aerial	Pierce/Smeal	1990	$111,000
6 x 6	Am General	1981	$9,000
F350 Pickup	Ford	1981	$10,000
Total Vehicle Replacement Cost			$2,472,440

Source: City of Lincoln Risk Management Dept., "Vehicle Schedule," June 20, 2000.

The total cost of fire facilities, including buildings, vehicles and equipment, is approximately $11.3 million. Dividing this total capital cost by total existing service units yields a cost of $75.03 per equivalent dwelling unit, as summarized in Table 57.

Table 57
FIRE COST PER SERVICE UNIT

Fire Station Replacement Cost	$8,865,324
Vehicle and Apparatus Replacement Cost	$2,472,440
Total Station and Vehicle Cost	$11,337,764
Total Fire Equivalent Dwelling Units, 2000	151,112
Cost per Equivalent Dwelling Unit	$75.03

Source: Fire station replacement cost from Table 55; vehicle and apparatus replacement cost from Table 56; total equivalent dwelling units from Table 54.

Net Cost per Service Unit

Some of the cost to provide new development with fire protection facilities will be paid by the new developments themselves through future property tax payments that will be used to retire outstanding debt on existing fire facilities. There are two outstanding bond issues that were wholly or partially used to fund fire facility improvements. The City issued $8.22 million in 1999 to refund 1989 and 1991 GO bonds, and the 1989 bonds were partially used to fund two fire stations. In addition, the City issued $6.5 million in 1995 GO bonds to construct a new fire station, expand Fire Station #12, purchase new fire trucks and other vehicles and equipment, and upgrade the radio system. All told, the outstanding debt for fire facilities is estimated to be about $3.2 million, as shown in Table 58. Dividing this amount by existing service units results in a debt service credit of about $21 per equivalent dwelling unit.

Table 58
FIRE DEBT SERVICE CREDIT PER SERVICE UNIT

	Original Principal Amount		Outstanding Debt Principal	
Bond Issue	**Total**	**Fire Share**	**Total**	**Fire Share**
1999 Various Purposes Series B	$8,220,000	$450,000	$7,455,000	$408,000
1995 Various Purposes	$6,500,000	$3,500,000	$5,200,000	$2,800,000
Total Outstanding Fire Debt				$3,208,000
Fire Equivalent Dwelling Units, 2000				151,112
Debt Service Credit per Equivalent Dwelling Unit				$21.23

Source: Total original principal and total outstanding debt as of September 2000 from City of Lincoln debt service schedules; original fire share from John Huff, Lincoln Fire Department, September 15,2000; fire equivalent dwelling units from Table 54.

Deducting the amount that new development will pay through property tax debt service payments, the net cost to maintain the existing fire protection level of service is about $54 per equivalent dwelling unit.

Table 59
FIRE NET COST PER SERVICE UNIT

Capital Cost per EDU	$75.03
Debt Service Credit per EDU	$21.23
Net Cost per EDU	$53.80

Source: Capital cost per EDU from Table 57; debt service credit from Table 58.

The net cost per equivalent dwelling unit of providing new developments with the existing level of fire protection facilities is shown in Table 60 below for various land use types.

Table 60
FIRE NET COST SCHEDULE

Land Use	Unit	EDUs/ Unit	Net Cost/ EDU	Net Cost/ Unit
Single-Family Detached*	Dwelling	1.00	$53.80	$54
Duplex	Dwelling	1.76	$53.80	$95
Multi-Family	Dwelling	1.24	$53.80	$67
Retail/Commercial	1,000 sq. ft.	3.33	$53.80	$179
Office	1,000 sq. ft.	0.29	$53.80	$16
Industrial/Warehouse	1,000 sq. ft.	0.16	$53.80	$9
Government/Institutional	1,000 sq. ft.	0.78	$53.80	$42

* includes mobile homes
Source: EDUs per unit from Table 53; cost per EDU from Table 59.

[page intentionally left blank]

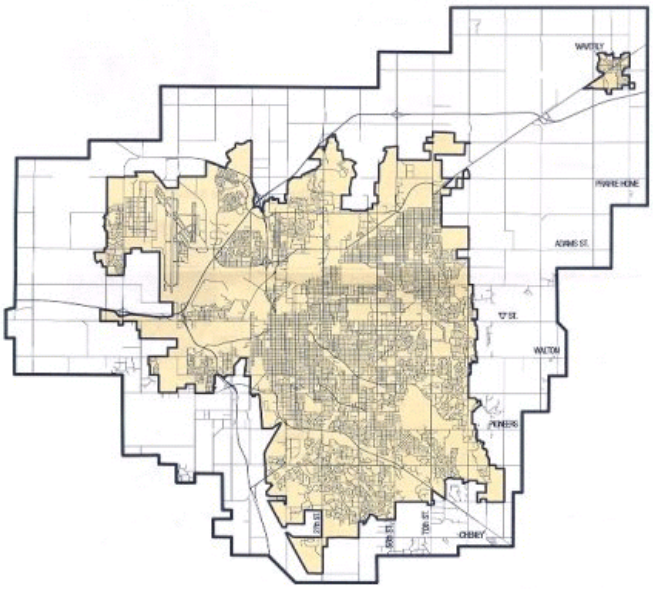
ELECTRICAL FACILITIES

The Lincoln Electric System (LES) is owned by the City of Lincoln and is operated by an administrative board appointed by the Mayor and City Council. The electric system is revenue-producing, and no tax funds are used to support its operation. LES makes annual payments in lieu of taxes to the City, Lancaster County and the Lincoln School District. The in lieu payments represent five percent of electric revenue collected the previous year and are distributed among the local governments based on a proportionate share of the tax mill levy.

LES provides electric service to the City of Lincoln and most of the surrounding area within Lincoln's three-mile planning zone, include the City of Waverly and the unincorporated villages of Cheney, Walton, Prairie Home and Emerald. The rest of Lancaster County is served by the Norris Public Power District (see Figure 8). LES has about 110,000 customers within its current 190 square mile service area, and gains about 2,200 to 2,500 new customers each year.

The City's electric service area boundary used to extend out to the three-mile extraterritorial jurisdiction boundary, but that was changed by state law. Now, the only way to extend the service boundary is to annex an area outside the current service boundary. While this has not yet happened, the buffer outside the city has been reduced to as little as one-half mile in some areas to the south and southeast.

Figure 7
LINCOLN ELECTRIC SERVICE AREA



Annexing land in the Norris Public Power District service area can be expensive, as LES must compensate the District for 2.5 times annual revenue from lost customers, the cost of existing facilities (reproduction less depreciation) and the reintegration of their system. LES estimates acquiring existing Norris Power customers in the Stevens Creek area would cost $10,000 per customer, compared to a cost of about $5,000 per customer for new distribution facility costs. Out of Norris Public Power District's total customer base of about 13,000 in five counties, approximately 1,000 are within three miles of Lincoln's city limits. LES is currently negotiating with Norris Public Power District to find a mutually agreeable solution to allow LES to expand its service area to include a buffer area surrounding Lincoln that will allow LES to efficiently and economically install electrical infrastructure in advance of significant growth and development.

LES installs all facilities in new subdivisions, although it does get easements for its lines in new plats. It charges $150 to make a residential connection on a lot up to 150 feet wide. Most of its distribution lines are underground. Up to five times the estimated annual revenue from potential new customers will be spent to extend service without asking for developer participation.

LES owns approximately 800 megawatts (MW) of capacity, most of which is in jointly-owned facilities, as shown in Table 61. This does not include the 150 MW and 90 MW units currently under construction. The new 150 MW Salt Valley generation station will cost about $90 million. LES only buys generating capacity to serve peak loads, not for resale. It does, however, sell some excess power on the spot market.

Table 61
ELECTRICAL GENERATING CAPACITY, 1999

Facility	Type	LES Share	LES Capacity
Laramie River Station	Coal	11.09%	179 MW
Cooper Nuclear Station	Nuclear	12.50%	95 MW
Sheldon Station	Coal	30.00%	68 MW
Gerald Gentleman Station	Coal	8.00%	109 MW
Western Area Power Administration	Hydroelectric	na	56 MW
Rokeby Generation Station	Oil or Gas	100.00%	150 MW
8th & J	Oil or Gas	100.00%	31 MW
Wind Turbine Generators	Wind	100.00%	66 MW
Nebraska Distributed Wind Generation Project	Wind	na	45 MW
Total			799 MW

Source: Lincoln Electric System, *Financial Report '99*, p. 3.

Service Unit

A service unit is a common unit of measurement of facility demand or capacity. A reasonable basis for a service unit for electrical facilities is energy usage. Data on energy usage by four broad land use classifications was available for 1999. It is assumed that energy usage by residential units will be roughly proportional to the number of people in the dwelling unit. This is the same basis that was used earlier in this report to determine single-family Equivalent Dwelling Units (EDUs) for the purpose of allocating park and library capital costs (refer to Table 31). Dividing total annual residential energy usage by the total number of residential EDUs results in an average energy usage of 11.35 megawatt-hours (MWHs) per EDU. Dividing this into the annual energy usage of commercial, industrial and public land use categories yields the number of nonresidential electrical facility service units. Summing the four land use categories leads to an estimated total of 229,938 service units or EDUs currently served by the Lincoln Electric System (see Table 62).

Table 62
ELECTRICAL FACILITY SERVICE UNITS, 2000

Land Use	1999 MWHs	MWHs/ EDU	EDUs
Residential	895,981	11.35	78,930
Commercial	930,745	11.35	82,004
Industrial	527,882	11.35	46,509
Public	255,318	11.35	22,495
Total			229,938

Source: 1999 megawatt-hours from LES, *Report to Rating Agencies*, March 2000; MWHs per EDU is residential MWHs divided by residential EDUs; residential EDUs is single-family equivalent dwelling units for the year 2000 based on household size from Table 31; nonresidential EDUs is energy usage divided by MWHs per residential EDU.

Residential service units per dwelling unit for electrical facilities will be the same as for parks and libraries. Nonresidential service units per 1,000 square feet are estimated by dividing the respective electrical facility EDUs calculated above by the estimated square footage for each land use category. The resulting service unit multipliers by land use category are summarized in Table 63.

Table 63
ELECTRICAL FACILITY SERVICE UNITS BY LAND USE

Land Use	Unit	Units, 2000	EDUs	EDUs/Unit
Single-Family Detached	Dwelling	53,580	53,580	1.00
Single-Family Attached	Dwelling	3,300	2,772	0.84
Duplex	Dwelling	5,840	4,322	0.74
Multi-Family	Dwelling	27,339	16,130	0.59
Mobile Home	Dwelling	2,501	2,126	0.85
Commercial	1,000 sq. ft.	20,186	82,004	4.06
Industrial	1,000 sq. ft.	18,243	46,509	2.55
Public	1,000 sq. ft.	27,021	22,495	0.83

Source: Residential units, EDUs and EDUs per unit from Table 31; nonresidential square feet from Table 71; nonresidential EDUs from Table 62.

Cost per Service Unit

The cost to serve new development in Lincoln with electrical facilities can be estimated based on the *Directional Growth Analysis* study prepared by City staff in 1996. That study assumed that planned residential land would be fully built-out, and that under this "Build Out Scenario" the county population would increase from 230,126 to 315,145. Next, it was assumed that an additional

increment of growth, up to a total county population of 350,000, would occur exclusively in one of four growth areas. LES staff estimated the capital costs associated with the build-out scenario, as well as for each of the four growth areas. Taking an average of the costs for the four growth areas and adding that to the costs for the build-out scenario results in an estimate of total capital costs to serve 20-40 years of growth.

The growth in electrical facility service units anticipated in the 1996 Directional Growth Analysis study can be estimated by multiplying the projected increase in population and commercial and industrial development by the service unit ratios calculated above.

Table 64
NEW ELECTRICAL FACILITY SERVICE UNITS, 1996 ANALYSIS

Land Use	Unit	Growth Increment	EDUs/ Unit	New EDUs
Residential	Population	119,874	0.36	43,155
Commercial	1,000 sq. ft.	15,314	4.06	62,175
Industrial	1,000 sq. ft.	12,754	2.55	32,523
Total New Service Units				137,853

Source: Growth increments from 1996 to a presumed future County population base of 350,000 from Lincoln-Lancaster County Planning Department, *Directional Growth Analysis*, November 22, 1996 (industrial estimated from acres based on 0.20 floor-to-area ratio); EDUs per unit from Table 63 (EDUs per person is total residential EDUs from Table 62 divided by year 2000 population estimate from Table 11).

The capital cost to provide the electrical facilities required to serve new development based on the growth assumptions used in the 1996 Directional Growth Analysis was estimated to be just under $1 billion. Dividing this by the projected growth in electrical facility service units over the same period results in a capital cost per service unit of 7021, as shown in Table 65.

Table 65
ELECTRICAL FACILITY COSTS PER SERVICE UNIT

Power Supply	$478,700,000
Distribution	$352,200,000
Transmission	$50,400,000
Substation/Transformer	$74,800,000
Norris Service Adjustments	$9,500,000
Arterial Street Lighting	$2,300,000
Total Capital Expenditure	$967,900,000
New Service Units (EDUs)	137,853
Capital Cost per EDU	$7,021

Source: LES capital costs to accommodate growth from 1996 to a presumed future County population base of 350,000 from Lincoln-Lancaster County Planning Department, *Directional Growth Analysis*, November 22, 1996; costs include build-out scenario costs, non-directional directed growth costs and average of directional directed growth costs for four growth areas; new EDUs from Table 64.

Net Cost per Service Unit

Annual debt service on the electrical utility's revenue bond debt is about $25.7 million. Existing customers are paying $112 per equivalent dwelling unit annually to retire the debt for past improvements. Over the typical 25-year useful life of major capital facilities, existing customers will pay a current lump sum equivalent of $1,431 per service unit. It is reasonable to assume that new customers will make an equivalent capital payment through their utility rates, so this should be credited against their capital cost in determining their net capital cost.

Table 66
ELECTRICAL FACILITY DEBT CREDIT PER SERVICE UNIT

Annual Debt Service	$25,677,000
Existing EDUs	229,832
Annual Debt Service per EDU	$112
Net Present Value Factor	12.78
Debt Service Credit per EDU	$1,431

Source: Annual debt service for 1999 from LES, *Report to Rating Agencies*, March 2000; existing EDUs from Table 62; net present value factor based on 25 years at 6% discount rate.

Deducting the debt service credit calculated above from the capital cost yields the net cost per service unit. This is $5,590 per equivalent dwelling unit.

Table 67
ELECTRICAL FACILITY NET COST PER SERVICE UNIT

Capital Cost per EDU	$7,021
Debt Service Credit per EDU	$1,431
Net Cost per EDU	$5,590

Source: Cost per EDU from Table 65; credit per EDU from Table 66.

Multiplying the number of service units (EDUs) per development unit (dwelling or 1,000 square feet) for each land use type by the net cost per EDU calculated above results in an estimate of the net capital cost to provide new development with electrical facilities. The net cost schedule for electrical facilities is presented in Table 68.

Table 68
ELECTRICAL FACILITY NET COST SCHEDULE

Land Use	Unit	EDUs/ Unit	Net Cost/ EDU	Net Cost/ Unit
Single-Family Detached	Dwelling	1.00	$5,590	$5,590
Single-Family Attached	Dwelling	0.84	$5,590	$4,696
Duplex	Dwelling	0.74	$5,590	$4,137
Multi-Family	Dwelling	0.59	$5,590	$3,298
Mobile Home Park	Pad Site	0.85	$5,590	$4,752
Commercial	1,000 sq. ft.	4.06	$5,590	$22,695
Industrial	1,000 sq. ft.	2.55	$5,590	$14,254
Public	1,000 sq. ft.	0.83	$5,590	$4,640

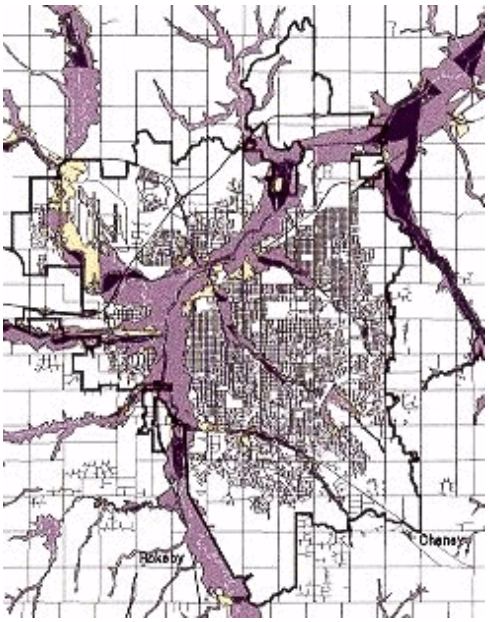
Source: Residential units, EDUs and EDUs per unit from Table 31; nonresidential square feet from Table 71; nonresidential EDUs from Table 62.

DRAINAGE

Responsibility for storm drainage improvements and maintenance in Lincoln is divided among the private sector (developers and land owners), the Lower Platte South Natural Resources District (NRD), and the City. About five years ago the City began requiring developers to install on-site detention so that stormwater runoff after development does not exceed pre-development conditions. In many cases, drainage channels and detention facilities are not dedicated to the City, and the maintenance of these facilities is the responsibility of the property owner or a homeowners association. City has an inventory of drainage facilities, but staff acknowledges that it is not completely accurate or up-to-date. A drainageway often will go from public to private to public to private, with little clarity on who is responsible for maintenance.

The Lower Platte South NRD is one of 23 such entities in the state. Its jurisdiction covers 1 million acres, including part of six counties. The NRD has responsibility for the main storm drainage channels, including all named creeks. The NRD does NPDES reviews/inspections for nonpoint pollution, purchases open space and constructs trails, such as the current project in Stevens Creek.

Figure 8
MAJOR DRAINAGEWAYS



The City has responsibility for the street drainage system, including curb and gutter and storm sewers, and bridges and culverts over major and minor drainageways. It also has responsibility for tributaries to the main drainage channels maintained by the NRD. The City has only a few regional detention facilities. The Street Maintenance division of the Public Works Department does storm drainage as well as street maintenance, including storm sewer repair and replacement, mowing and curb and gutter repair and replacement. The City has issued some general obligation bonds for storm sewer improvements.

The new Federal Clean Water Act requires local governments to identify sources of pollution in the stormwater system and to develop measure to reduce that pollution. The funding sources the City has historically relied upon, primarily general fund revenues and the NRD, will not be sufficient to address the cost of complying with the stringent new requirements. The *Lincoln City—Lancaster County Comprehensive Plan* calls for the preparation of a Stormwater Management Master Plan, and also calls for the development of additional funding sources:

> It is expected that the implementation of the regulations will place a financial burden upon the City in the magnitude of five or six times that which has been previously provided. Some methods to be considered include ad valorem taxes, user fees, bonds, and utility bills.

Even though Lincoln appears to have the legal authority to impose drainage impact fees, such fees are relatively rare, primarily because drainage systems are very complex and few communities have the data required to support the impact fee calculations. Lincoln is no exception. Determining the capital cost of drainage improvements needed to accommodate growth virtually requires a comprehensive stormwater master plan. Even communities that do have an up-to-date, comprehensive master plan are often unable to distinguish, based on available data, which improvements or portions thereof are attributable to growth rather than to existing deficiencies.

Service Unit

The stormwater runoff resulting from the development of land can be measured in terms of the equivalent land area that would shed all of the stormwater that falls on it. Runoff coefficients reflect the ability of various types of surfaces to shed water, and the runoff coefficient, even for impervious surfaces, is always less than one. However, the service unit for drainage impact fees is an acre that would theoretically turn all of the stormwater that falls on it into runoff (i.e., it has a runoff coefficient of 1.00).

To determine the number of drainage service units generated by a development, the acreage in each of several types of land treatment must be determined, then multiplied by the runoff coefficient for each land treatment. Land treatments can range from soil uncompacted by human activity with slopes of less than ten percent to impervious areas such as pavement and roofs. The runoff coefficients, in turn, may vary within the community based on typical rainfall patterns, called precipitation zones.

Cost per Service Unit

The capital cost per drainage service unit must be determined by extensive engineering analysis, usually in the form of a comprehensive stormwater master plan. The cost is likely to vary from one drainage basin to another. In the absence of a drainage master plan, an alternative that has been used in some communities is to study the drainage improvements in several typical fully developed areas. For example, we performed such a study in association with the engineering firm of Leedshill-Herkenhoff for the City of Albuquerque and Bernalillo County, New Mexico in 1995. For this project, an analysis was undertaken of existing drainage infrastructure in two fully developed areas: a 26 square mile case study in the Northeast Heights and a 10 square mile case study in the Rio

Grande valley. In addition, an analysis of geologic characteristics of the northwest mesa was undertaken to determine the additional drainage costs attributable to the higher excavation costs caused by basalt formations in this area. The approach to the development of drainage impact fees for the area of Albuquerque outside the Rio Grande valley is described in the rest of this section.

The Northeast Heights area of Albuquerque is generally representative of the hydrologic characteristics of most of the Albuquerque area outside of the valley. The major stormwater flows are primarily controlled by the use of open channels, detention dams and training dikes, with secondary reliance on underground stormwater pipes. The Northeast Heights case study consisted of an analysis of two areas totaling 26 square miles. The areas included a 15 square mile area covered by the Far Northeast Heights Master Drainage Plan prepared by Weston Engineering in January 1988 ("Far Northeast Heights study area"), and a separate 11 square mile area inventoried as part of this study ("Heights study area"). The drainage infrastructure required to accommodate development in these areas at build-out was analyzed to determine the drainage costs that are typical of most of the rest of the Albuquerque area outside the Rio Grande Valley.

The first part of the analysis consisted in developing an inventory of the existing drainage facilities that meet the definition of "major facilities." These consisted of open channels with a capacity of 50 cubic fee per second or greater, storm drainage pipes of 30 inches or more in diameter along with appurtenances such as manholes, and structures associated with crossings of major drainage facilities by arterial, collector and local streets.

The inventory analysis of the Far Northeast Heights study area was based on the inventory of existing facilities contained in the master plan, which were updated and verified with field inspections. Since the area was not completely built out, with about two of the 15 square miles currently undeveloped, additional improvements recommended by the master plan to accommodate full development of the area were also included in the facility inventory. The inventory of the fully developed 11 square mile Heights study area was based on analysis of City of Albuquerque Drainage Facilities Systems maps and field inspection.

The current costs to construct the existing facilities were estimated based on average unit costs compiled by the City of Albuquerque Public Works Department. The cost estimates do not include the cost of land or easements. The total facility cost was divided by the combined area of the two study areas to derive an average cost per acre. The resulting cost per acre was then divided by the average service units per acre for the East Mesa service area to derive an average cost per drainage service unit. These calculations resulted in an average cost of $8,610 per service unit, as summarized in Table 69.

Table 69
SAMPLE DRAINAGE COST PER SERVICE UNIT
Northeast Heights Case Study (Albuquerque NM)

Cost Factor	Far NE Hts Study Area	Heights Study Area	Total
Open Channels ($50 cfs capacity)	$30,175,000	$11,930,600	$42,105,600
Storm Drain Pipe ($30" diameter)	$18,462,000	$18,917,800	$37,379,800
Roadway Crossing Structures	$26,052,000	$9,071,700	$35,123,700
Total Cost	$74,689,000	$39,920,100	$114,609,100
Study Area (Acres)	9,600	7,040	16,640
Cost per Acre			$6,888
Service Units per Acre			0.80
Cost per Service Unit			$8,610

Source: Duncan Associates, Leedshill-Herkenhoff, Inc., et. al., *Capital Improvement Plan for Drainage Impact Fees for City of Albuquerque and Bernalillo County*, May 1995, Table 5.

The methodology used to determine the cost per service unit was very conservative (i.e., on the low side), primarily because it did not include the cost of land or easements. The exclusion of land costs was primarily due to the difficulty in determining the land area required for individual facilities and the highly variable cost of land depending upon location. The conservative nature of the resulting cost per service unit (e.g., excluding land costs) made it more defensible to apply cost estimates derived from limited case studies to entire service areas. This conservatively low unit cost approach was dictated by the tremendous effort that would be required to gather, develop and analyze demand, capacity and cost data for all drainage facilities throughout the Albuquerque area that were existing or that would be required to accommodate stormwater flows under fully developed conditions. An effort to extract information on existing drainage facilities from the Albuquerque Geographic Information System (AGIS) did not yield the quality of information that was needed, and an analysis of all existing drainage studies conducted in the area revealed major data gaps. In light of the time constraint imposed by the Development Fees Act and the potential negative consequences of failing to adopt drainage impact fees by the July 1, 1995 deadline, the use of conservative unit costs derived from case studies appeared to be the most reasonable approach.

Net Cost per Service Unit

Continuing with our example of how we calculated drainage impact fees for an area of Albuquerque, we next calculated a revenue credit for outstanding debt incurred by the City and County for past drainage improvements. To the extent that this debt was used to build capacity that has already been used by existing development, or to remedy existing capacity deficiencies, the drainage impact fee needed to be reduced accordingly. To be conservative, credit was provided for the entire amount of the outstanding debt.

The outstanding bonded indebtedness was divided by the total number of drainage service units to determine credits per service unit of $1,123 for the City and $772 for the County. To avoid creating different fee structures between the City and County, and to be even more conservative for the County, where drainage information was more limited, we recommended that the higher credit calculated for the City be applied to both jurisdictions.

Drainage impact fees should be reduced to account for future revenues generated by new development that will be used to remedy existing drainage capacity deficiencies. Reconstruction and replacement projects identified as needed by build-out in the Far Northeast Heights Master Drainage Plan were used as a basis for estimating the extent of existing deficiencies. Reconstruction costs, however, will be significantly higher than capacity deficiency costs, since some of the projects provide increased capacity needed for complete build-out of the 15 square mile master plan area and other projects are needed for reasons other than inadequate capacity. Consequently, only one-half of reconstruction costs were assumed to represent capacity deficiencies. Using the same approach used to calculate growth-related costs, deficiency costs were estimated to amount to $1,240 per service unit.

The net cost per service unit for each of the service areas was derived by subtracting the credits for outstanding debt and existing deficiencies from the gross cost based on the case study analysis. A generalized example of a one-acre subdivision to be developed at a density of five single-family units per acre was used to illustrate the calculation of drainage impact fees. The fees were based on the gross site area of the subdivision, including local streets to be dedicated. Roadways, driveways, sidewalks and roofed areas were estimated to be 50 percent of the total subdivision land area. It was assumed that the yards would be evenly divided between desert landscaping and irrigated lawns. Multiplying the runoff coefficient for each Land Treatment by the acres of that Land Treatment within the development site and adding them together gave the number of total drainage service units resulting from the development. As shown in Table 70, the net drainage costs per single-family lot for an urban density subdivision was calculated to be $950 in the Northeast Heights area of Albuquerque.

Table 70
SAMPLE DRAINAGE NET COST PER SINGLE-FAMILY UNIT
Northeast Heights Case Study (Albuquerque NM)

Acres, Treatment D	0.50
Acres, Treatment C	0.25
Acres, Treatment B	0.25
Acres, Total for Subdivision	1.00
Runoff Coefficient, Treatment D	0.94
Runoff Coefficient, Treatment B	0.50
Runoff Coefficient, Treatment A	0.37
Service Units	0.76
Net Cost/Service Unit	$6,247
Net Cost/One-Acre Subdivision	$4,748
Number of Lots in Subdivision	5
Net Cost/Single-Family Unit	$950

Source: Duncan Associates, et. al., *Capital Improvement Plan for Drainage Impact Fees for City of Albuquerque and Bernalillo County*, May 1995, Table 13.

Another example of drainage impact fees are those assessed by the City of Colorado Springs, Colorado. The City has developed drainage fees that are designed to reflect the average cost of capital facilities required in different drainage basins. The fees are assessed at platting on a per acre basis, without regard for the amount of impervious cover. They are based on drainage studies that determined the drainage facilities required at build-out and divided the cost of the facilities by the total number of acres in the basin. The fees do not provide any type of revenue credits. The current drainage fees for the 30 drainage basins average about $6,400 per acre. Since the drainage fees are assessed on a per acre basis, they are sensitive to density. For example, for residential developments at a density of eight units per acre, the fee would average about $800 per unit. At a density of five units per acre, the fee would average $1,280 per unit.

APPENDIX

The amount of existing nonresidential development in Lincoln is estimated to be about 65 million square feet, as follows. These estimates are based on recent employment figures for Lincoln and typical square foot per employee ratios. The City/County Planning Department has been tracking occupied commercial space for years, but only monitors development in commercial zoning districts. In addition, because the definition of the land use categories differs from the one used by the state Department of Labor in its employment data, the two data sets cannot easily be merged.

Table 71
EXISTING NONRESIDENTIAL DEVELOPMENT

Land Use	Employees	Sq. Ft./Employee	Square Feet
Retail/Commercial	24,992	500	12,496,000
Office	25,634	300	7,690,000
Industrial/Warehousing	28,957	630	18,243,000
Govt/Institutional	58,742	460	27,021,000
Total Square Feet			65,450,000

Source: Employees in Lincoln MSA by place of work in 1998 from Nebraska Dept. of Labor; retail square feet per employee from National Association of Office and Industrial Parks, *America's Future Office Space Needs*, 1990 p. 22); square feet per employee for other land uses based on average daily trip rates per employee and per 1,000 square feet from Institute of Transportation Engineers (ITE), *Trip Generation*, Sixth Edition, 1997 for ITE land use codes 710 (General Office), the average of 130 (Industrial Park) and 150 (Warehousing) for industrial/warehousing, and the average of the following for government/institutional: 520 (Elementary School), 610 (Hospital), 730 (Government Office Building) and 732 (U.S. Post Office).