A G E N D A

600 NORTHEAST GRAND AVENUE | PORTLAND, OREGON 97232 2736
TEL 503 797 1700 | FAX 503 797 1797

METRO

Meeting: **FUTURE VISION COMMISSION**

Date: July 25, 1994

Day: Monday

Time: 4:00 p.m. - 6:30 p.m.

Place: Metro, Room 370

	Approximate Time
1. CALL TO ORDER	10 minutes
2. ROLL CALL	
3. PUBLIC COMMENT	
4. OTHER BUSINESS	
5. FULL COMMISSION WORK SESSION ·Preparation for July 27th Joint MPAC/JPACT/FV meeting -discussion of carrying capacity, no resource lands lost, ???	140 minutes

Enclosures:
- Agenda for the July 27th Joint Committee meeting.
- No/Growth Slow Growth report per Ken Gervais' request
- Article "The New Commute" from Chair Freiser
- Notice of Ag/Forestry Tour from Peggy Lynch
- Teaser for the book "Reclaiming our Cities and Towns" from Barbara Duncan

To assure a quorum members please R.S.V.P. to Barbara Duncan at 797-1562 if you are unable to attend.

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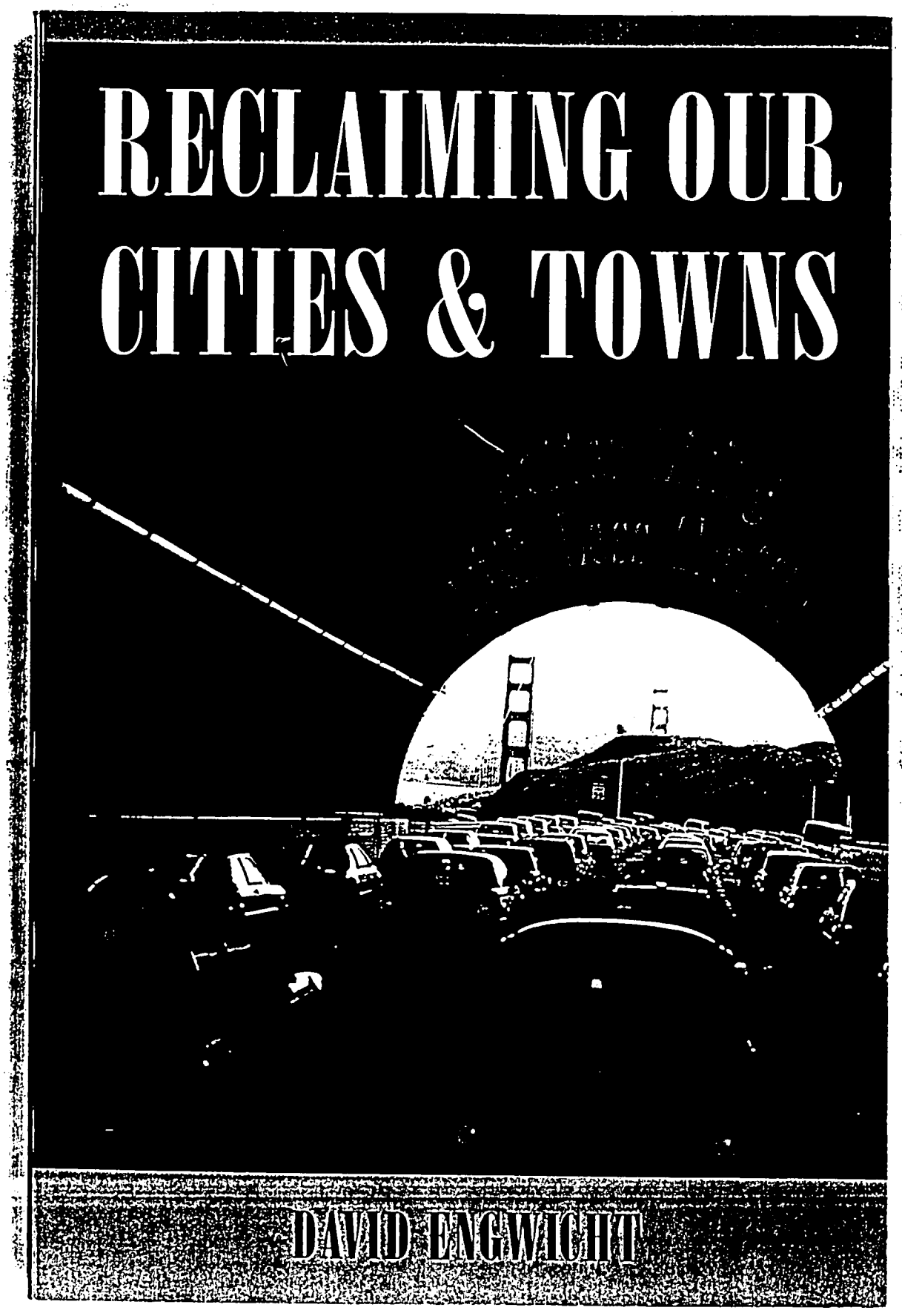
FUTURE VISION COMMISSION

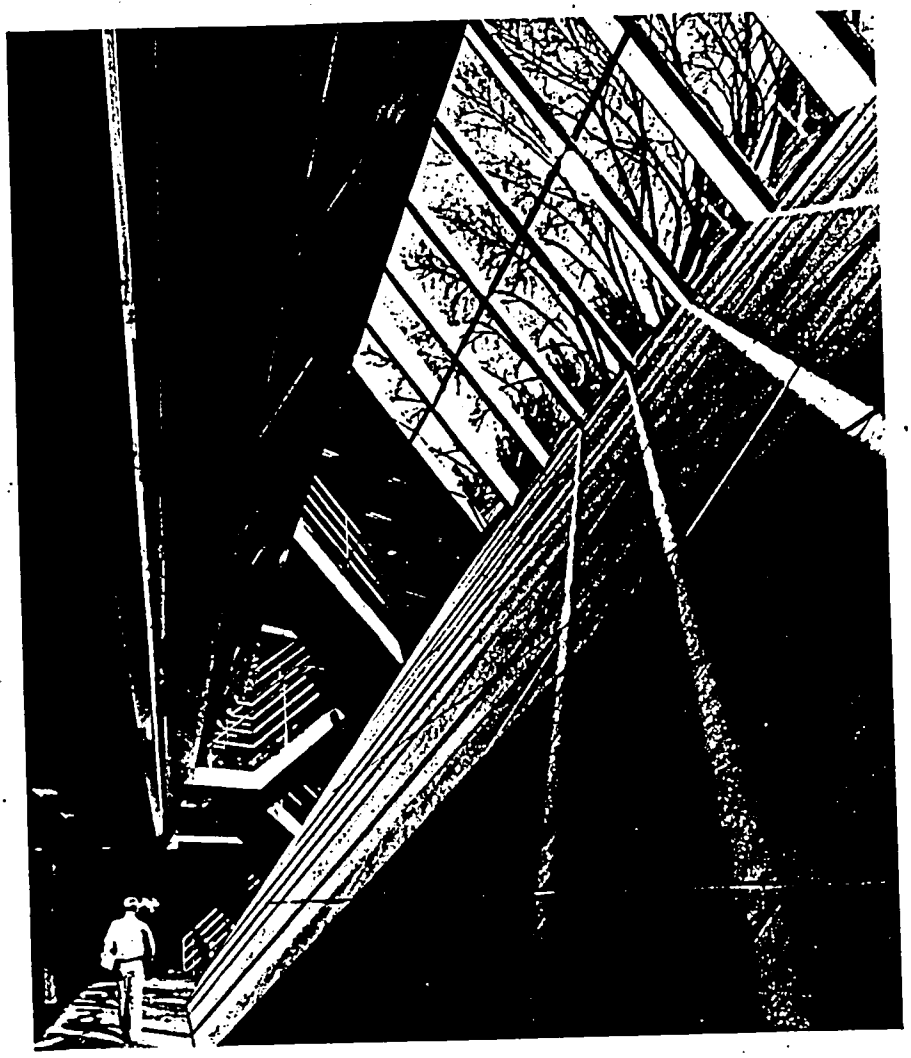
FYI: THERE HAS BEEN AN ADDITIONAL ITEM ADDED TO THE AGENDA FOR THE JULY 27TH JOINT MPAC/JPACT/FUTURE VISION COMMISSION MEETING.

MPAC AND JPACT WILL BE DISCUSSING A PROPOSED CONSTRUCTION EXCISE TAX.

ATTACHED IS THE DISCUSSION DRAFT PROPOSAL.



Coming soon to a Future Vision Library shelf near you!



A pragmatic and aesthetic use of underground space: the University of Michigan's law library

Timothy Hursley, photographer/Gunnar Birkerts, architect

Notes From the Underground

Building beneath the earth's surface makes increasing sense—and could become surprisingly affordable in the years ahead

by Fred Hapgood

IN 1901 H. G. Wells, then full into his stride as the premier science-fiction writer of his time, published a novel describing an expedition to the moon. When the explorers land, they discover that our satellite is honeycombed with underground cities. One of the party is captured and taken beneath the surface to the chief of the moon men, who asks what uses earth people have found for the interior of their planet. Virtually none, the explorer replies. At this point the interview collapses: the Grand Lunar and his court are incredulous that any people could go off traveling to other planets while their relationship with their own remained—literally—so superficial.

Though relatively little has changed in this respect since Wells wrote, a growing number of people today share the Grand Lunar's perspective: engineering geologists, civil engineers, architects, equipment designers, and contractors who, when they look down, see a whole new niche for the human race. As Gary Brierley, the president of the American Underground-Space Association, has observed, the underground-construction industry does more than just produce new real estate. It offers an altogether new kind of development medium: quiet, earthquake-resistant, weatherproof, secure, and energy-efficient, with virtually no constraints of geometry, scale, or location, and perfectly compatible with conservationist and preservationist values, no matter how strictly construed.

Clearly, some customers agree. Underground highways are being built or planned in Boston, Singapore, Stockholm, and Tokyo. The European Union is planning dozens of miles of tunnels to accommodate its high-speed rail system. Underground parking garages are, of course, ubiquitous. And over the past decade or so hundreds of laboratories, libraries, restaurants, shopping centers, offices, sports complexes, community and cultural centers, transportation centers, and industrial facilities (such as storage areas and waste-treatment plants) have been built underground, primarily in Europe and the Pacific Rim countries. Examples include facilities for last winter's Olympics, in Lillehammer, Norway; the Les Halles development, in Paris; the Toronto, Montreal, and Atlanta underground shopping districts; the tunnels for the late Superconducting Supercollider, in Waxahachie, Texas; the Seattle bus tunnel; the new wing of the Smithsonian museum; and the Moscone Convention Center, in San Francisco. And beyond these fairly traditional uses of underground space lie such dramatic possibilities as using tunnels for freight distribution in cities (thereby keeping trucks out of traffic), connecting cities with super-

Foreword

Just think: 70 per cent of the surface area of the city of Los Angeles is in some way dedicated to the motor car. Freeways, garages, buildings for parking, parking lots, factories...70 per cent! And one job in six, in the USA, is linked to the car industry; it's about one in ten in Australia.

In Bangkok recently, where there is no public transport worth speaking of and where roads have been built over swelling streams, there was a traffic jam stretching for 50 kilometres. Also, recently in Lyon, the second city of France, the mayor likened the relationship between motorists and residents to the Hundred Years War. In Stockholm the head of Volvo declared that the time had come to ban private motoring from the inner city.

A survey just published in Britain shows that motorists no longer expect pleasure from their driving, however elaborate their vehicles. It's become a chore. This is how the *Times* of London commented in an editorial:

> Traffic merely increases the boredom and succeeds in turning ennui to fury. Commuting by car in all but the most rural of areas is unpleasant, matched only by commuting by train, bus or Tube. The logic of yesterday's survey is that, instead of exploring other modes of transport, drivers may start to ask themselves the wartime question: 'Is my journey really necessary?' For those with enlightened employers, the answer may be, 'No'. A telephone, home computer and fax machine may do just as well. ('Driven to Despair', *Times*, 3/9/91)

Without even invoking clear and obvious concerns about pollution and greenhouse, it is clear the situation in the world's cities, including those of Australia, is grim. Yes, technology will deliver clever and cleaner cars, traffic studies will permit sophisticated planning of roads and flow will be pushed to the limit. But, as Gertrude Stein might have said: 'A jam is a jam is a jam!'

There are alternatives. Exciting ones. And they will make life quieter, cleaner, safer, more fun and more human. It will not be achieved with the approach of a Luddite but with that of a very modern scientist. We have the maths, the number-crunching machines and the experience to put with our sensible everyday needs as people. Cities are for us, not for juggernauts, concrete wastelands or muck. This book shows how we can reclaim our cities for the purpose they were created: decent living.

ROBYN WILLIAMS.
Chairperson, Commission For the Future.

sonic trains (sometimes called the planetary subway), and starting a systematic program of habitat restoration by zoning the underground for industrial, commercial, and transport infrastructure.

The rhetoric of enthusiasts sometimes suggests that all that is preventing our wholehearted embrace of the underground option is lack of "commitment," but a more concrete factor is also at play: costs. The first 4.4 miles of the Los Angeles subway cost more than a billion dollars; the thirty-five lane-miles now being built under Boston in its Central Artery project are expected to cost $8 billion; the Swiss voted not long ago to commit more than $10 billion for about fifty miles of railway tunnels; and the costs of the Chunnel linking France and England have exceeded $15 billion. Nonetheless, prices used to be even higher. Tunneling bids have fallen to historic lows, and there are reasons to suspect that prices will continue to fall for a long time. If they do, the consequences for city planning, energy use, transportation, the urban landscape, and the environment could be profound.

THE high costs of underground work are often perceived as inherent to the medium, but what they really reflect is the extremely low degree of automation in the industry. Until very recently miners, as tunnel workers call themselves, worked right up against the face, drilling holes, filling them with explosives, blowing the charges, shoving support beams under the new ceiling created by the blast, and shoveling the shattered fragments into "muck cars" for extraction. (I will focus my discussion on hard-rock excavation, since bedrock has much greater long-term potential than soil has, but the same points could be made with examples from the tools and protocols of tunneling through soil or sand.) In the sixteenth century silver was mined from Europe's Erzgebirge Mountains in much the same way.

Part of the problem is that the underground environment is dirty, wet, and cramped, and therefore requires a technology different from surface construction: you can't take a bulldozer underground. The other part is that until recently the market for underground space was too small and episodic to pay for the development of that technology. Engineers have been talking about mechanizing hardrock tunneling since at least the middle of the nineteenth century, but the first chance they had to do so arrived only in the last third of this century, when a flurry of sewer and subway orders allowed The Robbins Company, of Kent, Washington, to pursue the development of the hardrock power shovel: the tunnel boring machine, or TBM.

TBMs operate on the same principle as glass cutters: they push tough metal discs, or cutter wheels, into the rock until it starts to splinter, and then roll the wheels around in a circle, shattering successive layers of fragments off the working face. The first effective TBMs, which appeared in the 1960s, worked only in soft, homogeneous rock and under the driest conditions, and could cut only along roughly straight lines. Robbins has never been a large company—it has made a total of 180 TBMs—but it has found enough customers to keep its engineers busy. Today, after thirty years of development, it makes true general-purpose excavators: machines that can cut through the hardest rock, work under high water pressures, travel up or down at very steep angles, and run in circular or spiral paths.

The great virtue of the TBM is that it breaks rock in predictable patterns, as explosives do not. This higher degree of control permits more energy to be directed to the face, which means that work proceeds more quickly. A good rate for "drill and blast" might be twenty-five or fifty feet a day; TBMs commonly roll along at 100 feet a day, and twice that is not unusual. The contractors digging the tunnels for the Superconducting Supercollider worked at an average rate of 400 feet a day, with occasional bursts of up to 500 feet a day—a rate that, if sustained, would have produced a mile of tunnel every ten days or so.

Partly because most of the costs of underground work (labor, rentals, interest charges) are time-sensitive, contractors with TBMs have been able to underbid drill-and-blast contractors. The old order put up a fight but the machines prevailed, and over the 1980s the cost of tunneling fell by half. Gary Brierley offers the following example: in 1990 a TBM was used to dig a large tunnel under the St. Lawrence River in fifteen months for $20.5 million (Canadian); ten years earlier another tunnel, of the same size and in the same geology, dug with drill and blast, had taken twenty-four months and (assuming a correction of five percent a year for inflation) cost $38.5 million.

The TBM took underground development over the threshold of mechanization, but the industry is still basically a handicraft business, and is priced accordingly. (Boston's Central Artery project is consuming nearly 75,000 man-years of labor, according to a 1990 report.) Nonetheless, demand for underground construction has been rising, driven partly by the relentless increase in real-estate costs and a growing emphasis on conservationist and preservationist values, especially in Europe. "European authorities tell me the public tolerance for putting things on the surface has fallen so low," says Ray Sterling, the director of the Underground Space Center at the University of Minnesota, and a co-author of *Underground Space Design*, "that increasingly the test of whether something gets built at all is whether it can be put underground." Sterling spoke to me from an office seven stories beneath the Minnesota winter.

There is some evidence that this bounce in market activity is spurring a second round of automation. More and more contractors have replaced the old trains of muck cars with linked systems of horizontal and vertical high-speed conveyors. These are not cheap machines—they must be able to carry hundreds of thousands of tons of rock over distances of several miles without a significant failure for months or even years—but they can clear rock from a site faster than any TBM can cut it, which removes one of the long-standing limitations on TBM performance. They make sense for contractors in a position to amortize their purchase over many projects.

Other technological innovations are following. Robbins has recently announced a new line of machines that can excavate noncylindrical spaces, such as horseshoe tunnels or arches or hemispheric chambers. The French contractor Perforex has been attracting attention with a new tunneling method, in which a slot of the desired shape is sawed in rock and filled with a tough concrete or grout. The rock inside the shape described is blown away by small, controlled charges; the concrete or grout prevents the blast from damaging the ambient rock. The cost of "mechanical pre-cutting tunneling," as this approach is called, can be as low as one tenth that of

tunneling with a TBM, according to a civil engineer consulting to Perforex, and the technique has the added advantage of allowing excavation in nonstandard shapes. It was used recently near Grenoble to dig a tunnel forty feet in diameter—a dimension that would have been enormously expensive with a TBM. So far it works well only in soft rock, but it may gain wider application: all tunneling technologies have started in soft rock. Ramex Systems, Inc., in Washington state, has built a prototype machine that uses a battering ram to create completely variable shapes, such as rectangles and irregular curves. The Colorado School of Mines has explored a number of new cutting technologies, including abrasive jets, chemical sprays, lasers, ultrasonic vibration, and heat shock (using plasma jets and liquid nitrogen). A consortium of engineers at MIT, the University of Texas, and the University of Missouri at Rolla have designed a TBM that continuously extrudes a lining to hold up the walls and roof, preventing water seepage.

Funding the development of better tools is only one of several ways in which increasing markets drive down costs. In addition, contractors can amortize their fixed costs over many projects; clients become savvier; and the geotechnical data base for a given region—the map of the underground—gets more detailed, lowering the risk of expensive surprises. Perhaps most important is the felicitous influence of steady work. Historically the high prices associated with underground construction have attracted far more contractors into the business than could find continuous employment. Once a job was over, TBMs and other expensive tools had to be sold and crews laid off, no matter how skilled or compatible they might be. When a new job turned up, the contractor would cobble together a new tool kit and crew out of whatever happened to be available. This stop-and-go work rhythm kept costs high by keeping learning curves flat and encouraging contractors to squeeze every possible dollar out of their clients.

The consequences for pricing were illustrated recently by the contractors digging the tunnels for the Superconducting Supercollider. According to Howard Handewith, a market analyst for the American Underground-Space Association, by the time Congress canceled the project (for reasons unrelated to the tunneling), the costs were working out to a mere $5 million a mile—about a third of the average cost of big-tunnel work. Although no single factor explains the entire difference, Handewith points out that the tunneling teams arrived fresh from working on the Chicago water system and the Dallas subway. They came already tuned to one another and to their tools. Handewith believes that these results suggest the kind of returns that can be expected as the opportunity to work steadily, as part of a stable team, becomes more common.

THE idea that expanding markets bring down prices, specifically by attracting more investment and accelerating the flow of practical experience into an industry, is by no means a new one. The most famous example is the computer industry, in which a market increase of seven orders of magnitude (or a factor of ten million) has been associated with a price reduction of five orders of magnitude over the past forty years. The consumer-electronics industry offers many other examples, as does the metals and materials industry, in which a doubling of the market has been associated with a halving of price for many years. Therefore the undoubted truth that the costs of underground space are still very high can be qualified with the point that the market is still very small: according to Handewith, only about $1 billion a year in the United States, and probably somewhere between $20 billion and $30 billion worldwide (about what Hong Kong is spending on its new airport). The faster and longer the market grows, the faster and longer prices should fall.

It seems safe to predict many years of steady growth for an industry starting from such a small base and having so many applications. The intolerance for building on the surface is rising not just in Europe and the Pacific Rim. Our infrastructure is deteriorating. The route to full compliance with the Clean Water and Safe Drinking Water and Clean Air acts often leads underground. Sewer and subway work in China during the rest of the decade could in itself double the world market, assuming that China continues to prosper. And surely the growing cities in the developing world are going to engage in some underground development.

Finally, at some point falling costs start to expand markets on their own. Projects that had been postponed or uninvestigated because of high costs can be undertaken. The two halves of this cycle will then link up—prices driving markets and markets driving prices—and the cost of underground space will chase its tail right through the basement.

This scenario might be of special interest to environmentalists. Until now those interested in preserving the surface of the earth as the domain of plants and animals have had no reason to consider the future with anything but a gloomy, rearguard fatalism. The occasional local battle might be won—two acres into a land trust here, a development scaled back there—but the trends have seemed inexorable. The tides of population and economic growth are clearly not going to crest, let alone ebb, anytime soon. Even the few scraps of habitat that have been preserved up to now could be lost at any time.

Many environmentalists attribute this problem to the failure of the culture to place enough importance on green space. "Most men, it seems to me," Thoreau wrote, "do not care for Nature and would sell their share in all her beauty, for as long as they may live, for a stated sum—many for a glass of rum." The promise of the price trend line for underground space is that at some point the cost of preserving and restoring habitat will fall beneath this sum, no matter how small it might be. I see no reason why at some point in the future the cost of tying every home and building into a single underground transit system—in effect, putting a subway station in every cellar—couldn't fall so low that even "most men" would go along, whereupon roads could be torn up and planted. The environmentalist utopia is a surface devoted entirely to those functions that only the surface can perform: the support of farms, homes, parks, gardens, commons, arboretums, conservatories, preserves, reservations, and wilderness. Many environmentalists suppose that we must reach this promised land through cultural transformations, by embracing revolutionary new lifestyles centered on voluntary poverty and childlessness. Their utopia might well be achieved instead through low-cost underground construction. Of course, there is no guarantee that the culture will choose this road—but it will become easier to do so every generation from now on.

A G E N D A

600 NORTHEAST GRAND AVENUE | PORTLAND, OREGON 97232 2736
TEL 503 797 1700 | FAX 503 797 1797

METRO

JOINT MEETING: **METRO POLICY ADVISORY COMMITTEE, JOINT POLICY ADVISORY COMMITTEE ON TRANSPORTATION and FUTURE VISION COMMISSION**

Date: July 27, 1994

Day: Wednesday

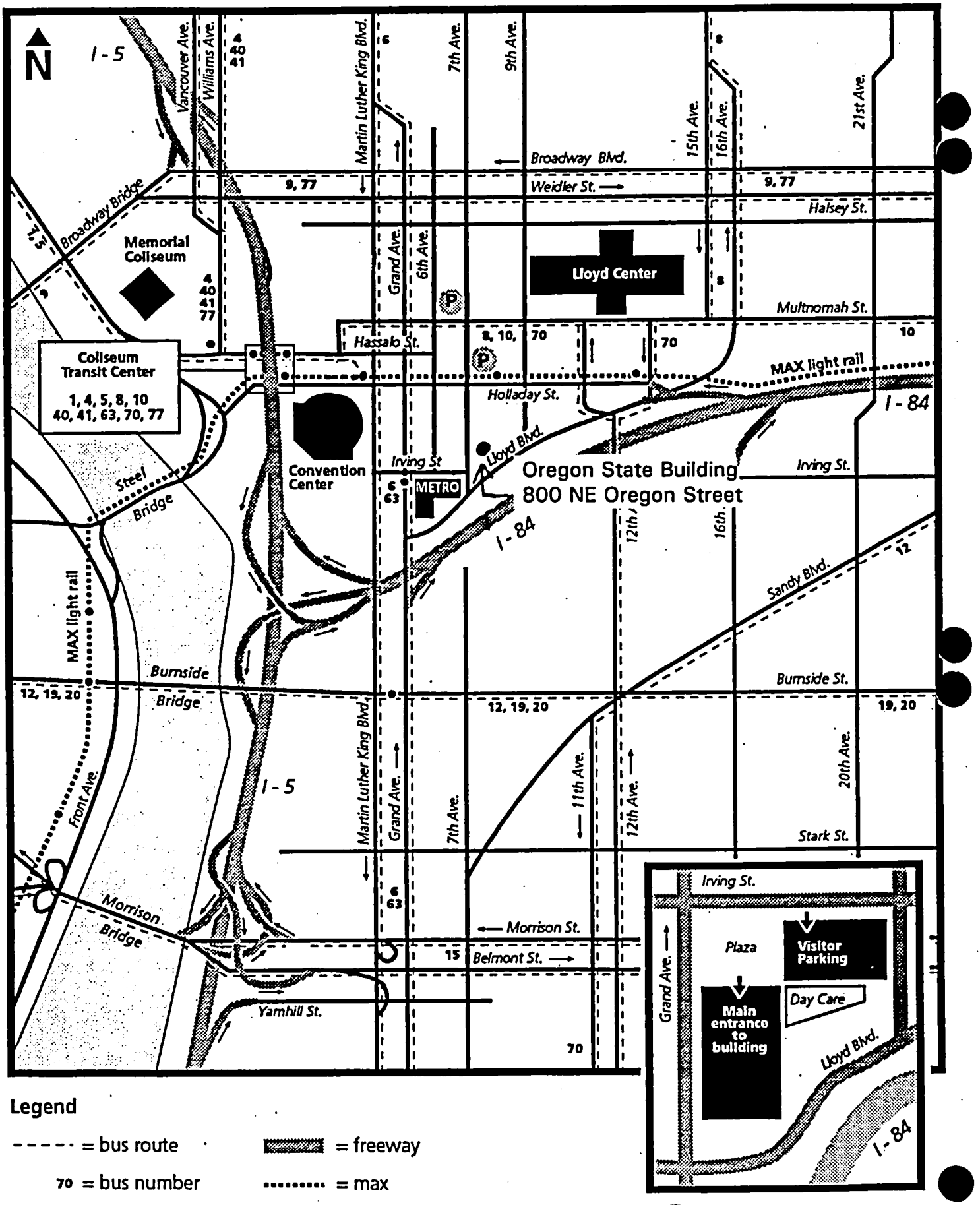
Time: 5:00 p.m. - 7:00 p.m.

Place: Oregon State Building,
800 NE Oregon Street (1 block from Metro), Room 120 C, 1st floor.
** ***Please note location*** **

AGENDA

I.	Process and timeline, overview	5 minutes
II.	Region 2040 Concept Report	10 minutes
III.	Region 2040 Public Involvement · survey response	20 minutes
IV.	Descriptive Indicators	15 minutes
V.	Preferred Alternative	60 minutes
VI.	Slideshow by the "Transformers" group on the Preferred Alternative	10 minutes

Call 797-1562 if you have any questions or to correct our mailing list.



Legend

- ----- = bus route
- 70 = bus number
- ——— = street
- (P) = public parking; $2 half day, $4 full day
- ▬ = freeway
- ····· = max
- • = bus/max stop

METRO

Enter Metro visitor parking from Irving Street (time limit 4 hours per visit). Enter Metro Regional Headquarters from the plaza.

(503) 646-4580
(503) 646-6286 fax

3840 SW 102nd Avenue
Beaverton, OR 97005-3244

July 19, 1994

To: Future Vision Commissioners (Barbara @ fax 797-1794; 4 pages total)

Misc. Notes

In our work regarding Industrial Lands, I called Betty Atteberry of the Sunset Corridor Assn. to get her perspective about the possibility of excess industrial lands in Washington County. She sent me two pieces of info: 1) A copy of info on Industrial Parks in the "Silicon Valley" of California, which includes statistics on acreages available. (Copy attached.) She also sent a magazine article on Site Selection by big businesses. (Copy attached.).

As we talk about carrying capacity, I called Washington County's Unified Sewerage Agency, because most testimony indicates that it is less expensive to increase density within existing service areas UNTIL you need to add capacity to those existing areas. A chapter of their current Master Plan is available. They will send me that same chapter of their draft update soon. See page IV-3 for 2010 holding capacity. I was also sent a flyer from the Assn. of Metropolitan Sewerage Agencies (Wash, DC) which discusses costs. That brochure is also available.

I recommend that FVC members get on the mailing list for the "Regional Water News". Call 823-7528.

On July 11, I attended a Washington County Council on Aging panel discussion on transportation. As I shared w/the Commission, the Hillsboro Volunteer Transportation Program served 300 clients giving 7,200 rides the first year. The second year, it increased to 900 clients and over 15,000 rides w/55 volunteers. This year, as of May they have given 16,025 rides. The large demand for seniors & disabled rides has been in areas not served by Tri-Met, with rural regions creating increased demands. These requests are not only for emergency or doctor rides, but people want rides to maintain their social contacts in order to have a "real" life. Tri-Met shared that the American for Disabilities Act will change its service to this population. OF IMPORTANCE TO FVC IS THAT WE NEED TO RECOGNIZE THE INCREASED AVERAGE AGE OF 2040 CITIZENS AND HOW THEY WILL GET AROUND. I think our emphasis on building communities w/services nearby is reinforced by this report. (A copy of a Summary of Volunteer Transportation Programs in the Tri-County area is available, as is a VTI brochure.

Lastly, on July 12th Elsie Stuhr, a 90-year young active and honored citizen of Beaverton, called with her reaction to the June Draft Vision. She said it was "idealistic", but that might be good in a Vision. She was pleased to hear about our intended work on carrying capacity. She had concerns about the amount of "monitoring" we were suggesting--there is always concern about the validity of any testing. She suggested we focus on educating people to see the needs themselves (and the monitoring keys). She referred to a Massachusetts program that educates newcomers, so they become active members of the community. Another suggestion was that there be less emphasis on categories of people. Also, if we want to emphasize a second language for citizens, it must be done early in the educational system.

Specifically focusing on seniors, she suggested that HOUSING will continue to be critical. On line #292, she supports the concept of LIFELONG learning. On #170, she suggested a change from "child" to "individual". EVERYONE needs to fulfill their potential in life. Regarding lines #378, 255 and 264, she suggested that park-type recreational activities were important to add, as well as the arts. Sports and physical challenges would keep us all healthy.

SAN JOSE'S INDUSTRIAL DEVELOPMENT PROGRAM

Promotion and retention of industrial development is vital to the city's economic growth and expansion of the tax base.

The Industrial Development Program of the Redevelopment Agency focuses its efforts on maintaining the economic vitality of four industrial redevelopment project areas, including Rincon de Los Esteros, Edenvale/Silicon Valley South, Julian-Stockton and Olinder.

Responsibilities of the industrial program include:

- interacting with the local development community,
- funding and managing infrastructure improvements, including bridges, overpasses, underpasses, signal lights, water wells, storm and sanitary sewers,
- providing site selection services on request,
- participating in and supporting business associations,
- coordinating efforts with key City departments with the development process,
- producing videos, brochures, and promotional material,
- conducting business forums.

MAJOR INDUSTRIAL PARK DESCRIPTIONS AND HIGHLIGHTS

Rincon de Los Esteros

Created	1974	
Total Acreage	4,669 acres	
Industrial/Office Space	32 million square feet	
→ Vacant Land Inventory	798 acres	
Tax Increment Revenue	1992-1993: $44.9 million	
Funded Infrastructure	1977-1992: $44.6 million	
Most Recent Projects		
Guadalupe Charcot Overpass	$17 million	
Brokaw Road Underpass	$11 million	
Airport Parkway Landscaping	$300,000	
Signal Light Installations	$325,000	
Total Number of Employers	1,700	
Total Number of Employees	77,000	
Most Recent Development		
Hitachi Instruments	100,000 sqft	150 employees
Cadence Design Systems	192,000 sqft	900 employees
Mentor Graphics	125,000 sqft	200 employees
Sony America	500,000 sqft	700 employees
Under Construction		
Cisco Systems	300,000 sqft	1,600 employees

Edenvale/Silicon Valley South

Created	1976	
Total Acreage	2312 acres	
Industrial/Office Space	6 million square feet	
→ Vacant Land Inventory	1384 acres	
Tax Increment Revenue	1992-93: $17.7 million	
Funded Infrastructure	1977-92: $37.5 million	
Most Recent Projects		
Fontanoso Avenue Bridge	$5 million	
Rue Ferrari Fence	$200,000	
Street Improvements	$175,000	
Fontanoso Landscaping	$ 50,000	
Gateway Designs	$ 20,000	
Total Number of Employers	173	
Total Number of Employees	19,500	
Special Classification	Incentive Zone	
Most Recent Development		
Xerox Engineering Systems	286,000 sqft	600 employees
Swenson Development		
State Compensation	80,000 sqft	250 employees
Nuclear Power	20,000 sqft	70 employees
Arcadia Development	42,000 sqft	Spec Development
Integretel	100,000 sqft	250 employees

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Peggy-
thought you might find this of interest
Betty

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custody of assets used as margin collateral.

"There's nothing magical about what's done, it's just very tedious"—particularly for traders with 40 or 50 counterparties and dozens of transactions each month, says Dolan. And at a cost of $450 to $1,000 per counterparty per month, C-TRAC+ is "a lot less expensive than a couple of salaried employees and an in-house system." Pricing is based on several variables, including the types of assets moved; whether they are domestic; the frequency of comparison and collateral pricing; and the number of counterparties.

The recent release of a template to help set thresholds for exposure should ease risk reduction.

Ezra Zask, president of Ezra Zask Associates Inc., money managers and consultants in Norfolk, Conn., says C-TRAC+ could prove to be valuable, being "the only system integrated to work in a number of different trading areas" and because it can monitor exposure on "close to a real-time basis. If you don't do that, you're leaving yourself open to risk."

Risk reduction should get considerably easier with the recent release of a template to help set thresholds for exposure and structure other elements of a counterparty deal. BT's Dolan says the standardized agreement, released by the International Swaps and Derivatives Association Inc., is a "watershed event" that will increase collateral trade activity.

But while the template "will help players get into the game...there will still be a big management tiger that needs to be kept straight."

◆ Kathleen Cahill

SITE SELECTION

A Good City Is Hard To Find

Location, location, location. The concept isn't tough to grasp, but when it boils down to re-siting a business or establishing a new branch, the variables can be mind-boggling.

How to make an informed relocation decision? One way is to listen to fellow businesspeople. In a study conducted last year by New York–based consultants Moran, Stahl & Boyer (MS&B), executives sounded off about which cities best meet critical factors for successful business operation.

MS&B, which specializes in corporate location decisions, formatted the survey data to *CFO* specifications, providing a list of the top 5 cities in each of nine categories chosen by *CFO*. From those nine categories, listed in order of importance on the accompanying chart, MS&B calculated the top 10 cities. The categories were based in part on survey respondents' views of what factors make for successful operation, and in part on cost-oriented criteria particular to finance offices.

Overall, the survey shows CFOs getting more involved in relocation decisions, says Steve Stavish, a former CFO who is now president of MS&B. "The CFO could be renamed the chief resource officer, because the job is moving toward total management of all assets of a business," Stavish observes.

MS&B has contributed research to *Fortune* magazine's "Best Cities for Business" articles for the past five years, but the data here haven't been published previously. MS&B received responses from 989 executives, representing a broad cross-section of industries, regions, and company sizes. Economic development organizations in 60 metropolitan areas also responded to questionnaires.

◆ Esther Kuntz

CITIES WITH THE BEST ENVIRONMENTS FOR BUSINESS

SKILLED WORKERS	LOW CITY/STATE TAXES	PRO-BUSINESS ATTITUDES	COMPETITIVE WAGE RATES	SUPPORTIVE FISCAL, REG., AND POLITICAL CLIMATE
1. Washington, DC	1. Ft. Lauderdale	1. Charlotte, NC	1. San Antonio	1. Las Vegas
2. Scranton, PA	2. Las Vegas	2. Las Vegas	2. Kansas City	2. Charlotte
3. Raleigh-Durham	3. Nashville	3. Tulsa	3. Tulsa	3. Tulsa
4. Oakland, CA	4. Orlando	4. Dallas	4. Memphis	4. Nashville
5. Boston	5. Birmingham, AL	5. Nashville	5. Salt Lake City	5. Dallas
				5. Ft. Lauderdale
				5. Kansas City

*Note: Where there are ties, the next immediate numerical rankings are eliminated.

AVAILABILITY OF A QUALITY LABOR FORCE	LOW COST OF LIVING	LOCAL ECONOMIC CONDITIONS	FAVORABLE LABOR/MGMT. RELATIONS	THE TOP 10: COMBINED, THE PREVIOUS CATEGORIES PRODUCED THE FOLLOWING RANKINGS...	
1. Salt Lake City	1. Oklahoma City	1. Salt Lake City	1. Charlotte	1. Salt Lake City	6. Nashville
2. Seattle	2. Tulsa	2. Charlotte	2. Tulsa	Columbus	7. San Antonio
3. Tulsa	3. San Antonio	3. Columbus, OH	3. Atlanta	3. Tulsa	Las Vegas
4. Columbus	4. Kansas City	4. Las Vegas	3. Houston	4. Dallas	9. Memphis
5. Austin, TX	5. Louisville	5. Nashville	3. Phoenix	5. Grand Rapids	10. Charlotte
					Atlanta

Source: Moran, Stahl & Boyer

BOOK 'EM, SAMO

▶ There have been more than 5,000 changes in tax laws since 1986, reports publisher Commerce Clearing House, which in 1913 squeezed all federal tax laws and interpretations into one 400-page volume. Today it takes 36,000 pages in 22 volumes.

To: Future Vision Commission
From: Judy Davis

FYI

Please see pp. xiv and xv for some interesting conclusions about satellite cities and UMTA.

Transit-Supportive Development in the United States:

Experiences and Prospects

Final Report
December 1993

Prepared by

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Transit-Supportive Development in the United States: Experiences and Prospects

Executive Summary

Many American suburbs and exurbs are hostile environs to transit users and pedestrians. Campus-style office parks, walled-in residential subdivisions, and mega-malls are often designed so that it is difficult to access them or get around by any means other than the private automobile.

In recent years, there has been a chorus of calls to redesign America's suburbs so that they are less dependent on automobile access and more conducive to transit riding, walking, and bicycling. One prominent movement, neotraditionalism, borrows many of the successful elements from turn-of-the-century American communities, like gridiron streets, commercial cores, and prominent civic spaces. Another, transit-oriented development (TOD), focuses the entire community on a central transit facility. To date, relatively few such projects have broken ground. The handful that have are too new to carry out in-depth evaluations of their transportation impacts.

This report examines recent experiences in the U.S. with transit-supportive developments—projects which, by design, give attention to the particular needs of transit users and pedestrians. The study focuses mainly on experiences in the suburbs and exurbs of large U.S. metropolises, which in most cases are served only by bus transit. Assessments are carried out at three levels—individual sites, neighborhoods, and communities. Since in the course of the research we found fewer U.S. examples of transit-supportive developments in bus-only suburban-exurban environs than popular accounts might have us believe, the study gives particular emphasis to implementation issues—how recent market and regulatory factors have influenced the transit-supportive design movement.

Site-Level Analyses

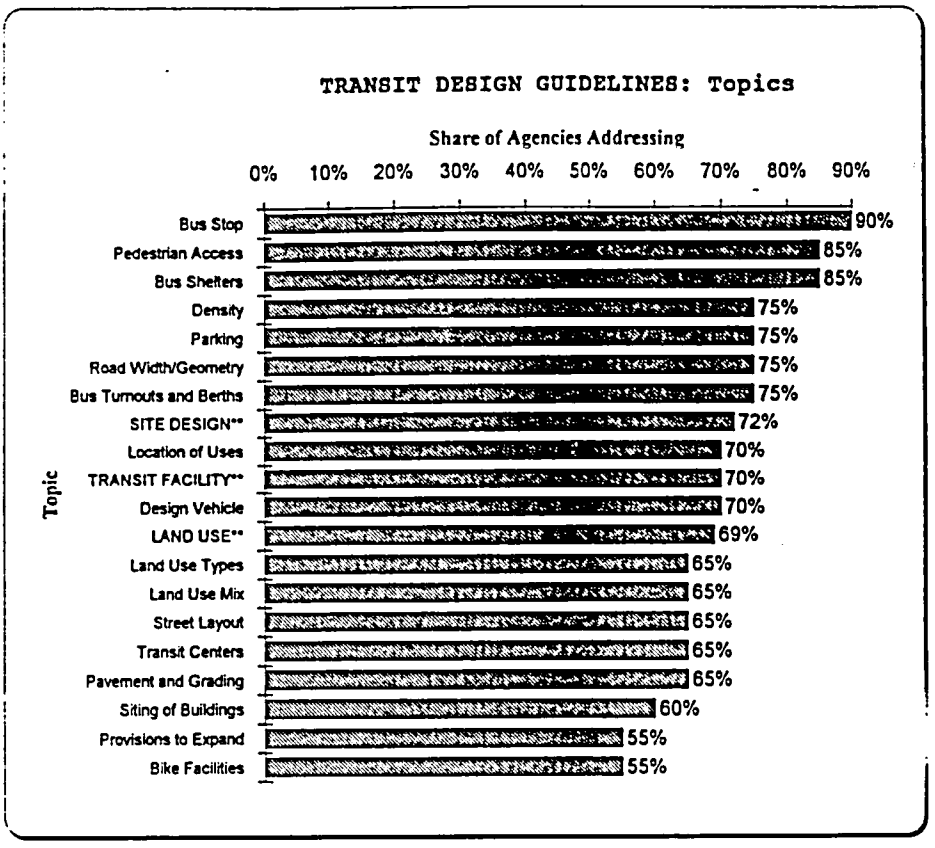
In order to study transit-supportive designs at the site level, a national survey was conducted that elicited information from U.S. transit agencies on local real estate projects that are friendly to transit users and pedestrians. The survey also gathered useful background information on transit-supportive guidelines themselves.

In all, around one-quarter of the surveyed U.S. transit agencies had guidelines, and around one-half of the guidelines have been approved or endorsed by a local policy body. Most guidelines are devoted to some combination of three topics: transit facilities design, site design, and land use (Figure E1). Around 70 percent of guidelines give at least some attention to all three topics. Levels of treatment varied greatly, however. Around 85 percent of guidelines contain illustrations and offer recommendations on the design and placement of bus stops and shelters, while only 65 percent suggest minimum densities for transit and only 40 percent address specific land-use programs that are

TRANSIT DESIGN GUIDELINES:

TOPICS

Topic	Share of Agencies Addressing
Bus Stop	90%
Pedestrian Access	85%
Bus Shelters	85%
Density	75%
Parking	75%
Road Width/Geometry	75%
Bus Turnouts and Berths	75%
SITE DESIGN**	**72%**
Location of Uses	70%
TRANSIT FACILITY**	**70%**
Design Vehicle	70%
LAND USE**	**69%**
Land Use Types	65%
Land Use Mix	65%
Street Layout	65%
Transit Centers	65%
Pavement and Grading	65%
Siting of Buildings	60%
Provisions to Expand	55%
Bike Facilities	55%



** Represents average percentage for each topical category.

Figure E1

Transit Design Guideline Topics

conducive to transit usage. Over 40 percent of guidelines set standards for transit facility designs, but only around 10 percent contain any standards for urban design or land-use planning.

From the survey, a surprisingly small number of specific real estate projects outside of rail corridors could be identified by transit officials that were genuinely transit supportive. While not a complete list, fewer than 30 transit-supportive sites were identified nationwide; most of these, moreover, incorporated micro-design features (e.g., on-site benches at bus stops and special staging areas for buses) rather than embracing macro-design elements aimed at shaping travel behavior (e.g., dense, mixed-use developments). Overall, the national survey provided few promising leads for finding "transit-friendly" sites that could be evaluated in terms of impacts on ridership and service delivery. It did, however, provide a compendium of good transit-supportive design practices as well as good examples of guidelines themselves. Based on criteria related to clarity of text, effective use of illustrations, quality of technical information, and integration of materials, eight areas had exemplary guide-

lines: Austin, Texas; Denver, Colorado; Montreal, Quebec; Reno, Nevada; Sacramento, California; Seattle, Washington; Snohomish County, Washington; and Portland, Oregon.

More in-depth analyses were carried out on the ridership characteristics of transit-supportive sites in five metropolitan areas: Chicago, San Diego, San Francisco, Seattle, and Washington-Baltimore. Besides the fact these areas have been at the forefront of promoting transit-sensitive site planning and designs, they were chosen also because travel data were available for the tenants of several transit-supportive projects. For the most part, differences in transit ridership rates were fairly modest across sites. Wherever transit-supportive projects were clearly outperforming other nearby similar projects, there were always extenuating circumstances. In suburban Chicago, for example, around one-third of workers at the new "transit-friendly" Sears headquarters in Hoffmann Estates commute by bus or vanpool/carpool, much higher than in any other outer suburban workplace in the region; however, these shares are due more to Sears' aggressive TDM program, the size of the company, and the carry-over of prior transit commuting habits among those who transfered from the Sears Tower in downtown Chicago. A number of offices and mixed-use centers in Bellevue, Washington, that have densities and site features supportive of transit average substantially higher shares of non-drive-alone commuting than in nearby campus-style developments; however, Bellevue's strict parking controls have as much to do with these outcomes as anything. Several transit-supportive retail and mixed-use projects in the Bay Area, San Diego, and greater Washington average ridership that is 8-15 percent higher than comparison sites, however in most of these instances the projects are near rail stations. Transit-supportive designs and rail service seem fairly compatible, in part because most rail-served areas are comparatively dense; for bus-only settings, however, the relationship between transit-supportive design and ridership is more tenuous.

To date, perhaps the biggest impact of the transit-supportive movement has been on local policy-making, such as the passage of Washington state's Growth Management Act and Baltimore's Access by Design program. Once such initiatives gain a momentum of their own and once sagging real estate estate markets begin to perk up, promotional campaigns like the marketing of transit-friendly guidelines will likely begin exerting stronger influences on development practices. The challenge will then rest with the public sector to mount good quality transit services which take advantage of transit-sensitive residential, office, and mixed-use developments.

Neighborhood-Level Analyses

The next level of analysis involved a comparison of commuting characteristics of transit-oriented versus auto-oriented neighborhoods in the San Francisco Bay Area and Southern California. Transit neighborhoods averaged higher densities and had more gridded street patterns compared to their nearby automobile counterparts. Efforts were made to match neighborhoods closely in terms of median household incomes and, to the extent possible, transit service levels to control for these effects.

For both metropolitan areas, pedestrian modal shares and trip generation rates tended to be considerably higher, in some cases well over 50 percent higher, in Transit than in Auto neighborhoods (Figures E2 and E3). Transit neighborhoods had decidely higher rates of bus commuting only

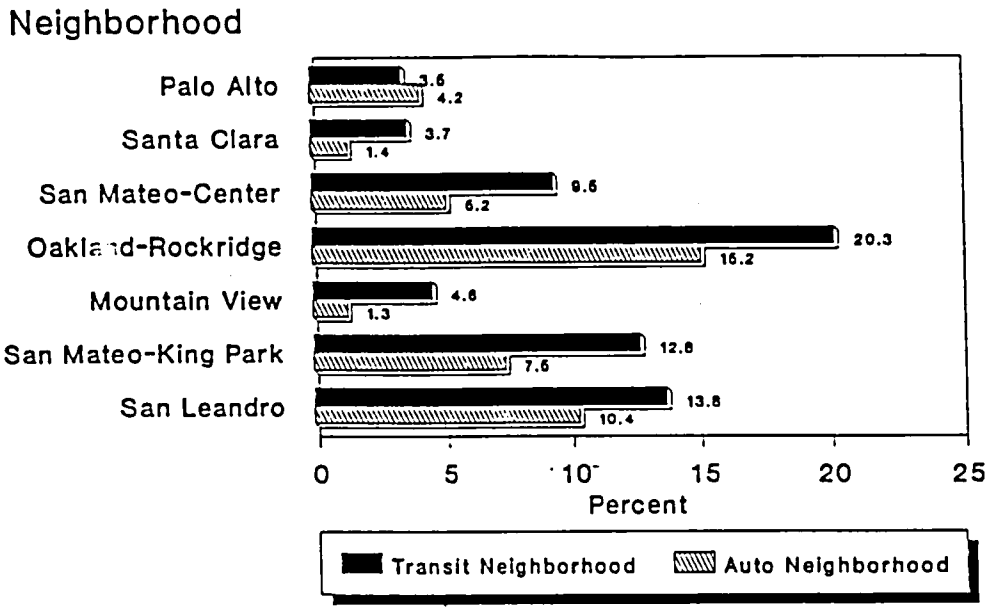


Figure E2

Neighborhood Comparisons of Transit Modal Splits, San Francisco Bay Area, 1990 Work Trips

in the Bay Area; in Southern California, both groups of neighborhoods had comparable transit modal splits and trip generation rates. On the whole, however, Transit neighborhoods won over larger shares of commuters to alternative modes than their Auto counterparts— for example, even in Los Angeles, Transit neighborhoods averaged around 50 more transit work trips per 1,000 households than Auto neighborhoods, controlling for household incomes and residential densities.

The general absence of strong and decisive relationships was no doubt due to several factors. One, finding true neighborhoods that met both differentiation and control criteria was problematic. Second, traditional transit-oriented neighborhoods probably have the biggest influence on non-work trips, particularly shop trips. Even if near-perfect matched pairs were obtained and shop travel data were available, it seems unlikely that bus transit modal splits will ever differ markedly among neighborhoods. However, when combined with pedestrian, bicycle, and carpool/vanpool travel, non-drive-alone shares are likely substantially higher in transit-oriented neighborhoods for many non-work trips.

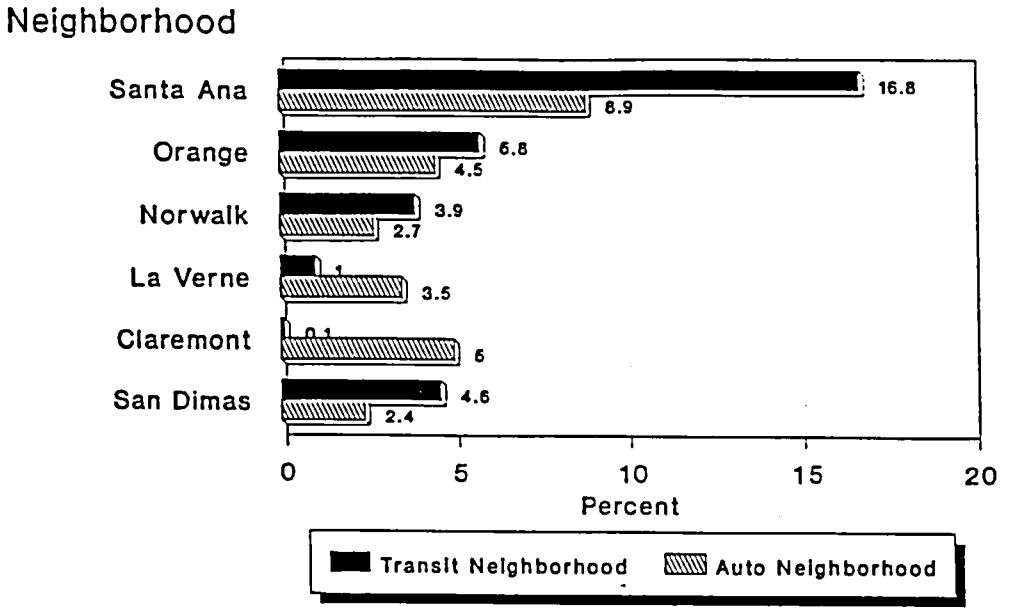


Figure E3

Neighborhood Comparisons of Transit Modal Splits, Los Angeles Region, 1990 Work Trips

Community-Level Analyses

At the community scale, the research focus shifted away from micro-design questions and more toward probing the ridership influences of structural elements of the built environment, like land-use compositions and levels of jobs-housing balance. One comparison was drawn between the commuting behavior of residents from ten traditional U.S. communities versus those of the metropolitan area at-large. Traditional communities averaged substantially higher shares of walk and bicycle travel as well as shorter trips. On average, larger shares of residents commuted by transit in traditional communities than did residents of the typical regional suburb, however not in all cases (Figure E4). The study of Edge Cities found that densities and mixed land-use compositions paid off only if Edge Cities are served by rail transit.

The bulk of the community-level analyses concentrated on planned communities. America's new towns were found to be fairly self-contained, averaging relatively large shares of residents working within the community. This produced shorter average commutes in new towns. Balanced new towns had slightly lower shares of transit and drive-alone commuting. In general, America's new communities seem to enjoy only modest mobility benefits.

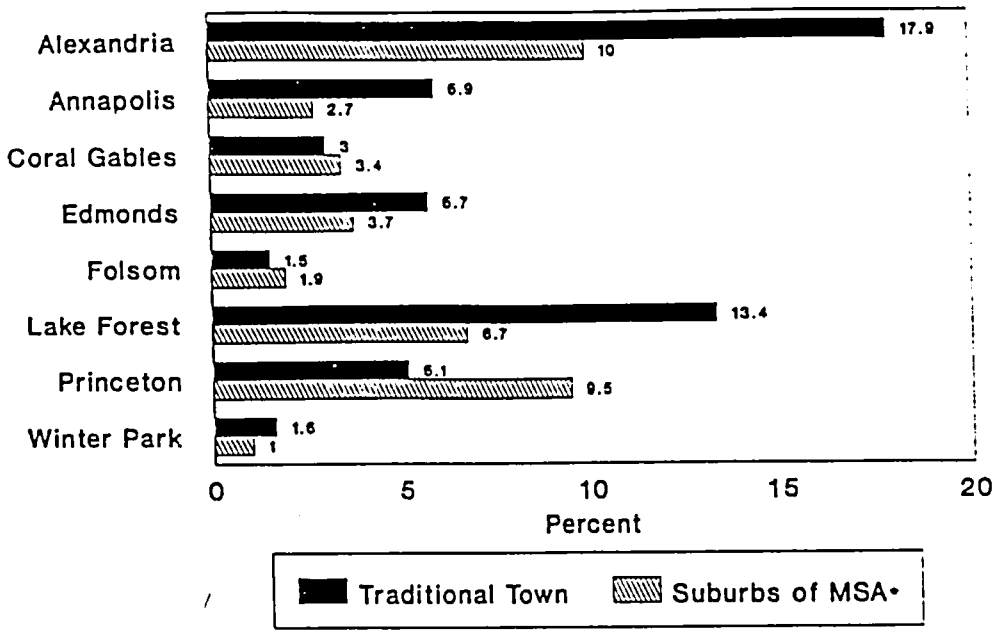


Figure E4

Transit Shares of Work Trips in Traditional Communities and Surrounding Suburbs, 1990

The best evidence on the link between community planning and commuting is from Europe. In general, an inverse relationship was found between how self-contained and balanced communities were and the share of work trips made by transit users. Britain's more recent new towns, epitomized by Milton Keynes, are highly balanced and theoretically self-contained, yet they are auto-dependent and average high levels of annual VMT per capita. In stark contrast are new towns outside of Paris and Stockholm. In both metropolises, satellite new towns are linked to the regional core by rail transit. While numerically balanced, new towns outside of Paris and Stockholm are not self-contained; rather, external commuting by residents and workers far exceeds internal commuting. Importantly, the external commuting that takes place is predominantly by rail transit, resulting in low annual vehicle-miles-traveled (VMT) per capita.

Experiences abroad suggest that having good quality rail or dedicated line-haul service is the key to luring new-town commuters out of their cars in substantial numbers, with such land-use considerations as density, neotraditional designs, jobs-housing balance, and self-containment of secondary significance. This is particularly so when regions have a built form similar to that of Paris or Stockholm —a strong, pre-eminent regional core orbitted by satellite centers that are radially linked to the core by fixed guideway services. In both instances, this regional form is the direct outcome of pro-active regional planning. Where regional planning is absent and development patterns are more diffuse

Notes: These European new towns are all separated from the central city by greenbelts. 'Balance' means "job-housing" balance.

and random-like, the opposite will result—commuting between communities will predominantly and almost unavoidably be by drive-alone automobile, even if rail services exist.

Conclusions

At the site level, there is little evidence that transit-friendly design features, like front-door bus staging areas and internal pathways, have much, if any, measurable impact on transit demand. Such micro-elements seem to be too "micro" to exert any meaningful influences on travel choices. More macro-factors, like densities and cost differentials of transit versus automobile commuting, are far more powerful determinants of how people travel. Once commuters have opted for a travel mode, micro-design features probably have some affect on secondary travel choices, such as during the midday. Thus someone commuting alone might be more inclined to walk to a restaurant several blocks away in a transit-and pedestrian-friendly setting than in a blatantly auto-oriented environment. However, the presence of micro-design features, in and of themselves, are too weak to shape the more fundamental decision of how to arrive at work.

The ability to evaluate the impacts of transit-supportive designs is confounded by the fact that all transit-friendly environments have transportation demand management (TDM) programs in place. Every office park or residential enclave with on-site transit shelters, front-door bus staging areas, and internal pathways also has an active, often ambitious, TDM program. Transit-supportive designs and TDM complement each other and no doubt mutually benefit. However, we believe that most of the differences in modal splits between transit-supportive sites and comparison sites are due to TDM programs rather than elements of the built environment. Overall, transit-supportive designs are helpful and well-intentioned, though fairly meaningless without good quality transit and rideshare services and pro-active measures that reduce auto-dependency.

To date, the transit-supportive design movement has had a bigger impact on the public than the private sector in many parts of the country. This has mainly been in the form of convincing local planners of the importance of considering the needs of transit vehicles and pedestrians in the review of development proposals. For the most part, the economic downturn of the late-1980s and early-1990s has slowed down the transit-oriented design movement since relatively few large-scale commercial projects are being built. However, when urban real estate markets begin warming up again, a number of jurisdictions will be well-positioned to see that whatever gets built is highly conducive to transit riding and walking. The burden will then shift to public transit agencies and private providers to ensure that good-quality transit services are delivered.