3 Planning & Zoning

Planning and zoning practices profoundly influence the impact of development on watersheds.

Planning determines the pattern of development, what type is permitted, and its relationship to streams and other natural features. Zoning determines where particular land uses are located, requirements for parking, sizes of roadways, permitted impervious land coverage, and types of approved drainage systems.

By understanding how these powerful tools work, they can be focused to protect water quality.

Planning & Zoning

3.1 Watersheds and planning – historical context. Political decisions made a century ago affect our ability to plan for watershed quality. Understanding the historical context of watershed planning helps us to focus current efforts more effectively.

3.2 Watershed-based planning & zoning. Conventional zoning practices don't typically address the impact of development on water quality. Specific zoning approaches can be adopted to make zoning a more effective water quality tool.

3.3 Cluster/infill development. Clustering development at higher densities on a portion of a site can have a beneficial impact on overall watershed health. The denser area may have a very high percentage of impervious land coverage, but total impervious area and land disturbance will be less.

3.4 Street design standards. Streets comprise a very large proportion of land use – up to 25% of total land area. The street pavement itself is often the largest component of total impervious land coverage. A carefully designed street system can protect water quality while also serving its primary transportation function.

3.5 Parking requirements. Parking is often the greatest single land use, and usually it is made of impervious pavement. The amount of parking mandated by zoning codes and standards often far exceeds the usual parking demand. A variety of zoning and planning tools are available to provide adequate, but not excessive, parking supply.

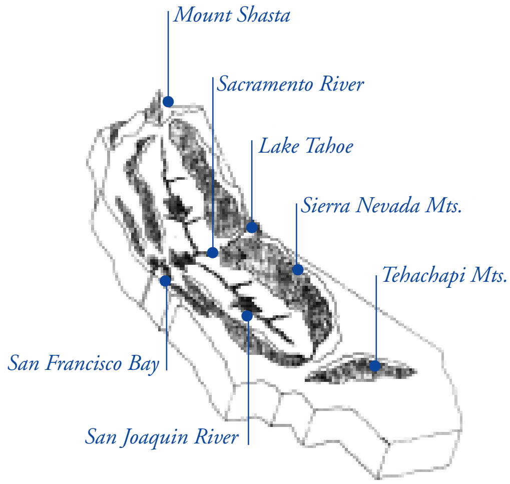
3.6 Community education and outreach. Education and outreach are critical elements of designing for water quality protection. Generating public awareness increases general interest and acceptance and improves long-term maintenance prospects.

3.7 SWMPs, SWPPPs, and BMPs. An alphabet soup of acronyms define government regulations relating to stormwater quality protection. Understanding these regulations is a key to successfully navigating the approval process.

Planning & Zoning

3.1

Waterseds and planning – historical context



SF Bay drains a vast watershed

In 1878, Major John Wesley Powell, the first Director of the United States Geological Survey, submitted his *Report on the Lands in the Arid Region of the United States* to the U.S. Congress on the future of the American west. In this document, Powell recognized that water would be the limiting resource in the future development of the arid west. He understood that the rectilinear surveys used to divide properties and political entities in the rainy east would not work in the drier west. Instead of boundaries drawn along arbitrary lines, Powell proposed that drainage divides, or watersheds, be the organizing land use principal.

Congress ignored Powell's recommendation, continuing its practice of dividing properties and political entities along arbitrary lines. Where waterways such as rivers or creeks were used for creating political divisions, they often were used to form the border between entities. Yet, ecologically speaking, waterways do not divide land, but unite it by collecting drainage from throughout the watershed. Thus, in the adopted planning system, the political function of a waterway is often precisely opposite to its environmental function. [9]

These kinds of political and jurisdictional barriers to watershed planning also effect the San Francisco Bay, which drains a vast regional watershed extending from the coast ranges in the east to Mount Shasta in the north to Kern County in the south to Lake Tahoe in the east. County and city jurisdictions occasionally follow watershed boundaries (like the Mayacmas ridge separating Sonoma from Napa County), but more often lie in the center of watersheds (like San Francisquito Creek which divides San Mateo from Santa Clara County).

As planners and scientists recognize the threats to water quality, they create new mechanisms to better facilitate watershed-based planning and zoning. These include specific efforts to protect specific streams, such as the San Francisquito Creek Watershed Coordinated Resource Management Process, a collaboration between two counties and multiple cities along San Francisquito Creek, as well as larger regional efforts, such as the Santa Clara Basin Watershed Management Initiative, the Alhambra Creek Watershed Program, the Alameda Creek Watershed Management Program, many regional water quality programs, BASMAA, and the Association of Bay Area Governments (ABAG).

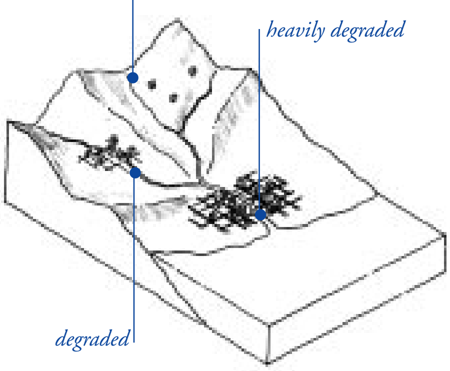
In Powell's scheme, the San Francisco Bay Area would have been treated as a single political entity, and the counties within it would have been divided on the basis of sub-watersheds, protecting the precious water resource and making environmental planning much easier.

Major John Wesley Powell (on horseback) proposed that watersheds be the organizing land use principal in the arid west.

(photo by Smithsonian Institution)

Planning & Zoning 3.2

Watershed-based planning & zoning



Land use patterns and the types of development permitted are determined by the planning process, which considers social, political, institutional, natural and other factors. In all planning and zoning, protection of natural resources must be balanced with other community priorities such as roads, schools, housing and economic development.

Limits of conventional planning and zoning. Conventional planning and zoning can be limited in their ability to protect the environmental quality of creeks, rivers and other waterbodies. This is a result of two principal factors. First, conventional zoning arises from political, transportation, and social factors that often do not mirror the natural watershed boundaries of a community. Second, conventional zoning can limit development by density (units per acre or allowable square footage). These regulations often address the maximum density of rooftop impervious cover, but have limited impact on the transportation network's contribution to impervious land coverage (roads, parking, pathways, driveways, etc.). Because this transportation component is usually greater than the rooftop component of impervious land coverage, density is an indirect and imprecise measure of forecasting the effect of development on water quality.

State planning law offers guidelines for resource protection but does not require specific protection measures. Local governments consider various priorities to develop General Plans that guide growth over a relatively long time horizon, such as twenty or thirty years. In some instances, local governments may consider the relationship of development to natural features such as creeks and hillsides, and may guide land use changes to minimize impact to these features. These local considerations may differ from city to city and can be difficult to coordinate regionally. In some local jurisdictions, natural factors may only be addressed to the extent of identifying hazards and land that is not suitable for development, while other jurisdictions may set a higher value on natural resource protection. Regardless of the approach of any particular local planning jurisdiction, the priorities of complex natural systems can be difficult to address at the local level, making a balanced pattern of development and resource protection at the regional level difficult to achieve.

Watershed based planning. An alternative to conventional planning and zoning is natural resource and watershed-based planning. Because such planning is natural resource-based, it begins by considering the natural resources of a given area. By being watershed-based, it orients such considerations to watershed areas, rather than only within town, city, or county lines. Such planning enables multiple jurisdictions to work together to plan for both development and conservation that can be environmentally as well as economically sustainable.

The regional approach is inherently difficult because it involves balancing the interests of many independent local governments. When practiced effectively, however, regional resource-based planning enables local and regional areas to realize economic, social and other benefits associated with growth, while conserving the resources needed to sustain such growth, including water quality.

This kind of comprehensive planning involves four basic steps:

- identify the watersheds shared by the participating jurisdictions,
- identify, assess, and prioritize the natural, social and other resources in the watersheds,
- prioritize areas for growth, protection and conservation, based on prioritized resources, and,
- develop plans and regulations to guide growth and protect resources.

Watershed-wide plans can become very detailed, with in-depth data gathering and assessment, extensive public involvement, identification of problems and needs, development of management strategies, and long-term implementation of policies and actions. Local governments, however, can start with simpler yet important steps toward effective watershed planning, such as adopting a watershed-based planning approach, articulating this basic strategy in their General Plans, and beginning to pursue the basic strategy in collaboration with neighboring local governments who share the watersheds.

Watershed-based zoning. Some watershed protection strategies have been adopted under conventional zoning, but they typically have limited value. These strategies include large lot residential zoning, which can reduce the overall impervious area on individual lots, but expands the impervious coverage of the roadway network as well as contributing to urban sprawl.

Another approach is the widespread use of stormwater treatment devices (often called BMPs) to mitigate the impact of impervious land coverage. These devices, even in the best of circumstances, have limited value as a watershed protection strategy, and their performance is often compromised by poor design, construction, or lack of maintenance.

Some resource-based zoning policies that can be developed and incorporated into conventional zoning include:

- overlay districts,
- performance zoning,
- incentive zoning,
- imperviousness overlay zoning,
- planned unit development zoning.

The intent of each of these tools is to introduce flexibility into the zoning structure to encourage natural resource protection.

Restoration. In many cases, municipalities undertake efforts towards preservation or restoration of existing natural resources, such as streams or other water bodies. In areas with the highest levels of existing urbanization, streams may have been impacted so that they don't support habitat in their present degraded condition. It is usually not practical in these circumstances to restore degraded streams to a pristine pre-development condition, with full habitat and ecological function. In these cases, an "urbstine" condition, or one of enhanced environmental vitality consistent with the urban context, may be sought. Planners can work with the community, water quality engineers and wildlife fisheries biologists to define the criteria for an "urbstine" condition, and work to achieve those goals.

Efforts to restore biological diversity may include:

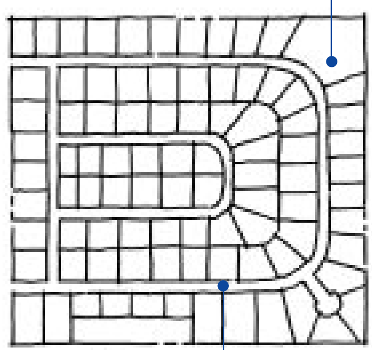
- preventing the introduction of urban pollutants to protect downstream waters,
- mitigating effects of development using biofilters, detention/infiltration basins, pervious pavements, and other strategies,
- retaining the natural riparian corridor and carefully applying measures to prevent or treat runoff,
- protecting and restoring creekbank vegetation,
- restoring the riffle/pool structure and meander length,
- preventing unauthorized diversions of water.

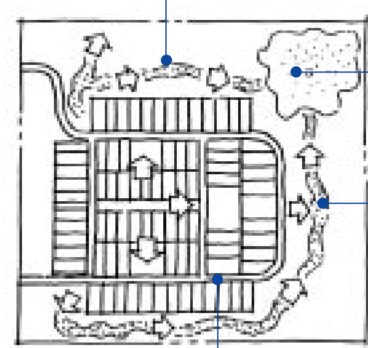
Ideally, General Plans need to look at development projects in the context of the entire watershed, considering site impacts in terms of an overall watershed plan.

Planning & Zoning

3.3

Cluster / infill development





Conventional development standards use setbacks, frontages, roadway geometry, and other methods to arrange individual buildings on individual lots. Development based on the individual lot usually creates a homogeneous community, an extensive roadway network and other infrastructure systems.

Cluster development, a site planning technique in use for several decades, considers not only individual lots, but larger site boundaries. It concentrates development on one portion of a site, and conversely maintains more of the site in open space. One of the principal results of cluster development is reducing the length of the roadway network. Because the other infrastructure elements, such as sewer, power, telephone, and water follow the roads, their costs are also reduced. This means that cluster development can be significantly less expensive to build than conventional single lot development. On-going costs for city services, such as police and fire protection, are also reduced, because the community is more concentrated and therefore more efficiently served. Finally, cluster development provides increased area for passive recreation, because the open space is concentrated in a public or semi-public place, rather than divided in many large, private yards. However, cluster developments can face resistance in the marketplace, because home buyers sometimes prefer the larger lot sizes and wider streets of conventional development patterns.

From a water quality viewpoint, cluster development has multiple benefits compared to conventional zoning. These include:

- reduced impervious surface area by 10 to 50%,
- reduced stormwater runoff,
- reduced encroachment on stream buffers,
- reduced soil erosion since 25 to 60% of site is never cleared and steep hillsides are avoided,
- reduced need for expensive flood control measures,
- larger urban wildlife habitat islands, and,
- reduced reliance on automobiles, because shorter distances make pedestrian, bicycle and mass transit more attractive.

Most cluster development zoning policies have not been explicitly created to support water quality protection. To enhance these benefits, proponents of cluster development for stormwater quality protection have suggested the following cluster development criteria:[10]

- significant impervious surface reduction from reduced roadway network compared to conventional zoning,
- minimum site size (approximately 5 acres),
- minimum open space requirement of approximately 50% of total site,
- consolidation of open space, such that at least 75% is in a contiguous unit for habitat value,
- maintenance of approximately half of the open space in undisturbed vegetated areas (i.e. wetlands, forests, meadows), with the other half as a community green space (i.e. turfgrass, playgrounds, constructed stormwater basins),
- formation of private legal entity to maintain open space in perpetuity (e.g. homeowner's association), and,
- dedication of open space to a public open space district.

Planning & Zoning

3.4 *Street design standards*

A typical pre-war residential street

28 foot wide with tree-lined parkway between the curb and sidewalk. This traditional design can be found in older neighborhoods throughout the Bay Area.

A typical post-war residential street

36 foot wide with no parkway between sidewalk and curb. This modern design can be found in newer neighborhoods throughout the Bay Area.

Streets are at the nexus of a wide variety of land use and environmental issues. An understanding of their scope, history, and function helps to explain their central importance in the design of development for stormwater quality.

Considered a number of ways, the street is a large design element. In a typical neighborhood, the public right-of-way – the street – comprises approximately 20 to 25% of total land area, making it the single most important determinant of neighborhood character. Streets also can comprise up to 70% of a community's total impervious land coverage, with the remainder of impervious land coverage from rooftops and other structures. This can make street design the single greatest factor in a development's impact on stormwater quality. Because the street exists in the public right-of-way, it comprises a large proportion of total public open space in a typical development. It is also subject to municipal ordinances, standards, and management, giving local jurisdictions a great deal of control over street design. For these reasons, the street is the one of the most important design elements in site planning, and an element that can be most directly affected by local ordinances and policies.

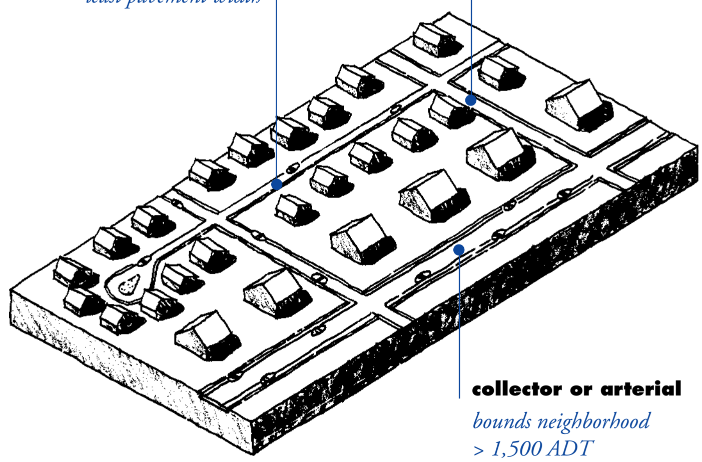
Residential streets. Residential streets present a significant opportunity to apply design for water quality. Unlike streets in commercial and industrial settings, which must be sized to accommodate large trucks, high speeds, and heavy volumes, residential streets typically are intended for low volume, low speed automobile traffic.

Prior to World War II, traditional residential streets were designed as multiple use spaces, shared by pedestrians, children at play, animals, and low volumes of vehicular traffic traveling at low speed. The prototypical residential subdivision, laid out by Frederick Law Olmsted at Riverside, Illinois, in 1869, has 24 foot wide streets with concrete curb and gutter, lined with broad 12 foot wide parkway strips planted with trees. Outside of the parkway strip is a 5 foot wide sidewalk on both sides.[11] This model was copied all over the United States, and many pre-war neighborhoods can be found today with similar traditional street geometries.

After World War II, new street standards were developed to facilitate the automobile, which was growing both in dominance and number. Standards set by professional associations such as the Institute of Transportation Engineers (ITE) and the American Association of State Highway and Transportation Officials (AASHTO) as well as rules promulgated by the Federal Housing Administration increased paved area by up to 50% compared to pre-war designs, setting typical residential street width at 36 feet, plus curb, gutter and 5 feet of sidewalk on both sides.[12]

Planning & Zoning

3.4 Street design standards, continued



3.4a Street hierarchy

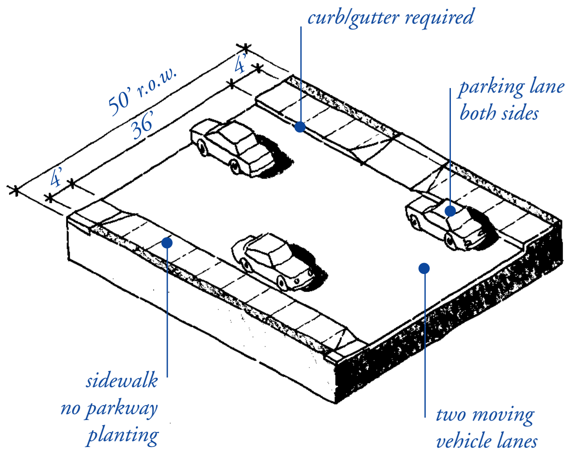
These standards were applied in communities throughout the Bay Area and the United States. For ease of maintenance, many communities abandoned the parkway strip between the curb and sidewalk, bringing the sidewalk flush with the back of the curb and eliminating the street trees. In a typical 50 foot wide right-of-way, this 46 foot wide pavement section (36 feet of street plus 10 feet of sidewalk) creates 92% impervious land coverage in the right-of-way. Compared to the inviting, park-like space of the original Olmsted model, with its 57% impervious land coverage (34 feet of pavement inside a 60 foot right of way), the modern residential street with its 90% impervious coverage can be a hot, treeless place that generates signifcant runoff.

Today professionals from many fields, including transportation engineers, landscape architects, urban designers, and environmental scientists, are reevaluating residential streets with the intent of creating new standards that are more hospitable and more environmentally responsible. New street standards based on the pre-war models (known as "neo-traditional design") are now being studied and adopted in municipalities across the country. At the national professional level, ITE has published neo-traditional street standards that permit local streets between 22 and 30 feet wide, allowing parking on both sides, with or without curbs.

3.4a Street hierarchy. Municipal standards generally classify street widths by the planned function of the street: local, collector or arterial. *Local streets*, the smallest class, are intended to provide access to abutting properties, and have a typical average daily traffic (ADT) of less than 1,500 vehicles. By definition, through traffic and truck traffic are generally discouraged on local streets. *Collector streets* are an intermediate class, intended to collect traffic from local streets and deliver it to larger arterial streets. They also can serve as the primary traffic route within a residential or commercial area, and have a typical ADT between 1,500 and 3,000. Finally, the largest class (except highways and freeways), *arterial streets,* have an ADT between 3,000 and 10,000, and are intended to provide long distance travel, with controlled intersections and higher speeds. For residential design, local streets are most relevant.

A survey of Bay Area municipalities reveals that the **typical current standard** for a two-way local street with parking on both sides requires two moving lanes, plus two parking lanes, plus curb, gutter and sidewalks each side, making a total of 40 to 50 feet of pavement within a typical 50 foot right-of-way (see table).

Yet, the number of vehicle trips on a local street can vary considerably, depending on the number of abutting dwelling units.



Typical current standard for a local street:

90± % impervious land coverage

Given the generally accepted rule-of-thumb for residential street design of 10 vehicle trips per day per dwelling unit, a street with ten single family homes can be expected to generate an ADT of 100, or an average of one vehicle trip approximately every 15 minutes (every 6 minutes in the peak hour). In comparison, a local street serving one hundred homes (1,000 ADT) will generate an average of one vehicle trip every 90 seconds (every 30 seconds in the peak hour). When built to typical municipal standards, the two mandated moving lanes of a local street use a great deal of land area for very little traffic. If the street is considered in terms of space, rather than lanes, a central space wide enough for one vehicle can be retained for movement, with parking and waiting space along both sides. In the infrequent instance when two vehicles approach in opposite directions, one vehicle can pull into the parking lane to allow the other vehicle to pass in the central moving space. The many driveway openings on either side of the street ensure than at any given segment of the street some space will be available for waiting, even if parking spaces are full on both sides. On lightly traveled streets, the minor inconvenience of waiting for oncoming traffic does not occur very often, making a shared central moving space feasible for streets serving up to 50 dwelling units (500 ADT, one vehicle every 3 minutes average, every 1.5 minutes peak).[13]

Impervious land coverage and street design standards.

Most Bay Area municipal street standards mandate over 80% impervious land coverage in the public right-of-way. Alternative standards can significantly reduce impervious land coverage while meeting access needs of local, residential streets.

Representative local street standards for Bay Area municipalities.

Jurisdiction	Street width	curb/gutter required	sidewalk required	parkway planting	r.o.w. imper.
Alameda Co.	40 ft.	yes	5'/side	no	100%
Concord	36	yes	4'/side	varies	90%
Contra Costa Co.	32	yes	4'/side	no	78%
Palo Alto	40	yes	4'/side	yes	85%
San Jose (std.)	35	yes	5'/side	no	100%
San Mateo Co.	36	yes	4'/side	no	94%
Alternative street standards for local and access streets.					
Neotraditional	28±	no	4'±	yes	74%
Rural	20±	no	no	yes	36%
San Jose (alt.)†	30	yes	4'/side	yes	81%

(All standards reflect minor or local street standards for flat areas to accommodate two way traffic, with parking both sides, typical right-of-way between 45 and 60 feet wide.)

† San Jose Narrow Residential street standard, parking one side only.

Street design standards, continued

Unlike most municipal standards, which set street width by number of vehicle lanes and roadway classification (local, collector, arterial), street design by anticipated traffic volumes (ADT) allows for varying pavement width to match usage. Using the analogy of stream flow, this "headwaters streets" system allows the most "upstream" streets, those serving approximately 50 adjacent dwelling units, to have widths as low as 16 feet while allowing two-way traffic. As traffic volumes increase on neighborhood streets, pavement widths also increase, just as streams widen downstream to accommodate increased water volumes.[14] In practice this generates a new class of street for very low traffic volumes, referred to as "access" streets, which are below "local" street in the standard street hierarchy.

For example, an access street serving 50 single family homes (25 each side) with 50 foot width lots would require 1,250 linear feet of street [(50 sfh/2) x 50 ft = 1250]. A 36 foot wide street would cover 45,000 square feet, usually in impervious asphalt or concrete pavement. A 26 foot wide street would cover 32,500 square feet, a reduction of 12,500 of impervious land coverage. Assuming street construction costs of $3 per square foot, this reduction in pavement generates a $37,500 reduction in development costs, or $750 per lot. This does not account for added cost reductions in reduced need for drainage systems because of smaller impervious land coverage. Even greater reductions in pavement can be achieved if on-street parking is not required on both sides the entire length of the street, or if sidewalks are not required on both sides.

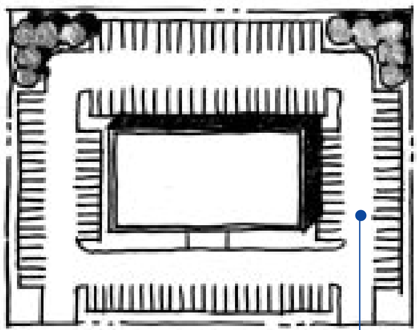
General considerations for residential street design. Alternative standards are feasible for local residential streets that employ "neo-traditional" or "headwaters street" design. These alternative standards can reduce impervious land coverage and provide drainage systems with less impact on stormwater quality compared to current typical municipal street standards, while accommodating local traffic and emergency access.

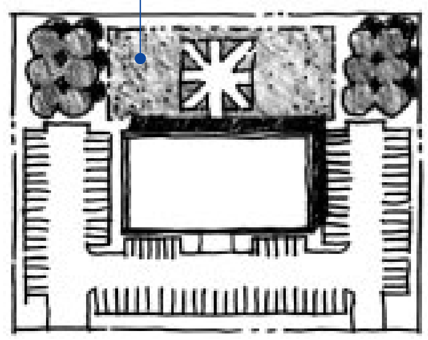
Street designs are often controversial, and development of new street standards must meet a variety of engineering, public safety and functional criteria. Municipal agencies with a strong interest in street design, such as Public Works, Planning, and emergency service providers, often differ on priorities and approaches. Alternative standards must be developed cooperatively so that each agency's legitimate interests are accommodated. In municipalities which have not adopted alternative standards, developers can propose these designs as part of a planned unit development zoning, subject to government approval.

Several communities in the United States have recently adopted new street standards for local access streets, including Bucks County, PA., Boulder, CO., Portland, OR, and San Jose, CA.[15] These new municipal street standards vary, but they all include reduced street widths (generally between 16 and 30 feet), shared moving lanes, reduced design speeds, and an ability to omit curbs, gutters and/or sidewalks on one or both sides. New ITE neo-traditional street design standards currently in review may help formalize acceptable alternative residential street designs.[16]

Planning & Zoning
3.5

Parking requirements





Parking is the greatest single land use in most industrial, office, and commercial development. Municipal codes usually mandate a minimum amount of parking and the type of approved pavement. Adjusting these requirements can significantly mitigate the negative environmental impact of parking, while still providing adequate storage space for cars.

Amount of parking. Parking minimums have been established by planners and professional associations, such as Urban Land Institute, the Institute of Transportation Engineers, the National Parking Association, and the American Planning Association. These minimums are based on empirical methods, usually by counting cars parked at existing land uses, identifying the peak use, and then requiring developers to supply enough parking to meet the peak demand (or near peak demand). These standards typically result in a large, underutilized parking capacity.

For example, a 1995 study of office buildings in ten California cities found that peak parking demand averaged only 56% of capacity. In shopping centers, parking lot design standards supply enough parking for the demand at the "20th busiest hour" of the year. This means that for all but 19 of the 3,000 hours that a typical center is open annually there will be a parking surplus, leaving at least half of the center's spaces vacant at least 40 percent of the time.

Because of these high minimum standards, parking and its associated transportation system usually account for the majority of land use in commercial and industrial sites. A recent survey completed by the City of Olympia, Washington, for example, found that over half of the city's commercial sites were devoted to parking and driveways.

Not only do these standards and their related zoning ordinances mandate high parking minimums– developers are free to build more. They usually do, if they can, because retailers and office tenants demand "plenty of parking" – they naturally want to make it easy for shoppers and tenants to reach their sites. Also, conventional asphalt parking lots are less expensive to build and maintain than turf or landscaped areas, further contributing to the tendency to build even more than the minimum standards.

Land Use Solutions. Several solutions can promote a more balanced approach to parking and land use.

a. institute paid parking. Studies show that motorists park free for 99 percent of all automobile trips. By pricing parking at its true cost, natural economics would tend to reduce demand, free more land for other uses, and encourage alternative transportation. Employer-paid parking programs, with cash incentives for employees who opt not to park, or employee-paid parking, have both proven effective at reducing parking demand in commercial and office uses.

b. reduce parking minimums. Reducing the mandated parking minimums in zoning ordinances can significantly reduce the amount of parking provided. For example, reducing the office use minimum from four to three spaces per thousand square

Parking requirements, continued

feet (1:250, 1:333) would reduce the number of required parking spaces for a 100,000 square foot office building from 400 to 300, a reduction of 25%, or approximately an acre of land that could be converted from parking to landscape that can be designed to filter and infiltrate the runoff from impervious surfaces (see 6.6). Depending on the number of building occupants and availability of alternative transportation, reduced parking minimums may be adequate for a variety of uses.

c. establish parking maximums. Some municipalities, in seeking to reduce the negative impacts of these large parking demands, have established *maximum* parking ratios instead of the more conventional parking minimums. For example, Lacey, Washington, has developed a phased program to implement maximum parking standards for its downtown. These standards will be reduced in three year intervals, giving businesses and travelers time to adjust driving patterns. Parking maximums prevent developers from building more than the maximum allowed parking, and the scarcity of parking, usually coupled with pricing strategies, naturally reduces parking demand and encourages alternative transportation. [17]

d. allow reduced minimum requirements as incentives. Some municipalities allow reduced minimum parking requirements as incentives for transportation demand management programs or for developments that encourage alternative transportation such as live-work, transit oriented residences, office buildings with bicycle commuter facilities, or neighborhood retail shopping areas. In these areas parking requirements can be reduced by as much as 20 to 30%, reflecting the fact that a significant proportion of people do not park at the site.

e. establish landscape reserves. Another strategy to reduce the amount of parking that allows for parking expansion if needed is to identify "landscape reserve" on site plans. These landscape reserves are areas adjacent to parking lots that are of appropriate size and geometry to accommodate additional parking. They are initially installed as landscape areas, but identified as "landscape reserve" on approved plans. If the need for parking increases beyond the amount originally provided, the landscape reserve can be converted to parking.

f. allow shared parking facilities. Shared parking facilities are another strategy to reduce overall parking supply, while still meeting demand. For example, a movie theater's parking demand is usually evenings and weekends, while office building demand usually peaks on weekdays– these uses can share a single parking lot, owned either by the city, or by one or both of the property owners. In commercial districts, parking supply for shoppers can be maintained by allowing employees to park on nearby residential streets, since resident parking peaks in the evening while employee parking peaks during the day. There are considerable obstacles to these shared parking approaches, such as zoning regulations that do not allow combining parking for separate uses, resistance of neighborhood residents towards employee parking on their streets, and liability and insurance issues surrounding sharing of a single, privately owned parking facility by multiple property owners.

g. promote parking garages. Underground or above ground parking garages reduce land coverage by allowing parking to be stacked or combined with building area. The expense of these solutions can be mitigated by providing building credits, inlieu parking fees, subsidies, or fee waivers.

Parking lot paving. Aside from the amount of occupied land area, the type of parking lot pavement has a direct impact on stormwater quality. Parking lots are usually built of impervious pavement, such as conventional asphalt, and their large land area makes them a significant contributor to environmental degradation. Permeable materials such as porous asphalt, crushed aggregate, open-celled unit pavers, or turf block can be suitable parking lot pavements, especially for parking stalls (as opposed to aisles– see 6.3a Hybrid parking lot), for outlying spaces that are only typically used during peak demand (see 6.3c Overflow parking), or for occasional uses such as churches or sports stadiums.

Many municipalities mandate an impermeable pavement such as conventional asphalt or concrete for parking lots and prohibit the use of other materials. Where these impermeable pavements are mandated, rewriting municipal codes to allow permeable pavement alternatives is a prerequisite for their use.[18]

Planning & Zoning 3.6

Community education and outreach

All those involved in the development industry need to understand the impacts of development on water quality, as well as the appropriate application of various strategies. This includes not only those who design and build, but the residents, occupants, and maintenance staff.

Community education and outreach are the key to building this understanding. Furthermore, community education and outreach on stormwater impacts is a minimum requirement of the NPDES regulations.

The NPDES regulations mandate public education and outreach and public involvement/participation as *minimum* control measures.

The activities enumerated in the regulations include:

- distributing of educational materials to the community
- conducting outreach activities on the impacts of stormwater
- providing public education on how to reduce stormwater pollution
- informing individuals and households on proper maintenance of stormwater systems
- teaching how to limit the use and runoff of garden chemicals
- promoting local stream restoration through conservation corps and other citizen groups
- participating in storm drain stenciling
- targeting specific industries or groups with specific stormwater impacts (e.g. restaurants and grease impacts on storm drains)
- engaging the public in a participatory process to develop, implement and review the local stormwater management program
- impaneling a group of citizens to participate in the decision-making process, hold meetings, or work with volunteers
- reaching out to all members of a community.

This outreach effort can be directed towards members of the public and individuals, as well as to targeted groups of commercial, industrial, and institutional entities likely to have significant stormwater impacts. For example, restaurants can be targeted with specific information on the impact of grease on storm drains, and architects can be targeted with specific information on selection of building materials and design for stormwater quality management.

Finally, it is important to involve the public in the development of outreach programs, and to tailor the message to address the viewpoints and concerns of all communities, including minority groups, disadvantaged communities, and children.

Planning & Zoning 3.7

SWMPs, SWPPPs, and BMPs

The current construction environment presents designers and developers with an array of mandates, regulations, and conditions for approval that relate to stormwater quality. By understanding the alphabet soup of acronyms, review agencies, and conditions it becomes easier to navigate the approval process and anticipate the design strategies that will be successful.

The National Pollution Discharge Elimination System (**NPDES**), a provision of the federal Clean Water Act, mandates that each large population center obtain a permit to discharge stormwater. BASMAA's seven participating stormwater programs, for example, serve as umbrella organizations for their co-permittee municipalities.

These NPDES permits are issued by the Regional Water Quality Control Board (**RWQCB**), a division of the State of California Environmental Protection Agency. There are nine regions throughout the state, and each Regional Board monitors each permittee for compliance.

To meet the goals of the NPDES permit, each local stormwater program, and each co-permittee within a program, establishes a Stormwater Management Plan (**SWMP**). These SWMPs give specific local requirements targeted to meet the environmental needs of each watershed, as well as reflecting the political consensus of each community. Because of the differences in each watershed's environmental context, as well as each permittee's attitude towards balancing environmental protection with economic growth, regional SWMPs may have different goals, methods, or targets.

In order to comply with the NPDES permit and requirements for a construction permit, each new development project resulting in a land disturbance of five acres or larger must prepare a Storm Water Pollution Prevention Plan (**SWPPP**). In a typical project, a SWPPP is a document consisting of narrative and a separate sheet within the construction document set, usually in the Civil Engineering or Landscape series, that outlines both a plan to control stormwater pollution during construction (temporary controls) and after construction is completed (the permanent constructed stormwater pollution prevention elements). The permanent controls are usually found on the sheet within the construction documents.

A SWPPP is a series or collection of Best Management Practices (**BMP**). The term Best Management Practice is a widely used, but somewhat inaccurate nomenclature, because the elements described as BMPs are not necessarily always best, nor are they always management practices. They can range from public education, like stenciling catch basins (which may not be as good as replacing the catch basin with an infiltration area), to site planning and design features, like a vegetated swale (which requires management but is not a management practice), to street sweeping (which actually is a management practice). In any case, the term BMP has wide currency and has been formalized in many local ordinances and codes. This document doesn't explicitly use the term BMP to describe the design alternatives presented, though each could be identified as a BMP in any particular SWPPP, depending on the requirements of the local SWMP.

The true management practices widely adopted in the past twenty years like stenciling catch basins and street sweeping, can be considered *"first wave BMPs."* These housekeeping practices have value, and deserve to be continued. But they perpetuate a conventional approach to stormwater management based on collection and conveyance.

Given development pressures and the environmental goals established by the Clean Water Act, more fundamental changes are required. Because the most economical and effective strategies arise in site planning and design, this document emphasizes ways to minimize the creation of new runoff, and to infiltrate or detain runoff in the landscape.

These *"second wave BMPs"* go beyond incremental changes to a conveyance storm drain system. They require a new way of thinking about impervious land coverage and stormwater management. They are a collection of proven methods and techniques that integrates stormwater management into planning and design, that reduces overall runoff, and manages stormwater as a resource, by starting at the source.

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