



UNIT VIII: SITING



SITING

INTRODUCTION

Siting residential buildings to minimize their vulnerability to coastal hazards is one of the most important aspects of the development (or redevelopment) process.

Unfortunately, prudent siting has often been overlooked or ignored in the past as properties have been developed close to the shoreline, near bluff edges, and atop steep coastal ridges. There are literally hundreds, if not thousands, of examples where residential buildings have been constructed with little regard for coastal hazards, only to suffer what could have been preventable damage or loss.

Today, there are few places along our shorelines where we lack sufficient information to make rational, informed siting decisions. Following the lessons and procedures described in this course will help designers, purchasers, developers, and community officials identify those locations where coastal residential development and buildings can be sited so that the risks associated with coastal hazards are minimized.

Ignoring siting and hazard identification issues only increases the likelihood that structures will be damaged, destroyed, or left standing—but inhabitable—by flooding, erosion, landslides, or other coastal hazards.

In Unit IV we discussed the process of identifying and evaluating site alternatives. In this unit we will continue that discussion—especially with regard to siting a building on a given coastal property.

UNIT OBJECTIVES After completing this unit, you should be able to:

- 8.1 Identify recommended siting practices for raw land development.
- 8.2 Identify recommended siting practices for infill development.
- 8.3 Describe the influence of beach nourishment and dune restoration on siting decisions.



SITING CONSIDERATIONS

A variety of factors must be considered in selecting a specific site and locating a building on that site:

- Regulatory requirements.
- Presence and location of infrastructure.
- Previous development and/or subdivision of property.
- Physical and natural characteristics of the property.
- Vulnerability of the property to coastal hazards.

CONSTRAINTS

A thorough review of these factors will sometimes show that minimum regulatory requirements and/or previous subdivision/infrastructure decisions allow or constrain future development on sites that will be highly vulnerable to the effects of coastal hazards. In other words, **regulatory controls do not necessarily result in prudent siting of coastal buildings** (see Fig. 8-1). Likewise, constraints imposed by previous lot creation and infrastructure construction sometimes drive development to more hazardous locations.

Figure 8-1.
Hurricane Opal (1995).
Damage to new
construction in a mapped
A zone. The flood and
debris damage could have
been avoided had the site
been considered a coastal
A zone and had the
structure been elevated on
an open foundation.



TIMING OF SITING DECISIONS

Although these situations should have been discovered when the property was first evaluated for its suitability for purchase, development, or redevelopment, it is common practice for property owners to undertake detailed studies only after property has been acquired. This is especially true in the case of the development of raw land—where planning, engineering, architectural, and site development costs can be substantial.



MINIMIZING RISKS Designers should recognize situations in which poor siting is allowed or encouraged and should work with property owners to minimize risks to coastal buildings. Depending on the scale of the project, this could involve one or more of strategies listed below.

SITING STRATEGIES FOR MINIMIZING RISK

- Locating development on the least hazardous portion of the site.
- Rejecting the site and finding another.
- Transferring development rights to another parcel better able to accommodate development.
- Combining lots or parcels.
- Reducing the footprint of the proposed building, and shifting the footprint away from the hazard.
- Shifting the location of the building on the site by modifying or eliminating ancillary structures and development.
- Seeking variances to lot line setbacks along the landward and side property lines (in the case of development along a shoreline).
- Moving roads and infrastructure.
- Modifying the building design and site development to facilitate future relocation of the building.
- Altering the site to reduce its vulnerability.
- Constructing protective structures (if allowed by the jurisdiction).



RAW LAND DEVELOPMENT: INFRASTRUCTURE AND LOT LAYOUT

GENERAL GUIDELINES

Large, undeveloped parcels available for coastal development generally fall into two classes:

- **Parcels well-suited to development.** These parcels may be vacant because of the desires of a former owner, lack of access, or lack of demand for their development (see Fig. 8-2).
- **Parcels that are difficult to develop.** These parcels may have:
 - Extensive areas of sensitive or protected resources.
 - Topography or site conditions requiring extensive alteration.
 - Other special site characteristics that make development expensive relative to other nearby parcels (see Fig. 8-3).

Figure 8-2.
Example of coastal development well-suited to the land. Deep lots, generous setbacks, and avoidance of dune areas should afford protection against erosion and flood events for years to come.



Figure 8-3.
Example of parcels that are problematic to develop. Increasingly, coastal residences are being built as part of mixed-use developments, such as this marina/townhouse development. These projects can involve a new set of environmental and regulatory issues, as well as more difficult geotechnical conditions and increased exposure to flood hazards.





Proper development will be much easier for the former, and much harder for the latter. Nevertheless, development in both instances should satisfy the planning and site development guidelines listed below.

**DEVELOPMENT OF RAW LAND IN COASTAL AREAS:
SITE PLANNING AND SUBDIVISION GUIDELINES**

DO's	DON'Ts
1. DO ... Determine whether the parcel is suitable for subdivision or should remain a single parcel.	1. DON'T ... Rely on engineering solutions to correct poor planning decisions.
2. DO ... Ensure that the proposed land use is consistent with local, regional, and State planning and zoning requirements.	2. DON'T ... Rely on relocation or restoration efforts to replace resources impacted by poor planning decisions.
3. DO ... Ensure that all aspects of the proposed development consider and integrate topographic and natural features into the design and layout.	3. DON'T ... Assume that omissions in planning can be corrected during site development.
4. DO ... Avoid areas that require extensive grading to ensure stability.	4. DON'T ... Overlook the effects of infrastructure location on the hazard vulnerability of building sites and lots.
5. DO ... Study the parcel thoroughly for all possible resource and hazard concerns.	5. DON'T ... Overlook the effects of modifications to the parcel on surface and groundwater hydrology.
6. DO ... Identify and avoid, or set back from, all sensitive resources and prominent land features.	6. DON'T ... Plan development: <ul style="list-style-type: none"> ▪ On beaches or dunes. ▪ On ridge lines. ▪ On top of prominent topographic features. ▪ On steep slopes. ▪ In or adjacent to streams.
7. DO ... Consider combining subdivision elements, such as access, utilities, and drainage.	7. DON'T ... Forget to consider future site and hazard conditions on the parcel.
8. DO ... Account for all types of erosion (e.g., long-term erosion, storm-induced erosion, erosion from inlets) and governing erosion-control policies when laying out lots and infrastructure near a shoreline.	8. DON'T ... Assume that engineering and architectural practices can mitigate all hazards.
9. DO ... Consider existing public access to shoreline and resource areas.	
10. DO ... Incorporate setbacks from identified high-hazard areas.	
11. DO ... Use a multi-hazard approach to planning and design.	
12. DO ... Involve a team of experts with local knowledge, and a variety of technical expertise and backgrounds.	



Planning for the Future. Development of raw land in coastal areas must consider the effects of all hazards known to exist and should not ignore the effects of those hazards on future property owners.

Likewise, development of raw land in coastal areas should consider any local, State, or Federal policies, regulations, or plans that will affect the abilities of future property owners to protect, transfer, or redevelop their properties—such as those dealing with:

- Erosion control.
- Coastal setback lines.
- Post-disaster redevelopment.
- Landslides.
- Geologic hazards.

***PRACTICES TO
AVOID AND
RECOMMENDED
ALTERNATIVES***

A review of previous coastal development patterns and resulting damages suggests there are several subdivision and lot layout practices to avoid.

Shore-Parallel Road

In the case of an eroding shoreline, placing a road close to the shoreline and creating small lots between the road and the shoreline results in buildings, roadway, and utilities being extremely vulnerable to erosion and storm damage. It can also lead to future conflicts over shore protection and buildings occupying public beaches (see Fig. 8-4).

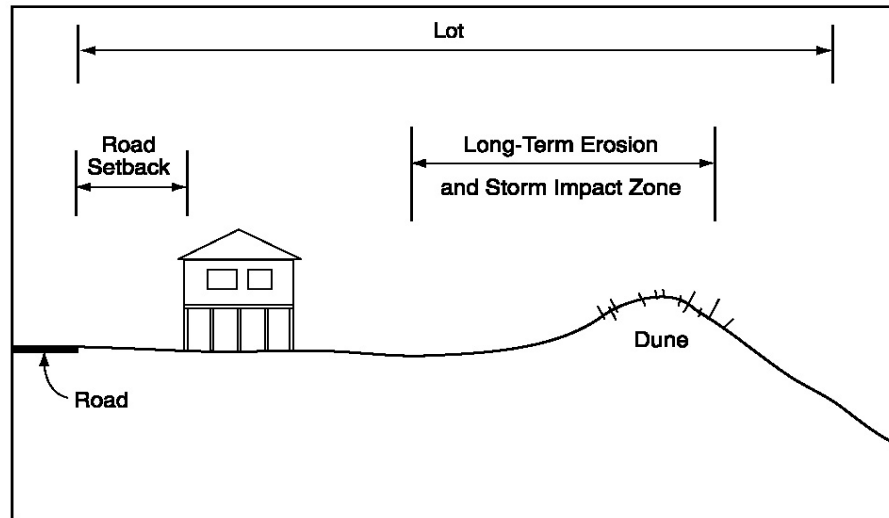
Figure 8-4.
View along a washed-out, shore-parallel road in Bay County, FL, after Hurricane Opal. Homes to the left are standing on the beach and have lost upland access. Some homes to the right have also lost their roadway access.





Recommended Alternative. Figure 8-5 shows a recommended lot layout that provides sufficient space to comply with State and/or local setback requirements and avoid damage to dunes.

Figure 8-5.
Recommended lot layout.

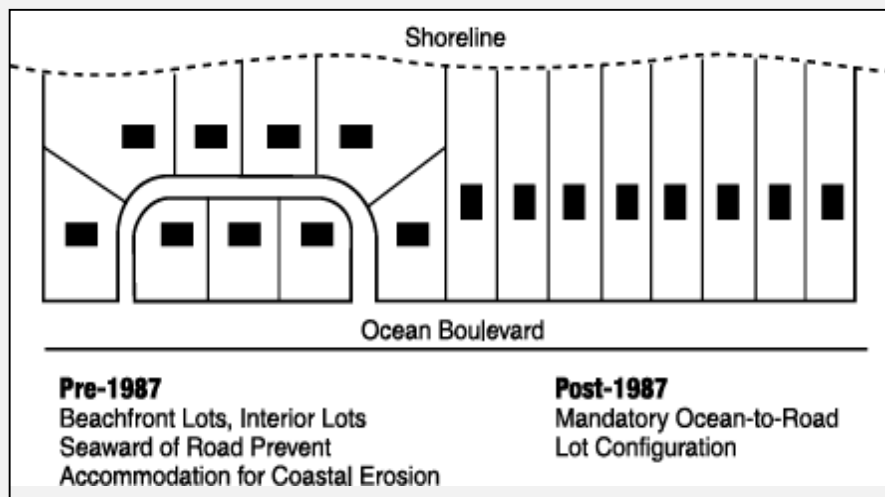


Some communities have land development regulations that help achieve this goal, as shown in the following example.

EXAMPLE

The Town of Nags Head, North Carolina, modified its subdivision regulations in 1987 to require all new lots to extend from the ocean to the major shore-parallel highway. Figure 8-6 compares lots permitted in Nags Head prior to 1987 with those required after 1987. The town also has policies and regulations governing the combination of nonconforming lots.

Figure 8-6.
Comparison of Nags Head, NC, oceanfront lot layouts permitted before 1987 and post-1987 oceanfront lot requirements.

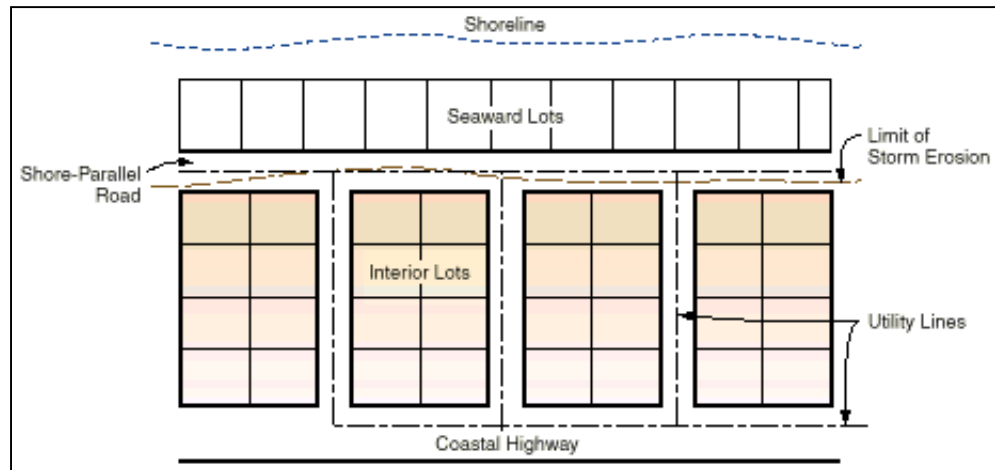




Shore-Parallel Utility Lines

A second problem associated with a shore-parallel road close to the shoreline is storm erosion damage to the road and associated utilities (see Fig. 8-7).

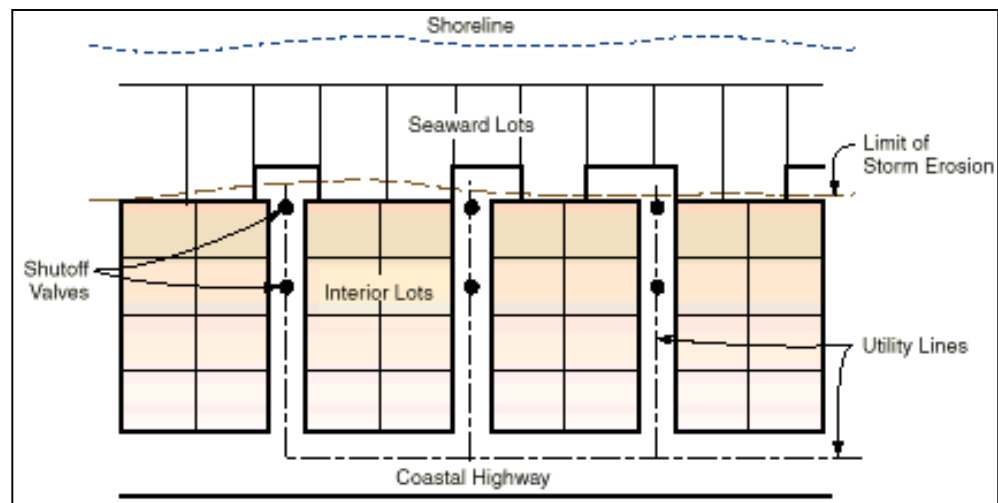
Figure 8-7.
Layout not recommended:
Shore-parallel roadways and utilities vulnerable to storm effects and erosion.



Some infrastructure damage can be avoided by:

- Reconfiguring the seaward lots (so they all have access from shore-perpendicular roads).
- Eliminating the shore-parallel road.
- Eliminating the shore-parallel utility lines (see Fig. 8-8).

Figure 8-8.
Recommended alternative:
Lots and infrastructure created without the shore-parallel road; shutoff valves installed on water and sewer lines.

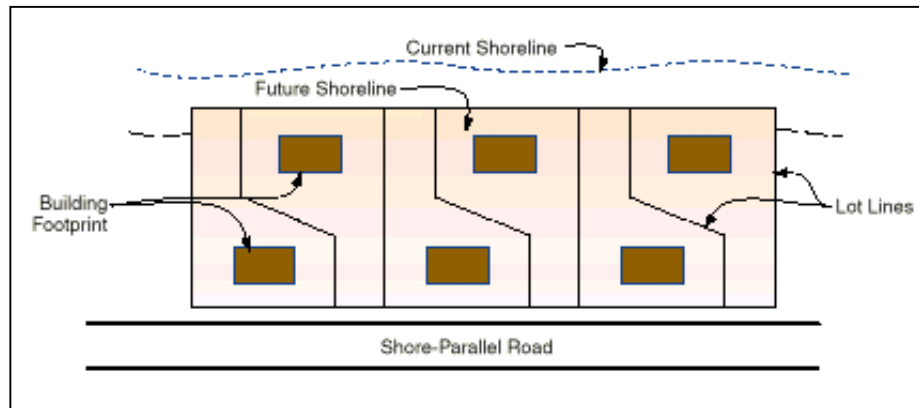




Flag or Key Lots

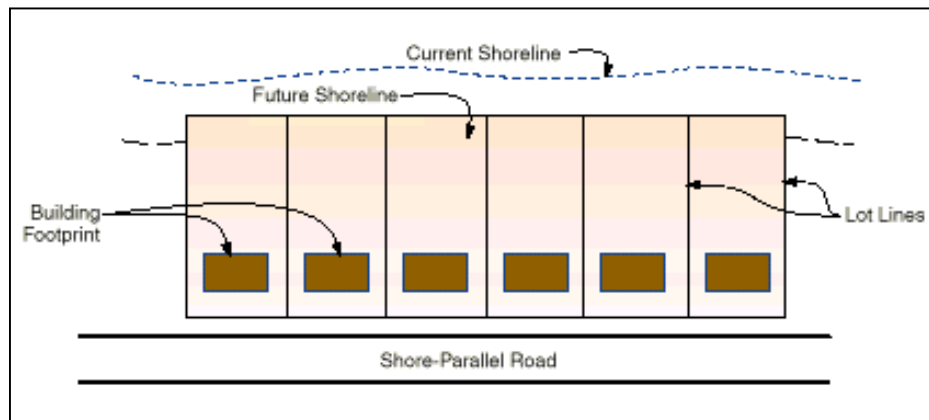
Another type of lot layout not recommended for vulnerable or eroding coastal shorelines is the “flag” lot or “key” lot illustrated in Figure 8-9. This layout is used to provide more lots with direct access to the shoreline. However, it limits the ability of half of the property owners to respond to coastal flood hazards and erosion by constructing or relocating their buildings farther landward.

Figure 8-9.
Layout not recommended for use along eroding shorelines: Typical layout of “flag” lots or “key” lots.



Again, the recommended alternative is to **locate the shore-parallel road sufficiently landward** to accommodate coastal flooding and future erosion and to create all lots so that their full width extends from the shoreline to the road.

Figure 8-10.
Recommended alternative layout





Lots on Narrow Sand Spits

Creation of lots along narrow sand spits and low-lying landforms (see Fig. 8-11) is not recommended—especially if the shoreline is eroding. Any buildings constructed there will be routinely subject to coastal storm effects, overwash, and other flood hazards.

**Figure 8-11.
Not recommended.
Construction along this
narrow, low-lying area of
St. Johns County, FL, is
routinely subjected to
coastal storm effects. The
lots and buildings are
landward of a previous
State highway location,
now abandoned.**





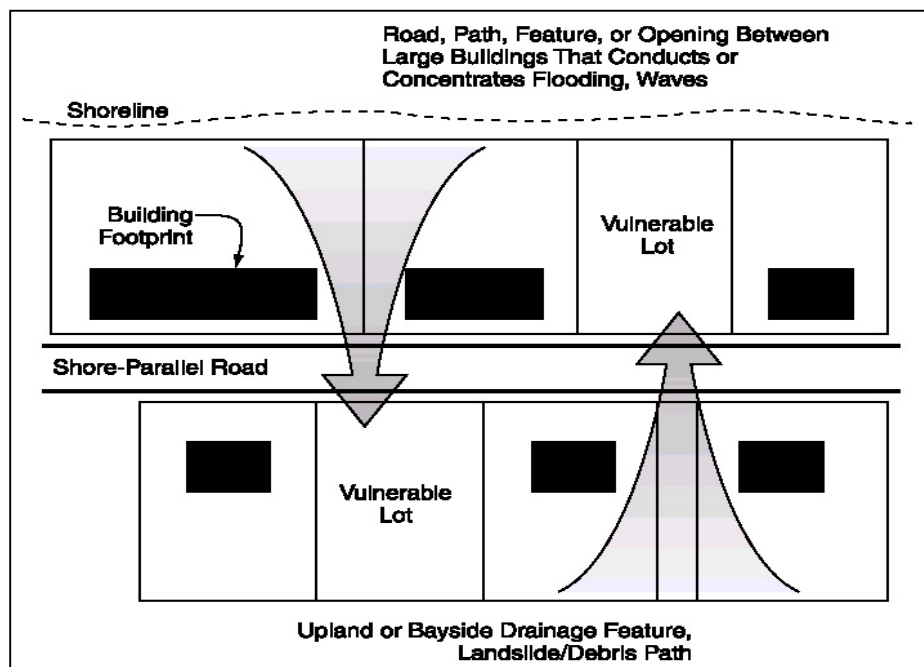
Exposure to Concentrated Floodwaters

Lots should not be created in line with natural or manmade features that concentrate floodwaters. These features can include:

- Areas of historic shoreline breaching.
- Roads or paths across dunes.
- Drainage features or canals.
- Areas of historic landslides or debris flows.

In the layout shown in Figure 8-12, the lot landward of an opening between dunes, or landward of obstructions, may be more vulnerable to flooding and wave effects. The front-row lot waterward of an interior drainage feature may be vulnerable to concentrated flooding from the upland or bay side.

Figure 8-12.
Lot layout that exposes
lots to concentrated
floodwaters.



One alternative is to **leave these vulnerable areas as open space** and/or to modify them to reduce associated hazards to adjacent lots.

Care should also be exercised when lots are created between or landward of gaps between large buildings or objects capable of channeling floodwaters and waves.



Concentration of Small Lots Near Shoreline

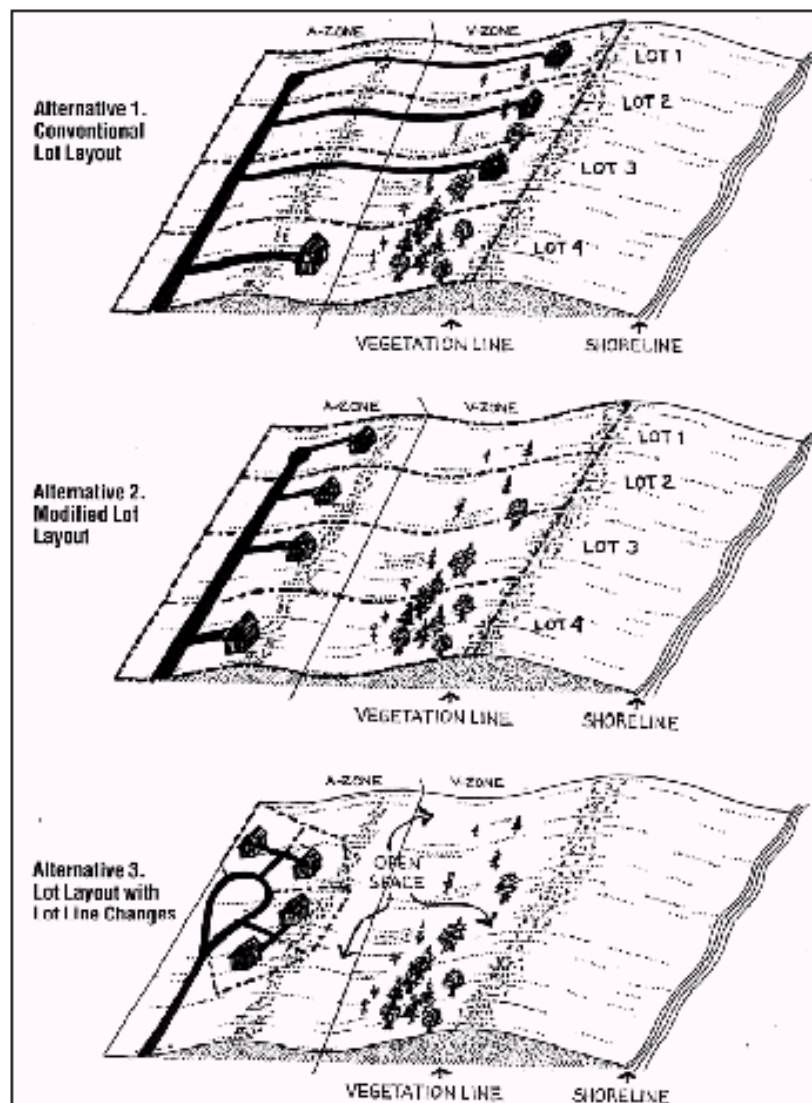
Lot configurations should not be created where small lots are concentrated along an eroding or otherwise hazardous shoreline.

The following approaches are preferable:

- Create **deeper lots** along the shoreline.
- Locate building sites **farther landward** on the lots.
- **Cluster development** away from the shoreline.

Figure 8-13 illustrates this progression, from a “conventional” lot layout, to a “modified” lot layout, to a “cluster development” layout with lot line changes.

Figure 8-13.
Coast lot development
scenarios





Another related approach is to occupy a small fraction of the total buildable parcel and to **accommodate erosion by moving threatened buildings** to other available sites on the parcel.

EXAMPLES

A small Pacific Ocean community in Humboldt County, California, has successfully used this approach. Figure 8-14 shows a community of 76 recreational cabins on a 29-acre parcel, jointly owned by shareholders of a corporation.

As buildings are threatened by erosion, they are relocated (at the building owner's expense) to other sites on the parcel, in accordance with a cabin relocation policy adopted by the corporation.

Figure 8-14.
As buildings are threatened by bluff erosion, they are moved to other sites on the parcel.



village of Shishmaref, Alaska, for example, voted in November 1998 to relocate their community of 600 after recent storm erosion threatened several houses and after previous shore protection efforts failed.



Layout Near Inlets

Layout of lots and infrastructure along shorelines near tidal inlets, bay entrances, and river mouths is especially problematic. The following figures, shown earlier, illustrate instances where the recent subdivision and development of oceanfront parcels near ocean-bay connections have led to buildings being threatened by inlet-caused erosion: Figures 3-2, 3-3, 4-6, and 7-14.

Infrastructure development and lot layout in similar cases should be preceded by a **detailed study of historical shoreline changes**, including development of (at least) a conceptual model of shoreline changes. Projections of potential future shoreline positions should be made, and development should be sited well landward of any areas of persistent or cyclic shoreline erosion.



SELF-CHECK REVIEW: RAW LAND DEVELOPMENT

Instructions: Answer the following questions. Then turn the page to check your answers. If you answered any items incorrectly, you should review the related material before continuing.

1. List three siting practices for raw land development that should be avoided, and identify an alternative for each.

(1) AVOID:

ALTERNATIVE:

(2) AVOID:

ALTERNATIVE:

(3) AVOID:

ALTERNATIVE:

2. For each of the following siting practices, check DO or DON'T.

	DO	DON'T
a. Assume that engineering and architectural practices can mitigate all hazards.		
b. Incorporate setbacks from identified high-hazard areas.		
c. Consider and integrate topographic and natural features into the design and layout.		
d. Plan development on beaches or dunes.		
e. Plan development on ridge lines.		



ANSWER KEY

1. List three siting practices for raw land development that should be avoided, and identify an alternative for each.

Answers will vary but should include practices such as the following. (Alternatives are in parentheses.)

- **Shore-parallel roads with small lots between road and shore. (Road setback; longer lots)**
- **Shore-parallel utility lines. (Shore-perpendicular access roads and utilities)**
- **Flag or key lots. (Road setback and longer lots)**
- **Lots on narrow sand spits. (Build elsewhere.)**
- **Layout in line with features that concentrate floodwaters. (Leave vulnerable areas as open space.)**
- **Concentration of small lots near shoreline. (Create deeper lots; site buildings farther landward; cluster development away from the shoreline.)**

2. For each of the following siting practices, check DO or DON'T.

	DO	DON'T
a. Assume that engineering and architectural practices can mitigate all hazards.		X
b. Incorporate setbacks from identified high-hazard areas.	X	
c. Consider and integrate topographic and natural features into the design and layout.	X	
d. Plan development on beaches or dunes.		X
e. Plan development on ridge lines.		X



INFILL DEVELOPMENT: SITING A BUILDING ON AN EXISTING LOT

Many of the same principles discussed for raw land development also apply to the construction or reconstruction of buildings on existing lots. Building siting on a particular lot should take into consideration:

- Site dimensions.
- Site features (e.g., topographic, drainage, soils, vegetation, sensitive resources).
- Coastal hazards.
- Regulatory factors.

KEY ISSUES However, several other factors must be considered at the lot level that are not a primary concern at the subdivision level:

- **Buildable area limits** imposed by lot line setbacks, hazard setbacks, and sensitive resource protection requirements.
- Impacts of coastal hazards on **lot stability**.
- Location and extent of **supporting infrastructure**, utility lines, septic tanks and drain fields, etc.
- **Impervious area requirements** for the lot.
- **Prior development** of the lot.
- Need for **future** building repairs, relocation, or protection.
- **Regulatory restrictions** or requirements for on-site flood or erosion control.

GENERAL GUIDELINES Although the local regulations, lot dimensions, and lot characteristics generally define the maximum allowable building footprint on a lot, the designer should not assume construction of a building occupying the entire buildable area is a prudent siting decision. The designer should consider all the factors that can affect an owner's ability to use and maintain the building and site in the future.

Guidelines for siting buildings on existing lots are given on the next page.



**DEVELOPMENT OR REDEVELOPMENT OF EXISTING LOTS IN COASTAL AREAS:
GUIDELINES FOR SITING BUILDINGS**

DO's	DON'Ts
<ol style="list-style-type: none">1. DO ... Determine whether the lot is suitable for its intended use. If not, alter the use to better suit the site or look at alternative sites.2. DO ... Study the lot thoroughly for all possible resource and hazard concerns. Seek out all available information on hazards affecting the area and prior coastal hazard impacts on the lot.3. DO ... Account for all types of erosion (e.g., long-term erosion, storm-induced erosion, erosion from inlets) and governing erosion-control policies when selecting a lot and siting a building.4. DO ... Avoid lots that require extensive grading to achieve a stable building footprint area.5. DO ... Ensure that the proposed siting is consistent with local, regional, and State planning and zoning requirements.6. DO ... Identify and avoid, or set back from, all sensitive resources.7. DO ... Consider existing public access to shoreline and resource areas.	<ol style="list-style-type: none">1. DON'T ... Assume engineering and architectural practices can mitigate poor building siting.2. DON'T ... Assume that siting a new building in a previous building footprint or in line with adjacent buildings will protect the building against coastal hazards.3. DON'T ... Rely on existing (or planned) erosion or flood-control structures to guarantee long-term stability of the lot.4. DON'T ... Overlook the constraints placed on site development and future landward relocation of the building (if necessary) by:<ul style="list-style-type: none">▪ Site topography.▪ Infrastructure and ancillary structures (e.g., utility lines, septic tank drain fields, swimming pools).▪ Trees and sensitive resources.▪ Adjacent development.5. DON'T ... Overlook the constraints that building footprint size and location place on future work to repair, relocate, or protect the building. Allow for future construction equipment access and room to operate on the lot.6. DON'T ... Overlook the effects on surface and groundwater hydrology from development of the lot.



**PRACTICES TO
AVOID AND
RECOMMENDED
ALTERNATIVES**

Just as there are certain subdivision development practices to avoid in hazardous coastal areas, there are individual lot siting and development practices to avoid.

Shore Proximity

One of the most common siting errors is placing a building as far seaward or waterward as allowed by local and State regulations. Although such siting is permitted by law, it can lead to a variety of avoidable problems, including:

- Increased building vulnerability.
- Damage to the building.
- Encroachment onto a beach.

On an eroding shoreline, this type of siting often results in the building owner being faced with one of three options:

- Loss of the building.
- Relocation of the building.
- Protection of the building through an erosion-control measure (if permitted).

Alternatives. Alternatives to this practice include the following:

- Site the building farther landward than required by minimum setbacks. This also allows (in some cases) for the natural episodic cycle of dune building and storm erosion to occur without jeopardizing the building itself.
- Design the building so it can be easily relocated.



Bluff Proximity

Siting a building too close to a coastal bluff edge can result in building damage or loss (see Fig. 8-15). (Figures 3-3 and 7-6, presented earlier, also illustrate this problem.)

Figure 8-15.
Residential buildings
outside the floodplain
threatened by long-term
erosion along the Lake
Michigan shoreline.
Ozaukee County, WI
(1996).

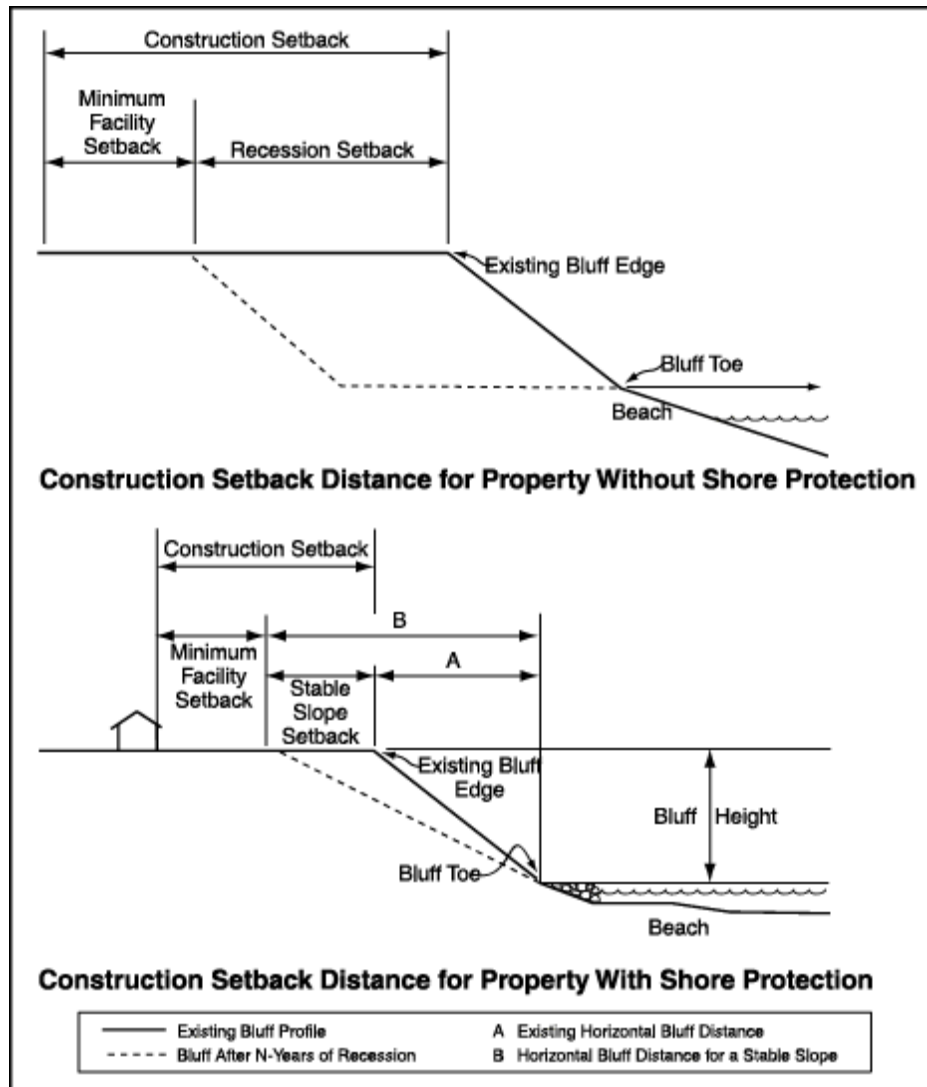


To avoid these hazards, construction setbacks (see Fig. 8-16) should be used:

- **Stable slope setback** (where the bluff toe has been stabilized against extreme lake levels and storm events)—based on bluff height and local soils and geology.
- **Recession setback** (where the bluff is not stabilized).
- **Minimum facility setback** (whether stabilized or not)—based on building construction, use, and maintenance considerations.



Figure 8-16.
Recommended coastal
bluff setbacks





Exposure to Multiple Hazards

Some sites present multiple hazards, which designers and owners may not realize. For example, Figure 8-17 shows southern California homes that have been constructed along the Pacific shoreline at the mouth of a coastal stream. The homes may be subject to:

- Storm waves and erosion.
- Stream flooding and debris flows.
- Earthquakes.

Figure 8-17.
Coastal building site
subject to multiple
hazards. Malibu, CA
(1994).





Proximity to Erosion-Control Structures

Siting a building too close to an erosion-control structure, or failing to allow sufficient room for such a structure to built, is another siting practice to avoid. Figure 8-18 shows an example of buildings that were constructed near the shoreline, only to be damaged by storm effects and erosion.

Figure 8-18.
Damage to buildings sited close to an eroding shoreline. Garden City Beach, SC, Hurricane Hugo (1989). Storm waves often overtop revetments and damage buildings.



Alternatives. Subsequent construction of a rock revetment will provide some protection to the buildings, but not as much as if there were a greater distance between the revetment and buildings. Storm waves can easily overtop the revetment and damage the buildings.

An alternative to this situation is simply to plan ahead by siting the building farther landward and providing enough room between the building and the erosion-control structure to dissipate the effects of wave and flood overtopping.



Bulkheads. A related siting problem (also observed along bay or lake shorelines, canals, manmade islands, and marina/townhouse developments) is the construction of buildings immediately adjacent to bulkheads (see Fig. 8-19). The bulkheads are rarely designed to withstand a severe coastal flood and are easily overtopped by floodwaters and waves.

During severe storms, landward buildings receive little or no protection from the bulkheads. In fact, if such a bulkhead fails, the building foundation will be undermined and the building may sustain additional damage or be a total loss.

Figure 8-19.
Damage at Bonita Beach,
FL, from 1982 subtropical
storm. Had this building
not been supported by an
adequate pile foundation,
it would have collapsed.





Proximity to Large Trees

Although preservation of vegetation and landscaping are an important part of the siting process, designers should avoid siting and design practices that can lead to building damage. The potential consequences of siting a building immediately adjacent to existing large trees (capable of falling and damaging structures) should be evaluated carefully.

Additionally, designs that “notch” buildings and rooflines for placement of large trees should be avoided (see Fig. 8-20). This siting practice may lead to avoidable damage to the roof and envelope during a high-wind event.

Figure 8-20.
Avoid notching for trees.
Siting and designing buildings to accommodate large trees is important for a variety of reasons. However, notching the building and roofline to allow placement around a tree can lead to roof and envelope damage during a high-wind event.





Uncontrolled Access

Pedestrian access between a coastal building and the shoreline is often overlooked when siting decisions and plans are made. Experience shows, however, that uncontrolled access can damage coastal vegetation and landforms, providing weak points upon which storm forces can act.

Dune blowouts and breaches during storms often result, and buildings landward of the weak points can be subject to increased flood, wave, erosion, or overwash effects.

Several options exist for controlling pedestrian and vehicular access to shorelines. The *Coastal Construction Manual* identifies various publications that provide guidance for the planning, layout, and construction of access structures and facilities.



SELF-CHECK REVIEW: INFILL DEVELOPMENT

Instructions: Answer the following questions. Then turn the page to check your answers. If you answered any items incorrectly, you should review the related material before continuing.

1. List three siting practices for infill development that should be avoided, and identify an alternative for each.

(1) AVOID:

ALTERNATIVE:

(2) AVOID:

ALTERNATIVE:

(3) AVOID:

ALTERNATIVE:

2. For each of the following siting practices, check DO or DON'T.

	DO	DON'T
a. Avoid lots that require extensive grading to achieve a stable building footprint.		
b. Substitute engineering and architectural practices for prudent siting decisions.		
c. Allow for future construction equipment access and room to operate on a lot.		
d. Consider the constraints that building footprint size places on future repair work.		
e. Rely on existing erosion- or flood-control structures to guarantee long-term stability of the lot.		



ANSWER KEY

1. List three siting practices for infill development that should be avoided, and identify an alternative for each.

Answers will vary but should include practices such as the following. (Alternatives are in parentheses.)

- **Siting as close to the shoreline as permitted by regulations. (Exceed minimum setbacks; design for easy relocation of the building.)**
- **Siting too close to a coastal bluff edge. (Incorporate construction setbacks for slope instability, recession, and facility issues, as needed.)**
- **Siting without regard for multiple hazards. (Consider all hazards in siting the building.)**
- **Proximity to erosion-control structures. (Site farther landward with enough room between the structure and the building for hazard forces to dissipate.)**
- **Siting too close to—or notching for—large trees. (Maintain distance from large trees.)**
- **Uncontrolled access. (Restrict pedestrian access to protect dunes and vegetation; plan vehicle access to avoid creating weak points that storm forces can exploit.)**

2. For each of the following siting practices, check DO or DON'T.

	DO	DON'T
a. Avoid lots that require extensive grading to achieve a stable building footprint.	X	
b. Substitute engineering and architectural practices for prudent siting decisions.		X
c. Allow for future construction equipment access and room to operate on a lot.	X	
d. Consider the constraints that building footprint size places on future repair work.	X	
e. Rely on existing erosion- or flood-control structures to guarantee long-term stability of the lot.		X



BEACH NOURISHMENT AND DUNE RESTORATION

Beach nourishment was discussed in Unit VII as a means of mitigating potential adverse effects of shore protection structures. Beach nourishment and dune restoration can also be carried out alone, as a way of replacing beach/dune sediments already lost to erosion or of providing nourishment in anticipation of future erosion.

BEACH NOURISHMENT

Beach nourishment projects typically involve dredging or excavating hundreds of thousands to millions of cubic yards of sediment and placing it along the shoreline. Beach nourishment projects are preferred over erosion-control structures by many States and communities, largely because the projects add sediment to the littoral system and provide recreational beach space.

Longevity

The longevity of a beach nourishment project will depend on several factors:

- Project length.
- Project volume.
- Native beach and borrow site sediment characteristics.
- Background erosion rate.
- Incidence and severity of storms following construction.

Thus, most projects are designed to include an initial beach nourishment, followed by periodic maintenance nourishment (usually at intervals of 5 to 10 years). The projects can provide protection against erosion and storms, but future protection is tied to a community's commitment to future nourishment efforts.

Controversy

Beach nourishment projects are expensive and often controversial. The controversy usually arises over environmental concerns and the use of public monies to fund the projects. Planning and construction of these projects can take years to carry out, and economic considerations usually restrict their use to densely populated shorelines.

Therefore, as a general practice, designers and owners should not rely on future beach nourishment as a way of providing significant and continuous relief that can compensate for poor siting decisions.



NOTE

Beach nourishment and dune restoration projects are temporary. Although they can mitigate some storm and erosion impacts, they should not be used as a substitute for sound siting, design, and construction practices.



Implications for Siting

As a practical matter, beach nourishment is the only viable option available to large, highly developed coastal communities where both upland protection and preservation of the recreational beach are vital. Beach nourishment programs have been established and are ongoing in many of these communities, and infill development and redevelopment will continue landward of nourished beaches.

Owners and designers should realize, however, while the nourishment programs will reduce potential storm and erosion damage to upland development, **they will not eliminate all damage. Sound siting, design, and construction practices MUST be followed.**

DUNE RESTORATION

Dune restoration projects typically involve placement of hundreds to tens of thousands of cubic yards of sediment along an existing or damaged dune. The projects can be carried out in concert with beach nourishment or alone. Smaller projects may fill gaps or blowouts caused by pedestrian traffic or minor storms, while large projects may reconstruct entire dune systems.

Dune Revegetation

Dune restoration projects are often accompanied by dune revegetation efforts, where native dune grasses or ground covers are planted to stabilize the dune against windblown erosion, and to trap additional windblown sediment.



Although dune vegetation serves many valuable functions, it is not very resistant to coastal flood and erosion forces.

Success Factors

The success of dune restoration and revegetation projects depends largely on the condition of the beach waterward of the dune. Dune restoration and revegetation projects along an eroding shoreline will be short-lived. Without a protective beach, high tides, high water levels, and minor storms will erode the dune and wash out most of the planted vegetation.



Implications for Siting

In some instances, new buildings are sited so that there is not sufficient space waterward to construct and maintain a viable dune. In many instances, erosion has placed existing development in the same situation. A dune restoration project waterward of these structures will not be effective; those buildings in greatest need of protection will receive the least protection.

Therefore, dune restoration and revegetation should not be used as a substitute for proper siting, design, and construction practices.



UNIT VIII EXERCISE

Instructions: Use this Unit Exercise to test how well you learned the material presented in Unit VIII. When you complete the exercise, check your answers against those in the Answer Key that follows. If you answered any questions incorrectly, be sure to review the corresponding section of the unit before proceeding to Unit IX.

1. Which of the following is a siting strategy for minimizing risk?
 - a. Place a road near the shoreline with small lots between road and shore.
 - b. Design the building to facilitate future relocation.
 - c. Site a building behind the gap between two shore-front buildings.
 - d. Cluster development as close to the shoreline as possible.

2. It is best to undertake a detailed hazard study:
 - a. After purchasing a lot but before building on it.
 - b. During development.
 - c. Before acquiring a property for development.
 - d. As soon as the decision has been made about building placement.

3. Regulatory controls:
 - a. Are the best guideline for siting decisions.
 - b. Should be disregarded when making siting decisions.
 - c. If complied with, guarantee the safety of the site.
 - d. Do not necessarily result in prudent siting of coastal buildings.

4. Designers and owners should consider the effects of hazards on future property owners.

True False

5. Which of the following siting decisions would be preferable?
 - a. Exceed the minimum setback requirements on a shore-front property.
 - b. Create lots on a narrow sand spit if the shore has not eroded appreciably in the last ten years.
 - c. Place houses as close to the beach as possible and build erosion-control structures to protect them.
 - d. Site close to a bluff edge as long as the bluff toe has been stabilized.



-
6. The supporting infrastructure should be considered in siting decisions for infill development.
- True False
7. If erosion-control structures are present or will be used at a coastal property, the best location for the building would be:
- a. Against the structures.
 - b. Atop the structures.
 - c. Landward and away from the structures.
 - d. Anywhere on the lot because the structures provide protection.
8. Beach nourishment involves feeding the natural grasses that grow on and stabilize the dunes.
- True False
9. Beach nourishment and dune restoration:
- a. Are most often used in sparsely populated areas.
 - b. Are permanent measures for erosion control.
 - c. Make siting practices such as construction setback unnecessary.
 - d. Are temporary measures for erosion control.



UNIT VIII EXERCISE — ANSWER KEY

1. Which of the following is a siting strategy for minimizing risk?
 - b. Design the building to facilitate future relocation.**
2. It is best to undertake a detailed hazard study:
 - c. Before acquiring a property for development.**
3. Regulatory controls:
 - d. Do not necessarily result in prudent siting of coastal buildings.**
4. Designers and owners should consider the effects of hazards on future property owners.

True
5. Which of the following siting decisions would be preferable?
 - a. Exceed the minimum setback requirements on a shore-front property.**
6. The supporting infrastructure should be considered in siting decisions for infill development.

True
7. If erosion-control structures are present or will be used at a coastal property, the best location for the building would be:
 - c. Landward and away from the structures.**



8. Beach nourishment involves feeding the natural grasses that grow on and stabilize the dunes.

False

9. Beach nourishment and dune restoration:

d. Are temporary measures for erosion control.