Appendix I

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CHAPTER 10

LAND AND SITE ANALYSIS

An appraiser may undertake appraisal assignments to develop an opinion of the value of land only or to value both land and improvements. In either case, the appraiser must provide a detailed description and analysis of the land. Land can be raw or improved; raw land can be undeveloped or put to an agricultural use. Land may be located in rural, suburban, or urban areas and may have the potential to be developed for residential, commercial, industrial, agricultural, or special-purpose use.

This chapter focuses on the description and analysis of the land component of real property. Since appraisers typically deal with land that has been improved to some degree, the term site is often more precise than land; therefore, the term site is used predominantly in this chapter. The information needed to complete a full site description and analysis is noted and explained and sources for obtaining this information are presented. Although this discussion relates primarily to the property being appraised, the same type of data is collected and examined in analyzing the comparable properties used in the appraisal.

site description
A comprehensive listing of site data, including a legal description, other title and record data, and information on the site's physical characteristics.

A parcel of land can have various site improvements that enable the vacant parcel to support a specific purpose. A site can have both on-site and off-site improvements that make it suitable for its intended use or development. Off-site improvements may include utility lines, access to roads, and water, drainage, and sewer systems. On-site improvements may include landscaping, site grading, access driveways, drainage improvements, accessory buildings, and support facilities.

In valuing any type of property, the appraiser must describe and analyze the site. Site description consists of comprehensive factual data, information on land use restrictions, a legal description, other title and record data, and information on pertinent physical characteristics. Site analysis goes further. It is a careful study of factual data in relation to the market area characteristics that create, enhance, or detract from the utility and marketability of specific land or a given site as compared with other sites with which it competes.

raw land
Land on which no improvements have been made; land in its natural state before grading, construction, subdivision, or the installation of utilities.

site
Land that is improved so that it is ready to be used for a specific purpose.

One primary objective of site analysis requires the appraiser to gather data that will indicate the highest and best use of the site as though vacant so that the appraiser can estimate the land value for a specific use. Whether a site or raw land is being valued, the appraiser must determine and evaluate its highest and best use. When the highest and best use of land is for agriculture, the appraiser usually analyzes and values the land by applying the direct comparison approach. If the land is to be developed for urban use, the appraiser may use a more sophisticated technique such as subdivision development analysis. Chapter 12 discusses highest and best use in detail.

LEGAL DESCRIPTIONS OF LAND

Land boundaries differentiate separate ownerships, and the land within one set of boundaries may be referred to as a *parcel*, *lot*, *plot*, or *tract*. An appraiser may apply these terms to all types of improved and unimproved land and market participants often use them interchangeably. However, the appraiser should use the terms consistently in the appraisal report to avoid confusing the client.

A parcel of land generally refers to a piece of land that can be identified by a common description and is held in one ownership. Every parcel of real estate is unique. To identify individual parcels, appraisers rely on legal descriptions, surveys, or other descriptive information typically provided by the client or found in public records. A legal description identifies a property in such a way that it cannot be confused with any other property. An appraiser usually includes or references a legal description in an appraisal report, although it is not required.

In Canada, three methods are commonly used in legal descriptions of real property:

- Metes and bounds system
- Rectangular survey system
- Lot and block system

legal description
A description of land that identifies the real estate according to a system established or approved by law; an exact description that enables the real estate to be located and identified.

An appraiser should be familiar with these forms of legal description and know which form or forms are common in the area where the appraisal is being conducted.

Metes and Bounds

The oldest known method of surveying land is the metes and bounds system, in which land is measured and identified by describing its boundaries. A metes and bounds description of a parcel of real property describes the property's boundaries in terms of precise reference points. To follow a metes and bounds description, one starts at the point of beginning (POB), a primary survey reference point that is tied

to a benchmark or adjoining surveys, and moves along past several intermediate reference points before finally returning to the POB. The return to the POB is called closing and is necessary to ensure the survey's accuracy.

In Canada, the three principal methods used to describe real property are the metes and bounds, rectangular survey, and lot and block systems.

Surveyors in the field increasingly rely on modern "total stations" to collect data in digital form. The familiar surveyor's measuring instrument mounted on a tripod uses infrared technology and today is augmented by portable computer technology. The data is downloaded into the surveyor's office computer for plotting the property boundaries and computing the land area. Coordinate geometry software and global positioning system (GPS) technology allow for more accurate determinations of directions, distances, and areas. GPS technology is only limited by physical obstructions that prohibit receiving satellite transmissions, and its use in surveying will probably increase.

metes and bounds system
A system for the legal description of land that refers to the parcel's boundaries, which are formed by the point of beginning (POB) and all intermediate points (bounds) and the courses or angular direction of each point (metes).

The metes and bounds system is an older method of describing real property, and is found most often in provinces with the oldest land registry systems, e.g., the Maritime provinces. It is used across the country as a corollary to the rectangular survey system, especially in describing unusual or odd-shaped parcels of land.

Rectangular Survey System

The rectangular survey system is also known as the Dominion Land Survey (DLS) and the section and township system. It is commonly used in western Canada, and to a lesser extent in Ontario.

The initial reference points for government surveys were established in 1871, shortly after Manitoba and the Northwest Territories became part of Canada. From each point specified, true east-west and north-south lines were drawn. The north-south reference points for government surveys were established firstly as being west of specified meridians. (The prime meridian of 98 degrees lies approximately 12 miles west of Winnipeg). East-west reference points commence at the 49th parallel of latitude. From each point specified, true east-west and north-south lines were drawn. The east-west lines are called base lines and the north-south lines are called principal meridians. Each

rectangular survey system
A land survey system, called the Dominion Land Survey (DLS), used in western Canada and to a lesser extent, Ontario; it divides land into townships approximately six miles square, each normally containing 36 one-square-mile sections of 640 acres, except when adjusted for the curvature of the earth.

base line
In the government survey system of land description, a line running due east and west through the initial point of a principal meridian from which township lines are established.

principal meridian
In land surveying, major north-south lines established as general reference points. They converge towards the North Pole. Therefore, the north edge of every township is slightly shorter than the south.

lot and block system
A system for the legal description of land that refers to parcels' lot and block numbers, which appear on recorded plans of subdivided land. These plans are registered at provincial and territorial land registry and land titles offices.t

principal meridian has a unique number and is crossed by its own base line. Using these base lines and principal meridians, land can be located accurately.

The land surveyed under the rectangular survey system is divided by north-south lines six miles apart called range lines, and by east-west lines six miles apart called township lines. The system has its basis in the imperial system of measurement: as no province has undertaken a comprehensive program of metric conversion, dimensions remain in imperial until resurveying occurs. The rectangles created where these lines intersect are called townships. The standard township is six miles square and contains 36 square miles. When applied to surveying, the term township has two meanings: a location on a line north or south of a base line and a square of land that measures six miles by six miles. In Ontario, townships were oriented to geographic features including Lake Ontario, the St. Lawrence River, and early military roads. Concession lines defined townships and subdivisions involved lot surveys. The Ontario system is referred to as the township lot and concession system. Township can also refer to a political subdivision similar to a county, regional district, or rural municipality.

The intersection of a base line and a principal meridian is the starting point from which the range lines and township lines are counted to locate a specific township in a legal description. Ranges are numbered east and west from the principal meridian; townships are numbered north and south from the base line.

Townships are divided into 36 sections, each of which is one mile square and contain 640 acres. For a more specific description of a parcel, a section may be divided into quarter sections and fractions of quarter sections. To accommodate the spherical shape of the earth, additional lines called guide meridians are drawn every 24 miles east and west of the principal meridian. Other lines, called standard parallels, are drawn every 24 miles north and south of the base line. These correction lines are used to adjust the rectangular townships to fit the curvature of the earth.

Lot and Block System

The *lot and block system* was developed as an outgrowth of the rectangular survey system and can be used to simplify the locational descriptions of small parcels, particularly for lots in densely populated metropolitan areas, suburban areas, and exurbs. This system is sometimes referred to as the *recorded plat survey system* or the recorded map survey system. The system was established when developers subdivided land in the rectangular survey system and assigned lot numbers to individual sites within blocks. The maps of these subdivisions were then filed with the local government to establish a public record of their locations. Each block was identified precisely using a ground survey or established monuments.

Applying the lot and block system to old, unsurveyed communities helped to identify each owner's site or parcel of land. Typically, a surveyor located the

boundaries of streets on the ground and drew maps outlining the blocks. Then lot lines were established by agreement among property owners. A precise, measured description was established for each lot and each was given a number or letter that could be referred to in routine transactions. For example, a lot in a rectangular survey area might be described as follows: Lot 5 of Block 18, registered plan 5396, southwest quarter of Section 10, Township 3 North, Range 3 East. This information was recorded in public records and was known as a recorded plat of the defined area or subdivision.

TITLE AND RECORD DATA

Before making an on-site inspection, an appraiser should obtain an appropriate description and other property data from the client or from published sources and public documents. Most jurisdictions have a government office (which increasingly is accessible via the internet) where transactions are documented and made public. Under the registry system, the accessibility of public records, which is legally known as constructive notice, ensures that interested individuals are able to research and, if necessary, contest deed transfers. Most registry offices keep index books for land deeds and mortgages, from which the book and page number of a recorded deed may be found. An appraiser might also find pertinent information in the property's abstract of title, which includes a summary of conveyances, transfers, and other facts used as evidence of title as well as any other public documents that may impair title. Under the Torrens system, this information is shown on the certificate of title. In addition, official municipal consolidated legal plans may exist and be available for examination at local or regional government offices.

Sometimes public records do not contain all relevant information about a particular property. Although official documents are the most dependable sources of information, they may be incomplete or not suited to the appraiser's purposes. Useful support data can be found in land registration systems, land data banks, and asses-

THE TORRENS SYSTEM

A system of land registration used in some Canadian provinces in which the land title authority issues title certificates covering the ownership of land, which often serve as title insurance. The system was first introduced in Australia in 1858, to combat the problems of uncertainty, complexity, and cost associated with prior title systems, which depended on profit of an unbroken chain of title back to a good "root" of title. Under the common-law form of prior title systems, land owners needed to provide their ownership of a piece of land back to the original grant of land by the Crown to its first owner. (This is the deeds registration system associated with the Registry system found in eastern Canada.) The documents relating to transactions involving the land were collectively known as the "title deeds" or the "chain of title". The original land grant could have occurred many years prior, and be influenced by many changes in the land's ownership, or of interests affecting it. A person's ownership over land could be challenged, possibly causing great expense to land owners and hindering its development. Even an exhaustive search into the chain of title would not give an owner complete security because of the possibility of undetected outstanding interests; claims by others might not be obvious.

sors' maps. The availability of internet access to government land titles or registry records simplifies reference to title and deed information.

WHERE TO FIND – TITLE DATA AND OWNERSHIP INFORMATION

Most provinces now make available title and registry information through the internet. Some commercial data providers maintain reporting services available on a subscription basis, and title search companies will conduct customized research for a fee. Provincial agencies such as the assessor's office make land titles data such as sales reports available.

A property's legal owner and type of ownership can be ascertained from the public records maintained at the provincial or territorial land titles or land registry office. This information is often available online for a fee, and local title search or abstract companies may also provide useful information.

Ownership Information

If an appraiser values a partial interest in a property rather than the fee simple interest, the appraiser should indicate and carefully analyze the excluded elements of title. An appraiser who is asked to develop an opinion of the value of a fractional ownership interest must understand the exact type of legal ownership to define the property rights to be appraised.

After defining the property rights being appraised, the appraiser must identify any excluded rights that may affect value. In addition, Canadian Uniform Standards requires appraisers to analyze and report any prior sales occurring within a specified number of years. In most assignments, the appraiser will also investigate the presence and nature of surface and subsurface rights through a title report, an abstract of title, or other documentary evidence of the property rights to be appraised. Title data indicates easements, rights of way and other restrictions that might limit the use of the property, as well as special rights such as air rights, rights-to-purchase, reversionary rights, mineral rights, obligations for lateral support, and easements for common walls. Typically, the appraiser is not an expert in title information but must rely on legal opinions, title research reports, and title data provided by other professionals. Easements, rights of way, and private and public restrictions affect property value.

Easements may provide for overhead and underground electrical transmission lines, underground sewers or tunnels, flowage, aviation routes, roads, walkways, and open space. Some easements or rights of way acquired by utility companies or public agencies may not have been used for many years, and the appraiser's physical inspection of the property may not disclose any evidence of such use. In certain jurisdictions, easements that are not used for a finite period of time may be automatically terminated. Use of a property for access without the owner's written permission may give the user a prescriptive easement across the property. This type of easement usually must be used for several years without being contested or challenged by the property owner. Restrictions cited in the deed or title may limit the type of building or business that may be conducted on the property. A typical example is a restrictive covenant that prohibits the sale of liquor or gasoline in a certain place. Often

a title report will not specify the details of private restrictions. The appraiser must read a copy of the deed or other conveyance to identify the limitations imposed on the property; interpretation can require legal training or the advice of a lawyer. Appraisers often include a limiting condition in their appraisal reports regarding easements or private restrictions that have not been recorded in public records.

Zoning and Land Use Information

Local governments such as cities, towns, and regional districts usually regulate land use and development, but they are often subject to regional, provincial, and federal controls as well. In analyzing land use controls, an appraiser considers all current regulations and the likelihood of a change in the law. Usually a zone calls for a general use such as residential, commercial, or industrial and then specifies a type or density of use. Zoning and other land use regulations often control use and building standards, with the latter including the following:

- Height and size of buildings
- Lot coverage or floor space ratio (FSR) density[1]
- Required landscaping or open space
- Number of units allowed
- Parking requirements
- Sign requirements
- Building setbacks
- Plan lines for future street widenings
- Other factors of importance to the highest and best use of the site

Most zoning ordinances identify and define the uses to which a property may be put without reservation or recourse to legal intervention. This is referred to as a *use by right*. They also describe the process for obtaining nonconforming use permits, variances, and zoning changes, if permitted. In areas subject to floods, earthquakes, and other natural hazards, special zoning and building regulations may impose restrictions on construction. In coastal and historic districts, zoning restrictions may govern building location and design.

The appraiser must also consider potential changes in government regulations. If, for example, a building moratorium or cessation of land use applications is in effect for a stated period, a property's prospective highest and best use may have to be delayed. The appraiser must consider the appropriateness of the current zoning and the reasonable probability of a zoning change. Highest and best use recommendations may rely on the probability of a zoning change. One of the criteria for the highest and best use conclusion is that the use must be legally permissible. If the highest and best use of a site is predicated on a zoning change, the appraiser must investigate the probability that such a change will occur. The appraiser may interview planning and zoning staff and study patterns of zoning change to assess the likelihood of a change. The appraiser can generally eliminate those uses that are clearly not compat-

[1] SR (floor space ratio) is synonymous with the term FAR (floor area ratio) and is defined as the ratio or percentage of the site area that can be built upon, e.g., if a property has 100,000 square feet and a 0.5 or 50% FSR, then the buildable area is 50,000 square feet (100,000 x 0.5)

ible with existing uses in the area as well as uses that have previously been denied. After reviewing available public and private land use information, the appraiser may also prepare a forecast of land development for the area. If the zoning of the subject site is not compatible with the probable forecast uses, the probability of a change in the zoning is especially high or speculative. However, the appraiser should recognize that a zoning change is never 100% certain and should alert the client to that fact if it is relevant to the purpose of the appraisal.

WHERE TO FIND – ZONING AND LAND USE INFORMATION

Although zoning by-laws and maps are public records that are available at zoning offices or on the internet, an appraiser may need help from planning and zoning staff to understand the impact of zoning regulations. Often an appraiser must contact several agencies. Zoning and land use restrictions are not usually listed in the recorded title to a property, so confirmation from controlling agencies is necessary.

Assessment and Tax Information

Real property taxes in all jurisdictions are based on ad valorem assessments. Taxation levels are significant in considering a property's potential uses. From the present assessment, the current tax rate and a review of previous tax rates, the appraiser can form a conclusion about future trends in property taxation. Assessed values might not be good indicators of the market value of individual properties because mass appraisals based on statistical methodology tend to equalize the application of taxes to achieve parity among assessment levels in a given district. Nevertheless, in some areas and for some property types, assessed value may approximate market value if the enabling legislation requires market value assessments. The reliability of local assessments as indicators of market value varies from district to district.

WHERE TO FIND – ASSESSMENT AND TAX INFORMATION

The records of the assessor or tax collector can provide details concerning a property's assessed value and annual tax burden. Often, an appraiser obtains property information from the local assessment authority in the early stages of an appraisal to confirm legal description, address, and other property particulars.

PHYSICAL CHARACTERISTICS OF LAND

In site description and analysis, an appraiser describes and interprets how the physical characteristics of the site influence value and how the physical improvements relate to the site and to neighbouring properties. Important physical characteristics include the following:

- Site size and shape
- Corner influence
- Plottage

- Excess land and surplus land
- Topography
- Utilities
- Site improvements
- Accessibility
- Environment
- Size and Shape

The physical characteristics of a site relate to size, shape, plottage potential, corner influence, the presence of excess or surplus land, topography, available utilities, on-site and off-site improvements, location, and environment.

A size and shape description states a site's dimensions such as street frontage, width, and depth and lists any advantages or disadvantages caused by these physical characteristics. The appraiser describes the site and analyzes how its size and shape affect property value. The appraiser should pay special attention to any characteristics that are unusual for the neighbourhood. The effects of the size and shape of a property vary with its probable use. For example, an odd-shaped parcel may be appropriate for a dwelling but unacceptable for certain types of commercial or industrial use. A triangular lot may not have the same utility as a rectangular lot due to its size and shape.

The size of a parcel of land is measured and expressed in different units, depending on local custom and land use. In Canada, professional land surveyors' work is normally completed using the metric system; however, the real estate industry continues to work with the imperial system. Large tracts of land are usually measured in acres or hectares. Smaller parcels are usually measured in square feet or square metres. Imperial dimensions are expressed in feet and tenths of feet, not inches, for easy calculation.

Frontage is the measured footage of a site that abuts a street, lake or river, railroad, or other feature recognized by the market. The frontage may or may not be the same as the width of the property because a property may be irregularly shaped or have frontage on more than one side.

Size differences can affect value and are considered in site analysis. Reducing sale prices to consistent units of comparison facilitates the analysis of comparable sites and can identify trends in market behaviour. Generally, as size increases, unit prices decrease. Conversely, as size decreases, unit prices increase. The functional utility or desirability of a site often varies depending on the types of uses to be placed on the parcel. Different prospective uses have ideal size and depth characteristics that influence value and highest and best use. An appraiser should recognize this fact when appraising sites of unusual size or shape. An appraiser can observe value tendencies by studying market sales of lots of various sizes and their ability to support specific uses or intensities of development. In residential appraisal, a large triangular lot may not have any greater value because only one dwelling unit can be built on it according to zoning and subdivision regulations. The large undeveloped remainder would be surplus land, which is discussed below.

Metric	Imperial
Distance – Metre(m) 1m = +/-3.028084 feet	Distance – Feet (Ft) 1 ft = 0.3048006 metre
Distance – Kilometre (km) 1km = +/-0.621371 mile (3,280.84 feet)	Distance – Mile (mi) 1 mi = +/- 1.609.35 kilometres (1,609.35 metres)
Area – Hectare (ha) 1 ha = 2.471054 acres (107,639.1 square feet)	Area – Acre (ac) 1 ac = 0.404687 hectare (4,046.87 square metres)

Corner Influence

In the layout of building improvements and the subdivision of large plots, corner lots have more flexibility and higher visibility than interior properties. A store on a corner may have the advantage of direct access from both streets and prominent corner visibility and exposure. Corner exposure may provide advantageous ingress and egress for a drive-in business. For residential properties, corner locations may have negative implications; quiet, cul-de-sac sites in the interior of a subdivision may be more desirable and command higher prices. Residences on corner sites are exposed to more traffic noise and provide less security. Owners of corner sites may pay higher costs for front-footage sidewalks and assessments, and the side street setback may affect the permitted size of the building. Usually owners of residences on corner lots have to maintain a larger landscaped area that may, in fact, be public property.

Plottage

Sometimes highest and best use results from assembling two or more parcels of land under one ownership. If the combined parcels have a greater unit value than they did separately, plottage value is created. Plottage is an increment of value that results when two or more sites are combined to produce a larger site with greater utility. For example, there may be great demand for one-acre lots in an industrial park where most of the subdivided lots are of one-half acre. By itself, a half-acre lot has a value of $1.00 per square foot. However, when combined with an adjacent half-acre lot, the value may increase to $1.50 per square foot. The value difference may be offset by the premium a developer often has to pay to combine adjacent properties, or the reverse may occur if the lots are very large and assemblage yields a lower value per square foot in the marketplace due to negative economies of scale. Plottage value may also apply to an existing site of a special size or shape that has greater utility than more conventional, smaller lots. The appraiser analyzes neighbouring land uses and values to determine whether an appraised property has plottage value.

corner influence
The effect on value produced by a property's location at or near the intersection of two streets; the increment of value or loss in value resulting from this location or proximity.

assemblage
The combining of two or more parcels, usually but not necessarily contiguous, into one ownership or use; the process that creates plottage value.

plottage
The increment of value created when two or more sites are combined to produce greater utility.

Plottage is significant in appraising agricultural land. Properties of less-than-optimum size have lower unit values because they cannot support the modern equipment needed to produce maximum profits. In an urban area, plottage of commercial office and retail sites and of residential apartment sites may increase the unit values of the lots assembled. For example, some cities wanting to encourage larger mixed-use developments will establish zoning policies that allow higher densities for larger sites. If a 66-foot wide lot can only achieve a 1.0 FSR, plottage will exist and developers will endeavour to assemble adjacent 66-foot lots.

Although the assemblage of land into a size that permits a higher and better use may increase the land's unit value (dollars per square foot or acre), the reverse may also occur. Land that must be divided or subdivided to achieve a higher and better use is commonly sold in bulk at a price less than the sum of the retail prices of its components. The lower unit price for the bulk sale reflects market allowances for risk, time, management, development, costs, sales costs, profit, and other considerations associated with dividing and marketing the land.

Excess Land and Surplus Land

A given land use has an optimum parcel size, configuration, and land-to-building ratio. Any extra or remaining land not needed to support the specific use may have a different value than the land area needed to support the improvement. The portion of the property that represents an optimal site for the existing improvements will reflect a typical land-to-building ratio. The appraiser can identify and quantify the land area needed to support the existing or ideal improvement. Any remaining land area is either *excess land* or *surplus land*.

Excess land is land that is not needed to serve or support the existing or proposed improvement. The highest and best use of the excess land may or may not be the same as the highest and best use of the improved parcel. Excess land has the potential to be sold separately and must be valued separately.

Surplus land is not currently needed to support the existing improvement and cannot be separated from the property and sold off. Surplus land does not have an independent highest and best use and may or may not contribute value to the improved parcel.

As an example, consider a residential property comprising a one-unit home and two standard-size lots in a fully developed subdivision. If the house was situated within the boundaries of a single lot and the normal land area for properties in the neighbourhood is a single lot, then the second, vacant lot would most likely be considered excess land, which could be separated from the lot of the existing

excess land
Land that is not needed to serve or support the existing improvement. The highest and best use of the excess land may or may not be the same as the highest and best use of the improved parcel. Excess land has the potential to be sold separately and must be valued separately.

surplus land
Land that is not currently needed to support the existing improvement but cannot be separated from the property and sold off. Surplus land does not have an independent highest and best use and may or may not contribute value to the improved parcel.

structure for future development to that parcel's highest and best use. If land values in the neighbourhood were $1.00 per square foot, then the excess land in this situation would probably add the full $1.00 per square foot to the value of the subject property, i.e., the house and the two lots. If the typical land area for properties in the neighbourhood were a double lot, regardless of building placement, then the same property would have neither excess land nor surplus land.

Now consider an industrial park where floor space ratios for warehouse properties range from 0.28 to 0.35 and land value is $2.00 per square foot. The subject property is a 20,000 square foot warehouse on a 100,000 square foot site, which results in floor space ratio of 0.20, well below the market area norm. If the additional land not needed to support the highest and best use of the existing property were in the back portion of the site, lacking access to the street, that land would probably be considered surplus land because it could not be separated from the site and does not have an independent highest and best use. In this situation, the surplus land would probably still contribute positively to the value of the subject property (because the existing improvements could still be expanded onto the surplus land), but it would most likely be worth less than the $2.00 per square foot price commanded by vacant land elsewhere in the industrial park.

Topography

Topographical studies provide information about land's contour, grading, natural drainage, soil conditions, view, and general physical usefulness. Sites may differ in value due to these physical characteristics. Steep slopes often impede building construction. Natural drainage can be advantageous, or, if a site is downstream from other properties or is a natural drainage basin for the area, it may have severely limited usefulness. Adequate drainage systems can offset the topographic and drainage problems that would otherwise inhibit the development of such a site. Upland land area (i.e., land above the mean high water line) and land with good drainage can typically support uses that are more intensive.

Topographical characteristics, surface soil and subsoil quality, grade, drainage, and the bearing capacity of the soil determine the suitability of a land parcel for an agricultural use or a proposed improvement.

In describing topography, an appraiser must employ the terminology used in the area. What is described as a steep hill in one part of the country may be considered a moderate slope in another. In some instances, descriptions of a property's topography may be taken from published sources such as topographic maps (see Figure 10.1).

Geodetic Survey Program

Topographic maps prepared under the direction of the Geodetic Survey Division of Natural Resources Canada are referred to as quadrangles or quads They provide information that is useful in land descriptions (see Figure 10.2). Base lines, principal meridians, and township lines are shown along with topographic and man-made features. The topographic features commonly depicted on these maps include land elevations (represented by contour lines at specified intervals), rivers, lakes, inter-

Figure 10.1: Topographic Map

WHERE TO FIND – TOPOGRAPHIC MAPS

Topographic maps are available at most local and regional government offices and their websites. The Centre for Topographic Information produces topographic maps of Canada at scales of 1:50,000 and 1:250,000. They are known as the National Topographic System (NTS). A government proposal to discontinue publishing of all hardcopy or paper topographic maps in favor of digital-only mapping data was shelved in 2006 after intense public opposition. National Resources Canada maintains the centre, and makes topographic maps and data available in print from regional offices and on the web. For more information, see: www.nrcan.gc.ca. Topographic and other maps are available online at *atlas.nrcan.gc.ca/site/english/maps/topo/index.html*

mittent streams and other bodies of water, poorly drained areas, and forest. The man-made features identified include improved and unimproved roads, highways, bridges, power transmission lines, levees, railroads, airports, churches, schools, and other buildings. Quadrangle maps also show surface geology.

Soil Analysis

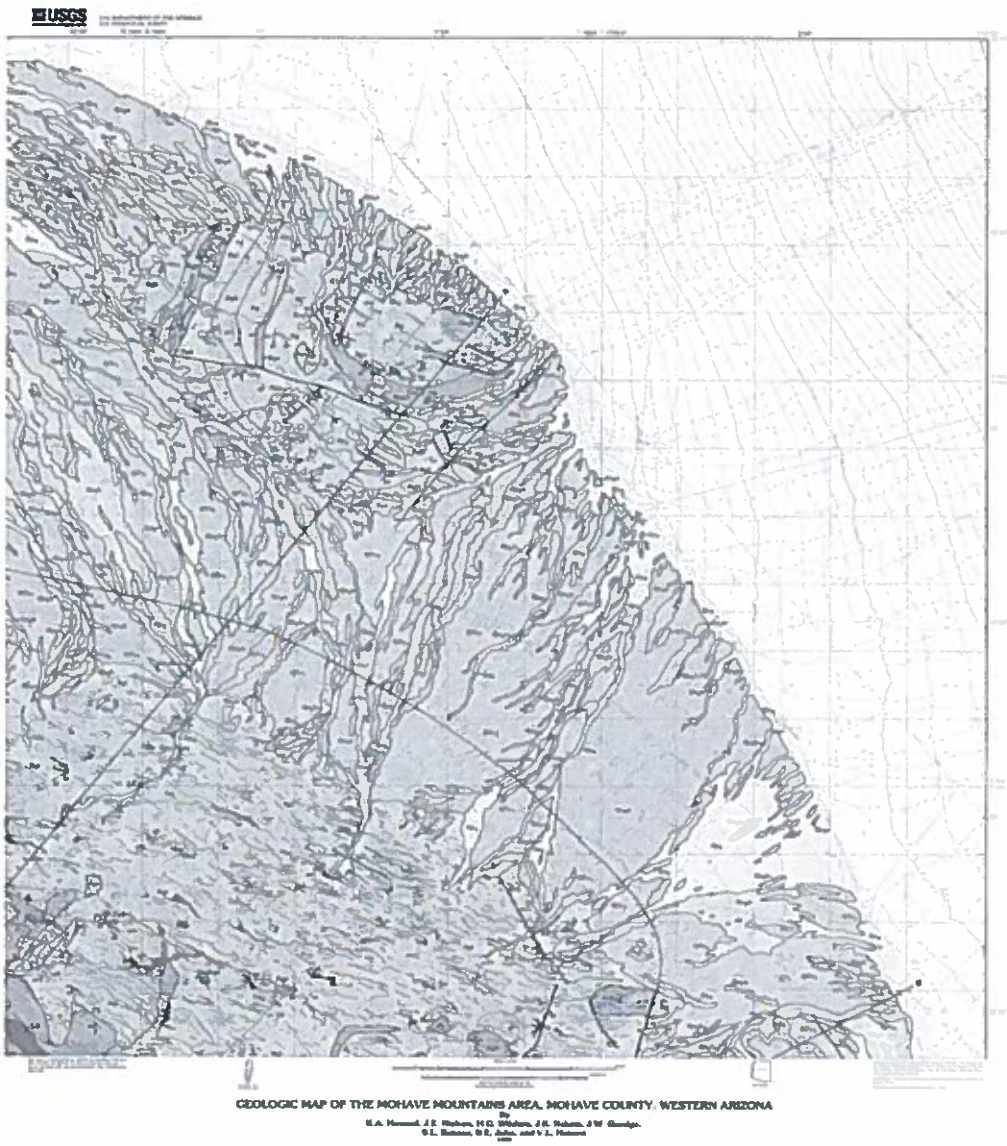
Surface soil and subsoil conditions are important for both improved properties and agricultural land. A soil's suitability for building or for accommodating a septic system is important for all types of improved property, and it is a major consideration when the construction of large, heavy buildings is being contemplated. The need for special pilings or floating foundations has a major impact on the adaptability of a site for a particular use. Soil conditions affect the cost of development and therefore the property value.

Agronomists and soil scientists measure the agricultural qualities of soil and capacity of soil for specific agricultural uses. Engineers trained in soil mechanics test for soil consistency and load-bearing capacity. Local builders, developers, and others frequently know subsoil conditions, but if there is any doubt about the soil's bearing capacity, the client should be informed of the need for soil studies. All doubts must be resolved before the land's highest and best use can be successfully analyzed, or a description of any special assumptions must be included in the appraisal report.

WHERE TO FIND – SOILS DATA

Soils surveys conducted by Agriculture and Agri-Food Canada in aggregate are called the National Soil Database (NSDB). The NSDB is the set of computer readable files which contain soil, landscape, and climatic data for all of Canada. It serves as the national archive for land resources information that was collected by federal and provincial field surveys, or created by land data analysis projects.
For more information, see *www.agr.gc.ca*

Figure 10.2: US Department of the Interior Geological Survey

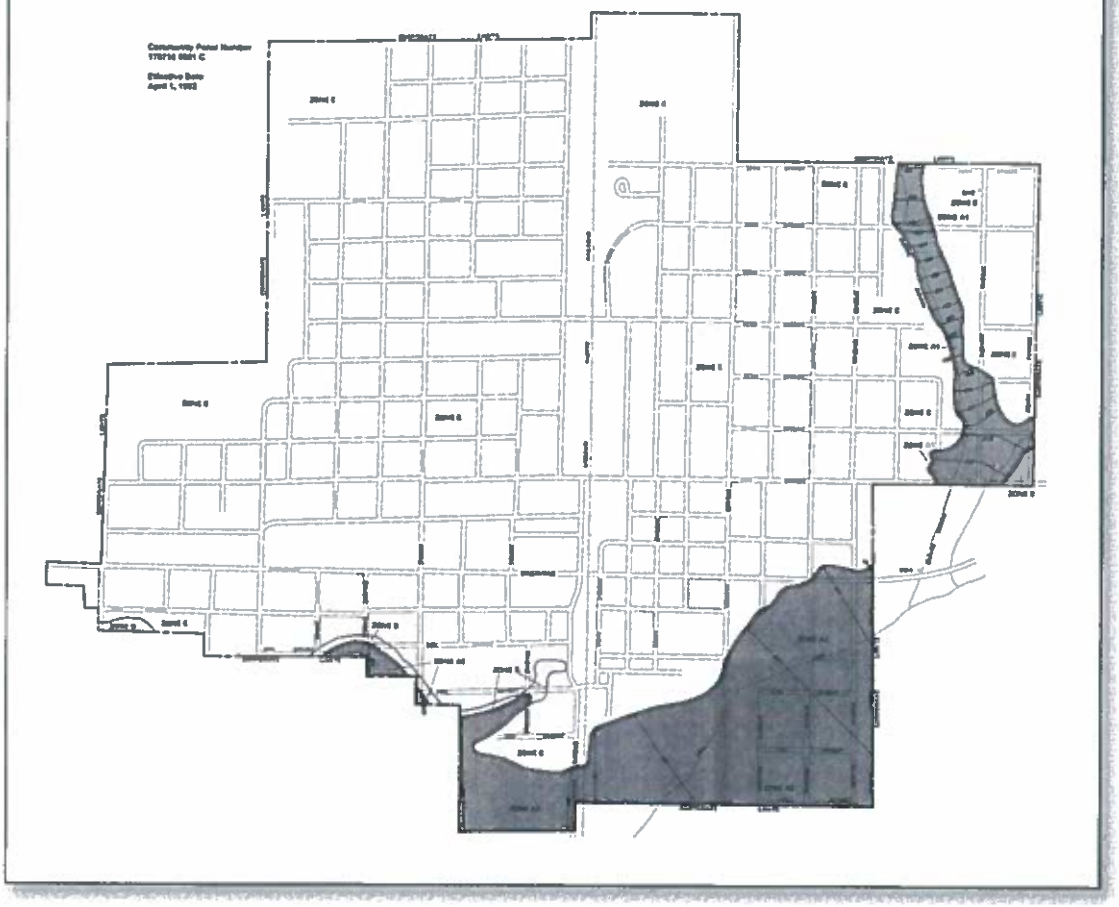


Floodplain and Wetlands Analysis

Wetlands are lands that are seasonally or permanently covered by shallow water, including lands where the water table is at or close to the surface. The presence of abundant water causes the formation of hydric soils (lacking air) and favours the dominance of either hydrophytic plants (adapted to aquatic environments) or water-tolerant plants. Wetlands are characterized by plants adapted to saturated-soil conditions. The five major types of wetlands are marshes, swamps, bogs, fens, and shallow open waters.

Wetlands are the only ecosystem designated for conservation by international convention because they absorb the impact of hydrologic events, filter sediments and toxic substances, supply food and essential habitat for many species, provide products for food, energy, and building material, and are valuable recreational areas. Some wetlands help recharge groundwater, while others receive groundwater discharge. Wetlands are vulnerable to climatic variations and extreme events.

Figure 10.3: Floodplain Map



Wetlands occur across most of Canada; their location usually depends on local factors such as drainage, topography, and surface material.

The appraiser should check floodplain maps prepared by local governments and review any available surveys or topographical data provided by the client. Proximity to any flood zones may be determined by studying maps published by provincial and territorial agencies, pursuant to federal-provincial agreements that provide for the mapping of floodplains. Information is available through Environment Canada, and the relevant provincial and territorial agency.

floodplain
The flat surfaces along the courses of rivers, streams, and other bodies of water that are subject to flooding.

wetlands
Areas that are frequently inundated or saturated by surface or groundwater and support vegetation typically adapted for life in saturated soil conditions; generally include swamps, marshes, bogs, and similar areas, but classification may differ in various jurisdictions.

The definition of what constitutes a wetland varies. Most laws describe wetlands in terms of three possible characteristics:

1. Soils
2. Hydrology, i.e., the study of movement, distribution, and quality of water
3. Vegetation

There is no specific wetlands legislation in Canada. Wetlands receive indirect protection through a variety of national, provincial, and territorial legislation, for example see the Federal Fisheries Act.

Swamps, bogs, fens, marshes and estuaries are subject to varying degrees of influence from local, provincial, and federal governments. To value wetlands, appraisers must understand the unique features of the land, the evolving laws protecting these areas, the niche market for such properties, and the proper application of the approaches to value.

WHERE TO FIND – FLOODPLAIN MAPS

National Resources Canada publishes maps of wetlands; local, territorial, and provincial agencies often adapt this data for local wetland mapping and GIS systems.
For more information, see: *www.atlas.nrcan.gc.ca/site/english/maps/freshwater/distribution/wetlands*

Utilities

An appraiser investigates all the utilities and services available to a site. Off-site utilities may be publicly or privately operated, or there may be a need for on-site utility systems such as septic tanks and private water wells. The major utilities to be considered include the following:

- Sanitary sewers
- Domestic water, i.e., potable water, for human consumption
- Types of raw water for commercial, industrial, and agricultural uses
- Natural gas

- Electricity
- Storm drainage/sewer
- Telephone service
- Cable television

Although market area analysis describes, in general, the utility systems that are available in an area, a site analysis should provide a detailed description of the utilities that are available to the appraised site. An appraiser should determine the location and capacity of the utilities and note any unusually high connection fees. The appraiser should also identify and analyze atypically high or low service costs. It is not sufficient simply to establish which utilities are available. Any limitations resulting from a lack of utilities are important in highest and best use analysis, and the appraiser should investigate all available, alternative sources of utility service.

The cost of installing utilities is considered in the highest and best use conclusion and may be reflected directly or indirectly in the analysis, depending on the selection of comparable sales used in the valuation.

The appraiser should also consider the rates for utility service and the burden of any bonded indebtedness or other special utility costs. Of particular concern to residential, commercial, and industrial users are the following:

- Quality and quantity of water and its cost
- Costs and dependability of energy sources
- Adequacy of sewer facilities
- Any special utility costs or surcharges that might apply to certain businesses
- Impact of special or local improvement districts (SIDs or LIDs) on tax rate and repayment methods, e.g., special assessment

WHERE TO FIND – DATA ON UTILITIES

Accurate information on public utilities can be obtained from:

- Local public works departments
- Providers of on-site water and sewage disposal systems
- Local public works departments
- City/county planning departments

Site Improvements

In a site description, an appraiser describes off-site and on-site improvements. Then the appraiser analyzes how the site improvements affect value. On-site improvements include grading, landscaping, fences, curbs, gutters, paving, drainage and irrigation systems, walks, and other improvements to the land. Off-site improvements include access roads, utility hook-ups, remote water retention ponds, and sewer and drainage lines. An appraiser typically considers the value of off-site improvements in the site valuation process.

An appraiser must also describe and analyze the location of existing buildings on a site. Many appraisers make approximate plot plan drawings that show the

placement of major buildings in relation to lot lines, access points, and parking or driveway areas. Land-to-building ratios and overall site configuration are usually quite important to a site's appeal and ability to support specific uses. The space allotted for parking influences a site's value for business and commercial use; therefore, the appraiser must analyze the parking space-to-building ratio in a commercial and industrial property. Zoning codes and parking by-laws will specify the minimum number of spaces required.

The appraiser considers any on-site improvements that add to or detract from a property's optimal use or highest and best use. For example, a lot zoned for multi-unit residential use might be improved with an 18-unit apartment building that is too valuable to demolish. If the site as vacant could accommodate a 24-unit building but the location of the present structure blocks the ability to add additional units, the appraiser may conclude that the site is underimproved and not developed to its highest and best use.

Accessibility

Site analysis focuses on the time-distance relationships between the subject site and other sites that serve as common origins and destinations. An appraiser describes and analyzes all forms of access to and from the property and the neighbourhood. In most cases, adequate parking area and the location and condition of streets, alleys, connector roads, freeways, and highways are important to land use. Industrial properties are influenced by rail and freeway access and the proximity of docking facilities. The location of airports, freeways, public transportation, and railroad service all affect industrial, commercial, and residential areas.

Traffic volume may be either advantageous or disadvantageous to a site, depending on other conditions that affect its highest and best use. High-volume local traffic in commercial areas is usually an asset; heavy through traffic may hurt retail stores, except those that serve regional travelers. Heavy traffic within residential areas is usually detrimental for single-unit residential neighbourhoods, but high-traffic streets that provide access to a subdivision or development are advantageous.

WHERE TO FIND – TRAFFIC VOLUME DATA

The volume of traffic passing a property is determined by a traffic count, which can usually be obtained from municipal engineering departments or provincial departments of transportation. Traffic counts indicate average daily traffic, peak hours, and direction. Observing the speed and turning movements of actual vehicles helps an appraiser judge how traffic affects a property's highest and best use.

The noise, dust, light, and fumes that come from a heavily travelled artery or freeway are not desirable for most low-density, residential lots. On the other hand, the advertising value of locations on major arteries can benefit offices and shopping centres, unless congestion restricts the free flow of traffic. The visibility of a commercial property from the street (commercial exposure) is an advertising asset; this asset

is most valuable when the driving customer can easily exit the flow of traffic and enter the property.

Median strips, turning restrictions, one-way streets, and access restrictions can limit the potential uses of a parcel. In site analysis, the appraiser should test the probable uses of the site in relation to the flow of traffic. The appraiser must verify planned changes in access with the appropriate authority and consider these in the appraisal.

Environment

Appraisers also analyze land use in light of environmental conditions. Environmental considerations include factors such as the following:

- Local climate
- Availability of adequate and satisfactory water supply
- Pattern of drainage
- Quality of air
- Presence of wildlife/endangered species habitats
- Location of earthquake faults and known slide or avalanche zones
- Proximity to streams, wetlands, rivers, lakes, or oceans

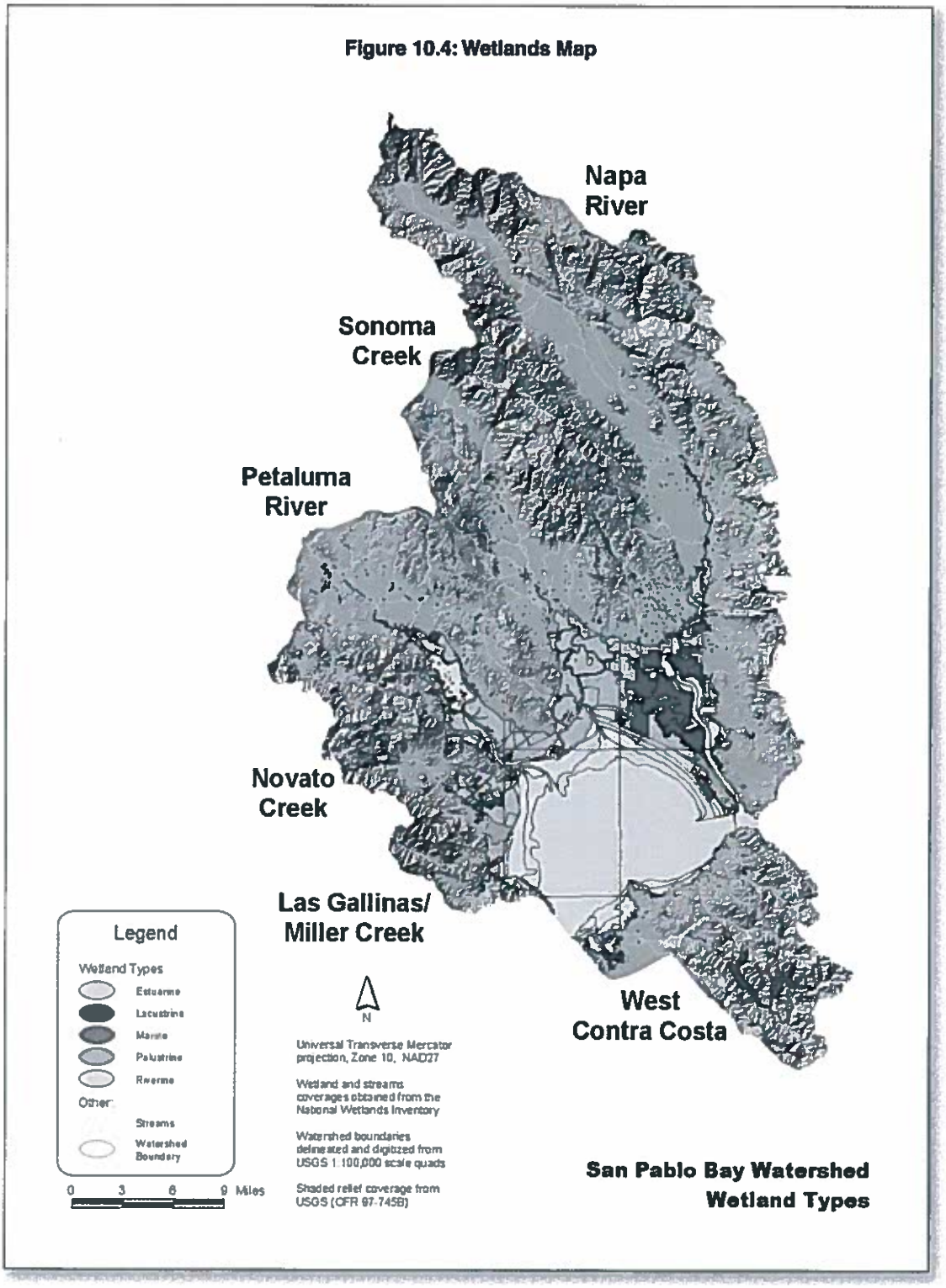
Air and water pollution are by-products of increased population and urbanization. Public concern over pollution has prompted political action and legislation to protect the environment. In areas subject to extreme air pollution, regulations may exclude certain industries and limit the volume of traffic; such restrictions affect land use in these jurisdictions. In some jurisdictions, pollution rights have also become a saleable commodity. In locations near natural water sources, industrial uses may be prohibited while recreational uses are promoted. An appraiser must analyze environmental and climatic advantages and constraints to determine the proper land use for a site. Future land uses must be compatible with the local environment.

A site in a specific location may be influenced by its exposure to sun, wind, or other environmental factors. A very windy location can be disastrous to a resort but beneficial to a fossil-fuel power plant. The sunny side of the street is not always the most desirable for retail shops. In hot climates, the shady side of the street often gets more pedestrian traffic and greater sales, thus producing higher rents and higher land values. Ski resorts usually have slopes facing north for snow retention, and buildings facing south are desirable.

Analysis of a site's environment focuses on the interrelationships between the appraised site and neighbouring properties. An appraiser must consider the effects of any hazards or nuisances caused by neighbouring properties.. Of particular importance are safety concerns, e.g., the safety of employees and customers, of occupants and visitors, or of children going to and from school.

A site's value is also influenced by nearby amenities and developments on adjoining sites, such as parks, fine (or landmark) buildings, and compatible commercial buildings. The types of structures surrounding the property being appraised and the activities of those who use them can greatly influence site value.

Figure 10.4: Wetlands Map



Federal and provincial environmental agencies have issued many environmental regulations that affect the use of land and may affect the value of land and improved properties. A complex network of regulations defines the environmental responsibilities and potential liabilities of property owners and investors, and these responsibilities and liabilities can adversely affect the value of real property interests. On one hand, environmental regulations can limit the use of land through protection of natural areas such as wetlands, aquifer recharge zones, and habitat areas for endangered or threatened species. On the other hand, real property interests may be impacted due to man's use or misuse of the land. Man-made environmental issues may be indicated by the presence of hazardous materials such as asbestos, PCBs, or petroleum hydrocarbons from leaking underground storage tanks (LUSTs). The existence of one or more adverse environmental conditions can reduce the market value of real property interests in a site.

Appraisers are not expected to have the knowledge or experience needed to detect the presence of hazardous substances or to measure their quantities. Like buyers and sellers in the real estate market, the appraiser must often rely on the advice of others, such as engineers or technical personnel with training in the detection and analysis of hazardous substances. However, depending on their knowledge and experience in the appraisal field, appraisers could reasonably be expected to estimate the impact of environmental contamination on property value. The consideration of environmental contamination in the appraisal process has been specifically addressed in professional appraisal standards, with topics addressed including relevant property characteristics

Figure 10.5: Relevant Property Characteristics

Professional standards discuss the relevant property characteristics that an appraiser should consider in an assignment involving a contaminated property:

- Whether the contamination discharge was accidental or permitted
- The status of the property with respect to regulatory compliance requirements
- The remediation lifecycle stage (before, during, or after cleanup) of the property as of the appraisal date
- The contamination constituents, e.g., petroleum hydrocarbons, chlorinated solvents
- The contamination conveyance, e.g., air, groundwater, soil
- Whether the property is a source, non-source, adjacent, or proximate site
- The cost and timing of any site remediation plans
- Liabilities and potential liabilities for site cleanup
- Potential limitations on the use of the property due to the contamination and its remediation
- Potential or actual off-site impacts due to contaminant migration (for source sites)

These characteristics may be used to describe the site and its environmental history and condition. They can also form the base of information from which to value a contaminated site and estimate the impact of the contamination on its value using one or more specialized valuation methods that have emerged in recent years for this purpose.

Figure 10.6: Specialized Terms and Definitions

Professional standards set forth the following key terms and definitions for use by appraisers who may be involved in the valuation of environmentally impacted properties:

- Diminution in Value (Property Value Diminution): The difference between the unimpaired and impaired values of the property being appraised. This difference can be due to the increased risk or costs (or both) attributable to the property's environmental condition.
- Environmental Contamination: Adverse environmental conditions resulting from the release of hazardous substances into the air, surface water, groundwater, or soil. Generally, the concentrations of these substances would exceed regulatory limits established by the appropriate federal, provincial, or local agencies.
- Environmental Risk: The additional or incremental risk of investing in, financing, buying, or owning property attributable to its environmental condition. This risk is derived from perceived uncertainties concerning: 1) the nature and extent of the contamination; 2) estimates of future remediation costs and their timing; 3) potential for changes in regulatory requirements; 4) liabilities for cleanup (buyer, seller, third party); 5) potential for off-site impacts; and 6) other environmental risk factors, as may be relevant.
- Environmental Stigma: An adverse effect on property value produced by the market's perception of increased environmental risk due to contamination (see Environmental Risk above).
- Impaired Value: The market value of the property being appraised with full consideration of the effects of its environmental condition and the presence of environmental contamination on, adjacent to, or proximate to the property. Conceptually, this could be considered the "as-is" value of a contaminated property.
- Remediation Cost: The cost to cleanup (or remediate) a contaminated property to the appropriate regulatory standards. These costs can be for the cleanup of on-site contamination as well as mitigation of off-site impacts due to migrating contamination.
- Remediation Lifecycle: A cycle consisting of three stages of cleanup of a contaminated site: before remediation or cleanup, during remediation, and after remediation. A contaminated property's remediation lifecycle stage is an important determinant of the risk associated with environmental contamination. Environmental risk can be expected to vary with the remediation lifecycle stage of the property.
- Source, Non-source, Adjacent, and Proximate Sites: Source sites are the sites on which contamination is, or has been, generated. Non-source sites are sites onto which contamination, generated from a source site, has migrated. An adjacent site is not contaminated, but shares a common property line with a source site. Proximate sites are not contaminated and not adjacent to a source site, but are in close proximity to the source site.
- Unimpaired Value: The market value of a contaminated property developed under the hypothetical condition that the property is not contaminated.

Source: Canadian Uniform Standards, 2010, 12.22 to 12.26 and Advisory Opinion 9 of Uniform Standards of Professional Appraisal Practise (USPAP), originally adopted in 1992 and substantially revised in 2002, Appraisal Foundation, Washington

(see Figure 10.5), specialized terms and definitions, and issues involved in valuing potentially impacted properties as if unimpaired and as impaired.[2]

The appraisal profession has arrived at a common set of specialized terms and definitions that pertain to contaminated properties and their valuation. Figure 10.6 lists terms, definitions, and concepts relevant to an appraisal assignment involving a site that might be potentially impacted by environmental contamination.

[2] Canadian Uniform Standards of Professional Appraisal Practise, 2010, 12.22 to 12.26.

The relevant property characteristics in Figure 10.5 and the valuation concepts, definitions, and terms in Figure 10.6 lead to a valuation framework that focuses on the potential effect of contamination on the hypothetical unimpaired value of the property.

These effects can reduce the unimpaired value to what has been referred to as the property's impaired value. For the appraiser, the key consideration involves the assembly of relevant market evidence of the reduction in value. Appraisers must avoid substituting their judgment for that of the marketplace. In recent years, contaminated properties have become more marketable and have begun to change hands with increasing frequency. Such transactions will usually provide sufficient basis for valuing or analyzing a site that may be impacted by environmental contamination.

SPECIAL CHARACTERISTICS OF RURAL, AGRICULTURAL, OR RESOURCE LAND

Rural or agricultural resource lands have specific characteristics that appraisers should investigate to describe these properties adequately:

- **Soil.** Precise soil surveys that indicate the soils found on properties, appropriate crops, and expected production are often available (see Figure 10.7). These surveys are useful in comparing agricultural properties.
- **Water rights, drainage, and irrigation.** The legal right to water is as important to the value of a property as the physical source of the water. Unlike the United States, the owners of property in Canada that abuts a waterway have reasonable rights to the water and to physically access the water. The provinces control water rights and regulate water usage, usually through their environmental ministry. Various provincial agencies determine the permissibility of large-scale use such as irrigation. Water export is a matter of some sensitivity that the federal government regulates.[3]
- **Climate.** General climatic conditions and growing seasons can affect crop production and, therefore, land value.
- **Potential crops.** The crops grown on a property are related not only to climate, soil, and irrigation, but also to the availability of labour, transportation, and access to the markets that make, transport, and sell the products produced from crops.
- **Environmental controls.** Cropping patterns are influenced by regulations on herbicides, insecticides, fertilizers, air and water pollution, and wildlife protection. Lead-based paint, underground storage tanks, asbestos in farm buildings, and cattle vats are common environmental liabilities.
- **Mineral rights.** The presence of precious metals, oil and gas, sand and gravel, quarry red rock such as building stone, clay deposits, or gemstones on a plot of land can affect its value. As with water rights, the legal right to extract

[3] For more information on water rights in Canada, see *www.wsc.ec.gc.ca/hydrology/main_e.cfm?cname=hydro_e.cfm* and *www.watergovernance.ca*

ENVIRONMENTALLY IMPACTED PROPERTIES

The effects of environmental contamination on the value of real property can be categorized as follows:

- Cost effects: deductions for costs to remediate a contaminated property to appropriate regulatory standards, recognizing that not all costs are recognized by the market as having an effect on value.
- Use effects: limitations on the highest and best use of properties that may be impacted by environmental contamination, recognizing that these effects would be meaningful only if they limited the use of the site or property that would be the highest and best use without the effect of the contamination, and would otherwise meet the four highest and best use criteria (physically possible, legally permissible, financially feasible, and maximally productive).
- Risk effects: the effects on value due to increased perceptions of environmental risk by relevant market participants.

These factors influence the value of a potentially impacted site according to the following formula:

Impaired Value = Unimpaired Value
– Cost Effects (Remediation and Related Costs)
– Use Effects (Effects on Site Usability)
– Risk Effects (Environmental Risk/Stigma)

In measuring the three potential effects on value (cost, use, and risk), cost effects are derived from remediation costs, which are usually estimated by environmental specialists. Assuming the market recognizes these costs, the appraiser can usually deduct them as a lump sum from the unimpaired value in the same way that a capital expenditure is deducted for deferred maintenance. When a discounted cash flow analysis is used, the anticipated costs can be deducted from the projected cash flows in the periods in which they are projected to occur.

Uncertainty regarding cost estimates, projection, and timing would be reflected in the environmental risk premium added to the unimpaired property or equity yield rate (risk effect). Use effects can be analyzed by evaluating the highest and best use of the subject contaminated property in an impaired and unimpaired condition. Risk effects, on the other hand, are derived from the perceived environmental risk and uncertainty related to the property's environmental condition. Measuring this element usually requires more sophisticated, less direct techniques.

Contamination may also have no effect on value. The influence of environmental impairment on real property value must always be found in the marketplace. Appraisers should be cautioned that, while formulaic approaches exhibit a structural logic and may be easy to explain, the market does not always respond in the same manner.

For further information, see Thomas O. Jackson, "Appraisal Standards and Contaminated Property Valuation", The Appraisal Journal (April 2003); Thomas O. Jackson, "Methods and Techniques for Contaminated Property Valuation", The Appraisal Journal (October 2003); William N. Kinnard Jr. and Elaine M. Worzala, "How North American Appraisers Value Contaminated Property and Associated Stigma", The Appraisal Journal (July 1999); Richard J. Roddewig, editor, Valuing Contaminated Property: An Appraisal Institute Anthology (Chicago: Appraisal Institute, 2002), Larry O Dybvig, Contaminated Real Estate; Implications for Real Estate Appraisers; Appraisal Institute of Canada, 1992.

all minerals contained in or below the surface of a property is as important as ownership of the land itself. Mineral rights may be granted with surface rights or without surface entry because the mineral estate is the dominant tenant in most provinces. Various lease and ownership relationships may be in effect and should be investigated. Since subsurface minerals can never be fully and absolutely quantified until they are extracted, and their extent and

quality are subject to many variations, appraisers should recognize the risks and uncertainties associated with mineral properties. It is also important to remember that the activity of mineral extraction is a business activity and that real property interests must be separated from those of a business.

- **Unapparent environmental hazards.** Although the environmental liabilities associated with industrial plants are well known, many of the same liabilities may be present in other properties. Investors and analysts cannot assume that green rural properties that appear clean are actually free of environmental liabilities. In the 1940s and 1950s, farmers commonly used cattle vats, i.e., trenches filled with fuel oil through which cattle were led to rid them of mites and small insects. The fuel oil was often treated with DDT and other pesticides. When this practice fell into disuse, the trenches were simply filled in. In addition, farms often have aging underground storage tanks that held gasoline used to fuel farm vehicles. Farmland may also be contaminated by the accumulation of fertilizers and pesticides. Old railroad

Figure 10.7: Soil Map

beds can constitute an environmental hazard because railroad ties were commonly soaked in creosote-filled trenches dug on site when tracks were laid. Timberlands are not free of contaminants either. Old turpentine stills are often found in areas where forests were once harvested.

- **Other considerations.** The appraiser must consider and analyze the location of wildlife habitats, the distances from populated areas, and the potential for recreational land uses in valuing agricultural land. An appraiser should also study special tax provisions, such as reduced taxes on agricultural or resource properties.[4] In October of 2006, the Government of Canada tabled the Canada's Clean Air Act. This act would create a new Clean Air Part in the Canadian Environmental Protection Act to strengthen the government's ability to reduce air emissions, regulate indoor and outdoor air pollutants and greenhouse gases, and require the establishment of national air quality objectives. However, these proposed changes would not allow for the creation and sale of pollution rights. In contrast, the US Clean Air Act of 1990 regulated the tonnage of acid-rain emissions that smokestack industries may release in proportion to plant size. Industries that do not use their full legal allowance can transfer or sell their pollution rights to other industries. Since 1993 pollution rights have been sold on both the Chicago Board of Trade and in the off-exchange pollution rights market.

[4] For a thorough discussion of the methods used to describe and analyze the significant characteristics of land used for agricultural production, see American Society of Farm Managers and Rural Appraisers and Appraisal Institute, *The Appraisal of Rural Property*, 2nd ed. (Denver and Chicago, 2000).