clubs, interscholastic sports or activities sponsored by the community at local libraries, parks and community centers. As discussed in Principle 3 (see Section 1.4.3) in the About the Guidelines section (see Section 1), schools located within neighborhoods can also increase access to public transportation for students, faculty and staff in the neighborhood and in surrounding communities.[37,38]

4.3.1. Select Locations That Do Not Increase Environmental Health or Safety Risks

During the initial screen of candidate locations, the LEA and SSC should seek to avoid locations that are either on or are in close proximity to land uses that may be incompatible with schools, if acceptable alternative sites exist within the neighborhood(s) being served by the new school. These incompatible land uses may include contaminated sites that have not been remediated (i.e., cleaned up) to at least a residential use standard, clusters of industrial facilities, or other potential hazards identified in Exhibit 6: Screening Potential Environmental, Public Health and Safety. The section, Consider Environmental Hazards (see Section 4.4), describes some principles used to define environmental criteria and the typical environmental and safety issues that the school siting process should consider and address to ensure that the location chosen does not pose unacceptable environmental and public health risks.

If no alternative locations exist, it is critically important that the LEA and SSC fully explain the absence of alternatives in a transparent manner and fully engage the public in identifying and implementing both site-specific and community-wide exposure and risk reduction strategies to protect the health and safety of students and staff. The LEA and SSC should consult with regional planning authorities to be cognizant of future plans for development or facilities that may result in environmental or health threats to the school location (e.g., large industrial facilities). Exhibit 5: Factors Influencing Exposures and Potential Risks, introduces some potential mitigation options for potential environmental, safety and health hazards.

4.3.2. Locate Schools Near Populations and Infrastructure

Consider establishing clear goals and criteria to give preference to locations near existing populations and close to facilities and infrastructure that support school programs to minimize transportation and infrastructure costs and their related environmental, economic, public health and sustainability impacts. Additional school capacity and the location of new schools often influence the location of residential development.[39] School location is a critical aspect of quality community planning. Schools built on the fringes of communities can contribute to outward migration from city centers, which can cause disinvestment in existing neighborhoods and can hurt local economies. This phenomenon is particularly common when new school sites require the extension of infrastructure, making undeveloped areas more attractive for residential and commercial development.

Flexibility with respect to school size and site size allows communities to retain and upgrade (or replace on the same site, when necessary) existing schools. Smaller schools tend to be easier to locate near population centers, minimizing transportation needs and commuting exposures to traffic-related air pollution. Goals and criteria to

[37] Ariel H. Bierbaum, Jeffrey M. Vincent and Deborah L. McKoy, "Putting Schools on the Map: Linking Transit-Oriented Development, Families, and Schools in the San Francisco Bay Area," Center for Cities and Schools, Institute of Urban and Regional Development, University of California Berkeley (June 2010). Available at: http://citiesandschools.berkeley.edu/reports/Putting%20Schools%20on%20the%20Map_Final_Jul10_appendices.pdf.

[38] Ariel H. Bierbaum, Jeffrey M. Vincent and Deborah L. McKoy, "Linking Transit-Oriented Development, Families and Schools." *Community Investments* (Summer 2010) 22:2. 18-21. Available at: www.frbsf.org/publications/community/investments/1008/A_Bierbaum.pdf.

[39] Upper Grand District School Board, "Planning Department Frequently Asked Questions." (Accessed on September 16, 2011) Available at: http://www.ugdsb.on.ca/planning/article.aspx?id=4722.

give preference to locations near existing populations include:

- **Avoiding building schools in remote locations** that are not accessible by walking, biking and public transportation;
- **Maximizing proximity to program support facilities** such as community museums, theaters, libraries, program centers, recreational and enrichment activities and downtown commercial areas;
- **Developing joint use agreements** (see Section 10) to facilitate school access to community facilities and to allow community access to school facilities;
- **Considering proximity to other schools.** There may be local reasons to minimize or maximize distance between schools, such as the desire to promote diversity or reduce isolation in the LEA's schools; and
- **Avoiding locations that will require new infrastructure** such as roads, water/sewer or utilities.

Locating a school in the community it serves may result in proximity to pollution sources. Such situations should be addressed by considering information on associated hazards and the availability and effectiveness of mitigation options for addressing the environmental hazards, as well as the potential additional cost and time involved. Similar analyses for alternative options for locating the school should be made. With that information, communities should seek to balance the benefits of a community centered school with any potential environmental and public health risks.

4.3.3. Consider Implications of the School Location on Transportation Options

Transportation is a major factor in a school's overall environmental impact. Schools that offer more transportation choices can reduce the amount of land that is paved, reduce automobile and bus traffic and pollution and encourage walking or biking to school. Scientific literature on school travel shows clearly that the farther a school is from a child's residence, the less likely it is that the child will walk or bike to school, and that virtually no children walk over two miles to school.[40,41] Connecting a school to a network of sidewalks, bike paths and other infrastructure encourages physical activity by making walking or biking safe and enjoyable. It is also important to provide walking and biking routes that do not bring children close to large roads, highways and other major pollution sources (for both health and safety concerns). Site size, location and design all play a role in determining whether walking or biking will be an option for students. Locations that provide access for students and staff via public transit will also reduce vehicle use as well as potentially promote increased physical activity in getting to the transit stops from both home and school.

Transportation costs, either to the school district or to the families it serves, are also important to consider. For example, transportation costs to the district can include the cost to purchase, maintain and store buses; the cost of fuel and personnel; and the cost associated with an increase in school bus mileage. The costs to families may be direct (e.g., a fee for students to ride the bus) or indirect (e.g., transportation-related taxes and fuel costs associated with personally transporting their children to school). The siting process should also account for transportation cost externalities, such as the health implications of exposure to exhaust while riding the school bus or from idling vehicles. Low-income and minority families can be especially impacted by transportation costs since children may not have the option of being driven to school and often need to walk, bike, use the school bus or take public transportation. This reinforces the need to locate schools within reasonable distance and provide a safe biking and

[40] Lawrence Frank and Company, Inc., "Youth Travel to School: Community Design Relationships with Mode Choice, Vehicle Emissions, and Healthy Body Weight," Prepared for U.S. Environmental Protection Agency, Washington, DC, December 2008. Available at: www.epa.gov/smartgrowth/pdf/youth_travel.pdf.

[41] Noreen C. McDonald, "Active Transportation to School: Trends Among U.S. Schoolchildren, 1969-2001," *American Journal of Preventive Medicine* (2007) 32:6. 509-516. Available at: http://dot.ga.gov/localgovernment/FundingPrograms/srts/Documents/news/Trends_Among_US_School_Children.pdf.

walking environment for these populations. LEAs should also consider how these costs may change over the life of the school.

Communities should consider establishing goals and criteria to give preference to locations that will promote alternative modes of transportation, including walking or biking. Minimum acreage requirements, school funding formulas and building codes often favor construction of new schools over the renovation of existing neighborhood schools; however, giving preference to locations that will promote the use of public transportation, walking or biking or that require shorter driving distances will reduce transportation costs for local government, as well as parents and caregivers.[42] School consolidation policies should be carefully examined for their impact on school transportation and students' physical activity.

In new locations, schools can be designed to encourage integration with future developments by establishing street patterns, sidewalks and trail networks that support walking and biking as surrounding developments are constructed. This can happen both as part of the design and construction of the school campus and as a result of subdivision regulations guiding development within potential walking and biking distance from a school's boundary.

The SSC should assess walkability and bikeability of the area surrounding each school location under consideration and evaluate the potential long-term health effects of candidate locations on the students and staff.[43] A detailed example of how to assess the bikeability/walkability of candidate locations can be found in the "Active School Neighborhood Checklist" (www.epa.gov/schools/siting/resources.html#LINKS_cleanup_regulations_and_processes) developed in Arizona. The aim of the checklist is to provide decision makers with a quantitative tool for evaluating the potential long-term health impacts of candidate school locations on the children who will attend them. LEAs may also wish to consider conducting a health impact assessment that seeks to balance the health impacts of planning project alternatives, for example changes of transportation on air pollution and health risks. Information about health impact assessments can be found on the Resources page of the guidelines website. (www.epa.gov/schools/siting/resources.html#LINKS_health_impact_assesments)

By completing an assessment for proposed or existing school locations and comparing them, LEAs may find that one location is clearly preferable to others with regard to biking and walking potential and/or health impacts. LEAs should take the results of such assessments into consideration when selecting school locations or deciding whether to move from an existing location. If there is only one candidate location, it is still recommended that an assessment of walkability/bikeability be conducted.

If walking routes for a location are unsatisfactory, the school district should consider another location or work with the city or county to have safe walking routes installed before opening the school. New or renovated schools can act as an impetus for retrofitting or repairing sidewalk and bike trail networks in existing communities. Some localities may use different metrics and rules for determining walking/biking boundaries, and some may prioritize completion or repair of sidewalks and trail networks near school locations. Streets within realistic walking or biking distance of the location should include clear pedestrian pathways, bicycle routes, and speed control measures (e.g., traffic calming, design speeds).

[42] Renee Kuhlman, "Helping Johnny Walk to School: Policy Recommendations for Removing Barriers to Community-Centered Schools," National Trust for Historic Preservation (2010). Available at: www.preservationnation.org/issues/historic-schools/helping-johnny-walk-to-school/helping-johnny-walk-to-school.pdf.

[43] Safe Routes to School Program Arizona Department of Transportation, "Active School Neighborhood Checklist," Arizona Department of Transportation, ver. 14, August 6, 2010. Available at: http://www.adotenhancement.com/SafeRoutes/PDF/Documents_Active_School_Neighborhood_Checklist.pdf.

Commonly accepted maximum walking/biking distances are:

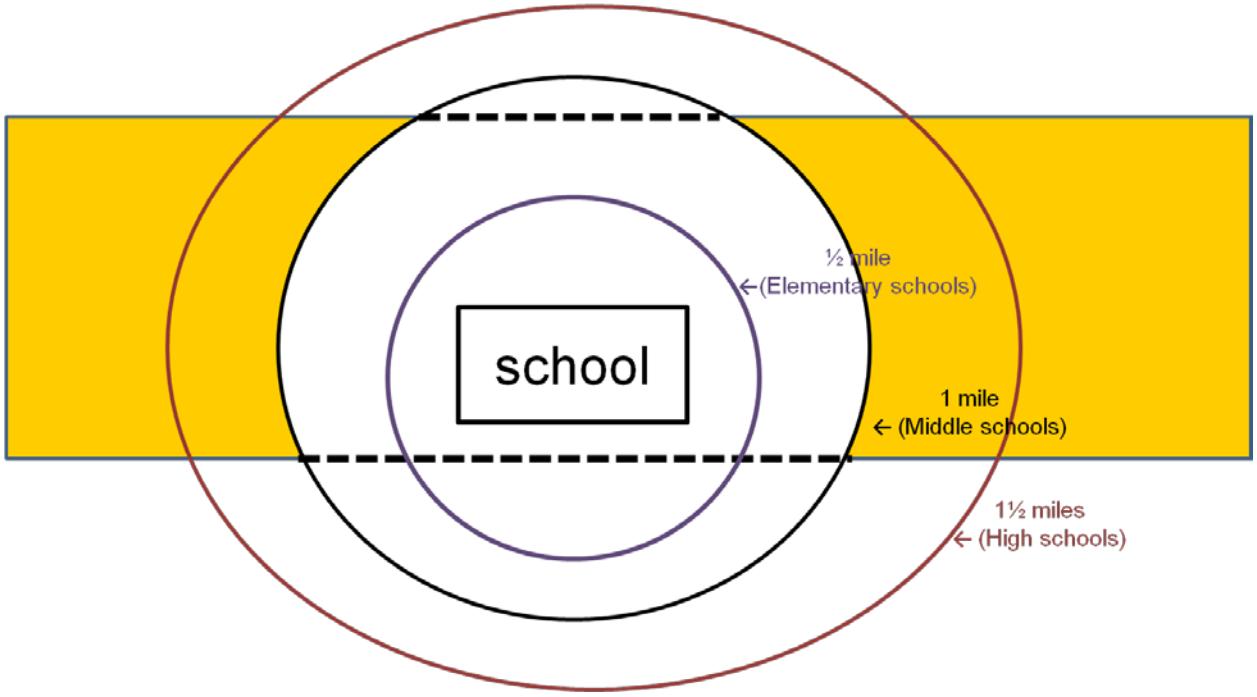
- Elementary schools: ½-mile radius around school;
- Middle schools: 1-mile radius around school; and
- High schools: 1½-mile radius around school.

The example in Exhibit 3, adapted from the "Active School Neighborhood Checklist" created by the Arizona Department of Transportation (www.adotenhancement.com/SafeRoutes/PDF/Documents_Active_School_Neighborhood_Checklist.pdf), shows a middle school enrollment area that exceeds one mile in radius and creates a prohibitively long walking/biking trip for students who live in the shaded areas.

4.3.4. Plan for and Develop Safe Routes to School Programs that Can Support Alternative Modes of Transportation

A growing number of communities are implementing measures to improve the safety of walking and biking to school. Many schools participate in a program funded by the U.S. Department of Transportation (DOT) called Safe Routes to School (www.nhtsa.gov/People/Injury/Pedbimot/Bike/Safe-Routes-2004/Index), which encourages both infrastructure improvements and education programs to help more children safely walk or bike to and from school. In addition to the federally funded program, many schools offer similar programs (also called safe passages or walk to school programs) that facilitate and encourage safe walking and biking to school. These programs often educate community members, families, students, administrators, faculty and staff on the benefits of walking and biking to school and on approaches to make walking and biking to school a safe alternative. Related efforts include improvements to existing infrastructure that

Exhibit 3: Example Enrollment Area that Creates a Prohibitively Long Walking/Biking Trip for Some Students



make routes to school safer and more convenient for walking and biking. More information about Safe Routes to Schools Programs can be found on the Resources page of the guidelines website. (www.epa.gov/schools/siting/resources.html#LINKS_Community_planning)

When planning for a new school location, the LEA and the SSC should consider ensuring that safe routes to school exist for children to bike and walk. In addition, transit connections near walking and biking routes may facilitate their use outside of the immediate school neighborhood. Factors related to walking and biking that should be considered include:

- The likelihood that bike lanes and paths, adequate sidewalks and crosswalks will be developed;
- Access to building entrances for pedestrians and bikers without crossing bus zones, parking entrances, or student drop-off and pick-up areas;
- Connectivity to transit lines for students outside the immediate neighborhood of a school;
- Bus flow plans that ensure pedestrian and bike safety;
- Accessibility for parents, students, teachers and staff with disabilities; and
- Walking and biking routes that do not cross or run adjacent to highways, other large roadways and transportation facilities (e.g., rail lines), and other large pollution sources.

Relevance of Childhood Obesity to School Locations

Today, nearly one in every three (or more than 23 million) children in the United States is overweight or obese, and physical inactivity contributes to this.[44] Children who carry their obesity into adolescence have up to an 80-percent chance of developing an associated chronic disease (e.g., high blood pressure, high cholesterol and diabetes).[45] This childhood obesity epidemic is the result of the interaction of three identified factors: genetics, behavior and environment.[46] Two of these factors are associated with an ever-decreasing amount of physical activity in the lives of our children due, in part, to how our communities are built. For example, a lack of sidewalks, safe bike paths and parks in neighborhoods can discourage children from walking or biking to school as well as from participating in physical activity. While childhood obesity does not discriminate across race and ethnicity, studies show that a disproportionate number of minority children are overweight and obese; while 30.7 percent of white children ages 2 to 19 are considered obese or overweight, 34.9 percent of African-American children and 38 percent of Mexican-American children are considered so.[47] Physical activity is especially important for youth not only because of its immediate health and academic benefits, but also because participation in physical activity tracks from youth into adulthood.[48] See Principle 3 (see Section 1.4.3) in the About the Guidelines section for further discussion (see Section 1).

[44] American Academy of Pediatrics Committee on Environmental Health, "The Built Environment: Designing Communities to Promote Physical Activity in Children," *Pediatrics* (June 2009) 123:6. 1591-1598. Online article available at: http://aappolicy.aappublications.org/cgi/content/full/pediatrics;123/6/1591.

[45] U.S. Department of Health and Human Services, "The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity," U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, 2001. Available at:: www.surgeongeneral.gov/topics/obesity/calltoaction/CalltoAction.pdf.

[46] Ibid.

[47] Cynthia L. Ogden, Margaret D. Carroll and Katherine M. Flegal, "High Body Mass Index for Age Among U.S. Children and Adolescents, 2003-2006," *Journal of the American Medical Association,* Washington, DC (May 2008) 299:20. 2401-2405.

[48] R.M. Malina, Institute for the Study of Youth Sports, Michigan State University, "Tracking of physical activity and physical fitness across the lifespan," *Research Quarterly for Exercise and Sport* (September 1996) 67(Suppl 3). S48-57. Available at: www.ncbi.nlm.nih.gov/pubmed/8902908.

4.3.5. Consider the Potential Use of the School as an Emergency Shelter

Although schools are built with a primary mission of providing education services to youth, schools can, and often do, serve multiple purposes for their communities. Schools located and designed to withstand natural disasters and terrorist attacks not only protect students, faculty and staff from harm, but can also serve as emergency shelters in the immediate aftermath of a disaster, particularly when proper emergency preparedness plans are coordinated among school officials, local emergency management authorities and voluntary relief organizations (such as the American Red Cross). In some jurisdictions, it may be required or encouraged for certain school facilities to be designed or available to serve as an emergency shelter for the community.

For some communities, schools may be the best suited structure to serve as a post-disaster shelter. Schools frequently contain gymnasiums or other large multipurpose spaces that can shelter large numbers of residents and frequently have food preparation and storage capacity. Further, school building locations tend to be well-known among residents and sited within the communities they serve. Because schools are public property, the financial costs of using school facilities temporarily are often minimal. Thus, choosing a school location that is central to the community and easily accessible to residents can aid in disaster preparedness, planning and recovery.

The Federal Emergency Management Agency, the Department of Health and Human Services, the Red Cross and other governmental and non-governmental entities have translated the lessons learned from Hurricane Katrina and subsequent disasters into better planning and operational considerations for both emergency and longer term community shelters. Links to these resources are available in the emergency planning section of the Resources page of the guidelines website. (www.epa.gov/schools/siting/resources.html#LINKS_emergency_planning_and_response)

4.3.6. Summary

Exhibit 4: Desirable Attributes of Candidate Locations is intended to summarize some of the important attributes for communities to consider in identifying candidate sites for school.

Exhibit 4: Desirable Attributes of Candidate Locations

Feature	*Description*	*Distance*	*Recommendation*	*Potential Benefit*	*References and Resources*[49]
No unacceptable environmental or public health risks	Poses the least potential for exposure and risks to children and staff from pollutants in air, soil and water	Site-specific	Conduct thorough and transparent environmental review of environmental risks	▪ Reduced risks to children and staff ▪ Avoid remediation costs ▪ Reduced potential liability and disruption due to environmental issues	*Meaningful Public Involvement* *(see Section 3)* *Environmental Review Process* *(see Section 5)* *Evaluating Impacts of Nearby Sources of Air Pollution* *(see Section 6)* *Quick Guide to Environmental Issues* *(see Section 8)*
Community facilities	Nearby community facilities, parks, public pools, etc.	½ mile	Locate school such that neighborhood resources are within walking/biking distance of schools and/or joint use is available onsite	▪ Ability to walk or bike to compatible student resources ▪ Reduced space required for parking ▪ Less air pollution ▪ Increased exercise	Community Centered Schools Resources Emergency Planning Resources Green/High Performance School Resources

[49] Visit the Resources website for additional information (www.epa.gov/schools/siting/resources.html).

Feature	*Description*	*Distance*	*Recommendation*	*Potential Benefit*	*References and Resources*[49]
Attendance boundary	Area in which most students live	½ mile to 1½ miles	Locate school such that a large portion of the student body lives within ½ mile (elementary) to 1½ miles (high school) of school	▪ Ability to walk or bike to compatible student resources ▪ Reduced space required for parking ▪ Reduced bus transportation costs ▪ Less air pollution ▪ Increased exercise	Community Centered Schools Resources
Neighborhood access via street connectivity and infrastructure	Presence of sidewalks, bike lanes, crosswalks, transit stops, etc.	½ mile	Ensure that safe routes to and from school are available for students	▪ Ability to walk or bike to compatible student resources ▪ Reduced space required for parking ▪ Reduced bus transportation costs ▪ Less air pollution ▪ Increased exercise ▪ Increased pedestrian and bike safety	Community Centered Schools Resources
Sensitive land preservation	Critical habitats, important farmland, parks, etc.	Site-specific	Avoid siting new schools on or in close proximity to existing sensitive land uses	▪ Preservation of critical land uses	Green/High Performance School Resources

Feature	*Description*	*Distance*	*Recommendation*	*Potential Benefit*	*References and Resources*[49]
Renewable energy	Potential to use alternative energy sources such as geothermal heat pumps, solar or wind	Site-specific	Make use of renewable natural resources for energy generation	▪ Contributes to green energy and sustainability	Energy Efficiency/Renewable Energy Resources Green/High Performance School Resources
Public water and sewer	Ability to tap into the public water supply and sanitary services; review the county sewer and water plan for boundary areas	Site-specific	If your school has to drill a well and become its own water source, it is a Public Water System and subject to the regulations of the Safe Drinking Water Act. If your school is on a septic system, you will need to determine if the soils are suitable according to tribal, state, municipal and/or county regulations.	▪ Little maintenance or upkeep ▪ No added regulatory or technical expertise needed to maintain a water and septic system ▪ Less costly to have municipal services	Water
Other infrastructure	Presence or absence of adequate roads, adequate traffic lights and telecommunication infrastructure	Site-specific	Take advantage of previous investments in infrastructure	▪ Avoided or reduced costs of building or extending infrastructure	Community Centered Schools Resources

4.4. Consider Environmental Hazards

The primary purpose of establishing environmental criteria for school siting is to guide the screening and evaluation of candidate school locations for natural, safety and environmental hazards to identify the location that poses the least potential health and safety risk to students and staff and financial risk to the community. While the typical steps and procedures that should be included in an effective environmental review are described in the Environmental Review Process section (see Section 5), this section describes some principles used to define environmental criteria and the typical environmental and safety issues that the school siting process should consider and address to ensure that the location chosen does not pose unacceptable environmental and public health risks. **EPA strongly recommends identifying and evaluating hazards associated with a location prior to taking title or ownership of that property, or in the case of leased space, prior to executing the lease.**

4.4.1. Potential Onsite Hazards

Current or prior site uses

A large number of properties in the United States have been contaminated by past uses or naturally occurring hazards, such as high levels of arsenic in ground water or radon in rock formations. Some of these properties fall under the oversight of EPA, in which case EPA works together with state, tribal and local authorities to assess and remediate the site. Other known contaminated properties may be under the jurisdiction of the Department of Defense, the Department of Energy or other federal land managers, such as the Bureau of Land Management or the Bureau of Indian Affairs in the Department of Interior, while others may be dealt with directly by state, tribal and local authorities. There is also an unknown number of sites that may be contaminated but have not yet been identified by federal, state, local or tribal authorities.

Applicability of the Guidelines

The school siting guidelines are NOT designed for retroactive application to previous school siting decisions. They are designed to inform and improve the school siting decision-making process from this point forward. In developing these guidelines, EPA seeks to strengthen information exchange and cooperation between LEAs, state and tribal education agencies and their environmental counterparts to better serve school children, parents, staff and their communities in providing safe school environments.

EPA recommends that districts periodically inspect existing schools for potential environmental health and safety risks using tools designed for that purpose such as EPA's Healthy School Environments Assessment Tool (HealthySEAT; www.epa.gov/schools/healthyseat/) or the NIOSH Safety Checklist Program for Schools. (www.cdc.gov/niosh/docs/2004-101/) Where deficiencies are found, steps to reduce student and staff exposure to potential hazards should be identified and implemented (see Section 9.13).

Documentation of contaminated sites can be housed in many different locations (e.g., federal or state environmental regulatory agency, local health or planning department, private property owner). This can make it difficult to find a complete record of the contamination history at the site. Efforts are underway to consolidate these different information sources through geospatial and Internet accessible methods. Currently members of the public can use EPA's MyEnvironment search application (www.epa.gov/myenvironment) to find a cross section of environmental information based on location. Additionally, members of the public can contribute to the information collection effort through their own recollections as neighbors or

Exhibit 5: Factors Influencing Exposures and Potential Risks

Potential Hazard	*Potential Variables*	*Potential Mitigation Options* ***N**=New schools* ***E**=Existing structure*
Air Pollution (see Section 8.1)	▪ Type and volume of contaminant released ▪ Distance from the source ▪ Nearby traffic type, fuel, volume and speed (mobile sources) ▪ Stack height, facility practices and type of pollution control employed (stationary/point sources) ▪ Timing of operations (stationary/point sources) ▪ Meteorological conditions (e.g., prevailing wind direction and wind speed) ▪ Atmospheric stability and mixing ▪ Regulatory compliance ▪ Intensity of use ▪ Presence of natural or man-made buffers (e.g., trees, hills, buildings) ▪ Planning and zoning	▪ Adopt an area-wide approach to address air pollution issues **(N/E)** ▪ Maximize distance from transportation or other pollution sources **(N)** ▪ Vegetation buffers **(N/E)** ▪ Anti-idling policies **(N/E)** ▪ Limiting bus or personal car use on and near campus **(N/E)** ▪ Enhanced indoor filtration/air cleaning **(N/E)** ▪ Locating sensitive activities and outside air intakes away from sources (e.g., locate playgrounds and classrooms away from source; place parking lots, utilities closer) **(N/E)** ▪ Timing of HVAC system operations **(N/E)** or industry operating periods **(N/E)** ▪ Limiting outdoor activities during high exposure periods **(N/E)**
Soil Contamination	▪ Type of contamination ▪ Extent of contamination ▪ Concentration of contamination ▪ Depth of contamination ▪ Potential transport (e.g., runoff or migration to ground water, air transport) ▪ Geology and soil characteristics ▪ Water table ▪ Access or exposure potential (e.g., dermal contact/ingestion) ▪ Barriers (e.g., plants, grass, ground cover, pavement)	▪ Site cleanup and removal **(N/E)** ▪ Onsite treatment **(N/E)** ▪ Engineering controls (e.g., cap, venting systems, vapor barriers) **(N/E)** ▪ Institutional controls **(N/E)**

Potential Hazard	*Potential Variables*	*Potential Mitigation Options* ***N**=New schools* ***E**=Existing structure*
Use of Agricultural Pesticides (see Section 8.12)	▪ Use pattern (application rate, crop type) ▪ Environmental conditions (wind, temperature, etc.) ▪ Toxicity of the pesticide ▪ Volatility ▪ Persistence	▪ Application of Integrated Pest Management measures to reduce pesticide use **(N/E)** ▪ Choice of pesticide active ingredients **(N/E)** ▪ Oversight and strict enforcement of product label use directions and drift restrictions **(N/E)**[50] ▪ Use of drift reducing application technologies and best management practices **(N/E)** ▪ Enhanced indoor filtration/air cleaning **(N/E)** ▪ Locating sensitive activities and outside air intakes away from sources (e.g., locate playgrounds and classrooms away from source; place parking lots, utilities closer) **(N/E)** ▪ Timing of HVAC system operations **(N/E)** ▪ Limit opening of classroom doors and windows during periods of potential spray drift **(E)** ▪ Limiting outdoor activities during high potential exposure periods **(E)** ▪ Notification when pesticides are applied **(N/E)**

[50] Buffer zones are specified on all pesticide product labels. The buffer zones provide flexibility based on several factors such as application rate, field size, application method, and soil characterization.

Potential Hazard	*Potential Variables*	*Potential Mitigation Options* **N**=*New schools* **E**=*Existing structure*
Ground Water Contamination	▪ Type of contaminant(s) ▪ Type and frequency of contact with contaminated water ▪ Type of contact with contaminated water/route of exposure (e.g., ingestion) ▪ Extent of contamination ▪ Concentration of contaminants ▪ Extent of vapor intrusion (for certain contaminants)	▪ Seek alternative drinking water sources or install water treatment systems **(N/E)** ▪ Restrict access to water bodies **(N/E)** ▪ Phytoremediation **(N/E)** ▪ Mitigation system for vapor intrusion **(N)**
Surface Water Pollution	▪ Type of contaminant(s) ▪ Type and frequency of contact with contaminated water/route of exposure (e.g., dermal) ▪ Extent of contamination ▪ Concentration of contaminants ▪ Stormwater runoff	▪ Improve riparian buffers **(N/E)** ▪ Restrict access to water bodies **(N/E)** ▪ Green roof, rain gardens and barrels **(N/E)**
Safety Hazards	▪ Frequency ▪ Intensity of hazard (e.g., explosion vs. flooding)	▪ Emergency response plans **(N/E)** ▪ Emergency shelter design incorporated **(N)**
Noise (www.epa.gov/schools/siting/resources.html#LINKS_noise)	▪ Distance ▪ Timing and intensity of source ▪ Presence of natural or man-made buffers (e.g., hills, noise barriers)	▪ Active noise control **(N/E)** ▪ Install or preserve noise barriers (e.g., highway barriers or other noise buffers) **(N/E)**
Odors	▪ Timing of operations ▪ Meteorological conditions (e.g., prevailing wind direction and wind speed)	▪ Locating sensitive activities and outside air intakes away from sources (e.g., locate playgrounds and classrooms away from source; place parking lots, utilities closer) **(N/E)** ▪ Enhanced indoor filtration/air cleaning **(N/E)**

4.4.3. Screening Locations for Potential Environmental Hazards

The initial screening process of identifying and narrowing potential school location choices takes into account a wide range of school siting considerations and challenges. Among the most important of these is to identify potential environmental and public health concerns as early in the process as possible to fully understand the potential costs and benefits of candidate locations before deciding to pursue a particular site. Unanticipated environmental issues can be extremely costly in terms of cleanup costs, time delays, community concern and potential loss of support for siting choices. A full understanding of the potential risks of candidate sites to ensure that a prospective school site does not pose unacceptable health and safety risks to students and staff is very important but can be costly and time-consuming. For this reason, it may be desirable to try to avoid sites that have onsite contamination or are in very close proximity to pollution generating land uses at the initial stage of identifying candidate sites if other acceptable locations exist in the community that may pose fewer environmental challenges.

Exhibit 6: Screening Potential Environmental, Public Health and Safety Hazards, below, contains a list of potential environmental and safety hazards that should be identified, evaluated and weighed, along with other factors, in choosing a school location. In general, the closer a potential hazard is to a candidate location for a school, the more important it is to gain an early understanding of the potential risks that may be associated with that hazard. Exhibit 6 is intended to be used in conjunction with the example Environmental Review Process (see Section 5) and with Evaluating Impacts of Nearby Sources of Air Pollution (see Section 6).

Screening perimeters can help the LEA and SSC quickly identify activities or features on or in the area surrounding a prospective school location that have the potential to pose a hazard to students and staff and warrant further evaluation. These include a wide range of potential ongoing sources of air, water and land contamination as well as features or activities that may pose safety risks from accidental releases. For potential school locations identified within the "screening perimeter" of an environmental feature, further study is warranted to ensure that the potential risks associated with that feature are not significant.

Screening perimeters are intended to facilitate:

- Rapid identification of land uses near candidate school locations that could potentially pose health and safety hazards to students and staff;
- Consultation with appropriate state, tribal, local and other authorities, local stakeholders and the public to assist with the evaluation; and
- Consideration of appropriate mitigation or separation strategies to reduce potential risks within the context of the broader school siting decision-making process.

Determining screening distances for various hazards is, to a large degree, a matter of best professional judgment. Several jurisdictions have adopted screening distances based primarily on existing state or local rules, law, ordinance, policy or guidance. Links to this information are provided on the Resources page of the guidelines website (www.epa.gov/schools/siting/resources). In the following table, EPA has included recommended screening distances based on existing approaches at the state and local level as *approximate* distances within which EPA recommends that potential hazards should be identified and considered for additional study.

NOTE: Screening distances are intended to identify potential land uses near candidate school locations that warrant further consideration rather than to identify land uses that may be incompatible with the location of schools. Screening distances, alone, may not be predictive of the actual potential for a source located within that distance to present an environmental or health hazard. Potential hazards associated with candidate school locations should be evaluated as part of the site screening and evaluation process.

Exhibit 6: Screening Potential Environmental, Public Health and Safety Hazards

IMPORTANT: This table is intended to assist with the initial screening of candidate locations but is NOT a substitute for case- and site-specific evaluation of potential risks and hazards. It is intended to be used in conjunction with the example Environmental Review Process (see Section 5) and Evaluating Impacts of Nearby Sources of Air Pollution (see Section 6). For more information on typical environmental hazards that may be encountered during the school siting process, see the Quick Guide to Environmental Issues in Section 8). Existing applicable federal, state, tribal or local statutes, ordinances, codes or regulations take precedence over the recommendations contained in this table. Users should check with state, tribal and local authorities for applicable requirements or other recommendations.

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Onsite buildings or structures (including all leased space)	▪ All onsite or adjacent buildings/structures slated for reuse, renovation or demolition.	▪ Legacy contaminants in existing structures including lead and other heavy metals, asbestos, PCBs, vapor intrusion/(VOCs), mold, radon, pesticides, pests ▪ For existing school buildings, chemicals from laboratory, art, shop, drama, maintenance, cleaning, grounds ▪ Structure may not meet current building codes (e.g., for seismic activity)	▪ All onsite structures slated for demolition, reuse or renovation	▪ Evaluate for the presence of hazardous materials or conditions. Age, location, condition and type of structure, and the history of use are critical factors to consider in assessing potential risks. Identify all potential hazards and remediate as appropriate.	▪ *Lead* ▪ *Heavy Metals* ▪ *Asbestos* ▪ PCBs ▪ *Vapor Intrusion/ (VOCs)* ▪ *Mold* ▪ *Radon* ▪ *Mercury* ▪ *Pesticides* ▪ *Air Pollution* ▪ *Risk Assessment*

[51] See the Resources page of the guidelines website for links related to the topics listed under the 'Additional Information.' (www.epa.gov/schools/siting/resources)

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Contaminated sites (formerly or currently regulated under Superfund, RCRA hazardous waste sites, state-regulated hazardous waste sites, or unremediated sites under federal, tribal or state orders or agreements for cleanup)	▪ Properties that have or are managing hazardous waste onsite, or have had releases of hazardous waste in the past, and are under federal (CERCLA, RCRA Subtitle C), tribal or state regulation.	▪ Air pollution ▪ Dust ▪ Soil contamination ▪ Ground water contamination ▪ Vapor intrusion into structures ▪ Surface water contamination ▪ Odors ▪ Accidental release/spill of hazardous chemicals	▪ Identify and evaluate all facilities within~1 mile of prospective locations ▪ Applies to both onsite as well as adjacent or nearby sites	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Regulating agencies should be consulted to obtain environmental status of the site, if it has been assessed. The site may have had contamination removed or addressed, and be safe for use, or the site may still need additional cleanup. The site should not be used for a school unless regulating agencies can confirm that the potential for unsafe human exposures has been prevented.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)* ▪ *Heavy Metals in Soil and Ground Water* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Solid waste landfills and transfer stations	▪ Properties that have or are managing non-hazardous solid waste.	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Vapor intrusion into structures ▪ Surface water contamination ▪ Odors ▪ Pests and disease vectors ▪ Diesel emissions and heavy truck traffic ▪ Fires	▪ Identify and evaluate all facilities within ~1 mile of prospective locations ▪ Applies to both onsite as well as adjacent or nearby sites	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Regulating agencies should be consulted to obtain environmental status of the site, if it has been assessed. The site may have had contamination removed or addressed, and be safe for use, or the site may still need additional cleanup. The site should not be used for a school unless regulating agencies can confirm that the potential for unsafe human exposures has been prevented.	▪ *Air Pollution* ▪ *Heavy Metals in Soil and Ground Water* ▪ *Vapor Intrusion/ (VOCs)* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Formerly Used Defense Sites (FUDS)	▪ Properties formerly owned, leased, possessed or used by the Department of Defense (DOD) or its components that were transferred from DOD control prior to the enactment of the Superfund Amendments and Reauthorization Act (SARA). The FUDS program communicates with regulatory agencies, tribes and the public to ensure proper characterization and cleanup of past DOD lands.	▪ Unexploded ordnance (FUDS) ▪ Discarded military munitions ▪ Munitions constituents ▪ Surface water contamination ▪ Ground water contamination ▪ Legacy contaminants in existing structures including lead and other heavy metals, asbestos, PCBs, vapor intrusion/(VOCs), mold, radon, pesticides, pests	▪ Identify and evaluate all facilities within ~1 mile of prospective locations ▪ Applies to both onsite as well as adjacent or nearby sites	▪ Consult with state, tribal and local authorities to identify sites.	▪ *Formerly Used Defense Sites* ▪ *Maps and Mapping* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
High-traffic roads and highways	▪ High-traffic roads or roads with heavy diesel truck traffic.	▪ Air pollution ▪ Noise ▪ Accidental releases/spills of hazardous chemicals ▪ Pedestrian and bike safety	▪ Identify and evaluate all high-traffic roads and highways within ~½ mile ▪ Roads farther away with a high likelihood of accidental releases should also be considered	▪ In general, air pollutant concentrations will be highest closer to the source, decreasing with distance from the road. Many factors affect the magnitude and extent of impacts, so the potential variables and mitigation options described in Exhibit 5 should be evaluated. Consider additional mitigation strategies for locations near high-traffic roads. Also, consider potential adverse consequences related to inability of students to walk/bike to school, etc.	▪ *Roads* ▪ *Air Pollution* ▪ *Noise* ▪ *Risk Assessment* ▪ *Water*
Distribution centers, bus terminals, bus garages and truck-stops	▪ Facilities with more than 100 trucks/buses per day, or more than 40 refrigerated trucks per day.	▪ Air pollution, including diesel emissions ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination ▪ Vapor intrusion ▪ Heavy truck or bus traffic	▪ Identify and evaluate all major distribution centers within ~½ mile ▪ Centers farther away with a high likelihood of accidental releases should also be considered	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options.	▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Large industrial facilities	▪ Fossil fuel power plants (more than 50 MW), incinerators, refineries, chemical/ pharmaceutical/rubber and plastics plants, cement kilns, metal foundries and smelters, other large industrial facilities.	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination ▪ Accidental releases/spills of hazardous chemicals ▪ Odors ▪ Heavy vehicular traffic	▪ Identify and evaluate all large industrial facilities within ~½ mile	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with local air quality agencies to determine sites with high concentrations nearby.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)* ▪ *Water*
Other large sources	▪ Metal platers (especially chrome), rendering plants, sewage treatment plants, composting operations, fertilizer or cement plants, large manufacturing facilities.	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination ▪ Accidental releases/spills of hazardous chemicals ▪ Odors	▪ Identify and evaluate all other large sources within ~½ mile	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with local air quality agencies to determine appropriate separation.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Gas stations and other fuel dispensing facilities	▪ Large gas station dispense more than 3.6 million gallons per year.	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Vapor intrusion into structures ▪ Heavy vehicular traffic	▪ Identify and evaluate gas stations and other fuel dispensing facilities within ~1,000 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with state, tribal and local authorities for applicable requirements. ▪ Evaluate for spills, leaking underground storage tanks, potential air emissions.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Underground Storage Tanks* ▪ *Vapor Intrusion/ (VOCs)*
Dry cleaners	▪ Facilities using perchloroethylene or similarly toxic chemicals.	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Vapor intrusion into structures	▪ Identify and evaluate dry cleaning operations within ~1,000 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with state, tribal and local authorities for applicable requirements. ▪ Consult with local environmental agencies to determine locations with high concentrations.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Other area/small sources	▪ Auto body shops, furniture manufacturing and repair; wood product manufacturing or processing; printing, electronics and chip manufacturing; charbroilers, commercial sterilization, back-up generators; small neighborhood metal platers	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination ▪ Odors ▪ Vapor intrusion into structures	▪ Identify and evaluate other small sources within ~1,000 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with local health and/or environmental agencies to determine locations with high concentrations.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping*
Large agricultural growing operations	▪ Operations employing aerial pesticide spraying	▪ Air pollution (from volatilization and drift) ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination	▪ Identify and evaluate all large agricultural growing operations within ~3 miles	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options.	▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Water*
Large concentrated animal feeding operations	▪ Animal feeding operations	▪ Air pollution ▪ Soil contamination ▪ Ground water contamination ▪ Surface water contamination ▪ Odors	▪ Identify and evaluate all animal feeding operations within ~1 – 3 miles	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with local health and/or environmental agencies to determine locations with high concentrations.	▪ *Concentrated Animal Feeding Operations* ▪ *Air Pollution* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Ports	▪ Marine ports with more than 100 truck visits/day	▪ Air pollution ▪ Noise ▪ Soil contamination ▪ Surface water contamination ▪ Heavy vehicular traffic ▪ Accidental releases/spills of hazardous chemicals	▪ Identify and evaluate all port facilities within ~1 mile ▪ Ports farther away with a high likelihood of accidental releases should also be considered	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options.	▪ *Air Pollution* ▪ *Noise* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)*
Rail yards, intermodal freight terminals and major rail lines	▪ A major service and maintenance rail yard; Rail lines serving more than 50 trains/day (excluding electric light rail, except for safety)	▪ Air pollution ▪ Noise ▪ Odors ▪ Soil contamination ▪ Ground water contamination ▪ Vapor intrusion into structures ▪ Accidental releases/spills of hazardous chemicals ▪ Fire/explosions ▪ Safety ▪ Large truck traffic	▪ Identify and evaluate all major rail yards, intermodal freight terminals and rail lines within ~1 mile ▪ Rail facilities farther away with a high likelihood of accidental releases should also be considered	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with local air quality agencies to determine locations with high concentrations. ▪ Consider additional mitigation approaches.	▪ *Air Pollution* ▪ *Noise* ▪ *Risk Assessment* ▪ *Maps and Mapping* ▪ *Vapor Intrusion/ (VOCs)*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Rail lines	▪ All rail lines (excluding electric light rail)	▪ Air pollution ▪ Noise ▪ Odors ▪ Soil contamination ▪ Ground water contamination ▪ Physical hazards due to derailment ▪ Hazardous cargo spills ▪ Train road crossings and access to rail tracks	▪ Identify and evaluate all rail lines within ~1/2 mile ▪ Rail lines farther away with a high likelihood of accidental releases should also be considered	▪ Evaluate on a case- and site-specific basis. Evaluate safety based on cargo, speed, traffic, etc. See Potential Variables under Exhibit 5. ▪ Consult with local air quality agencies to determine locations with high concentrations. ▪ Consider additional mitigation approaches.	▪ *Rail Yards and Rail Lines* ▪ *Maps and Mapping* ▪ *Noise*
Airports and heliports	▪ All commercial and military airports, consider flight patterns/runway configuration	▪ Safety concerns near runways ▪ Noise ▪ Air pollution	▪ Identify and evaluate all locations within ~2 miles from runways	▪ Evaluate on a case- and site-specific basis. See Exhibit 5 for potential variables and mitigation options. ▪ Consult with state, tribal and local authorities for applicable requirements. ▪ Consult with local air quality agencies to determine locations with high concentrations.	▪ *Airports* ▪ *Maps and Mapping* ▪ *Noise*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Power lines	▪ High voltage power lines more than 50 kV.	▪ Exposure to electromagnetic fields ▪ Safety concerns if power lines fall	▪ Identify and evaluate all high voltage power lines within ~500 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Consult with state, tribal and/or local authorities for requirements. ▪ Variable, depending on voltage and if lines are above ground or below ground.	▪ *Power Lines* ▪ *Electromagnetic Fields*
Cellular phone towers	▪ All cellular phone towers and antennas.	▪ Exposure to electromagnetic fields ▪ Fall distance of towers	▪ Identify and evaluate cell towers within ~200 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Review and apply Federal Communications Commission regulatory guidance.	▪ *Electromagnetic Fields*
Hazardous material pipelines	▪ Oil pipelines, high pressure natural gas pipelines, chemical pipelines, high pressure water lines.	▪ Soil contamination Ground water contamination ▪ Accidental release/spills of hazardous materials ▪ Fire/heat from flammable fuels ▪ Flooding/erosion from water ▪ Explosion hazard	▪ Identify and evaluate hazardous material pipelines within ~1,500 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ No hazardous pipelines on site (except natural gas serving school).	▪ *Pipelines* ▪ *Maps and Mapping* ▪ *Water*

Feature/Land Use	*Description*	*Potential Hazard(s)*	*Recommendations*		*Additional Information*[51]
			Screening Perimeter	*Evaluation*	
Reservoirs, water or fuel storage tanks	▪ All aboveground large volume liquid storage tanks	▪ Potential for inundation in an accident ▪ Surface water contamination ▪ Ground water contamination ▪ Vapor intrusion into structures ▪ Air pollution	▪ Identify and evaluate reservoirs, water or fuel storage tanks within ~1,500 feet of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Evaluate drainage direction and emergency planning options.	▪ *Aboveground Storage Tanks* ▪ *Maps and Mapping* ▪ *Water*
Geologic features	▪ Earthquake faults, liquefaction zones, volcanic/geothermal activity, landslide/lahar zones, flood zones, methane zones, naturally occurring hazardous materials (examples: asbestos, uranium, radon) areas, etc., reservoirs, high water table	▪ Natural hazards ▪ Air pollution ▪ Soil contamination ▪ Surface water contamination ▪ Ground water contamination ▪ Dust ▪ Moisture intrusion	▪ Identify and evaluate potential geologic hazards within ~¼ mile of prospective school locations ▪ Applies to both onsite as well as adjacent or nearby locations	▪ Evaluate geologic/ geotechnical hazards for every location.	▪ *Natural Hazards* ▪ *Maps and Mapping*