

**City of Milwaukee Commitments  
to  
Stormwater Management, Environmental Remediation and  
Geotechnical Improvements  
for the  
Shops Property  
March 2006**

The City of Milwaukee is redeveloping the former Shops area (Site) into about 70 acres of light industrial space and another 30 acres of greenspace for stormwater management / recreational use. The greenspace will be used for both active and passive recreation.

The Site is a former heavy industrial site (i.e., rail yard) that was originally built in the estuary of the Menomonee River. As such, there are issues with floodwater/stormwater management, environmental contamination, and soil conditions. The City is making extensive investments in addressing those issues during the redevelopment process. This memorandum summarizes the commitments that the City is making to stormwater management, environmental remediation, and geotechnical improvements to the Site. By providing this summary, the City hopes to provide important Site background information to prospective developers.

**Stormwater/Floodwater Management**

Integral to the overall redevelopment of the Site is an approximately 30-acre area of greenspace known as the “Stormwater Park”. The Stormwater Park includes the area dedicated to future soccer fields, walking trails, and a central stormwater management area for the 70 acres of industrial land use. The handling and treating of stormwater is an integral part of the overall greenspace design. Stormwater will not be treated through a conventional detention pond, but rather a series of filtering processes that are part of the Park’s landscape. This approach should meet both water quality and quantity requirements by which all new development needs to comply. Thus, developers are not required to dedicate their own space for stormwater management or construct a site-specific stormwater facility.

The City will:

- Build the stormwater park, including the stormwater treatment component.
- Obtain initial permits from the WDNR.
- Install the storm sewers along public streets/alleys for drainage from future development sites.

The responsibilities of future developers will be to:

- Provide the drainage infrastructure for their properties to public storm sewers.
- Obtain an individual permit from the WDNR to connect to this regional facility.
- In addition, the City would like to encourage good onsite stormwater management practices that further reduce pollutant runoff and will thereby extend the life of the stormwater treatment facility.

The Stormwater Park – both the recreational and stormwater treatment aspects – will be managed by the City or a public/private partnership. A typical declaration for business parks will be developed through which annual fees will be assessed to property owners for the maintenance of the stormwater treatment systems. Thus property owners will contribute to the maintenance costs but will not have direct responsibility for maintenance of the stormwater facility.

The Site is currently in the regulated flood plain and is listed as a flood fringe area. Because the Site will be raised as part of filling, the Site will be removed from the regulated flood plain. The City will eventually work through FEMA to develop new flood plain maps.

### **Environmental Remediation**

The City is making significant investments to address environmental issues at the Shops. The general remediation approach consists of placing several feet of soil over the existing contaminated soil and monitoring groundwater long-term. Free product will be recovered in a very limited area. “Hot spots” of soil have been removed. The goal of the City is to achieve an NR 726 flexible closure for the Site. Thus future property owners will not be required to manage environmental closure of their sites.

The City will:

- Undertake soil and free product management required for WDNR closure.
- Perform long-term groundwater monitoring associated with closure
- Convey the property to the developer with the assurance that the property is or will be closed.
- Provide an onsite placement area for impacted soil that is excavated as part of future developments.

Future developers will have some responsibilities to comply with site closure requirements. These are:

- Provide long-term right-of-entry agreements to the City so that they can access monitoring wells for groundwater sampling. The wells will be located at locations mutually agreeable to the developers and the City. Wherever possible, monitoring wells will be located on public right of way.
- Agree to maintain the 2-foot clean soil cover (or acceptable equivalent)– either through the final design of the landscaping, building, or parking areas.
- Acknowledge that soil generated during the excavation of building foundations, utilities, truck docks or other structures may need special handling and placement. The handling, transport, and placement of those soils to an onsite placement area are a developer responsibility. The City will provide an onsite placement location. The developer will not have long-term responsibility for those soils relocated onsite but are only responsible for their relocation.

In addition, methane generation is a potential issue across the entire Valley. Many new buildings constructed during the past decade in the Valley included passive methane/soil gas management systems. The need for methane abatement is very site specific. Developers will need to assess their own needs for a methane gas management system.

## **Geotechnical Requirements**

The City has completed a geotechnical engineering site feasibility study of the Site. The study indicates that a variety of geotechnical conditions could affect future building design. These conditions include:

- A layer of organic silts and soft clays that will pose the potential for settlement. The thickness of the organic silt layer varies across the Site.
- Relic floor slabs, sewers, and foundations from the Milwaukee Road facility and other developments.
- The addition of ten feet of compacted structural fill across the Site.

The City intends to address the existing soil conditions such that relatively lightweight, single story, industrial buildings can be built on shallow footings. Settlement sensitive equipment and process may require special foundations. Heavier or multi-story buildings would likely require piles. However, as with any site, it is emphasized that each potential owner will need to conduct their own comprehensive geotechnical exploration and site analysis to determine design characteristics for their planned development. The City has collected extensive data across the Site and will make all data available to prospective developers.

The City is addressing soil conditions by the following.

### Monitoring Long-term Settlement of the Organic Silt and Soft Clay Layer

- The City filled the Canal Street corridor in early 2004. As part of that effort, it is undertaking settlement monitoring associated with the additional roadway embankment soil loads. Most settlement of the underlying native organic silts and soft clays is expected to occur within the first year of filling. The roadway embankment monitoring results will be made available to the future owners. Again, each potential owner will have to conduct its own geotechnical evaluation and make its own determination of settlement potential, based on the Site specific soil conditions, expected building/structure loads and their settlement tolerance.
- Other settlement plates are being installed across the Site as various sections are filled. Settlement data will be collected during 2004 and 2005 and will be made available to developers.

### Addressing Relic Structures

- The former Milwaukee Road facility built a system of stormwater and process sewers to drain the Site. The City is making reasonable attempts to locate and abandon these structures. In particular, sewers more than 18-inches in diameter and less than 6-feet below existing ground surface are being abandoned. Sewers greater than 6-feet below grade will be left in place as is. After the additional fill is placed on the Site, these sewers will be at depths generally greater than 15 feet below the new ground surface.
- The existing building slabs and roads will be broken in place. Breaking the slabs will serve two purposes. First, it will help verify that there are no relic structures under the slabs. Second, if the developer deems necessary, it will allow piles to be pushed through the broken slabs in the future, if needed in areas conducive to piling. All known relic structures will be mapped and the location provided to the potential future owners. Some parts of the Site have had many known structures and others had very few known structures. The presence of buried structures will vary across the Site.

### Compaction of Additional Recent Fill Placed on the Site

- The development portion of the Site will be filled to a depth of about 10 feet. The City is treating this portion of the Site as an engineered fill Site. The City is only accepting material suitable for building pad construction as Site fill and the fill will be compacted and tested to at least 90% Modified Proctor value. Soil compaction results will be available for the developer to review.

The responsibilities of the developer will be to:

- Conduct its own geotechnical investigation, as required for any building project.
- Using the information provided by the City and other data it may choose to collect as part of its own investigation, design its own building foundations, floor slab and utilities consistent with the requirements of that particular building.

**Attachment B  
Shops Development Site  
Geotechnical Limitations**

The redevelopment of this 100-acre Site for industrial/commercial use is the focus of this technical memorandum. The Redevelopment Authority of the City of Milwaukee has a goal of entering into developer agreements as soon as the Site is filled to final grade in 2005/2006. There are a number of limitations that the City, and developers, should be aware of on this Site that will affect constructability depending on which portion of the Site is being considered.

**History--Summary**

The Site area was almost entirely used as a series of rail yards, with parallel sidings and main line tracks, maintenance shops for rolling stock, locomotive repair shops, roundhouses and ancillary buildings supporting these facilities. The Site was a former large marshy estuary associated with the Menomonee River that opened onto Lake Michigan. It was filled in, starting about 1875, beginning at about 44<sup>th</sup> Street and along the north bluff (present I-94 location), until about 1890.

**Subsurface Conditions—Summary**

The entire development area is thus underlain by organic clay and peat deposits of the marsh that are now buried under approximately 8 to 20 feet of mixed rubble, cinder, foundry sand and clay fill. Larger buildings in the CMC Shops area were founded on timber piles, and in some cases steel piles, driven through the fill and organics into the dense lake sands that underlie the entire Site. Bedrock ranges from approximately 30 to 80 feet below grade prior to filling depending on location. The groundwater table is approximately even with the Menomonee River that bounds the Site on the south and east, that is, about 6 to 8 feet below grade prior to filling. In summary, the large wetland marsh still exists, but it is entirely covered by the mixed fill.

**City Demolition Work—Summary**

The Site will have a major arterial road, West Canal Street, traversing it from NE to SW that is being built first, ahead of general Site preparation. This means the street will be on an elevated earthen embankment initially, that will be later filled against from both sides.

In 2004 and 2005, the entire Site was raised to create building pads, but also to bring the entire development Site above the 100-year floodplain elevation.

There are several hundred thousand square feet of concrete slabs remaining from the buildings. The slabs are generally about 6-inches to 12-inches thick. Slabs have been broken in place to a size of approximately 1-foot pieces. By breaking the slabs, the City was better able to determine the conditions around and under the slabs and where sub-surface structures exist. Concrete structures at or near the ground surface were demolished. Some of the former buildings had basements that were filled in with loose rubble when demolished in the years between 1993 and 2001. All known basements, utility vaults, and other sub-surface structures are being exposed

and mapped on record drawings. Where filled in with debris, these basements have been cleaned out and structurally backfilled with crushed stone and/or compacted fill. Removal of some of the larger utility lines crossing the Site was completed. Sewer pipes larger than 18-inch diameter located within 6 feet of pre-filling grade were excavated and crushed in place. Smaller diameter pipes were left in place as-is, if located within 6 feet of pre-filling grade. All pipes regardless of size were left in place if located below 6 feet of the pre-filling grade.

All relic structures could not be practically removed. Some footings, piles, and smaller diameter sewers remain. These relic structures may be underneath future building footprints, causing a potential for differential settlement of new buildings built over them. The existing fill lying between and around the relic structures remains in place. The existing fill was buried under new fill as discussed below.

### **Filling the Site**

The Site is in the process of being filled an average depth of ten feet. Compaction of new fill will be controlled by inspection and testing: Compaction to at least 90% Modified Proctor (ASTM D-1557) Density will be the minimum standard. This level of compaction should achieve an approximately 2,000 psf allowable bearing capacity within the fill mass. However, each potential owner should perform a geotechnical engineering exploration and analysis to determine design characteristics for their planned development and risk tolerance.

New fill over both these dissimilar elements will help spread out future foundation loads, but will not eliminate the potential for differential settlement. The greater the fill depth, the more these risks are reduced.

The addition of the new fill material placed over the relic structures and older fill will exert new downward pressures, re-starting, or accelerating settlement. The underlying native organic layers below these elements may experience some additional settlement also. It is difficult to predict how much settlement will occur and exactly where it will occur. Some Site areas will experience next to nothing, while others could settle up to 5 inches over ten years.

A way to better control the potential for settlement is to leave the new fill in place for 1 to 2 years and/or accelerate the settlement rate by using wick drains or drawdown wells on the future building sites. Settlement plates are being placed in the fill areas to monitor the rate and magnitude of new fill induced settlement.

### **Limitations for Development**

#### Deep Foundations—heavy building loads

Much of the Site will have limitations for the development of buildings requiring deep foundation support systems. In general, this will be any structure exceeding three stories, and any reinforced or precast concrete structure exceeding two stories. Many underground obstructions from residual foundations, piles, sewers, and structures remain, particularly in the northwest and

northeast quadrants of the Site. Historically, there were very few structures in the southeast corner of the Site and deep foundations can be considered in this area.

In addition to encountering obstructions due to pile driving or drilled shaft installations, the Site is underlain with environmentally-impacted soil. The Wisconsin Department of Natural Resources (WDNR) has restrictions to driving deep foundation units through such soils, because the units can become downward migration conduits for impacted groundwater that can contaminate deeper, clean, substrata.

#### Shallow Foundations—light building loads

The Site is not be restricted for light building loads that can economically be supported by spread footing systems. Despite rigorous field efforts to expose subsurface conditions, there will be voids under these footings from historic uses of the Site, particularly in the northwest portion of the Site. Site-specific designs for foundations, floor slabs, and utilities are expected to be more rigid than standard and need to be evaluated by each potential owners design team.

The mass Site-filling and grading was designed to surcharge the softer, natural subsoil underlying the Site. However, long-term settlement of the deeper organic clays may continue for many years, creating superficial cracking, or even structural distress to walls, floor slabs and utilities. The thickness of deeper organic clays varies across the Site. The organic soils are generally thicker in the northern half of the Site compared to the southern half. Again, long-term settlement potential will need to be addressed on a site-specific basis.

The amount of this residual settlement potential is on the order of 1 to 4 inches, and possibly more if the permanent water table is ever drawn down below present levels. This might happen as a result of low adjacent river levels, covering most of the Site with paved surfaces, or if organic soils above the water table continue to lose support by internal decay of their organic fractions.

The total amount of settlement that could be experienced is the sum of the above primary and secondary consolidation of the organic substrata and the primary consolidation of the new fill mass itself due to increased loads. Though the fill mass was subject to rigorous compactive effort and placement in thin lifts, some settlement, of up to approximately 1 inch, may occur within the fill mass itself several years after filling operations are completed. The sum of potential settlements at building pads could thus be on the order of 2 to 5 inches.

Further, because remaining building foundations were left in place in many areas, new buildings straddling these buried structures may experience some settlement in places and none at all in other, adjacent parts of new buildings or utility lines.

As a result, on a preliminary basis, maximum allowable soil bearing values in the compacted fills should not exceed 2,000 psf for footings placed in the upper 5 feet of the placed fill, and should not exceed 1,500 psf for footings placed from 5 to 8 feet into the newly-placed fill. Even with these low allowable bearing values, differential settlement exceeding 1 inch to 2 inches could occur between building columns spaced at 30 to 40 feet. Building structure types and exterior

walls, floor slabs and utilities should be designed with this amount of settlement potential considered.

An option for light building load construction would be to place buildings and foundations on floating-slab construction at final grade, supported by a free-draining bed of 12 to 16 inches of open-graded crushed gravel. Drainage and insulation to reduce frost heave needs to be considered with this type of system. This option would provide the most positive means of reducing differential settlement.

#### Loading Docks, Depressed Slabs, Basements

Loading docks typically are depressed 4 to 5 feet below finished grade floor elevations. By adding more fill to the entire Site at building pads, there will still be 4 to 5 feet of new, compacted soil under loading dock slabs. Drainage utility lines at loading docks may be deep enough to encounter obstructions in some areas of the Site, and developers should be aware of that possibility.

Basements are not recommended for any building pad on this project. Waterproofing would be required; impacted groundwater will be encountered during excavations; the strata at the bottom of basement excavations will be old, loosely-placed mixed rubble and clay, rather than the controlled, compacted upper new fill mass.

Elevator pits are not recommended for any building pad on this project, but may be a necessity for some building types. Pits should not extend deeper than 7 feet below final building pad grades, for the same reasons as above for restricting basement construction.

#### Utility Lines—New Construction

All underground new laterals from under buildings are expected to be placed in the new fill materials that will exist by the time building pads are ready for construction. These lines are expected to perform with a minimum of settlement deformation, except as noted above. Deep lines that will be placed more than 10 feet below grade will encounter obstructions that cannot be removed. These lines will also encounter groundwater that may, or may not, be contaminated, depending on the Site location.

#### Paved Areas and Parking Lots

There will be no restriction on the construction of on-grade pavements and parking lots associated with building pads other than to maintain a cover. Please note that the mass-grading fills will be clays with high frost-susceptibility. Their equivalent CBR-values for the mass-graded fill will generally exceed 5, meaning that soil support indexes will allow the design of both flexible and rigid pavement for truck traffic.



## Disclosure of Current Data

The City will make all geotechnical data from the Canal Street and Shops Sites available to any developer for review. The City will also make all compaction testing data on the mass fill/grading and documentation of all demolition work available. Known relic slabs, foundations and utility lines left in place will be documented and mapped; these maps will be made available to developers as well.

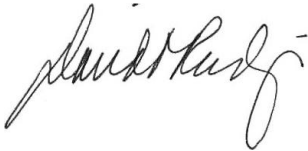
## Disclaimers

Even with fulltime inspection of demolition and compaction operations, neither Milwaukee Transportation Partners (MTP) nor the City of Milwaukee can guarantee that obstructions will not continue to exist below the newly-placed fill mass, or that settlement of up to 5 inches may not occur over a ten year period or longer at building pads. The Site is still fundamentally a filled-over marsh. Each potential owner must have a site specific geotechnical engineering exploration and analysis performed so that they can evaluate the cost and potential risk to their operation.

If greater assurances of settlement performance are needed for developers, then settlement monitoring and attendant observations should continue for 24 months after the mass filling is completed. The deeper the new fills are on this Site, the better the likelihood is that settlement will be more uniform and that it will occur earlier.

Any planned building construction should be accompanied by an independent geotechnical engineering exploration and analysis, as would be the case on any site. In fact, developer agreements should state specifically that the developer or builder is not relying exclusively on the City-supplied information, as the purpose of the City preliminary investigations was not to provide specific geotechnical design information for final design of a specific building, pavement, and associated utilities of any particular type or loading at any specific location.

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