APPENDIX

THE HISTORY OF FLUSHING MEADOWS CORONA PARK

THE HISTORY OF THE FMCP

The following history of the Flushing Meadows Corona Park site is based in part on Technical Support documents for the 1988 Plan report prepared by Skidmore Owings and Merrill. Not very much has changed to affect these notes in the intervening years.

Like much of the land on the north shore of Long Island, the land comprising Flushing Meadows Corona Park (FMCP) lies north of a glacial terminal moraine and was formed during the second of three advances of Early Wisconsin era glacial ice. The moraine is composed of sand, gravel, clay, and boulders that were pushed ahead of the glacier. North of the terminal moraine are estuarine deposits of organic silts and peat, lake deposits, and ground moraine materials. The ground moraine formed at the same time as the terminal moraine, but developed at the base of the glacier and up until the late 1800s, much of the FMCP area was covered with wetlands.

In 1907, a prolonged period of fill of the area began when contractor Michael Degnon bought up large tracts of salt meadows along Flushing Creek and arranged with the City of New York to collect and deposit 1,000 cubic yards of yard sweepings per day onto 350 acres of the marsh. Degnon also contracted with the Brooklyn Ash Removal Company to dump ash from thousands of city homes in the marshlands.

Flushing Bay was dredged several times, beginning in 1913, so that by 1917 approximately ten million cubic yards of dredged materials had been added to Degnon's acreage. In the 1920's, fill in the Flushing Meadows reached as high as 90 feet above the old marsh level. Much of this fill was malodorous and unsightly. People called the area "Corona Dumps" and "Mount Corona". It was described by F. Scott Fitzgerald in The Great Gatsby as a "Valley of Ashes ".

The Dumps remained largely empty until 1937, when New York City's Department of Parks Commissioner Robert Moses undertook a major rehabilitation of the area in preparation for the World's Fair of 1939.

1939 World's Fair

In 1935, a group of civic-minded commercial leaders in New York, embraced the idea of sponsoring a World's Fair as a means of alleviating regional economic distress. The purpose of the "Fair of the Future" (renamed "Building the World of Tomorrow " by World's Fair Corporation President, Grover Whalen), was to show the most promising developments of products, services and social factors of the day in relation to their bearing on the life of the people.

The Fair was to be divided into seven sectors to correspond to functional divisions of modern living: Production and Distribution, Transportation, Communications and Business Systems, Food, Medicine and Public Health, Science and Education, and Community Interests.

Moses chose the marshlands and dumping grounds of Flushing as the site of the 1939 World's Fair. He secured State and Federal funds and initiated a major reclamation scheme to create an ordered landscape of lakes and plantings on the ash fill. A total of 1,216 acres were developed, with the large central portion of the site reserved for a main exhibit area, and the narrow southern end developed into an amusement zone around a man-made Meadow Lake.

The Grand Central Parkway, built in 1932, was widened to accommodate additional traffic traversing the World's Fair site. At the north end of the site were the elevated tracks of the IRT subways and the tracks of the Long Island Railroad (LIRR) and parking lots. A new, temporary LIRR station was constructed north of the Trylon and Perisphere; and a spur of the IND subway ran north from Kew Gardens along the eastern edge of the site with stations at Willow Lake and the Amphitheater to provide direct service to the site. Bridges across Grand Central were widened to accommodate added pedestrian traffic.

The plan of the 1939 World's Fair was organized in a radial concentric plan with fan-like segments. The central axis ("Constitutional Mall") extended eastward from the Fair's focal point; the Trylon and Perisphere (a 610-foot-high triangular tower and a 180-foot diameter sphere), to the oval Lagoon of Nations and beyond to the Court of Peace, which was flanked by foreign-sponsored pavilions and terminated by the U.S. Government Building. Other buildings were situated in outlying plazas linked by Rainbow Avenue, a north-south cross-axis which bisected the axis of the central mall.

Approximately 45 million visitors came to the first New York World's Fair. Total cost of permanent improvements to the site as a direct result of the Fair was $59 million. Other nearby public works which were built at this time included the Bronx-Whitestone Bridge and the Queens-Midtown Tunnel. LaGuardia Airport was built upon ash removed from the Riker's Island ash dump.

The 1939 Fair was a cultural landmark, but a financial failure; no profits were made.

With the closing of the 1939 Fair plans of a rebirth as a public park would have been carried out but the plan was never fully realized due to a lack of funding and the subsequent outbreak of World War II.

The Plan for the Park to be built after the 1939 Worlds Fair closed, and which were never realized, were illustrated in an article by Francis Cormier in the September 1939 issue of Landscape Architecture Magazine. The development of this plan between 1936 and 1939 tells an intriguing story of the changes in attitude to public park design at the time. (Fig. 1, Fig. 2).

The first plan from 1936, (Fig. 1) illustrated a combination of formal, axial promenades and buildings on the west side of the Core Area and a much looser, almost Olmstedian open spaces to the east, ringed by the Flushing River following, presumably, its original course. This plan was supplanted by a much more grandiose, Beaux Arts "General Development Plan" (Fig. 2) developed after the formation of the World's Fair Board of Design in 1936 under the direction of Robert Moses. This plan incorporated many of the elements which dominate the park today; an axial arrangement of paths and boulevards linking

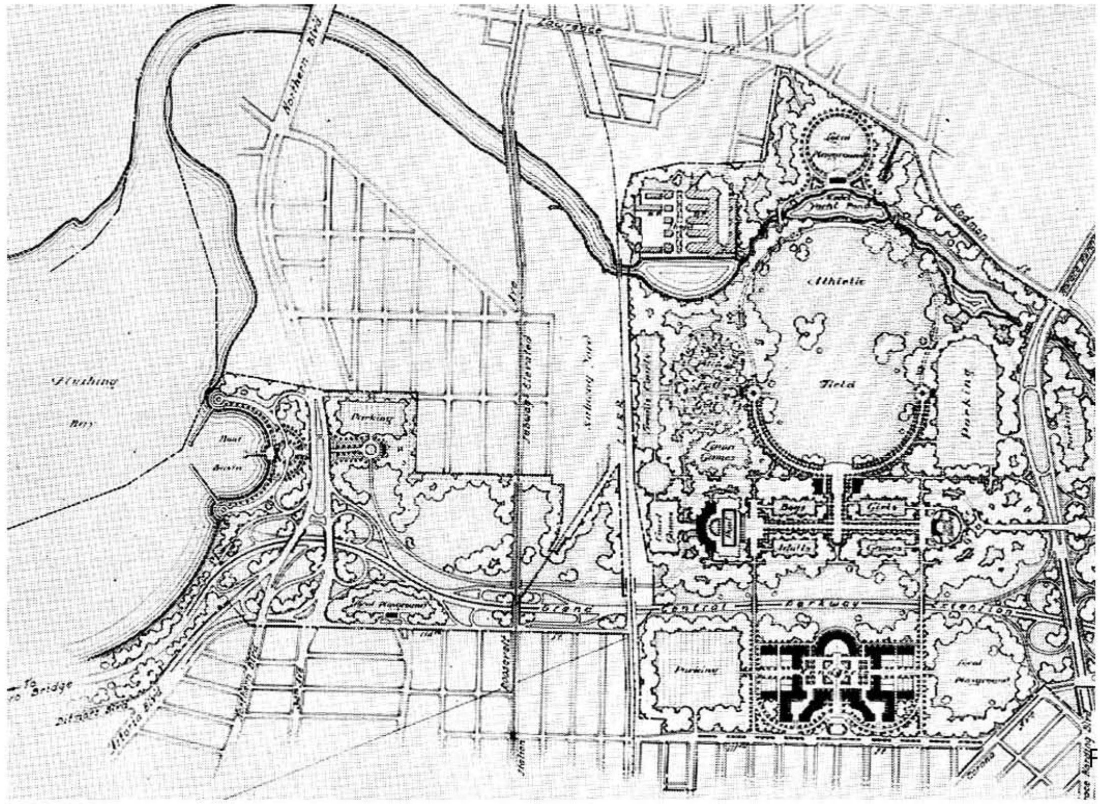

Fig. 1

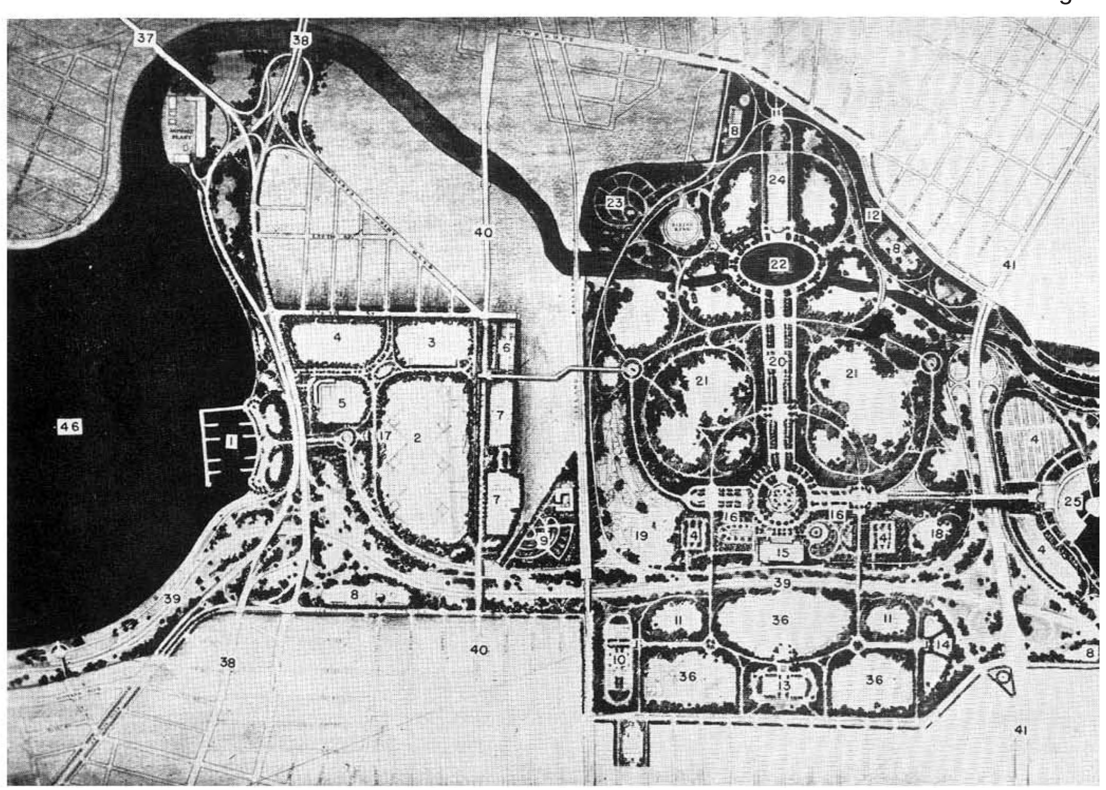

Fig. 2

formal pools, including a Model Yacht Basin on the site of what would become the Fountain of the Planets in the 1964 Fair. It should be noted, however, that even in this much more rigid plan, the open green areas between the site of the Perishpere and Trylon (now the Unisphere) and the Yacht Basin were more loosely planned and lacked the insistent radial path system which dominate today's core area.

Post War Reconstruction

The 1940s and 1950s were a period of post-Fair reconstruction. Elements remaining from the World's Fair included the pathways and circulation system, plantings, New York City Building, Ederle Amphitheatre and Pool, boathouse, tide gate, and Time Capsule.

From 1946 to 1950, the City Building in the Park was used as the temporary home of the United Nations. The site was also proposed for the permanent headquarters of the United Nations. In 1947, the State of Israel was created at a United Nations Session held at the Park. The presence of the United Nations spurred extensive restoration of parkland within and in the vicinity of Flushing Meadows.

1964 World's Fair

In the early 1960s, Robert Moses presided over a second World's Fair to be held at Flushing Meadows. The theme of the Fair was "Man's Achievement on a Shrinking Globe in an Expanding Universe." At this time the Park consisted of 1,258 acres of generally open land with limited facilities for ice skating at the City Building, swimming and water shows at the State-built Gertrude Ederle Amphitheatre, the Flushing Bay Marina, the World's Fair Gardens on Parade, ball fields, picnic areas, open play areas, and playgrounds.

The 1964 Fair adopted much of the same infrastructure as the 1939 Fair; however the focal point was the Unisphere, a large, stainless steel globe on the site of the Trylon and Perisphere in a court between the New York City Building and the Court of the President of the United States, beyond which, at the end of what was formerly Constitution Mall, lay The Fountain of the Planets and Pool of Industry. Three 1939 World's Fair structures remained: the Ederle Amphitheatre, the Meadow Lake Boathouse, and the New York City Building. Pavilions from different nations were situated on radial axes around the Unisphere. These were flanked in an outer ring by corporate exhibit buildings heralding American industry, including: General Motors, Ford Motors, Chrysler Corporation, The Bell System, General Electric, and IBM.

Permanent improvements to the Park included moving the "Gardens on Parade" to Kissena Corridor Park as the basis for a future Queens Botanical Garden. The Flushing River was relocated to an underground culvert, to emerge briefly if unrecognizably in the Fountain of the Planets, and piped to a lagoon. In addition, several facilities were built in the Park, such as the Hall of Science, New York State Pavilion, Singer Bowl (now the USTA/National Tennis Center), Passerelle Building, the Post Office, (now the Maintenance Building), Press Building, Administration Building, Pools and Fountains, the Unisphere, Port Authority Heliport (now Terrace on the Park), World's Fair Marina, Shea Stadium, and various sculptures.

Aerial Photograph of FMCP, ca. 1951. Credit: New York City Parks Photo Archive

Aerial Photograph of FMCP, ca. 1967. Credit: New York City Parks Photo Archive

Of the 1964 World's Fair structures, the Hall of Science, New York State Pavilion, Passerelle Building, Fountain of the Planets, Unisphere, Marina, sculptures, and Shea Stadium remain today. The Singer Bowl, renamed Louis Armstrong Stadium, is now part of the NTC facility, Shea Stadium has been renovated, and the Port Authority Heliport has been converted into Terrace on the Park, a catering facility.

The 1964 Fair occupied about the same space as the earlier Fair, but it had taller buildings, more exhibits, and greater attendance. Over a six-month period, approximately 57 million people came to the Fair. This was considered poor attendance. Total investment in the Fair was about one billion dollars, and physical improvements to the site cost $220 million. The Park was known as Flushing Meadows and was later renamed Flushing Meadows-Corona Park by Council resolution.

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Flushing Meadows Corona Park Transportation Plan

Transportation Issues of Flushing Meadows Corona Park (FMCP):

- Scale and lack of significant densities

  The scale of FMCP is such that accessibility to the various destinations within the park is difficult. The event locations within the park are spread out and difficult to reach on foot or by bus. Residential densities around the park are also relatively low thus limiting the number of persons that can walk into the park.

- Limited transit service and long distances to transit stations

  There is only one subway station in the park served by only one NYCT subway line (the #7 line stop at Willets Point Shea Stadium). Other subway lines are further away from the park. Bus service is also limited, with most buses driving through the park rather than serving the park.

- Limited pedestrian access

  The park is surrounded by expressways and has limited pedestrian access points. Some of these access points have been closed.

- Auto-orientation

  Because of its location, its scale and low densities, the park has a strong auto orientation.

- Highly peaked activities with lots of congestion

  Shea Stadium and the USTA National Tennis Center produce highly peaked activities causing tremendous activities and congestion during very short time periods. In addition, these two generators need very extensive supplies of parking, thus introducing large areas of pavement that further detract from the pedestrian friendliness of the park.

Transit Service Issues
Besides the Willets Point/Shea Stadium stop of the #7 line, FMCP is not served well by transit. The distances to the other NYCT stations are fairly long. A station that has greater subway service, but is further away is the Forest Hills/71st Street station served by the E, F, R, V and G lines. A short distance from this NYCT station is also the LIRR station at Forest Hills. This LIRR station is served by the main line LIRR trains, as opposed to the LIRR station at Shea stadium which is only served by the Port Washington line trains and only when Shea stadium is active.

The NYCT bus routes are not oriented towards serving FMCP. The main purpose of these routes is to serve larger communities in Queens, and therefore tend to pass through the park rather than serving it.

Queens Cultural Trolley: This trolley bus service had a very long route, serving several low-volume activities with very limited service. It operated on Saturdays and Sundays from noon to 6pm, with only 3 runs per day. The trolley did not serve the subway stations. This service was too dispersed and the number of runs was too limited to provide an effective and reliable transit service. With only 3 runs per day there was not enough flexibility for the users to visit a particular destination and then hop on the next bus to take them to the next event.

Potential Transit Solution
Operate a shuttle/feeder route connecting the Forest Hills LIRR and NYCT stations to the major destinations in FMCP in a relatively direct route. A potential route could be: Forest Hills transit stations, west side of Meadow Lake, Queens Museum of Art, Queens Zoo, Hall of Science, USTA, Shea Stadium, recreation areas in north east corner of the park, boathouse on the east side of Meadow Lake, and then the same route back. This route should be operated on a more frequent basis, possibly half-hour headways. This shuttle route may operate on weekends only, possibly on weekdays during the summer vacation months (July and August). Its schedule should accommodate the schedules of the persons employed in the park, as well as the visitor schedules.

Potential Pedestrian Improvements
Pedestrian access from adjacent neighborhoods is limited due to the barriers created by the expressways all around the park. Some former access points have been closed. Circulation paths in the park are in need of significant repair.

Reopen pedestrian overpasses, create new pedestrian path between new recreation center off College Point Boulevard and the pool. Undertake a comprehensive walkway upgrade program.

Bicycle Circulation and Strategies
The scale of FMCP lends itself to bicycle circulation. Clear bicycle paths should be established with bicycle racks at all major activity points.

Transportation Management Strategy
Due to the large variety of activities taking place in the park and the potential overlap of large crowd

events such as the Met games, the US Open and various cultural festivals, there is a need to coordinate these events and the associated transportation and parking strategies. A Transportation Management Association (TMA) including representatives from the Mets, USTA, Museum, Zoo, Hall of Science, Terrace on the Park, Parks and Recreation, etc. should be created. This group will communicate among themselves regarding upcoming activities and how to avoid or minimize negative impacts. They will also act as a lobbying group to encourage the various government agencies to improve FMCP. The TMA will also have an important management responsibility in the common use of some of the shared infrastructure elements (parking, roadways).

Transportation Plans for Low Activity Days, High Activity Days and Special Events

Due to the varying nature of activities in the park and seasonal peaks there is a need to have different transportation plans. On low-activity days (weekdays for most of the months except July and August) the plan should allow relatively easy auto access, maybe greater automobile access than is allowed today. During the low-activity days it is desirable to encourage greater presence of larger numbers of visitors, whether they walk or they drive. Providing two-way vehicular access around all or most of Meadow Lake may be one alternative for low –activity days. This can be achieved as long as the vehicles are forced to drive slowly, and their speeds are controlled through traffic calming devices (speed humps, speed tables, raised pedestrian crossings, chicanes, etc.)

On high-activity days (weekends throughout the year and weekdays in July and August) vehicular access should be limited to offer more room to pedestrians, bicycles and shuttle buses. The definition of high-activity and low-activity days can be further refined based on actual experience and visitor counts.

Special event days will require transportation and parking programs tailored towards each event. These special event programs may involve the following: 1) expansion of the shuttle bus service discussed above by having more frequent shuttle service, possibly express service and larger buses; 2) special shuttle buses to/from the Jamaica Station; 3) park-and-ride services to/from other large parking areas. These special event programs will need to be well advertised via a special web-site and media outlets. They will also need to be coordinated with local variable message boards at the entry points to FMCP.

Separating the Transportation Modes or Shared Pathways with Traffic Calming

A key question is to what degree the various travel modes (auto, shuttle, bicycles, pedestrians) in FMCP should have their own right-of-way. Whereas separate right-of-ways or lanes may be desirable, this may be difficult to achieve and may require additional pavement in the park. Another option would be to share the pathways among the various users. Shared pathways are feasible as long as the speeds of the faster modes (auto, bicycles) remain limited.

These design decisions need to be taken individually for each pathway segment in the park, taken into consideration the expected magnitudes of flows for each mode, the importance of separating the modes and the available widths. Providing a separate bicycle lane in a shared roadway may actually be less safe than letting everyone share the same roadway, because of the “empowerment” that the bicyclists feel in that lane, induces them to higher speeds and less attention. This could lead to more dangerous conflicts with pedestrians, compared to a situation where there is no bicycle lane.

String of Activities

One way to create better linkages in the park is to organize the activities in the park in such a way where they are easily accessible by foot, bicycle or shuttle bus. This calls for aligning the activities within a reasonable route so that the users can easily move from one to the other. A string of activities is more accessible than a series of dispersed activities distributed all over the park.

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Flushing Meadows Corona Park Stormwater Management System

It is difficult to limit my focus on the existing issues of drainage and stormwater management, after reviewing the information on the history and various human activities on this site. However, the simple fact is that we will never restore the original natural drainage system that existed here, nor would we wish to, given our need for recreation and open space in the city. So much has taken place on this land that we are limited to developing innovative solutions on the surface. Any attempt to understand the sub-surface conditions must be confined to those portions of the site where we need to take corrective actions for surface restoration or structures, which seem unlikely, at least for the immediate future.

I found the discussion of alternatives and further investigation by John Roebig quite interesting and informative, and I concur with most of his conclusions with respect to restoration of water quality in the lakes. My impression of the current program needs of the Park, however, is that they are unlikely to undertake a massive dredging program without substantial new funding and new building requirements, and if these develop they will take place elsewhere on the site.

Thus my recommendations are limited to those concepts that the Parks Department can implement on the site, within the constraints of time and money, specifically on the surface elements of the site.

Park Office Building (Olmsted Center)
It is difficult to understand how the Park Department can function in a building site that is so impacted by local drainage conditions. Since the building seems to be situated in a depression, the only structural answer is to create a drainage system surrounding the structure which will intercept both surface runoff and sub-surface groundwater. A trench drain surrounding the building would be somewhat intrusive and require a number of pedestrian crossings, but is the least expensive solution, with relief by gravity or mechanical pumping during rainfall. Lacking an alternative location on higher ground, this solution could be designed and built with limited funding. A combination of structural and landscape materials should both solve the issue and improve aesthetics for the building. We need to demonstrate how to solve drainage issues within the Park, and we should start here.

Highway Run-on to the Park
The current flow of stormwater to the property from the surrounding highways, especially on the west side near Meadow Lake, is both a nuisance and detracts from site usage. Since we need all the fresh water we can capture, but must remove the pollutants flushed from the impervious surfaces and the sediment eroded from the park site, we must design a landscape/drainage system to intercept and clean this runoff. Given the existing surface and sub-surface materials, we will probably use a mix of vegetated areas with suitable vegetation and drainage elements along the park edge. Since the source of this runoff is the roadway network and expansions are planned, the cost should be supported by highway funds rather than limited Park dollars, although the design should be retained by the Park to assure a system that protects our operations and water quality.

The development of a landscape/drainage solution could be applied at a number of other locations throughout the park, with the dual benefit of healing the land surface and reducing pollutant inflow to the park. We could label this approach as “bioremediation”, a term that has come to describe such a design. Again, the capital cost of such measures should be affordable and might be applied elsewhere in the Park system.

Surface Parking
The demand for parking at the various facilities on site, both temporary and permanent, suggests that we need a new type of design solution to mitigate the runoff produced by the current impervious surfaces. The use of porous pavements of different types (AC, PCC, pavers, etc) underlain by gravel storage/infiltration beds is an excellent solution in many locations, and should be tested as a demonstration system, again as a possible model for a number of locations, both in this and other parks. We have designed such systems for over twenty-five years, and are currently working on demonstration sites in other park locations. The subsurface conditions would need to be tested in any such locations, since the “soil” is complex at any given location.

On the larger scale, the new surface parking for Citi Field should use this technology, to eliminate the runoff and pollutant load to surface waters. I do not know how the Park can influence the current design, but it should raise the issue with the powers that be. A massive impervious surface is the last thing that we want to build within the Park, and is totally inconsistent with the stated city goals of building sustainably. This change in drainage design should not result in any increase in capital cost, and would serve as an excellent example of how to improve water quality in Flushing Bay.

Where we plan to use lawn areas as temporary parking during large festivals, we should investigate pervious vegetated surfaces that might be more durable for this heavy usage. We might also consider the use of turf surfaces with drainage systems in fields that are currently bare or severely compacted. We need a surface design that can serve these diverse functions and still look attractive. The elimination of chemicals for lawn maintenance would also be a positive step in reducing our surface waters, since phosphorus is considered the primary cause of eutrophic conditions in the lake.

Reduction of Impervious Surfaces
A number of pathways and roadways within the park could be eliminated, reduced in size or re-constructed with pervious surfaces that reduce runoff. As the function of portions of the site have reverted from exhibition areas to parkland, a "softening" of the landscape with increased vegetated elements has not taken place. We need to create more "people friendly" spaces that complement the intense recreational usage, especially on the west side, and also allow the off site visitor to enjoy the landscape as part of the visitation experience.

Surface Water Quality
This is a difficult issue on the site, since we are burdened with sub-surface contaminants, residues in the surface matrix (I hesitate to use the word "soil mantle"), on-going pollutant inputs from runoff (or run on), and tidal waters that are also severely polluted. Without massive intervention and removal of contaminants, we are faced with using the existing rainfall as our only source of clean water for recreation. This suggests the capture of all rooftop rainfall for any landscape feature that uses water, such as fountains or landscape irrigation. The use of reservoir water that has been conveyed a hundred miles for any function other than potable use seems wasteful at best. For those structures that could serve this function, we should investigate such storage elements and re-use systems. Several of our massive rooftops would be an excellent source of clean water, and become an asset rather than a nuisance. We have designed such systems, large and small, and believe it is a solution for both water quality and quantity.

The surface water bodies could be improved by contiguous wetlands, but where this requires extensive earth moving the risks of contaminant exposure present severe constraints. This may be the most difficult aspect of the Park restoration process, and many of the alternatives proposed by John warrant further investigation.

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1. Site History

a. Site was former tidal marshland

b. Between 1906 to 1934 site was filled with ash and garbage

c. Converted to a Park and used for 1939 World's Fair.

d. Tidal dam was built across Flushing Creek.

i. (reduce flooding and halt tidal action)

ii. Dammed Flushing Creek Phosphorous release (Eutrophic conditions)

e. The two lakes were dug out to provide topsoil to cover the ash.

f. The lakes were connected to Flushing Creek and water levels controlled by the tidal dam and supplemented by pumping wells. The wells and pumps were designed to pump ground water into Meadow and Willow lake for the World's Fair as a means of maintaining water levels and a higher water quality by increasing the flushing rate of the lakes.

g. The site was once again the site of the World's Fair in 1964-1965.

2. Existing Conditions:

a. Most of the site adjacent to the lakes consists of layer of ash fill of varying thickness with a thin covering of topsoil.

b. The bottom of the lakes have a thin (6") layer of fluid, black mud (high water and copper content), another (4-6 feet) of salt marsh sediment (organic matter mixed with clay; lower water and copper content than top) and below this a harder, low phosphorus sandy layer.

c. Underlying the ash is compressed meadowmat, clay, peat, silt and peat.

d. Some areas contain high concentrations of lead and residual petroleum which causes a major aesthetic problem, as evidenced by algal blooms and aquatic weeds.

e. Predominant algae is blue-green, commonly creates nuisance conditions.

f. Predominant aquatic weed is potamogeton; depending on the species can provide good habitat value if not over abundant.

g. From 1962 to 1965 applied large quantities of copper sulfate. The application of copper sulfate pentahydrate or other chelated copper compounds was the most common method of (in-situ) treatment of algae. Copper sulfate treatment methods and dosage varies greatly with the specific lake or reservoir being treated since at high dosages it can have a detrimental effect on fish and other biological life. If used regularly it can build up high levels of copper in the sediments. During the world's Fair, I understand that they wanted the lakes to be crystal clear and most likely used huge quantities of copper sulfate as an algal control. Copper sulfate is still used in lakes and reservoirs along with Alum and other water quality treatments.

h. Phosphorus (not nitrogen) is limiting nutrient.

i. Sources of phosphorus are in the surficial bottom sediments and the underlying marsh sediments

j. Groundwater constitutes about 95% of the phosphorus loading.

k. A 99% reduction in phosphorus loading would be required to go from eutrophic to Mesotrophic.

l. Tide range in Flushing Bay approximately 7 feet.

m. Presently they are giving lessons in Meadow Lake for sailing and kayaking.

3. No-action alternative.

a. Concept:

i. Do nothing

b. Pros:

i. Low cost

c. Cons:

i. Lake water quality would continue to deteriorate; causes of the poor water quality, phosphorus and contaminants would remain.

ii. Lakes would continue to fill in.

iii. Invasive species would continue to dominate and spread.

4. Dredge the Lake Sediments (to 12' and dispose sediments off site).

a. Concept:

i. Dredge entire lake to 12' (min) depth.

ii. Combine the two lakes into one large lake. This alternative was brought up during the recent Olympic bid and would require further study.

iii. Remove sediment off site to regulated landfill.

b. Pros:

i. Remove deep, nutrient rich peat and sediments

ii. Greater depth allow for added recreation activity (12' for Olympic rowing).

iii. Improve water quality, enhance habitat for aquatic species and improve angling.

iv. Would perhaps triple the lake volume.

c. Cons:

i. Dredging to remove the (2 meter deep) nutrient rich peat layer would be require additional study and expense.

ii. Disposal of possibly contaminated sediments would be difficult (particularly expensive if material is required to be disposed of in a regulated landfill).

iii. It would change the historic value of the two lakes.

d. Recommendations:

i. Best alternative for future Olympics. Presently, New York City does not have any intention to put in future bids for the Olympics. This alternative is very expensive so HDR does not recommend this alternative.

5. Selectively Dredge the Lake Sediments.

a. Concept:

i. Dredge some areas to 10-12 feet and fill other areas of the lake.

ii. Reconfigure bathymetry and topography to provide a better balance of land and water and improve habitat value and increase topographic diversity.

iii. Cap sediments that are high in phosphorus and/or contaminants with clay.

iv. Maintain same volume.

b. Pros:

i. Provides a better balance of open water and upland areas.

ii. Gives the public more land for activities.

iii. Selectively remove deep, nutrient rich peat and sediments

iv. Allows for some greater depth as fish refuge.

v. Improve water quality improvement

vi. Allow for improved boating and fishing

vii. Ecosystem improvement, by enhancing habitat, sequestering contaminants and controlling and removing invasives.

viii. Maintains the same volume of water may be easier to permit.

ix. Allows for low level of long term management

x. Maintains essentially the shape and character of the existing lakes.

xi. Improves lake habitat value at relatively low cost.

c. Cons:

i. Dredging to remove and reconfigure the (2 meter deep) nutrient rich peat layer would require some study and some dredging expense.

ii. Disposal of any contaminated sediments would be expensive, although this could be minimized by balancing cut and fill as much as possible.

d. Recommendations:

i. Best alternative for habitat and passive recreation.

ii. Reuse dredge material to reduce cost and reconfigure the landscape.

iii. HDR recommends this alternative (see final recommendations).

6. Cap High phosphate and contaminated layers with Clay.

a. Concept:

i. Seal layers to trap phosphorous and contaminants.

b. Pros:

i. Improve water quality.

c. Con:

i. May not make a significant change in lake condition without the dredge options.

d. Recommendations:

i. Use this in conjunction with a dredging option.

7. Pump and Treat

a. Concept:

i. Reengineer 7 existing groundwater pumping stations.

ii. Treat water to remove phosphorous and run through created wetlands.

iii. Use lake water to spray irrigate newly planting areas and at the same time renovate water before it returns to the lake.

b. Pros:

i. Improve water quality

ii. Has a lot of potential in the maintenance of long term water quality.

c. Con:

i. Initial cost Expensive.

ii. Long term energy costs and disposal sediment has associated maintenance costs.

iii. May not make a significant change in lake condition without the dredge options.

d. Recommendations:

1. Expensive with no guarantee of success.
2. Could be used in conjunction with other options.
3. This alternative would require additional study in order to determine its cost/effectiveness.
4. HDR recommends exploring these options by examining condition of the old pumps and

examine the spray irrigation and wetland treatment options.

8. Remove the Tidal Dam on Flushing Creek

a. Pros:

i. Return lakes to tidal ecosystem

ii. Good habitat if other measures are taken.

b. Cons:

i. Area will flood.

ii. Flushing creek poor water quality.

iii. Recovery to a tidal system would still be compromised by phosphorus, contaminants and invasives.

iv. Alternative would require major hydrologic study to determine impacts.

c. Recommendations:

i. HDR does not recommend the removal of the tidal dam.

9. Treat Invasive Species with Herbicides; Renovate Substrate and Replant

a. Concepts:

i. Treat Phragmites with Rodeo (two years)

ii. Import, loamy sand or sand soil.

iii. Plant emergents, shrubs and tree clumps.

b. Pros:

i. Improve habitat value and aesthetics

c. Cons:

i. Would require NYSDEC permits and approval.

d. Recommends:

i. Once a comprehensive plan has been develop, have pre-app meeting with NYSDEC to see if approval is possible.

ii. HDR recommends exploring this alternative further, particularly some limited treatment in combination with selective dredge alternative.

10. Treat Aquatic Invasive Species (Snakeheads) and Restock

a. Concepts:

i. Treat Lake with a fish toxicant such as Rotenone.

ii. Drawdown the Lake to have less volume and treat with chemical such as Lime that may be more toxic to the Snakeheads.

iii. Restock with native fish (e.g. warm water such as bass and bluegills)

iv. Replant with plants that provide good aquatic habitat.

b. Pros:

i. Improve habitat value and aesthetics.

ii. Improve fishery resources and recreational value.

c. Cons:

i. Would need to obtain permits and approval from NYSDEC.

d. Recommends:

i. Once a comprehensive plan has been developed, have pre-app meeting with NYSDEC to see if approval is possible.

ii. HDR recommends exploring this alternative further but combined with perhaps the selective dredge alternative to ensure removal of the Snakeheads.

11. Natural Controls;

a. Concepts:

i. Cut back and/or remove stormwater pipes flowing into Meadow and Willow Lakes replace with open swales.

ii. Direct stormwater runoff to constructed treatment wetlands (Biofilters).

iii. Plant trees and shrubs to shade out phragmites,

iv. Turn Willow Lake into Forested Wetland.

b. Pros:

i. Improve water quality

ii. Sustainable solution.

iii. Improve habitat value

iv. Will shade out and keep out invasives with minimum management.

c. Cons:

i. Will take a long time to improve water quality

ii. Open water would continue to fill in and be lost reducing the recreational value of the lakes.

d. Recommendations:

i. Good strategy to use in combination with other faster solutions.

ii. HDR recommends this alternative (see recommendation section).

12. Conclusions

a. Need to decide on the final use of the lakes for choosing best alternative that would best improve park quality and integrate lakes into use of parkland.

b. Lakes lack depth and diversity.

c. A water quality problem of Flushing Meadows lakes is one of eutrophication due to high phosphorus and aesthetics due to algal blooms and rooted aquatic plants. There are three major alternatives (all expensive) for dealing with the water quality problems. The first (1) is to dredge the bottom of the lakes to remove the phosphorus rich sediments. The second (2) is to separate this layer from the lake water by putting a clay cover on the lake bottoms and the third (3) is to treat of groundwater through a re-circulating and treatment system.

d. Weeds can be controlled by application of herbicides.

e. Dredging the Lake would have long term beneficial consequences.

f. The effects of the proposed project as sort-term consequences are outweighed by the long-term benefits of enhanced water quality in Flushing Bay and Creek

g. A proper cover layer should be placed over the ash adjacent to the lakes to prevent exposure.

13. Next Steps

a. Develop a Conceptual Plan with some restoration alternatives.

b. Discuss Plan and alternatives to develop a consensus among Parks, NYCDEP, and NYSDEC.

c. Collect initial data to test feasibility of selected alternatives.

d. Develop a comprehensive plan

e. Identify sources of stormwater for abatement.

f. Conduct required data (e.g. Sediment Sampling for Disposal and Surficial sampling where grading or construction would remove soil.)

g. Develop contract documents.

14. Preliminary HDR Recommendations:

a. Selectively dredge both lakes and reconfigure bathymetry and shoreline to improve habitat, aesthetics, recreational activities (e.g. fishing, boating, walking and bird watching.)

i. Based on transects taken of the two lakes (Lawler Matusky and Skelly, 1987) the shorelines of both lakes are very steep and drop very abruptly (about three feet), not allowing good shoreline vegetation. The shoreline could be reconfigured as a more gradual shallow littoral zone. This area can be replanted with native emergent aquatic plants. Beyond this aquatic bench the grade should drop quickly to control aquatic plants in the lakes basin.

ii. Most of the land area is on the east side of Meadow Lake whereas most of the population is on the western side. (East side is mostly a cemetery) the shoreline could be reconfigured to provide additional land area on the west side of the lake and provide access to the water for fishing and boating.

iii. Selected areas could be made by excavating the 3 meter peat layer deep enough to leave the underlying blue clay. The top sediments of both lakes is composed of fluid black mud with high water and copper content. This layer is about 1 ½ feet in Meadow Lake and only about 6-8 inches in Willow lake. This would remove the high phosphorus peat layer to reduce phosphorus levels in the lake. Areas not dredged or fill areas could be capped with the clay to seal other high phosphorus source sediments. Additional sand and gravels could be brought in to improve substrate.

b. Treat stormwater with constructed treatment wetlands (biofilters).

i. Perhaps 5-10% of the water inflow to the lakes is from runoff from the Park and Grand Central. This stormwater could be effectively treated by interrupting these storm water pipes and running the water through constructed wetlands. The long term pollutant removal rate of phosphorus by constructed wetlands is about 45%. This would significantly reduce the overland flow contribution of phosphorus.

c. Treat lake water to remove Snakeheads and restock with desirable species.

i. While lakes are drawn down, to facilitate dredging, treated the small volume of water to remove the snakeheads.

d. If feasible, utilize upland areas for spray irrigation and renovate water with constructed wetlands.

e. Treat invasive plants (phragmites) with herbicide.

i. An early pre-app meeting with NYSDEC would determine if this would be allowed by DEC. Phragmites could be sprayed in the fall with Rodeo, stalks cut during the winter and retreated the next fall. The area could be regraded to add ground surface hydrologic diversity.

ii. Bring in sandy topsoil to restored substrate.

iii. Replant with native herbaceous, shrubs, and trees.

f. Provide controlled access of pedestrians

i. Develop river walk along shoreline of Meadow Lake with perhaps planted safety bench to keep pedestrians at safe distance from the lake edge and prevent erosion.

ii. Restrict access to Willow Lake accept for birding groups or scientific studies.

iii. Provide some hardened fishing access points in Meadow Lake.

iv. Provide some bird blinds for bird watching in Willow Lake

g. Develop long term recommendations for reducing pollution sources.

i. Reduce impervious cover in the park to encourage infiltration.

1. Replace pavement with porous pavement.

ii. Work with MTA to control runoff from the site and perhaps phase out the MTA facility.

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Flushing Meadows Corona Park Signage, Identity & Way Finding

Signage Existing Conditions
The existing park-wide signage contains the remnants of an earlier program, probably neither maintained nor updated for 20 years or so. As a result, today's needs are either ignored entirely or satisfied with a variety of improvised signs, none of which follow the original program.

This present day confusing mix of uncoordinated messages and sign supports, while not numerous enough to actually litter the landscape, nevertheless do little to aid the visitors wayfinding needs. Nor do they send a message of a well-kept and organized facility.

Confusion starts with the park map itself which paints an idyllic picture of an endless greensward of over 1200 acres punctuated with lakes, cultural institutions and recreational facilities. Reality is somewhat different; the various highways and roads that crisscross the park are ignored.

The large pylons of the existing program are obviously meant for vehicular traffic; their related, scaled-down versions speak to pedestrians although neither are concise enough in their messaging or placement to be very effective. In addition, since they "express" the look and feel of the park, they neither present a positive image of what the park actually is nor what it aspires to be.

At present the permitted use of various roadways and paths is confusing. When using an assumed pedestrian path, the visitor is in danger of being run over by a vehicle. Mostly, the existing signage does not distinguish the various paths, made more confusing in areas where there are dual paths of vehicle width.

Observations and Guiding Principles for Future Signage
In our view, a successful program for the park needs to consider the following:

- **Identity**
  A fresh and newly designed program will be an opportunity to present an image of a park that is well-run and serves visitors with a wide variety of intent, whether it be personal recreation, organized sporting events or a cultural experience.

When reviewing nomenclature specifically, we should consider shortening the unwieldy name. Dropping "Corona" and using just "Flushing Meadows Park," an earlier name, would make it more easily recognizable on signage and printed materials. In addition, it presents a picture of a park without an urban appendage attached, creating a positive impression. As the third largest park in the City's system it would gain from an alignment with the simplicity of "Central, Prospect or Forest Park".

The park's identity today is very much connected to its history, particularly to the two World's Fairs. Consequently, a simple interpretive program highlighting the history and perhaps featuring installations and memorabilia could enhance the visitor's experience, adding to the special quality of place.

- **Wayfinding**
  Any successful wayfinding program needs to address two obvious concerns-how to get to the park and then how to navigate the facility on arrival.

Although highway signage could certainly be improved, there is also a need to locate the park when traveling local streets either in a car or on foot. Finding the entrances by either mode is very frustrating and could be alleviated by the use of simple, strategically-placed trail blazers of the type commonly used elsewhere. Subway and bus arrival locations also need to provide directions.

A visual picture of the park needs to be imprinted in the visitor's mind both at the start of a visit and as a memory as he ventures through the facility. This can be accomplished with a well-designed but simple map.

In view of the complexity encountered on the ground as well as the park's overwhelming size, we should also consider breaking the park into segments to help user understanding. These might be as many as five or six with names dictated by activity (marina, sports) or feature (Meadow and Willow Lakes).

The larger issue and most important one, is park use. Studies suggest that recreation is key and a reorganized landscape might group activities so that strategically placed, simple arrow

signposts could direct visitors as opposed to relying too much on the use of maps, however well designed.

The issue of vehicular and pedestrian mix and confusion might perhaps be solved by the creation of an obvious ring road with the necessary signage that will imply one use versus the other.

- **A Family of Signs**
  A signage support and message vocabulary should be developed that will help the visitor quickly understand the information presented on a particular sign and be compatible with the landscape of the park. The system will also enhance the visitor's experience, creating the impression of a well-run facility, and a park administration that cares.

  The family of signs will encompass all necessary signs needed for a facility such as this, and will include signs at major park entrances, map holders, all vehicular and pedestrian directional signs, regulatory signs, signs for recreational areas, bike paths signs, public transportation directions and so on.

  Particular attention should be paid to identifying Parking for ease of location and so as not to be intrusive in the landscape.

  We might consider temporary signage to be used at the many festivals that occur and create special situations of wayfinding and crowd movement throughout the park. These should add to the general sense of celebration that these days invoke.

  At a few key points we should perhaps consider a programmable information system which could provide mapping information, sports scores, activities announcements; this could be an important design element to enhance the visual experience of the Park and could be integrated with new circulation systems and with site access systems.

  Signs can only do so much; a staffed information center or two will enhance the experience and should be established at appropriate locations they should coordinate all information services and control programmable information display system.

  Informational handouts should be distributed at the information center, park institutions, transit access points, and other appropriate locations. They should be multilingual (English, Spanish, and perhaps Korean and Vietnamese), and changed monthly. Daily updates could be provided by electronic signage.

- **Ongoing maintenance**
  With any signage program, maintenance is key if the system is to have a useful life, create a positive impression and justify the initial expenditure. Consequently, we need to study available resources for maintaining the sign program and design for ease of replacement and periodic maintenance.

  Sustainable materials should be used when cost and availability make it a practical possibility.

  A detailed graphic standards signage manual should be developed on acceptance of the program. This will provide complete instructions for the fabrication of signs as well as directions for replacement and maintenance

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The Plan:

Visionary / Practicable Pockets of Density / Open areas of “Nature”

Reconfiguring the park for density would allow for more logical circulation and also might open up more areas to be “naturalized.”

Meeting with Linnea Tillett:

The park has had lots of negative publicity. In the last few years there have been some brutal crimes in the park. The areas that feel safer are the populated areas, the areas connected to the surrounding neighborhoods. If the park is perceived as dangerous, it becomes dangerous.

One of the biggest problems in FMCP is the ease with which one gets lost in the park. Once inside there is no clear way out. On the loop in Central Park, for example, there are always people, and you always know that you can get out of the park. In Flushing Meadows Corona Park the problem is threefold: circulation, signage, and lighting.

One solution is to design a two tiered lighting system for the park. The first tier would be a “boulevard of light.” Create a clear main path through the park connecting various “nodes” along the way. The boulevard would be very brightly lit. Along the route one would find “pods” of activity lit by the second tier, infrastructural lighting. Clear signage along the boulevard would direct visitors to each pod and also toward the nearest exit.

In addition to this line and node, two-tiered solution we also discussed a possible third system of lighting. One of the ideas being considered for the park is a bike sharing program, which would allow visitors greater range and flexibility in circulating through the 1,255 acre park. Bike paths could be lit by a system of distributed, low-power, partially-solar LEDs. LEDs of varying color could be used to designate paths or to create lighting effects. The shared bicyles could also be equipped with solar (or partially solar) LED lighting.

The two or three tiered lighting system for the park could also be accompanied by additional localized lighting schemes. Two areas of particular interest are the areas under the highways and the soccer fields.

The area under the Van Wyck Expressway in the northeast corner of the park is used extensively for parking. This area is also a major connection point between the park and the neighborhoods of Willets Point and Flushing. The area under Northern Boulevard and the Whitestone Expressway, adjacent to the present Shea Stadium site is the only connection between the Marina Area and the rest of the park. These areas could be made safer and more dynamic with innovative lighting programs for the underside of the elevated highway.

There has been much discussion of lighting for the soccer fields. Lighting the soccer fields would greatly increase use of the park after dark, drawing crowds of people into the park and making it safer. The relative isolation of the soccer fields relative to local neighborhoods means that light pollution is not a major concern. Lighting for the soccer fields could be an opportunity for the park to demonstrate its commitment to sustainability and to make extensive use of solar collection to power lights. The park has ample space for large photovoltaics, and a garden of solar collectors could become a design feature.

Flushing Meadows
Sustainability Recommendations

YRG

SUSTAINABILITY
CONSULTANTS

May 21, 2007 revised February 2, 2008

The following notes include a summary of recommendations as developed from a meeting on May 9th, 2007 with YRG sustainability consultants and Quennell Rothschild & Partners which included a brief project overview and discussion of sustainable land use and planning opportunities for the Flushing Meadows site. The intent of this meeting was to identify overarching concepts, with the option to follow up in more detail subsequently.

LEED Certification

While it is not currently possible to certify a park setting under LEED, the site can achieve individual LEED points for specific associated actions (stormwater management, heat island effect, etc.) that are within its scope. These points could be pre-approved by the U.S. Green Building Council as part of a process that is just being developed called "point accrual". These pre-approved points can then be made available to buildings being developed and/or operated within the park as a way to facilitate and sets incentives for site-wide sustainability.

Hydrology

Introducing more areas of shallow, overland water flow, daylighting the river, and examining areas to implement shallow flow hydrology could work to generally improve water quality and remove unwanted nutrients from stormwater. This would also help to restore a more natural hydrology resembling its original tidal marsh and wetland ecosystem.

A water balance and hydrologic study of the site would help to ensure appropriate onsite drainage and stormwater management. The study should assess the tide gate on site, soils, as well as surface and subsurface flows of the site.

Nutrients

- Water

  Various stormwater Best Management Practices (BMP) could be implemented to encourage infiltration and groundwater recharge. 'Green Streets' are an excellent stormwater management tool for managing urban stormwater particularly lining pedestrian streets.

  "Green Streets" offer alternative approaches to stormwater management, while providing pedestrian-friendly environments that typically seek to slow down (or "calm") car traffic through designs such as speed bumps or rotaries, and reduce on-street parking with curb bump-outs and extensions. Designed to capture street stormwater runoff, these added areas are landscaped with a variety of plants and checkdams that slow down and retain excess water, therefore reducing or even fully disconnecting the street's rainwater runoff from municipal storm/sewer pipe systems. "Green Streets" offer both environmental and aesthetic benefits to their users and surrounding community.

  Restoring the lake ecosystems on site could be accomplished by reducing and/or controlling nutrient loads flowing into the lake associated with stormwater. The hydrology could be designed to capture and treat stormwater prior to flowing into the lakes. Additionally, the maintenance practices of the landscape could be improved to reduce the use of fertilizers and pesticides. Fertilizers used in lawn maintenance increase nutrient loadings, causing algal blooms and potentially contributing to eutrophication of the lake.

  As noted by HDR, the lake could be improved by adding areas of shallow hydrology around the edges. It is also advisable to pursue some action to minimize nuisance bird species, and excessive bird populations. Typically, low cut grass can attract more nuisance species. Their excrement can contribute to nutrient loadings to the lake, and additionally raise unwanted bacteria levels. Aeration mechanisms could be considered to enhance dissolved oxygen levels in the lake, and prevent eutrophication. Small aeration systems running on energy provided by small solar panels are a potentially suitable alternative.

- Waste

  Digesters or methane collectors could be used to digest animal waste or foodscraps from the zoo. Food scraps from onsite buildings could also be collected and digested to produce energy. Typically digesters require a homogeneous feedstock, meaning a different digester would be necessary for each different waste stream.

  Black water and gray water from structures on the site could be collected and treated on site. Wastewater from toilets can be treated then digested to generate energy. In addition to digesters other onsite systems exist to treat gray and black water, and could be considered in combination with other technologies.

Biodiversity

Choosing plant species to optimize for biodiversity would improve the site. Local ecological models and inventories could be consulted to consider native species needing representation.

Parking

Placing parking decks would work to reduce the use of paved surfaces contributing to heat island effect and increasing the volume of stormwater runoff. Ideally such parking would be covered with some kind of pervious surface such as a trellis, green roof or a pervious paver with a low-

reflective surface to both reduce stormwater runoff and the heat island effect.

Porous pavement options should be considered to reduce stormwater runoff and contributions to urban heat island effect.

Lighting

Careful attention to appropriate lighting for parking and pedestrian areas could reduce energy usage and light pollution.

Noise

The concern for sound resulting from neighboring LaGuardia Airport and busy highways at Flushing Meadows is clearly a serious one. Road noise is certainly easier to buffer using tree plantings, berms, fences, trellises, walls, living walls, etc. than airplane noise, although some trees will provide better noise barriers to airplanes than others – species that given enough space will grow wide tree crowns and offer dense coverage for more months of the year (Oak vs. Gingko, e.g.) , etc...

Surface materials throughout the park could also impact the way overhead noise permeates the park space. Hardscapes will echo whereas as surfaces such as grasses and mosses will absorb more of the air traffic noise. This would be added reason for more impervious / soft surfaces, berming, etc.

Given the scale of the park, designating certain areas to be quiet and focusing on those seems to be the most realistic.

Creating channels for noise to travel through the park (almost a musical design with, for example, berms, tunnels, pathways and walls that direct noise away from designated quiet zones) could be also explored.

Additional Considerations

- Site to be developed as a closed loop resource system. A “closed loop system” is a system designed to sustain itself such that it does not rely on materials from the outside to function. Three suggestions for ways in which the Park might operate as a “closed loop system” would be :
- Food production on site, where all food scraps go into a compost that contribute to the growth of new produce. An area could be designated as a community garden, contributing to a local farmer’s market. This could generate community involvement in the park design and maintenance, and provide opportunities for education. Overall it also supports reduced transportation impacts of shipping foods.
- Stadium containers should be bio-degradable: Products made from 100% corn-based resin are readily available. (The food kiosks at Battery Park started using corn-based, bio-degradable cups and containers in the summer of 2007.)
- Glass bottles melted down on-site as art project opportunity
- Overflow parking for stadium as pervious / grass-crete system
- Provide electric vehicles and/or bicycles for site visitors
- Utilize the Pavilion building as a renewable energy hub
- Consider co-generation of energy on the site. Cogeneration (or combined heat and power) is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat. In this context an on-site cogeneration system would need to be approved and constructed (possibility of no/low-interest loans through NYSERDA) and could provide the park facilities with electric power and heating, reducing the amount of energy lost in transmission from a standard power plant off-site. Fuel cells might be another viable energy strategy for the project to generate power on site.
- Coordinate with the Mayor’s sustainability task force

COST ESTIMATE

ESTIMATED COSTS TO CARRY OUT KEY ELEMENTS OF THE STRATEGIC FRAMEWORK PLAN

We have looked at our proposals for future changes to the Park in an effort to establish a broad idea of the probable cost of the various principal elements.

We have broken down these into two broad groups:

Studies needed before any major capital projects can be carried out

As we have pointed out the Strategic Framework Plan revealed critical issues in the park for which more detailed data is needed. Completing these studies is essential if the bold physical changes outlined in the Plan are to be implemented. These include two park-wide studies:

- A detailed inventory of the park's trees, especially in the areas which would be impacted by the proposed physical reconstruction.
- A comprehensive traffic, circulation and parking analysis to include studies of how cars, bicycles, pedestrians and even boats move into and through the park and how these systems might be better planned and coordinated.

In addition more detailed studies of the park's signage and wayfinding systems, its lighting and a detailed study of the causes and potential solutions to the Park's drainage should be undertaken, perhaps phased to coincide with the areas of the park which are likely to be reconfigured in the early phases of reconstruction.

Analysis of the tide gates and of any repairs needed to allow for the proposed realignment of the river should also be undertaken.

Immediate Actions projects

Of the three proposals for change which we characterized as "Big Idea" proposals, we strongly recommend two for early implementation as they would make a significant impact on the appearance and functioning of the park. As both these projects involve major construction efforts, they would certainly be carried out as part of the City's Capital Budget.

These projects are :

1. Re-envision the World's Fair Core

We have broken down this first project into two distinct pieces :

A Opening up the Flushing River from the tide gate to Meadow Lake. This is a key element to the reconfiguring of the World's Fair Core and creation of major new festival grounds. It will involve:

1. Excavation of the new river course and lining it with appropriate material. Determination of the best method to do this work will certainly require detailed hydrolgic and soils exploration before design work can be completed.
2. Stabilizing the proposed shoreline, with rip rap or other methods.
3. Repairing the tide gates as needed to ensure that water levels in the creek are maintained.

B Creation of new festival grounds. In addition to the removal of the Fountain of the Planets we have proposed extensive removal of paths and the addition of paths in a few key locations, and new Festival grounds to reduce the area of paved impervious surfaces and to create a circulation system which is more responsive to the proposed uses of the area.

2. Reconfigure & Restore the Lakes

We have recommended that both Meadow and Willow Lakes be dredged to improve water quality and their habitat value. It is estimated that this might entail between one and two feet average over the entire lake area.

Removal and disposal of such a quantity of material – which may well be somewhat contaminated – would be very costly (up to $120 per cubic yard in 2007 rates). Removal and use of this material on site as a way to reconfigure Meadow Lake and create more topographic relief (and thus improved surface drainage) would reduce the net cost to about $30 per cubic yard.

Estimated cost for these two projects are summarized below. Detailed estimates are included in the following pages.

APPENDIX : BUDGET COST ESTIMATES					
SUMMARY TOTALS					
The following are summary totals of work detailed in the Budget Cost Estimates on the following pages.					
A.	**STUDIES NEEDED BEFORE MAJOR CAPITAL PROJECTS CAN BE CARRIED OUT**				
1.	**Detailed inventory of the park's trees**			**$110,000**	
2.	**Detailed traffic, circulation and parking study**			**$100,000**	
3.	**Graphics and signage and wayfinding Master Plan**			**$25,000**	
4.	**Coordination and Design Fees**				
4.1	Coordinate sub-consultants' work			**$25,000**	
4.2	Pre-Schematics & Scope resolution (World's Fair Core)			**$100,000**	
4.3	Design Fees : World's Fair Core			**$1,600,000**	
TOTAL ALL DETAILED STUDIES					**$1,960,000**
B.	**IMMEDIATE ACTION PROJECTS**				
ONE	**WORLD'S FAIR CORE**				
	TOTAL ITEM IA : DAYLIGHTING THE RIVER			**$4,953,333**	
	TOTAL ITEM IB : FESTIVAL GROUNDS			**$38,174,995**	
TWO	**DREDGING THE LAKES**			**$17,770,488**	*
TOTAL	**IMMEDIATE ACTION PROJECTS**				**$60,898,817**
* NOTE : ASSUMES DISPOSAL OF DREDGE MATERIAL ON SITE. DISPOSAL OFF SITE WOULD BE SIGNIFICANTLY MORE EXPENSIVE - SEE DETAILED COST ESTIMATES					

Flushing Meadows Corona Park : Strategic Framework Master Plan

APPENDIX : BUDGET COST ESTIMATES

The following budget estimates for the major projects identified in the Strategic Master Plan as ones which might be initiated in the next few years and which would make a significant impact on the use of the park .

They are of necessity based on broad assumptions as to area, scope of specific work envisages and probable unit costs.

A. STUDIES NEEDED BEFORE MAJOR CAPITAL PROJECTS CAN BE CARRIED OUT

1.	Detailed inventory of the park's trees		Estimated Cost	
1.1	Core area	*	$50,000	
1.2	Meadow Lake	*	$50,000	
1.3	West area	*	$10,000	
1.4	Willow Lake		$0	*see note*
note	Assumed that Willow Lake vegetation will not need to be inventoried as the area is to remain as a nature reserve.			
2.	Detailed traffic, circulation and parking study			
	Estimated cost	*	$100,000	
3.	Graphics and signage and wayfinding Master Plan			
	Estimated cost		$25,000	
*	These figures are provisional allowances for consultant fees			
4.	Coordination & Design Fees (Landscape/Architectural) : World's Fair Core			
4.1	Coordinate subconsultants' work		$25,000	
4.2	Pre-Schematics & Scope resolution		$100,000	
4.3	Design Fees (World's Fair Core incl. engineering for daylighting the river) (Assumed approx $40,000,000 cost * 4% fee)		$1,600,000	
TOTAL ALL DETAILED STUDIES				$1,960,000

B. IMMEDIATE ACTION PROJECTS

These projects are grouped into two main areas : ONE The World's Fair Core Area and TWO The Lakes

ONE WORLD'S FAIR CORE

IA. Daylighting River

Description	quantity	unit	unit cost	item total		Source
Earthwork and stablizing new shoreline						
Dredge for River - assume 6' deep	51,111	CY	$30	$1,533,333		QRP
Edge stabilization	5,000	LF	$300	$1,500,000		QRP
Line river bottom if needed	230,000	SF	$4	$920,000		QRP
Repairs to tide gate	1	LS	$1,000,000	$1,000,000		Allowance
TOTAL ITEM IA : DAYLIGHTING THE RIVER					$4,953,333	
IB. Festival Grounds						
Removals and Site Preparation						
Remove existing paving	2,650,000	SF	$1.00	$2,650,000		QRP
Remove Fountain of the Planets	11,000	CY	$110.00	$1,210,000		DPR
Remove Fountain of the Planets railing	2,200	LF	$11.50	$25,300		DPR
Remove Fountain of the Planets concrete structure	1	LS	$25,000.00	$25,000		QRP
Remove channel fountains	2,500	CY	$110.00	$275,000		DPR
Selective tree removal	50	EA	$600.00	$30,000		DDC/DPR
Stump removal	50	EA	$325.00	$16,250		DPR
Subtotal Removals and Site Preparation					$4,231,550	
Earthwork and Drainage						
Fill in Fountain of the Planets	51,900	CY	$36.50	$1,894,350		DPR
Topsoil at former Fountain of the Planets	10,500	CY	$47.00	$493,500		Parks
Fill in channel fountains	4,600	CY	$36.50	$167,900		Parks
Topsoil at channel fountains	4,000	CY	$47.00	$188,000		Parks
Topsoil - 1' at former paved sites	97,000	CY	$47.00	$4,559,000		Parks
Fill at proposed mounds	20,500	CY	$36.50	$748,250		Parks
Topsoil 1' at proposed mounds	10,000	CY	$47.00	$470,000		Parks
Grading	5,723,400	SF	$0.19	$1,087,446		Parks
Drainage : lawn areas	7,300,000	SF	$0.10	$730,000		QRP
Subtotal Earthwork and Drainage					$10,338,446	

Flushing Meadows Corona Park : Strategic Framework Master Plan

APPENDIX : BUDGET COST ESTIMATES

	Site Work						
	Paving	170,000	SF	$10.00	$1,700,000		QRP
	Soccer fields 7 new (artificial turf) (IF NEEDED)	504,000	SF	$10.00	$5,040,000		Desso DLW
	Foot Bridges (3)	3	EA	$1,000,000.00	$3,000,000		QRP
	Subtotal Site Work					$9,740,000	
	Site Furnishings						
	Benches (World's Fair 1964 with arms)	50	EA	$900.00	$45,000		Parks
	Lighting	8,150,000	SF	$0.15	$1,222,500		QRP
	Subtotal Site Furnishings					$1,267,500	
	Planting						
	Reconstruct lawn	850,000	SY	$7.25	$6,162,500		Parks
	Trees small	50	EA	$450.00	$22,500		QRP
	Trees large	50	EA	$1,000.00	$50,000		DDC
	Subtotal Site Furnishings					$6,235,000	
	Subtotal all Areas					$31,812,496	
	20% Contingency					$6,362,499	
TOTAL ITEM IB : FESTIVAL GROUNDS						$38,174,995	
TWO	**DREDGING THE LAKES**						
IIA	Dredging Meadow and Willow Lakes and creating new shoreline						
	1. Meadow Lake						
	Dredge - assume 18" dredge material	225,000	CY	$20.00	$4,500,000		LMS
	Placing on-site	225,000	CY	$10.00	$2,250,000		LMS
	New edge treatment (allowance)	10,000	LF	$200.00	$2,000,000		QRP
	Surface treatment : topsoil 6" deep	25,813	CY	$47.00	$1,213,227		QRP
	Hydroseeding	32	acre	$15,400.00	$492,800		QRP
	Planting trees assume 1 per 10,000 s.f.	150	EA	$450.00	$67,500.00		QRP
Sub-Total Meadow Lake						$10,523,527	
	2. Willow Lake						
	Dredge - assume 18" dredge material	113,500	CY	$20.00	$2,270,000		LMS
	Placing on-site	113,500	CY	$10.00	$1,135,000		LMS
	Surface treatment : topsoil 6" deep	12,907	CY	$47.00	$606,613		QRP
	Hydroseeding	16	acre	$15,400.00	$246,400		QRP
	Planting small trees/shrubs assume 2 per 10,000 s.f.	136	EA	$200.00	$27,200		QRP
Sub-Total Willow Lake						$4,285,213	
Sub-Total both lakes						$14,808,740	
20% Contingency						$2,961,748	
TOTAL ITEM II A. DREDGE LAKES & CREATE NEW SHORELINE AT MEADOW LAKE						$17,770,488	
II B	Alternate to dredge and dispose OFF SITE						
	Dredge both lakes	338,500	CY	$20.00	$6,770,000		LMS
	Dispose both lakes off-site	338,500	CY	$100.00	$33,850,000.00		LMS
Sub-Total						$40,620,000	
20% Contingency						$8,124,000	
TOTAL ITEM II B. DREDGE BOTH LAKES & DISPOSE OFF-SITE						$48,744,000	