
8. HYDROLOGY AND WATER QUALITY

This SEIR chapter describes the hydrology (i.e., storm drainage and flood control) and water quality implications of the Stanford Outpatient Center, focusing on project aspects that differ from those addressed in the 1996 Midpoint Technology Park Final EIR and 1998 SEIR. The chapter also describes current water quality regulations and how they would apply to the proposed Stanford Outpatient Center project.

8.1 SETTING

8.1.1 Local Topography and Drainage

The 11.3-acre project site is fully built out and nearly flat, with a gentle natural slope northward toward San Francisco Bay of less than one percent. Elevations on-site range between approximately six and eight feet above mean sea level. The slow flow of storm water runoff toward the Bay is blocked by U.S. 101, which is now crossed by force mains or large-diameter, gravity flow culverts. North of the freeway, these facilities discharge into the Bayfront Canal, which runs along the landward side of Cargill's salt evaporation ponds before discharging through a tide gate into Flood Slough and the Bay.

The project site has a fully developed network of in-ground storm drains, which are part of the larger Midpoint Technology Park drainage system. This system drains to the northwest corner of the Technology Park at the end of Douglas Avenue, where it discharges into the City-operated Douglas Avenue pumping station. This station serves the Douglas Avenue Drainage Basin, a 655-acre basin roughly bounded by Second Avenue, El Camino Real, Chestnut Street and U.S. 101. The station pumps the basin's storm water runoff into a 42-inch diameter force main that crosses the freeway and discharges into a drainage ditch that flows east, paralleling the freeway for approximately 1,900 feet, to three, 21-inch-diameter culverts that connect it to the beginning of the Bayfront Canal.

According to a utility study prepared for construction of the Midpoint Technology Park,¹ the Douglas Avenue pumping station only has capacity to accommodate the runoff from a one-year recurrence interval storm (a storm intensity expected to occur on an annual basis), although a representative of the City Engineering Department and the applicant's engineer have both concluded that the pumping station probably can accommodate a two-year capacity (i.e., a storm level expected to occur at least every other year).² In either case, the station's capacity is considerably lower than the City's typical 100-year recurrence interval design requirement.

¹Brian Kangas Foulk, Consulting Engineers; *Midpoint Technology Park Utilities Study*; August 27, 1996.

²Paul Willis, Redwood City Engineering and Construction Department, personal communication, February 8, 2005; and Ed Boscocci, Brian Kangas Foulk, Consulting Engineers, personal communication, January 31, 2005.

Plans have been in place for several years to upgrade the Douglas Avenue pumping station, as well as the Fifth Avenue pumping system, but have not been implemented because of discharge constraints within the downstream Bayfront Canal.¹ This canal borders low-lying mobile home parks north of the freeway, and it accepts runoff from Atherton Creek in addition to the Fifth Avenue and Douglas Avenue Drainage Basins before reaching the tide gate at Flood Slough. When high tides in the slough coincide with peak upstream storm water discharges, the canal backs up and regularly threatens the adjacent mobile homes. To address this situation, the City is currently negotiating with Cargill to permit diversion of the Bayfront Canal into the existing salt ponds during high tides, which would allow the canal to accommodate much higher rates of upstream runoff. There is no indication when this or some other downstream solution might be implemented, so further improvements to the upstream Douglas Avenue and Fifth Avenue pumping systems remain on hold.²

8.1.2 Rainfall and Runoff

Average annual rainfall in the project vicinity is approximately 20 inches.³ Nearly 95 percent of this precipitation falls during the winter rainy season, October through April, with the heaviest rainfall typically occurring in December, January, and February. Rainfall intensity during a 30-minute duration, 100-year recurrence interval storm is approximately 1.65 inches per hour, while during the more frequent 10-year and one-year storms, the intensity decreases, respectively, to 1.15 inches and 0.33 inches per hour.⁴ As noted above, the existing Douglas Avenue pumping station only has sufficient capacity for a one-year storm; runoff generated by more intense rainfall events backs up into low-lying areas throughout the drainage basin.

Storm water runoff is that portion of rainfall that is not absorbed into the ground, taken up by plants, or lost through evaporation. Coarse-grained, permeable soils and heavy vegetative cover reduce runoff, while steep slopes, fine-grained soils, and impervious surfaces (buildings and pavement) increase runoff. The duration, frequency, and total amount of rainfall also affect the volume of runoff; frequent or heavy rains saturate the soil and reduce infiltration, so that the percentage of rain that runs off the land increases with the severity of a storm.

Since the project site is fully developed, infiltration can only occur within existing lawn and other landscaped areas, which cover approximately 15 percent of the site. It is estimated that native existing soils underlying imported topsoil in these areas have a runoff coefficient of about 40 percent, as compared to a runoff coefficient of 95 percent for buildings and pavement. This results in a composite runoff coefficient of 84 percent, which means approximately 84 percent of

¹A 66-inch diameter freeway culvert was recently added to increase the capacity of the Fifth Avenue system, but, thus far, the culvert has been used only to increase the volume of subsurface detention storage, rather than total discharge capacity.

²Marilyn Williams Harang, Redwood City Wastewater Management Services Division Superintendent; personal communication, February 8, 2005.

³Santa Clara Valley Water District, "Mean Annual Precipitation Map for San Francisco and Monterey Bay Region," October 1989.

⁴California Department of Transportation, *Guidelines for the Use of Standards Developed by the 1941 - 1971 Rainfall Intensity-Duration-Frequency Analysis*; October 1974.

the rain that falls on the site would be expected to eventually run off into the on-site and downstream storm drain systems.¹

8.1.3 On-site Drainage Conditions

Because the Douglas Avenue pumping station had such limited capacity prior to construction of the Midpoint Technology Park, excess runoff was ponding within the lowest areas adjacent to the freeway, covering roughly two-thirds of the 48.4-acre property (and all of the 11.3-acre project site), sometimes to depths in excess of three feet.² To protect the proposed Technology Park improvements, the new buildings on the site were elevated above the maximum, 100-year flood elevation (5.3 feet above mean sea level), and to prevent a worsening of existing flooding elsewhere within the drainage basin, all parking and landscaped areas were left low to maximize the volume of available flood storage. According to calculations prepared in 1996, upon completion of the Midpoint Technology Park, water would begin backing up from the Douglas Avenue pumping station when the rainfall intensity exceeded a one-year storm, and would reach maximum depths on the Technology Park site of approximately 1.2 feet during a 10-year storm and 2.3 feet during a 100-year storm, an improvement over previous on-site conditions.³

8.1.4 Water Quality

(a) Existing Water Quality Conditions. The project site is currently covered by buildings, pavement, and landscaping. When the site was occupied by the previous tenants, it is assumed that these surfaces generated the typical range of non-point source urban pollutants, such as litter, packaging materials, landscaping fertilizers and pesticides, heavy metals, oil and gas residues, tire fragments, and debris normally deposited by vehicular traffic. Storm water runoff would have carried these materials through the Douglas Avenue pumping station to the Bayfront Canal, Flood Slough and San Francisco Bay, where they would have contributed to a small but cumulative degradation of water quality.

(b) Federal and State Water Quality Regulations. In California, the discharge of pollutants to water bodies from point and non-point sources is regulated at the federal level by the U.S. Environmental Protection Agency's National Pollution Discharge Elimination System (NPDES), under the auspices of sections 401 and 402 of the Clean Water Act, and at the state level by the

¹Runoff coefficients represent an estimate of the percentage of total rainfall expected to end up as runoff. They are often used in conjunction with the Rational Method, a widely used means of estimating maximum rates of storm water runoff from both undeveloped and developed watersheds. For each subarea within a watershed, the runoff coefficient is multiplied by the number of acres within the contributing drainage area and by the expected peak rainfall intensity (expressed in inches per hour) to calculate the peak rate of storm water runoff (expressed as cubic feet per second).

²Because the project site lies at the low end of a watershed that drains by gravity to the Douglas Avenue pumping station, the site historically (i.e., prior to development of the Midpoint Technology Park) provided the flood storage needed when runoff rates exceeded the station's capacity. The previously cited Midpoint Technology Park Utilities Study determined this storage equaled 43 acre-feet during a 10-year storm and as much as 81 acre-feet during a 100-year storm. The 100-year flooding volume includes 16 acre-feet it was estimated would spill out of Atherton Creek, extending the area of inundation across the boundary between the Douglas Avenue and Fifth Avenue basins.

³Brian Kangas Foulk, August 27, 1996.

Porter-Cologne Water Quality Control Act, Water Code section 13260. Federal regulations issued in November 1990 and revised in 2003 expanded the original scope of the NPDES to include permitting of storm water discharges from construction sites that disturb areas larger than one acre. (The proposed project changes, including the proposed storm water retention vault installation and landscape modifications, would disturb an area larger than one acre.)

In the Bay Area, the NPDES program and the Porter-Cologne Act are administered by the San Francisco Bay Regional Water Quality Control Board (RWQCB), a division of the State Water Resources Control Board (SWRCB).

For storm water discharges associated with construction activities, federal regulations allow two permitting options, Individual Permits and General Permits. The SWRCB utilizes a single statewide General Permit for construction-related storm water discharges. This General Permit requires dischargers where construction activity disturbs one acre or more, to:

- (1) Develop and implement a Storm Water Pollution Prevention Plan (SWPPP) that specifies Best Management Practices (BMPs) to be employed (1) on the construction site to prevent all construction materials that may be sources of pollution from contacting storm water and to prevent all products of erosion from moving off-site into receiving waters, and (2) on the developed site throughout the life of the project to minimize the discharge of urban pollutants into receiving waters;
- (2) Eliminate or reduce non-storm water discharges to storm sewer systems and other waters of the nation, utilizing Source Control Measures approved by the City;
- (3) Install permanent treatment control devices; and
- (4) Enter into an agreement with the City to maintain and perform inspections of all permanent storm water pollution prevention devices.

Revised storm water quality control regulations adopted by the RWQCB, effective July 1, 2003 (the "C.3" regulations), stipulate that construction activities that create one acre or more of impervious surface are subject to newly revised permitting requirements--i.e., must apply for an NPDES General Permit for Discharges of Storm Water Runoff Associated With Construction Activity (General Construction Permit) (*Municipal Storm Water Permit Revisions: Impacts to Cities and New Development Programs*, www.SCVURPPP.org, March 24, 2003). The SWPPP must be prepared before construction begins, usually during the planning and design phases of a project. The SWPPP must include specifications for Best Management Practices (BMPs) to be incorporated in project landscaping and engineering specifications for projects creating one acre or more of impervious surface, which would be implemented during project construction to control contamination of surface flows and the potential discharge of pollutants from the site. Additionally, the SWPPP must describe measures to prevent or control pollutants in runoff after construction is complete, and must include an Operations and Maintenance Plan providing for ongoing inspection and maintenance of these measures. As of August 15, 2006, the impervious area threshold will fall to 10,000 square feet.

New development projects covered under the revised standards include both private development projects and public projects such as streets, roads, and parking lots. Significant projects covered under the revised standards include major reworking of existing sites, but do

not include regular maintenance (e.g., roof replacement, routine repaving) and interior remodels.

Projects must incorporate source controls, design measures, and treatment controls to minimize storm water pollutant discharges. Where incorporating controls into a project is clearly impracticable--for example, at highly constrained urban sites--projects are allowed to satisfy their obligation elsewhere by implementing measures to provide an "equivalent water quality benefit." The permit allows cities to develop their own program to do this, subject to approval of the RWQCB. Alternately, projects may participate in regional solutions--such as storm water wetlands that treat runoff from a broad area--rather than providing on-site treatment controls.

(c) City Water Quality Control Requirements. In addition to its own programs designed to protect water quality (such as street cleaning and litter control), Redwood City has developed an "NPDES Permit Requirements Checklist" for implementation of its own Storm Water Pollution Prevention Program. The checklist sets forth specific provisions and design requirements for all construction activities, since new construction and redevelopment projects constitute a significant source of pollutants in municipal storm water discharges. Also, because the time of construction typically represents the only opportunity to incorporate permanent pollution control measures into a project, the checklist includes provisions covering site design and pollutant source controls.

8.1.5 Groundwater

Local groundwater recharge would not be affected by the proposed project, since there would be no change in the nature or extent of pervious areas through which rainwater could percolate into the soil.

8.2 PERTINENT PLANS AND POLICIES

The Redwood City Strategic General Plan Open Space, Conservation, and Safety Elements (adopted in 1990) contain the following drainage policy pertinent to consideration of the environmental impacts of the proposed project changes:

- *New development should be designed to provide protection from potential impacts of flooding during the 100-year flood. (Safety Policy S-8, page 12-3)*

8.3 SUPPLEMENTAL IMPACT AND MITIGATION FINDINGS

8.3.1 Supplemental Analysis Scope

The scope of this supplemental hydrology and water quality analysis is limited to identification of the mitigating (beneficial) effects of, and any additional adverse impacts associated with, the proposed project changes.

8.3.2 Significance Criteria

The significance criteria used in the 1996 EIR are not the same as those suggested in the current (2006) CEQA Guidelines. Based on the current CEQA Guidelines,¹ the project would be expected to have a significant hydrology or water quality impact if it would:

- (a) Violate any water quality standards or waste discharge requirements;
- (b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted);
- (c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- (d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- (e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- (f) Otherwise substantially degrade water quality;
- (g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- (h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows;
- (i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam;
- (j) Inundation by seiche, tsunami, or mudflow; or
- (k) Conflict with any applicable land use plan, policy, or regulation adopted by the City of Redwood City or the Regional Water Quality Control Board for the purpose of avoiding or mitigating an adverse effect on hydrology or water quality.

Regarding significance criteria (b), (d), (e), (g), (h), (i), and (j) above, the Initial Study (appendix 19.1 of this SEIR) determined that the proposed project would have no impact or a less-than-significant impact. Regarding criterion (k), the proposed Stanford Outpatient Center would be subject to the hydrology and water quality regulations and policies described in sections 8.1.4 and 8.2 above.

¹CEQA Guidelines, Appendix G, items VIII(a)-(j) and IX(b).

8.3.3 Pertinent Project Changes

The applicant has proposed one change to the existing site drainage improvements: an on-site storm water retention system, in the form of underground storage vaults, would be constructed to hold the storm water that currently backs up on the surface into on-site parking and landscaped areas. Runoff from up to a one-year recurrence interval storm would still be discharged directly to the Douglas Avenue pumping station, but higher flows from more intense storms would be diverted to the proposed vaults, which are being designed to accommodate up to a 100-year storm. The stored water would slowly drain out to the pumping station when capacity becomes available, after the peak of the storm has passed. Although the design of the proposed retention system has not yet been completed, the project engineer expects that one or more pumps would be needed to lift water out of the lowest of the new vaults into the existing gravity trunk line that connects the project site to the downstream sections of the Midpoint Technology Park drainage system and the Douglas Avenue pumping station.¹

Preliminary calculations prepared by the project engineers indicate that approximately 16,000 cubic feet (120,000 gallons) of storage capacity would be required to ensure that all runoff is stored underground rather than on the surface. An early design indicates that the vaults would need to be approximately 4 feet high by 5 feet wide, and 800 lineal feet of vault would be required. The vaults would be installed underneath the existing parking lot, although how they would be arranged or exactly where they would be placed on the site has not yet been determined. The installation would be designed to avoid the existing water and sewer utility easement the runs east-west across the north parking lot, following the abandoned Douglas Avenue right of way.

Since there are no plans to significantly modify the surface of the project site or change the amount of impervious cover (buildings and pavement), there would be no increase in the site's existing runoff characteristics. Therefore, if the discharge controls on the proposed underground storage vaults replicate the off-site discharge controls on the existing surface storage system, there should be no increased effect on the Douglas Avenue pumping station.

As noted in section 8.1.1, above, until the plans that have been in place for several years to upgrade the Bayfront Canal and Douglas Avenue pumping station are implemented, it is unlikely that the proposed underground vaults would prevent future flooding on the project site. Prior to its construction, the 48.4-acre Midpoint Technology Park site theoretically provided 14 acre-feet (610,000 cubic feet) of flood storage during a two-year storm, and as much as 81 acre-feet (3.5 million cubic feet) during a 100-year storm. A representative of the City's Engineering Department is not aware of any significant on-site flooding problems since construction of the park,² but it is not clear where such a large volume of water could go other than the low area at the downstream end of the Douglas Avenue Basin, north of the freeway. Some of the water would likely end up on the adjoining portion of the Technology Park site, but that would still leave more unconveyed water than could be accommodated by the proposed on-site storage vaults. As a result, flooding should still be anticipated within low-lying portions of the on-site parking lots and landscaped areas during major storm events, until the Douglas Avenue pumping station is improved.

¹Patrick McGuire, Brian Kangas Foulk, Consulting Engineers; personal communication, January 30, 2006.

²Willis, February 8, 2005.

Certified Mitigation 7-4 from the 1996 EIR would apply to the proposed Stanford Outpatient Center. The applicable text of the mitigation states: "[I]f and when the City decides to improve the storm drainage facility, the developer (or heirs) will be required to deposit funds with the City as "fair share" (for storm water runoff impacts caused only by the new development) participation in the system's construction costs. The developer will be required to participate and not protest the formation of an assessment district for storm drain system improvements."

In order to avoid potential flooding to the existing and proposed on-site emergency generators and associated above ground diesel fuel tanks, the Redwood City Engineering Department will also require that the generators and fuel tanks be elevated at least one foot above the highest anticipated flood elevation on-site.¹ Therefore, the generators and fuel tanks would be elevated at least 3.3 feet above ground level.

8.3.4 Supplemental Impacts and Mitigations

Supplemental Impact of Increased Risk of Soil Erosion or Contaminant Spills During Project Construction. Excavation required to construct the proposed underground storm water detention vaults would create a potential for on-site soil erosion. Other proposed construction activities could also increase the potential for surface water contamination. On-site erosion could lead to increased turbidity within the downstream Bayfront Canal and Flood Slough, and to increased sediment accumulation within the downstream Douglas Avenue pumping station, Bayfront Channel, Flood Slough, and San Francisco Bay. These possible construction period erosion and contamination effects would be reduced to ***less-than-significant levels*** with the implementation of the RWQCB and City requirements introduced previously in subsection 8.1.4 (Water Quality) and further described below.

Explanation:

It is estimated that construction of the detention vaults would entail the excavation of at least 2,250 cubic yards of soil and existing pavement, and the offhaul of approximately 1,600 cubic yards of excess material.² Without proper controls, storage of this material on the site and

¹Jon Lynch, City Engineer, Redwood City; personal communication, April 21, 2006.

²As noted in subsection 8.3.3 (Pertinent Project Changes), specifically how the vaults would be laid out has not yet been determined. However, if it is assumed they would be installed in four parallel rows, with each row approximately 7.5 feet wide (5 feet for the vault, plus 2.5 feet for walls and clearance between structures), so that the entire structure would be approximately 30 feet wide. Four rows would reduce the overall length requirement to 200 feet, for a total structure area of 6,000 square feet. An assumed overall excavation depth of 8 feet (4 feet of vault, plus 2 feet for floor and roof, plus 2 feet of cover), with 1:1 side slopes around the perimeter of the excavation, would yield a surface excavation area of 9,072 square feet. Averaging this with the 6,000 square-foot area at the bottom of the excavation, then multiplying by the 8 foot depth, results in a total excavation of 60,300 cubic feet, or 2,250 cubic yards.

Total offhaul volume would be the volume of the vault structure (6,000 square feet x 6 feet high) plus the volume of surface pavement to be reconstructed over the excavation (assumed 10" depth x 9,072 square feet), which equals 43,560 square feet, or 1,613 cubic yards. These estimates are intended to be conservatively high for both total excavation and offhaul; actual construction volumes would likely be lower.

subsequent off-site hauling would expose it to both wind and water erosion that could adversely affect downstream drainage facilities and waterways. In addition, spilled or improperly used construction materials, such as fuel, paint, cement, or solvents, could be washed into area storm drains or seep into the underlying groundwater.

Following the completion of project construction, there should be little likelihood of on-site erosion since the area of vault construction would be completely paved over, and all re-landscaped areas would be fully stabilized.

It is expected that the proposed vault installation and landscape modifications would disturb an area larger than one acre (the minimum area of disturbance regulated by the NPDES), so the project applicant would be required to obtain an NPDES general construction permit from the State Water Resources Control Board. The terms of this permit require applicants to prepare a Storm Water Pollution Prevention Plan (SWPPP) to demonstrate that project development would not cause any increase in sedimentation, turbidity, or hazardous material concentrations within downstream receiving waters.

Design requirements and implementation measures for project-specific erosion and sedimentation controls would be set forth in the applicant's SWPPP, in accordance with State and RWQCB design standards, and with the City's NPDES Permit Requirements Checklist and Storm Water Pollution Prevention Program. During construction, the City Engineer would monitor implementation of the project's approved SWPPP, with a particular focus on erosion control.

Pollution control measures that should be incorporated into the project's SWPPP are described in the City's NPDES Permit Requirements Checklist. It is also recommended that additional measures, as described in the *Construction Handbook of Best Management Practices*,¹ should also be considered to address conditions specific to the project site.

Supplemental Mitigation. No significant impact has been identified; no mitigation is required.

Long-Term Water Quality Effects. The quality of storm water runoff from the Stanford Outpatient Center would be expected to decline in comparison to previous (office/R&D) runoff conditions, due to the anticipated increase in vehicular activity. The resulting incremental degradation of water quality within downstream receiving waters would represent a **less-than-significant impact** with implementation of the standard RWQCB and City requirements introduced previously in subsection 8.1.4 (Water Quality) and further described below.

Explanation:

In commercial areas, potential non-point source pollutants typically include litter, landscaping fertilizers and pesticides, heavy metals, oil and gas residues, tire fragments, and debris normally deposited by vehicular traffic. Storm water runoff from developed sites can carry these pollutants into surface waters, where they can cause a small but cumulative degradation of water quality. Although the proposed project changes would not significantly change the site or

¹Camp Dresser & McKee, Larry Walker Associates, Uribe & Associates, and Resources Planning Associates, for the State Stormwater Quality Task Force (a municipal agency advisory body); *California Storm Water Best Management Practice Handbooks: Construction Activity*; March 1993.

its existing runoff characteristics, ***the number of vehicle trips is expected to more than double*** compared to the site's previous use (see chapter 12 of this SEIR), which is expected to result in a proportionate increase in the deposition of vehicle-related pollutants.

At this point, the applicant has not yet proposed the installation of any non-point source pollutant control measures.

As a condition of grading permit issuance to help reduce the long-term accumulation of non-point source pollutants from the project within downstream surface waters, the project would be required to incorporate long-term source control and/or pre-discharge treatment measures into the required *Storm Water Pollution Prevention Plan* (SWPPP) in accordance with RWQCB regulations and City of Redwood City design guidelines, subject to approval by the City Engineer.

(a) Source Control and Pre-Discharge Treatment Measures. Non-point source pollutant controls typically include both source control and pre-discharge treatment measures. Typical source controls include painting "Drains to the Bay" labels on storm drains, enforcing strict prohibitions on the use or disposal of contaminants, prohibiting the use of non-biodegradable fertilizers and pesticides, restricting vehicle maintenance and washing to areas not directly connected to the storm drain system, and regular cleaning and maintenance of all streets and parking areas, particularly at the onset of the rainy season, to reduce the build-up of the urban pollutants and debris that are normally washed into storm drains. Pervious pavement and infiltration basins are also used as source controls by reducing the total amount of storm water runoff, although it is expected the area's relatively impermeable soils and high groundwater table would preclude the use of these measures on the project site.

Pre-discharge treatment measures are put in place to remove storm water pollutants that bypass source controls. They are normally designed in accordance with "best management practices" and can be further categorized as either *active* or *passive*. The *active* category typically refers to either straight media filtration or to media filtration combined with hydrodynamic separators for removal of oil and grease, sediment, and debris. Simple filters can be installed in individual catch basins, while the much larger filter/separators are installed as "end of the line" structures that treat the runoff collected by many catch basins before it is discharged off-site. Both types of treatment measures require regular inspection, cleaning, and disposal of trapped pollutants, which generally makes them more effective on commercial or high-density residential sites, where a single owner is responsible for areawide maintenance.

Passive pre-discharge treatment methods generally utilize either small ponds or gently sloping swales to achieve pollutant removal through sedimentation and/or filtration. Ponds provide an opportunity for sediments to settle out before off-site discharge, while grass-lined swales (biofilters) pick up pollutants as the water slowly filters through the surface vegetation. Pollutants trapped in the sediment or adhering to the grass can then be removed by regular maintenance.

(b) Application to Proposed Project. It could be difficult to incorporate passive treatment measures into the already developed project site, because improvement grades have already been established and because open areas within the parking lots that might provide suitable locations are already fully landscaped. These options should still be evaluated by the applicant's engineer, but it is expected that active treatment measures might be more viable. The City Engineer has indicated that the City would prefer to see the installation of one (or

possibly a few) combination filter/hydrodynamic separators, as opposed to individual catch basin filters.¹ Test data indicates these facilities are more effective than individual filters, and are usually easier to properly maintain because there are fewer on a site. Guidelines for installing separators suggest that they should be installed upstream of any detention facilities, so they would need to be placed before the inlet(s) to the proposed storm water detention vaults.

(c) Approval Process. The design of all long-term water quality protection measures to be incorporated into the SWPPP would be the responsibility of the project applicant, subject to approval by the City Engineer. Selection of the appropriate source control and pre-discharge treatment measures, as well as establishment of a long-term maintenance and operation program, would need to be closely coordinated with the City to confirm that the plan conforms with current state and federal clean water goals. The project applicant would be required to enter into an agreement with the City to ensure ongoing maintenance and performance responsibility for all permanent storm water control measures.

Supplemental Mitigation. No significant impact has been identified; no mitigation is required.

¹Lynch, personal communication, February 13, 2006.

