

CHAPTER THREE

Hylebos Browns/Dash Point Basin

3.1 BASIN CHARACTERISTICS

The Browns-Dash Point and Hylebos drainage basins are both located in northern Pierce County within the *Puyallup Water Resource Inventory Area 10* (WRIA). Irrespective of their inclusion in WRIA 10, both basins flow directly into Puget Sound (Commencement Bay, East Passage and the Hylebos Waterway) rather than into the Puyallup River. The Hylebos Basin covers 29 square miles (18,625 acres), and the Browns-Dash Point Basin covers 15 square miles (9,589 acres). Both drainage basins straddle the Pierce/King County boundary. Because of incorporations by the cities of Tacoma, Fife and Edgewood, there is relatively little area of each drainage basin that is in unincorporated Pierce County. Within the Browns-Dash Point Basin, 758 acres (7.9% of the basin area) are in unincorporated Pierce County. Within the Hylebos Basin, 950 acres (5.1% of the area) are in unincorporated Pierce County.

3.1.1 Browns Dash Point Drainage

The Browns-Dash Point Basin is located upon a “peninsula-like” feature northeast of the city of Tacoma. It slopes gently to the west to Puget Sound, and more steeply toward the southwest to Commencement Bay. The study area is comprised of several smaller drainages. Most of these drainages begin near the top of the bluffs and drain to ravines which discharge directly into Puget Sound. There are a total of 28 stormwater outfalls in the study area that have been identified as discharging directly to Puget Sound. There are some headwaters in the northern part of the study area that discharge north into King County before flowing into the Puget Sound. In addition, a significant amount of flow enters the study area from upstream tributary areas that are within the city of Tacoma.

3.1.2 Hylebos Basin

Two major tributaries of Hylebos Creek, the West and East Forks, originate in King County. The forks are on the west and east sides of Interstate 5 and join south of the King/Pierce County border, along the eastern edge of I-5. Surprise Lake, located in the city of Milton, feeds another major tributary that joins Hylebos Creek near where it turns northwest and crosses under SR 99.

The headwaters of the West Fork of the Hylebos are in King County in the city of Federal Way, near South 320th Street. Drainage areas in the headwater areas are highly developed with commercial land uses. The West Fork has two significant tributaries. The western tributary extends to “The Commons” (SeaTac Mall) and Panther Lake. The two branches converge in a protected area near Brook Lake in Hylebos State Park. The West Fork continues south through private, undeveloped, large lots west of SR 99 and then crosses under SR 99 to merge with the East Fork in an area known as Spring Valley. Hylebos Creek enters Pierce County and the city of Milton at the northern end of 2nd Avenue near Birch Street. Spring Valley is mostly pasture land, large lots with hobby farms, cemeteries, parks, and open space. Hylebos Creek in Spring Valley has some of the best fish habitat, including spawning areas in the entire Basin.

The East Fork of Hylebos Creek begins in King County near North Lake and Lake Killarney, and flows southward to the confluence with the West Fork. The East Fork Subbasin is relatively narrow, with the eastern edge running just to the east of the lakes. Interstate-5 (I-5) typically constitutes the western edge, except for a small strip to the west of I-5 in the northern part of the subbasin. This small strip may have originally been a tributary to the West Fork but has been rerouted to the East Fork by commercial development or freeway construction. Generally, the East Fork subbasin is less developed than the West Fork subbasin, although significant residential development has occurred in the northern portion of the East Fork subbasin in the last ten years. South of State Route 161 (SR 161), the East Fork flows in a narrow ravine which affords the stream some protection from surrounding land uses. An abandoned railroad grade follows the ravine. The Creek flows about 2,000 feet before entering the city of Milton near 7th Avenue. After crossing under 5th Avenue, the East Fork flows through a broad floodplain with extensive commercial development, then joins the West Fork in Spring Valley. The lower main stem of the Hylebos begins at the confluence of the West and East forks on the Puyallup Valley floor. The lower stem flows approximately 1000 feet before crossing back into unincorporated Pierce County.

Surprise Lake, located in the city of Milton, is another significant tributary to the main stem. After crossing under Freeman Road, the Surprise Lake tributary is highly altered and channelized, following man-made agricultural and development drainage pathways that have been in-place for many years. The city of Fife is currently proposing to construct a new park facility with ball fields (Pacific National Soccer Park), along the Surprise Lake tributary, just to the east of I-5. After crossing under I-5, the Surprise Lake tributary joins the Hylebos where the lower main stem turns northwest and crosses under Pacific Highway 99 (SR 99). The lower main stem then flows along the very northern edge of the Puyallup Valley floor, following very closely along the base of Fife Heights, the hillside on the north side of the valley. This portion of the main stem also receives lateral inflows from tributary areas located within the city of Fife on the west.

The stormwater system in the unincorporated study area portion of the Hylebos Basin consists of pipes and channels mainly in the Fife Heights area. According to Pierce County GIS, there are at least five storm drain outfalls that discharge directly to Hylebos Creek. Drainage problems in the Hylebos Creek study area are typically the result of natural drainage paths being filled or erosion due to increased runoff from development. Channel erosion is evident in the ravines draining Fife Heights.

3.2 LAND USE WITHIN HYLEBOS BROWNS/DASH POINT BASIN

To assess the hydrologic characteristics of a basin and determine the potential for water quality/quantity problems, requires an accurate understanding of the basin's existing and proposed land uses. This section will look at both the existing and future land use of this basin.

3.2.1 Existing Land Use - Browns/Dash Point Drainage Basin

Land use in the Browns-Dash Point Basin has long been residential. Development in the area did not occur in a comprehensive manner, but rather on a lot-by-lot basis. Most of the drainage infrastructure consists of open roadside ditches and pieced together pipe systems that were designed to meet the needs of the individual projects for which they were installed. Retention and detention ponds were not used, since most development occurred prior to the requirement for detention.

The Browns-Dash Point Basin is located within the Pierce County *Urban Growth Area*. The study area is primarily zoned moderate density single-family residential with a small area of mixed use for a neighborhood center. Actual land use is approximately 56% residential as depicted in *Table 3-1*.

The basin is approaching full build-out with the highest levels of development along the shorelines. land, there are larger tracts of land that may ultimately be developed. However, these parcels tend to include steep slopes, streams and other environmental constraints that will delay, or possibly limit their development.

Existing Land Use	Area (acres)	Percent of Basin
Commercial/Industrial	5.5	0.8
Open Spaces/Resource Lands	19.6	3.0
Public Places/Religious Centers	50.5	7.6
Residential	368.4	55.7
Transportation	4.9	0.7
Vacant/Undefined	213.1	32.2

The undeveloped area includes a large area abutting the King County border that is designated as vacant, but is likely part of the Dash Point State park. This area accounts for approximately 17% of the basin. If this area were to remain vacant, the amount of developable (vacant, underdeveloped, or redevelopable) land is much less than the remaining 43%. Using the standard assumptions developed for the 2002 *Buildable Lands Report*, of the remaining developable land area, only 40% of that remaining 43% is considered available for development; a total of 113 acres. The rest is unavailable due to constraints such as critical areas, road and right.

3.2.2 Existing Land Use - Hylebos Drainage Basin

The Hylebos Basin study area is located within the Pierce County *Urban Growth Area*. The study area is zoned primarily single-family residential with small areas of mixed use and commercial activity as illustrated in *Table 3-2*. Actual land use is approximately 57% residential.

Existing Land Use	Area (acres)	Percent of Basin
Commercial/Industrial	41.6	5.0
Open Spaces/Resource Lands	18.9	2.2
Public Places/Religious Centers	4.3	0.5
Residential	479.1	57.1
Transportation	8.2	1.0
Vacant/Undefined	286.5	34.2

The Fife Heights area has a number of larger tracts of land that are not yet developed to full zoning density. Portions of the undeveloped area include steep slopes, streams and other environmental constraints that could preclude their development. Approximately 58% of the study area is vacant or underdeveloped. Of the remaining developable land area, only 40% is considered available for development; a total of 195 acres. The rest is unavailable due to constraints such as critical areas, road and right of way construction, and public facilities.

3.2.3 Future Land Use

The Washington state “Growth Management Act” (GMA) mandates that comprehensive plans be internally consistent (Revised Code of Washington (RCW) 36.70A.070), and that counties perform their activities and make capital budget decisions in conformity with their comprehensive plans (RCW 36.70A.120). Because basin plans recommend capital improvement projects and form the basis of the annual capital budget for the *County Storm Drainage and Surface Water Management Utility*, basin plan recommendations are required to be consistent with the *Pierce County Comprehensive Plan*. Basin plans are also used to formulate the longer-term (six-year) capital improvement plan, also known as the “Capital Facilities Element” of the County Comprehensive Plan.

Land use activities, determined by the County Comprehensive Plan and implementing regulations, can influence stormwater management infrastructure needs. The design of new facilities usually takes into account the impacts of zoning on potential future development within an area. “Critical Areas” designations are used to determine the suitability of potential sites for stormwater facilities, such as infiltration ponds (aquifer recharge areas) or natural stormwater detention sites (wetlands and riparian corridors). Information in basin plans can influence land use too. In example, a basin plan might identify areas such as potholes where development could be restricted.

3.3 FLOOD CHARACTERISTICS

The months of November, December, and January have very high stream flows due to winter rainfall. The mountain snow pack plays a strong role in controlling summer flow conditions. The low-flow month generally is August; most of the snow has melted and precipitation is very low during the months of July and August, on average. *Table 3-3* describes the stream reach characteristics typical for this basin. *Table 3-4* presents the modeled peak flows in cubic feet per second (cfs) for various stream reaches within the basin. By understanding the potential flood condition for a specific area, it better enables the County to identify mitigation alternatives appropriate for the level of risk for that stream or reach.

3.3.1 Known Flood Hazards

Figure 3-1 shows floodplains and wetlands in the Browns-Dash Point Basin. The floodplain boundaries are based on 1995 Federal Emergency Management Agency (FEMA) Q3 Flood Data. The data is derived from the FEMA Flood Insurance Rate Maps (FIRMS). The “A Zone” represents a 100-year flood hazard area; an area estimated to have a 1% chance of flooding in any given year, or a 1-in-100 year chance. The “X500 Zone” (formerly referred to as “B Zone”) represents the 500-year flood hazard area; an area estimated to have a 0.2% chance of flooding in any given year, or an area with a high-risk of flooding that has a small drainage basin (less than one square mile). The Browns-Dash Point Basin has a mapped “A Zone” flood hazard area along the Commencement Bay and Hylebos Waterway shoreline that illustrates areas of potential coastal flooding. This is the only mapped flood zone area in the study area.

As shown on *Figure 3-1*, the Hylebos Basin has a large mapped 100-year floodplain associated with the lower Hylebos, downstream of the confluence of the West and East Fork. Flood hazard areas are currently being reevaluated by FEMA. Mapped flood hazard areas may be expanded to include more lands within the incorporated Pierce County area of the Basin.

**TABLE 3-3
HYLEBOS BROWNS/DASH POINT BASIN
STREAM REACH CHARACTERISTICS**

Stream Reach Identifier	Slope	Channel Type	Flow Regime
Browns Dash Point Basin			
BDP1-R1	3.7%	Moderate Gradient contained	Perennial
BDP1-R2	12%	High Gradient Contained	Intermittent
BDP1-R3	6%	Moderate Gradient contained	Intermittent
BDP1-R4	3.4%	Moderate Gradient contained	Intermittent
BDP1-R5	7.5%	High Gradient Contained	Intermittent
BDP1-R6	9.7%	High Gradient Contained	Intermittent
BDP1-R7	8.6%	High Gradient Contained	Intermittent
BDP4-R1	11.3%	High Gradient Contained	Intermittent
BDP7-R1	19.7%	High Gradient Contained	Intermittent
BDP8-R1	14.1%	High Gradient Contained	Intermittent
Hylebos Basin			
LH1-R1	0.5%	Estuarine	Perennial
LH1-R2	3.5%	Palustrine	Perennial
LH1-R3	0%	Palustrine	Perennial
LH1-R4	0%	Palustrine	Perennial
LH1-R5	33.3%	High Gradient Contained	Intermittent
LH1-R6	0%	Palustrine	Perennial
LH1-R7	31.9%	High Gradient Contained	Intermittent
LH1-R8	0%	Palustrine	Perennial
LH1-R9	25%	High Gradient Contained	Perennial
LH1-R10	0%	Palustrine	Perennial
LH1-R11	0%	Palustrine	Perennial
LH1-R12	18.3%	High Gradient Contained	Intermittent
LH1-R13	0.6%	Floodplain	Perennial
LH1-R14	0%	Palustrine	Perennial
LH1-R15	0%	Palustrine	Perennial
LH1-R16	35%	High Gradient Contained	Intermittent
SL1-R1	-0.1%	Palustrine	Perennial
SL1-R2	0.2%	Palustrine	Perennial
EH1-R1	1.5%	Floodplain	Perennial
WHI-R1	0.4%	Palustrine	Perennial

**TABLE 3-4
HYLEBOS BROWNS/DASH POINT BASIN
WATERCOURSE FLOW CHARACTERISTICS**

Watercourse	Subbasin	Modeled Existing Conditions Peak Flows (cfs)		
		10-Year	25-Year	100-Year
Browns/Dash Point				
BDP-2	A	3.09	4.31	6.14
BDP-3	D	29.74	41.74	59.90
BDP-6	A	1.64	2.18	2.97
BDP-7	A	5.31	6.89	9.17
BDP-7a	A	1.22	1.49	1.88
BDP-8	A	0.50	0.75	1.12
Hylebos				
H-1	C	4.19	5.83	8.29
H-2	D	6.23	9.13	13.60

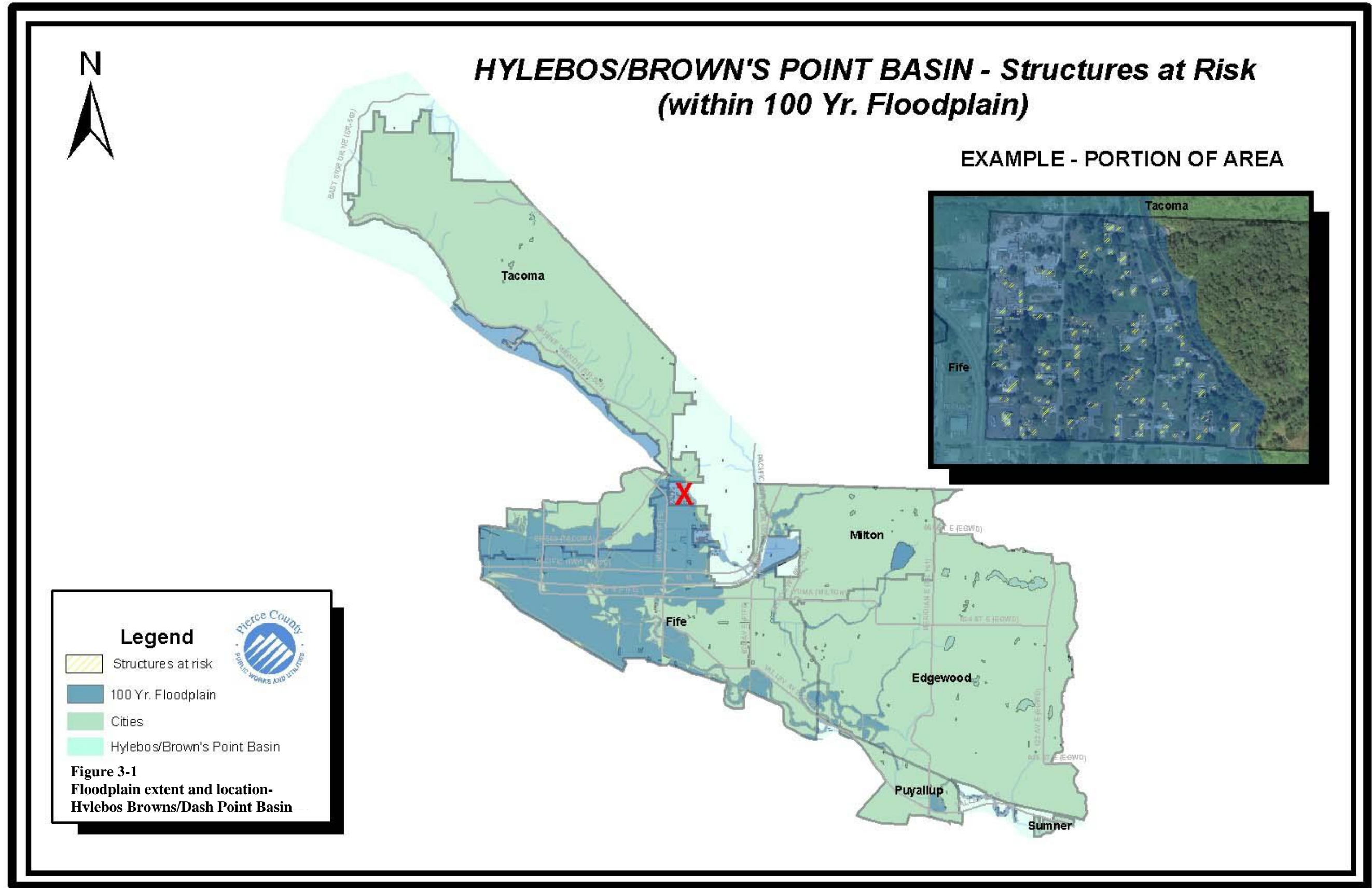
Pierce County wetland inventory maps show one large “Category 2” wetland (~ 64 acres) which correlates to the floodplain area, and eight uncategorized wetlands (~15 acres). The categories represented on the figure were assigned pursuant to Pierce County *Critical Area Regulations* that were effective until March 1, 2005. A “Category 2” wetland under that system was typically a larger wetland with significant habitat and diversity of vegetation classes. If the wetland is reevaluated under current rating criteria that category may change. Current rating criteria for wetlands are contained within *Section 18E.30.70, Pierce County Code Title 18E, “Appendix A”* and the *Washington State Wetland Rating System for Western Washington*, revised April 2004 (Ecology Publication #04-06-025). The wetland inventory does not contain all wetlands within Pierce County; there may be additional wetlands in the Basin that are not yet mapped.

3.3.2 Causes of Flooding

Generally, the problems observed within this basin planning area include flooding caused by the absence of drainage facilities, undersized facilities, inadequate maintenance of existing facilities, and erosion of natural drainage channels by increased peak flows and durations. These problems are typical of areas built prior to comprehensive site development stormwater regulations and areas that contain small projects built incrementally without master drainage planning. Many of the older site drainage improvements were sized with limited hydrologic and hydraulic analysis which may not have anticipated upstream development or flows from other jurisdictions. These would not meet current design standards. Some flooding has resulted from access constraints limiting Pierce County Water Programs Division’s ability to conduct maintenance activities. These constraints include lack of easements, or the inability to access easements due to encroachment by adjoining property owners. A more detailed breakdown of flooding problems within each drainage area is described below.

Browns Dash Point Drainage

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Hylebos Basin

Drainage, flooding, and erosion problems in the unincorporated Pierce County portions of the Hylebos Basin are typically related to increased runoff from development in the Fife Heights area or to floodplain filling along lower Hylebos Creek. The most significant flooding on lower Hylebos Creek occurs where the channel makes its turn to the northwest, comes close to, and then crosses under I-5 and Hwy 99.

During the 1996 and 1997 flood events, floodwaters encroached into the outer lanes of I-5 at this location. At this location, Hylebos Creek is confined to a narrow channel lined with ecology blocks and is forced to make a series of sharp degree turns. East of I-5, large fields and some houses were flooded during the 1996 and 1997 events. This flooding followed the Surprise Lake drainage path downstream to the confluence with the Hylebos main stem, west of I-5. At this location, a new SR 167 interchange is proposed by Washington State Department of Transportation (WSDOT).

Proposed WSDOT improvements to SR 167 include construction of a four-lane freeway. The two general-purpose lanes in each direction and high occupancy vehicle lanes would extend SR 167 from its junction with SR 161 to SR 509. Access to the new facility would be provided at interchanges in key locations: SR 509, 54th Avenue (partial interchange), I-5, Valley Avenue East, and SR 161. Early right of way acquisitions began in 2001 and construction could begin in 2009-2010. The project would include significant riparian restoration for stormwater management in the Hylebos Creek areas in north Pierce County (www.wsdot.wa.gov/Projects/SR167/TacomaToEdgewood, July 13, 2005). Some of the problems discussed below lie in areas that would be affected by the SR 167 project.

3.4 FLOOD IMPACTS

Flooding within the Hylebos Browns/Dash Point Basin planning area can have numerous impacts on the on the way of life within this basin, and Pierce County in general. Under this section, we will assess the vulnerability of the basins, improved property, critical facilities, and assess the impact a flooding on the Basin's population and economy.

3.4.1 Public Safety and Health

The type of flooding typical for this basin would be classified as urban stream/ground water types of flooding. Urban stream/groundwater flooding occurs when runoff exceeds the conveyance capacity of natural and manmade drainage systems, and typically occurs with moderate- to high-intensity storms that can last for several days or occur in succession over a period of weeks. For some streams, flooding inundates broad areas for lengths of 1,000 to 3,500 feet, and longer in some cases. Floodwater can be high, and flooding can last for several days until rainfall and saturated soil moisture conditions subside.

There have been historical occurrences of flooding within the Hylebos Browns/Dash Point Basin. However, in comparison to flood events and total damages within other basins within Pierce County, these losses and associated damages are a small percentage of the overall damages. Since the early

1960's, there have been no reports of fatalities immediately caused by flooding within this basin. Since the land uses within this basin are predominantly residential or vacant lands, the potential impact flooding can have on public health and safety within this basin would focus on potential damage to private property and life safety issues dealing with the use of potentially impacted infrastructure.

These potential impacts could be reduced via informing the public of the potential for flood damages within the basin, and refining or establishing procedures for early warning within the basin. There currently is no “real-time” flood threat recognition capability within this basin. However, it should be noted that Pierce County has been able to successfully avoid significant damages within this basin by its field monitoring protocol and physical presence within the basin during events that could cause flooding based on its flood threat recognition capability for larger watersheds within Pierce County.

According to 2000 census data, the population in the study area (which was calculated within unincorporated Pierce County only) was 2,027. In 2004, the population was estimated to be 2,163 or an approximately 7% overall increase (1.8% per year increase). According to estimates made by Pierce County Public Works and Utilities staff as part of the *Traffic Fee Impact Study* in Spring 2005, the population in the study area is projected to increase to 3,533 by the year 2025 (Shawn Phelps, personal communication) an approximately 63% over a 21-year period (3% average increase annually). The area is projected to increase from a total of 951 households in 2004, to 1380 households in 2025.

3.4.2 Critical Facilities

Using the parameters to define “Critical Facilities” discussed in Chapter One, Pierce County Water Programs coordinated with Pierce County Emergency management to identify the critical facilities that could be impacted by flooding within the Hylebos Browns/Dash Point Basin, as listed in *Table 3-5*. The basis for this determination is: physical location within a mapped or known floodplain; a known history of flooding; and the lack flood protection to the facility. These are facilities that are considered to be vulnerable and in need of an action(s) to mitigate the impacts of flooding. It should be noted that this list does not include critical “infrastructure”.

Since the Pierce County *Basin Planning Program* has such a strong capital facilities component, it has been assumed that critical infrastructure with vulnerability to flooding within each basin will be adequately addressed through basin planning “problem assessment and action prioritization process.” A detailed assessment of these facilities is not provided in this risk assessment for security purposes.

Pierce County Emergency management has performed this assessment as part of the countywide *Hazard Mitigation Plan* prepared pursuant to the “Disaster Mitigation Act.” The focus of the *Basin Planning Program* as it pertains to critical facilities will be to attempt to provide flood protection to potentially vulnerable critical facilities through the structural approach identified as “Actions” in the basin planning process. Non-structural approaches will be directed by the countywide *Hazard Mitigation Plan*. It is a high-priority of both programs to provide protection to critical facilities, and both programs are committed to working together to achieve this objective.

TABLE 3-5 HYLEBOS BROWNS/DASH POINT BASIN CRITICAL FACILITIES IN THE 100-YEAR FLOODPLAIN					
Medical and Health Services	Government Function	Hazardous Materials	Schools	Other	Total
1	3	0	2	1	7

3.4.3 Structures Impacted

Table 3-6 shows an estimate of the number of structures on parcels in the floodplain using Planimetric data available for this basin. To identify the potential dollar/loss exposure for the basin, assessed values for improvements to each of the parcels with structures located within the 100-year floodplain were accumulated by subbasin. This value is representative of the exposure.

To accurately gauge vulnerability, depth of flooding must be identified to apply FEMA’s depth/damage functions to this exposure. This detail of information was not available at the time of the preparation of this assessment. However, total exposure values can be a good gauge of potential flood impact for planning purposes, and for identifying potential project benefits when prioritizing mitigation actions.

TABLE 3-6 HYLEBOS BROWNS/DASH POINT STRUCTURES WITHIN THE 100-YEAR FLOODPLAIN					
Subbasin	Structure Type			Total	Market Improvement Value
	Commercial	Dwelling	Other		
Browns/Dash Point	3	164	2	169	\$13,772,249
Hylebos	22	218	7	247	\$20,958,251
Total	25	382	9	416	\$34,730,500.00

3.4.4 Repetitive Loss Areas

Utilizing the definition of “Repetitive Loss” under the federal FEMA “Community Rating System” (CRS), there are no identified repetitive loss properties within this basin. Therefore, there are no associated repetitive loss areas within this basin.

3.4.5 Insurance Analysis

Flood insurance statistics can help identify vulnerability by regionally isolating areas where claim activity is high and a high rate of flood insurance is in force. Table 3-7 summarizes vital insurance statistics that can be used to help identify vulnerability within the Hylebos Browns/Dash Point. The locations of these policies are identified in Figure 1-2.

**TABLE 3-7
HYLEBOS BROWNS/DASH POINT BASIN
FLOOD INSURANCE STATISTICS**

Number of flood insurance policies in force within the basin (as of May 1, 2007)	82
Number of Policies within a mapped floodplain (FIRM)	40
Number of Policies outside of a mapped floodplain	42
Number of Claims filed within the basin	11
Number of claims filed for losses outside the 100-year floodplain	8
Estimated number of insurable, primary Structures in mapped floodplains	407
Estimated % of at risk structures with flood insurance coverage	9.83%
% of current flood insurance coverage outside of a mapped floodplain	52.5%

Based on a review of this data, the following observations can be made:

- Based on the approximate number of primary, insurable structures in the floodplain, and the insurance coverage in force within the floodplain, insurance coverage as a form of mitigation appears to be well below the national average. According to a study being conducted for the NFIP by the Rand Corporation, nationwide about 49% of single-family homes in Special Flood Hazard Areas (SFHAs) are covered by flood insurance.
- With 51.7% of the current policies in force located outside of a mapped floodplain, there appears to be some flooding issues within this basin not addressed via the existing mapping. These could be drainage related flood issues that the Pierce County Water Programs “Basin Planning Program” seeks out that typically are not captured through standardized floodplain mapping techniques.
- The majority of the historical claims filed within this basin have been outside of a mapped floodplain. This once again, suggests that there are flooding issues within this basin not addressed through flood hazard mapping.
- Flood insurance needs to continue to be promoted within this basin as a means to protect private property interests at risk to flooding.